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**The influence of values on environmental behaviour: an evaluation of a segmentation
approach**

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Doctor of Philosophy

March 2019

Keele University

Abstract

It is in human interest to protect planet Earth by engaging in pro-environmental behaviour (PEB), yet many people are not doing so. Although the values we endorse are thought to influence PEB, relatively little research has considered the impact of endorsing *multiple* and *conflicting* values on environmental outcomes. To this end, this thesis evaluates whether segmenting (grouping) people based upon the importance they attribute to biospheric, altruistic, egoistic, and hedonic values, can help explain PEB. Based on over 7400 participants from eight countries, four segments of people were consistently identified who endorsed different combinations of these values. Differences were found between these segments regarding their preferences for environmental campaigns, and their self-reported pro-environmental intentions and behaviour. The values-based segmentation may also be used as a tool to shape behaviour, as it was found that tailoring campaigns to be congruent with the values endorsed by each of the segments, increased PEB more than non-tailored campaigns. Overall, the findings suggest that a values-based segmentation can aid our *understanding* of PEB, and is an effective mechanism for shaping it.

Key words: Values, Environmental Behaviour, Segmentation.

Table of Contents

Chapter 1. Environmental Behaviour, Values, and Segmentation Approaches: Introduction and Literature Review

General Introduction	1
Environmental Behaviour	4
Values	13
Segmentation	23
Summary	34

Chapter 2. An Initial Test of a Values-based Segmentation for Understanding Recycling Behaviour

Abstract	41
Introduction	42
Method	51
Results	53
Discussion	60

Chapter 3. Replicating and Enhancing a Values-Based Segmentation Model in the UK and in Brazil

Abstract	72
Introduction	73
Method	86
Results	90
Discussion	108

Chapter 4. The Profile of the Segmented Groups: Investigating the Geodemographic Differences between Segmentation Groups

Abstract	121
Introduction	122
Method	134
Results	137
Discussion	147

Chapter 5. Extending a Values-Based Segmentation Model: The Inclusion of a Wider Range of Environmental Outcomes and Group's Preferences for Tailored Communication

Abstract	159
Introduction	160
Method	174
Results	178
Discussion	197

Chapter 6. Integrating Theoretical Approaches: How the Segmentation Groups Perform on Determinants of Environmental Behaviour Proposed by Other Models

Abstract	212
Introduction	213
Method	222
Results	224
Discussion	231

Chapter 7. Utilising the Segmentation Approach in an Applied Setting: An Intervention to Increase Recycling

Abstract	238
Introduction	239
Method	262
Results	264
Discussion	267

Chapter 8. General Discussion

Summary of Findings	273
Relation of Findings to Previous Literature	274
<i>Which Values should be Included in a Values-Based Segmentation?</i>	274
<i>Is a Values-Based Segmentation Approach Replicable Within and Between Cultures?</i>	281
<i>Do the Segmentation Groups Differ on a Range of Environmental Outcomes?</i>	285
<i>Do Moral Norms Mediate the Relationship Between the Cluster Groups and Environmental Behaviour?</i>	294
<i>Can the Values-Based Segmentation Approach be used as a Basis to Shape Environmental Behaviour?</i>	295
Methodological Issues and Limitations	296
Suggestions for Future Research	304
Implications for Outside of Academia	307
Contribution to Environmental Psychology and Related Fields	309
Conclusion	310

References

Appendices

Table of Figures

Figure 1.1.	Representation of the VBN model proposed by Stern (2000)	11
Figure 1.2.	Value-domains and Value-types proposed by Schwartz (1992)	17
Figure 4.1.	Proportion of males and females in each of the cluster groups	143
Figure 4.2.	The percentages showing the highest education level taken of members in each of the cluster groups	144
Figure 4.3.	The percentages of people associated with each cluster group in each country	146
Figure 5.1.	Mean and standard deviation of the sample's performance of six environmental behaviours	180
Figure 5.2.	Means (and standard deviation) showing the appeal of the tailored posters as rated by the four segmentation groups	191
Figure 5.3.	Means (and standard deviation) showing the motivation provided by the tailored posters as rated by the four segmentation groups	195
Figure 6.1.	The sample's scores relating to six determinants of recycling behaviour	225
Figure 6.2.	Scores on the determinants of recycling from the four segmented groups	230
Figure 7.1.	The change in recycling behaviour reported by participants in the tailored and non-tailored conditions	266
Figure 7.2.	Self-reported usefulness of the app from participants in the tailored and not-tailored conditions	266

Table of Tables

Table 2.1.	Standardised values scores for each of the cluster groups	57
Table 2.2.	Means (and standard deviations) of moral norms and recycling for the cluster groups	57
Table 2.3.	The Direct and Indirect Effects of Cluster Group Membership on Recycling Behaviour	59
Table 3.1.	Mean values scores (and standard deviations) for the UK and Brazilian samples	92
Table 3.2.	Mean scores (and standard deviations) for the three environmental outcomes for the UK, Brazilian and combined samples	93
Table 3.3.	Standardised values scores for each of the cluster groups found in the UK sample	97
Table 3.4.	Standardised values scores for each of the cluster groups found in the Brazilian sample	98
Table 3.5.	Means (and standard deviations) of moral norms, recycling and green product purchase for the cluster groups in the UK	99
Table 3.6.	Means (and standard deviations) of moral norms, recycling and green product purchase for the cluster groups in the Brazil	101
Table 3.7.	The direct and indirect effects of cluster group membership on recycling for the UK sample	103
Table 3.8.	The direct and indirect effects of cluster group membership on green product purchase for the UK sample	104
Table 3.9.	The direct and indirect effects of cluster group membership on recycling for the Brazilian sample	105
Table 3.10.	The direct and indirect effects of cluster group membership on green product purchase for the Brazilian sample	106
Table 4.1.	A table to show the standardised values scores for each of the cluster groups	140
Table 4.2.	Means (and standard deviations) of intentions relating to car use and sustainable energy use for the cluster groups identified from the values-based segmentation	141

Table 5.1.	Beta co-efficients to show the strength of the effect of values on six environmental behaviours	182
Table 5.2.	Standardised values scores for each of the cluster groups	183
Table 5.3.	Segmentation groups' mean score (and standard deviation) on environmental behaviours and moral norms	184
Table 5.4.	Direct and Indirect effects of cluster group membership on recycling, green product purchase and re-use of carrier bags	187
Table 5.5.	Direct and Indirect effects of cluster group membership on Re-use of everyday items, using re-usable cups, and buying imperfect vegetables	188
Table 6.1.	Beta-coefficients for values when predicting determinants of recycling	226
Table 6.2.	Standardised values scores for each of the cluster groups	228
Table 8.1.	Beta co-efficients from multiple regressions of biospheric, altruistic, egoistic and hedonic values predicting environmental outcomes	276
Table 8.2.	Cluster group size and scores (standardised) on biospheric, altruistic, egoistic and hedonic values	283
Table 8.3.	An interpretation of the groups' performances regarding values, psychological determinants of behaviours, intentions and self-reported behaviour	293
Table 8.4.	Effect Size and Observed Power of the Analyses Completed in this Thesis	298

Acknowledgements

First, I would like to thank Prof. Linda Steg and Dr Judith de Groot for sharing their data on which I performed a secondary analysis in Chapter 4 of this thesis. I would also like to acknowledge Keele University for awarding me the funds to work towards a PhD. I would like to thank my supervisor Dr Chris Stiff for his time and patience. I appreciate the feedback you have given me throughout my studies. I also appreciate the space you have afforded me to make and learn from my own mistakes, and to take the work in the direction of my choosing. Finally, I am grateful that you encouraged me to explore other academic opportunities alongside my PhD, these have led to some great experiences during my time at Keele.

I would also like to thank Dr John Hegarty: Your unwavering belief in me, tremendous kindness, and relentless 'championing' of me at every opportunity, has been genuinely touching. Your anecdotes and 'wise words' have provided me with many life lessons that will stay with me beyond academia. It was your Open Day speech that first made me want to come to Keele; your warmth shone through then, as it still does now. I'd also like to thank Dr Claire Fox for her practical help with some of the analyses, and offering words of 'gentle encouragement' when it was needed. I would like to thank many of the other PhD students and staff at Keele for their friendliness and helpfulness, especially Dan Herron, for making 'those long days in the office' go that little bit quicker. I would also like to mention Dave and Jayne Parnham, Dougie Potter, Dr Ian Baxter, Tina Yemm, Andy Bennett, 'Wilberforce' Walne, and Grant Warrender. Without ever expecting anything in return, you have all gone above and beyond to help me.

Special thanks are reserved for my closest friends, especially Adam Larkin: Playing FIFA and generally clowning around every night meant coming back to the flat in the evenings was something I always looked forward to. I also owe a great deal of gratitude to Donna Berry. Looking back, it was this PhD that first brought us together. Since then, the support you have given me has been unrivalled, but more than this, you have made me smile and laugh-out-loud every day we have been together. Finally, I would like to thank my Mum and Dad for 'being there' while I have been working towards this PhD, and throughout my life. Your unconditional support is a constant source of motivation and happiness. Thank you for all that you have done for me.

Chapter 1. Environmental Behaviour, Values, and Segmentation Approaches:

Introduction and Literature Review

This thesis investigates how segmenting (grouping) people based upon the values they endorse can help explain and shape environmental behaviour. Drawing heavily upon Value-Belief-Norm Theory (Stern, 2000), empirical work demonstrating the link between values and environmental behaviour (e.g. De Groot & Steg, 2008), and research considering multiple motivations for engaging in environmental action (e.g. Goal Framing Theory; Lindenberg, 2001), this thesis explores how segments of the population that endorse multiple, and sometimes divergent values, differ on a range of environmental outcomes.

After outlining the importance of this work, this chapter is split into three sections that relate to the three main themes of this work: *environmental behaviour* (section 1.2), *values* (section 1.3), and *segmentation* (section 1.4). In each section, a *definition*, *methodological issues*, and *background and context*, will be discussed. Finally, section 1.5 of this chapter will provide a summary of the reviewed literature, outline the primary research aims of the thesis, and summarise the content of each of the following chapters.

1.1. General Introduction

The quality of the Earth's environment is dependent on human behaviour: as a species, we can solve, but also cause, many of the environmental problems plaguing planet Earth (Gardner & Stern, 2002; Nickerson, 2003). Since the late 19th century the planet's average surface temperature has risen by 1.1 degrees Celsius (National Centers for Environmental Information, 2017). Oceans have absorbed some of this heat, resulting in the temperature of the top 700 metres of ocean rising by 0.3 degrees Fahrenheit since 1969 (Levitus, Antonov, Boyer, Locarnini, Garcia, & Mishonov, 2009). This has contributed

to the decline of sea ice in the Arctic, and ice sheets in Antarctica, the latter of which has suffered from the loss of 152 cubic kilometres (36 cubic miles) of ice in three years (Polyak et.al., 2009). Other islands and low-lying lands are also under threat due to rising sea levels. Globally, the seas have risen eight-inches in the last century; with the rate of the sea-rise relating to two decades either side of the millennium, double that of the previous eight decades (Church & White, 2006).

The change in temperature has also resulted in an increase in extreme weather events such as floods, storms and wildfires (Kunkel et al., 2013). These events have serious consequences for the people and the eco-system in these areas with, on average, 21.5 million people being temporarily or permanently displaced by weather-related hazards each year (International Displacement Monitoring Centre, 2016). Of these, 69% of people are from the world's poorest countries (Climate and Migration Coalition, 2017). Consequently, climate change is impacting everyone in the world, either directly through weather-related activity, or in more indirect ways such as through rising food prices (Worldwatch Institute: Vision for Sustainable World, 2017).

Many countries around the world are committing to agreements working towards controlling climate change and enhancing environmental sustainability (e.g. the Paris agreement; European Commission, 2017). Yet while currently 160 of the 197 countries at the Paris convention have gone on to ratify the agreement to pursue efforts to limit further temperature increases to only 1.5 degrees Celsius, some pockets of the public appear to be in a state of 'apocalypse fatigue' (Nordhaus & Shellenberger, 2009). Thus, while governments are setting themselves ambitious targets, such as the UK Government's domestic target of an 80% reduction in all greenhouse gases by 2050 (Department for Environmental, Food and Rural Affairs [DEFRA], 2008a), encouraging the

public to support the actions required to meet these aims, may also present a substantial challenge.

Taking the UK as an example, even well publicised ways to help the environment, such as recycling, do not receive unanimous support: while almost two-thirds of people in the UK (61%) claim to be committed recyclers, evidence from observation of on-street waste collections suggest around 10-25% of the UK population are non-recyclers (Jesson & Stone, 2009). Moreover, despite steady increases over the past decade, recycling waste from households fell by 0.9% from 2014 to 2015, the lowest levels since 2011 (Vaughan, 2016). This trend is worrying as increasing engagement with recycling is important as the energy required to manufacture goods made from recycled materials is much less than that of manufacturing from raw materials (University of Michigan, 2017).

More widely, public indifference, or worse still, opposition, to acting in an environmentally friendly manner can have serious consequences. For instance, protesting against 'green' solutions (e.g. policy, technology) can cause the delay or cancellation of constructions that can benefit the environment (e.g. wind farms; Toke, 2005). Furthermore, the failure to mitigate the effects of climate change by increasing support for environmentally friendly behaviours, policies, and technologies, may result in reduced environmental quality and further damage to nature.

'Environmental Quality' and 'Nature' are two key indicators of Quality of Life (QoL; Poortinga, Steg, & Vlek, 2004). This suggests our environment impacts upon our physical, mental, and social wellbeing. For example, a questionnaire study based on over 10'000 people in the Netherlands by De Vries, Verheij, Groenewegen and Spreeuwenberg (2003) found that individuals living within 3km of greenspace (e.g. a park, forest or public fields) reported better general health and have fewer health complaints than residents with less

greenspace around their homes.¹ In terms of societal benefits, involvement in nature-based social activities, such as community agriculture, has been linked to an individual's sense of belonging to a wider community, and people's feelings of empowerment (Bosworth & Hegarty, 2017). Consequently, as we shape the environment around us, we are, to an extent, shaping our own quality of life. Yet, people don't always act in the best interest of the environment by performing pro-environmental behaviours. One of the aims of this thesis is to investigate why this may be the case. The following section outlines theories and empirical work that attempt to explain environmental behaviour.

1.2. Environmental Behaviour

1.2.1. Definition. Environmental behaviour can be defined as “all types of behaviour that change the availability of materials or energy from the environmental or alter the structure and dynamics of ecosystems or the biosphere” (Steg & Vlek, 2009, p.309). Importantly this definition recognises that environmental behaviour may not stem from environmental motivations, and moreover, it recognises that behaviour can have a negative or positive impact on the environment. Therefore, ‘pro-environmental behaviour(s)’ positively change the availability of materials or energy and/or positively alter the structure and dynamics of ecosystems or the biosphere².

1.2.2. Methodological issues. While most studies set out to measure environmental *behaviour*, some scholars suggest that this may not reflect an individual's environmental *impact* (Gatersleben, Steg, & Vlek, 2002). These authors demonstrated

¹ These effects are found even when controlling for socioeconomic and demographic characteristics, as well as urbanity.

² The author recognises that researchers may have preferences for other terms such as ‘ecological behaviour’ instead of ‘environmental behaviour’, and ‘environmentally friendly behaviour’ instead of ‘pro-environmental behaviour’ as they may provide a more relevant description or have nuanced differences that are pertinent to their work. However, for ease and clarity, in this thesis these will be assumed as equivalent.

that while individuals may assess the average annual impact of a range of household activities as approximately equal (around 2.8 on a 5-point scale of environmental impact), the actual impact, measured in gigajoules can range from 7.2 for washing, to 47 for household heating. People do not seem to be able to differentiate between low and high impact behaviours, so researchers must take responsibility for concentrating on the behaviours which are having the biggest impact on the environment (Stern, 2000).

Another methodological issue is that environmental behaviours are difficult to measure objectively. For example, it is difficult to attribute pollution to an individual if they live in a household or shared accommodation (Vlek, 2000). Similarly, in terms of domestic recycling behaviour, as this is normally at a household level (or for a block of flats, or student housing), it is difficult to isolate the behaviour of one individual. A solution to this is to observe behaviour (e.g. weighing recycling). However, the intensive labour and resources required mean this is difficult to carry out, meaning observation studies are far less common than self-report (Bolderdijk, Knockaert, Steg & Verhoef, 2011; Nigbur, Lyons, & Uzzell, 2010).

Self-report is widely regarded as 'the next best thing' if it is not possible to collect objective data (Manfredo & Shelby, 1988; Tarrant & Cordell, 1997). Although this may mean accepting that answers could be subject to response bias, such as social desirability and measurement error (e.g. Félonneau & Becker, 2008). Steg, van den Berg and De Groot (2013) propose one way to circumnavigate this is to ask more specific questions (e.g. *how many* items have you recycled today?) rather than using more general statements such as 'I always perform behaviour X'.

However, adding a level of specificity to the questionnaire by making the measure more detailed and precise can make the subsequent analysis more difficult. This is

because greater specificity may result in higher variance as the day selected may not represent a 'typical day' for that individual. The author tests both specific and general approaches in this thesis, and discusses the implications of this in the general discussion. In addition to measurement issues, studies of environmental behaviours also differ regarding the theoretical framework they adopt. The next section reviews some of the most widely used theories and models employed to understand environmental behaviour.

1.2.3. Background and context. Darnton (2008) provides an overview of more than 60 theories and models that have been employed to explain behaviour including pro-social and pro-environmental acts. While the review is thorough, if more recently proposed theories, and variants of existing theories are included, the number of theories and models increases substantially over the 60 suggested. Scholars such as Jackson (2005) have commented on the size of the field, suggesting it is bordering on the unmanageable and needs serious consolidation. This review will focus predominantly on the most frequently used theories and models used to explain behaviour in environmental contexts.

Sopha (2011, cited in Klockner, 2013) identified these as being the Theory of Planned Behaviour (TPB, Ajzen, 1991), the Norm-Activation-Model (NAM, Schwartz, 1977; Schwartz & Howard, 1981), and the Value-Belief-Norm Theory (VBN, Stern, 2000). Sopha (2011) found 39% of all studies reviewed used the TPB as theoretical framework, 15% the NAM, 15% the VBN, while 13% combined variables from at least two of the theories. Together, these findings suggest 80%, or four out of five papers, use a minimum of one of the three theories. The following sections review each of these in turn.

1.2.3.1. The Theory of Planned Behaviour. The Theory of Planned Behaviour (TPB; Ajzen, 1991) is an extension of the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen in 1975. The TRA was one of the first rational choice models considered from a psychological perspective. Rational choice models suggest that information provides us with knowledge, which helps us form our attitudes and ultimately our actions (Kolmuss & Agyeman, 2002). These models suggest that people will choose an option that yields the highest benefits and lowest costs for themselves (Steg & Vlek, 2009). TPB states our attitudes, subjective norms (following a socially accepted option) and perceived behavioural control (our belief in our ability to perform a specific action) predict our intentions, which in turn predicts our behaviour.

Behaviour change campaigns that have attempted to manipulate variables associated with the TPB have had some success. Goldstein, Cialdini and Griskevicius (2008) show that manipulating a subjective norm by alerting individuals about other people's behaviour, in this case about towel use in hotels, could motivate people to modify their own behaviour. Klockner (2013) suggests this may be because the variables proposed in the TPB are more proximal to behaviour than other variables included in models that will be discussed later in this section. So TPB is a useful model for explaining maximal variance with minimal variables.

However, the TPB has also faced some stiff criticism, particularly surrounding the inconsistency of certain predictors that are included in the model, most notably subjective norms. Armitage and Conner (2001) in a meta-analysis of 185 studies using the TPB, found subjective norms to be a weak predictor of behaviour. The authors suggested poor measurement, and the need to expand the measure to better capture these norms, may account for its performance. Ravis and Sheeran (2003), further investigated the latter

point, and suggested that descriptive norms (subjective representations of other people's behaviour) should also be included alongside subjective norms in the model to increase its explanatory power. Their study of 333 undergraduates found descriptive norms to be equally as strong as subjective norms (Beta co-efficient =.13) at predicting exercise intention.

Another criticism of the TPB is that of the 185 studies reviewed in the meta-analysis by Armitage and Conner (2001), the TPB only accounted for 27% of the variance in behaviour. This may be because the TPB relies too heavily on rational choice and places too much emphasis on attitudinal aspects of the model. Other variables such as affective functions (e.g. dislike or pleasure) or norm-based considerations (e.g. morals) are not considered. To rectify this some researchers have considered integrating additional variables into the model (e.g. Boldero, 1995; Davies, Foxall & Pallister, 2002; Tonglet, Phillips & Read, 2004). This may be justified as when other factors have been included (e.g. personal norms, community concern, moral norms) they have been shown to increase the explanatory power of the model (Bamberg & Schmidt, 2003; Chu and Chiu, 2003; Harland, Staats & Wilke, 1999). As a specific example, Harland et al. (1999) found when including moral norms (a measure regarding an individual's perceived moral obligation to perform a behaviour) the explanatory power of the TPB increased from 47% to 58% regarding meat consumption.

This seems to suggest that measures of morality (e.g. moral norms) seem to increase the explanatory power of the model, and thus rational choice models are not sufficient on their own to predict environmental behaviour. This may be because environmental action is not only regulated from cost-benefit analysis but also by our beliefs about what is right or wrong. Thøgersen (1996), in a critical review of the literature

linking morality and recycling concluded that, models conceptualising environmental actions as altruistic behaviour may provide a more satisfying basis on which to build our understanding. One such model that gives considerable weight to moral considerations is the Norm Activation Model (NAM; Schwartz, 1977; Schwartz & Howard, 1981).

1.2.3.2. Norm Activation Model. Unlike the TPB, the NAM is not based upon rational choice, but instead suggests normative considerations influence pro-environmental action. The model was originally designed to explain pro-social behaviour (e.g. bystander interventions such as helping in an emergency). Therefore, unlike the TPB it was not designed to explain all types of behaviour, but those that were likely to be influenced by moral considerations. One of the fundamental assumptions put forward by the model is that people may act because they feel a moral obligation to do so. This is referred to as a moral norm (or a personal norm). Moral norms are the most integrated of norms; driven by our anticipated guilt, irrespective of the actions or beliefs of others. In the simplest terms, they are representations of our values for a given situation (Klockner, 2015).

The NAM states that moral norms do not necessarily just occur, but are in fact activated. The model suggests that an individual must recognise there is a problem; often coined 'problem awareness' or 'awareness of consequences'. This causes a person to realise there may be a genuine reason to consider acting. The individual must also consider the ascription of responsibility for the problem, such that they need to decide whether they attribute any of the problem to be a result of their actions. Interestingly, even if a person believes there is a need to act, and feels responsible, they may not act if they believe there is a low outcome efficacy (e.g. changing their behaviour will still not be

enough to solve the problem), or if they doubt their own ability to implement the change. Finally, only if these three steps are in place a person's moral norms will be activated.

The NAM features prominently in published work explaining behaviours and intentions for a range of environmental topics such as water conservation (Harland, Staats & Wilke, 1999) and travel choice. (Abrahamse, Steg, Gifford & Vlek, 2009; Eriksson, Garvill & Nordlund, 2006). However, while the model appears to predict behaviours when they are not constrained by external factors, when structural conditions change, the NAM becomes less predictive of environmental behaviours. To illustrate this, Black, Stern and Elworth (1985) found from a path analysis considering 478 residential energy customers, the effect of rising fuel prices was a better predictor of energy-related behaviours than personal variables such as moral norms. This suggests that while the NAM may be useful in some scenarios, its impact may be limited when contextual factors are considered.

Another criticism of the NAM is the lack of formalisation in the model. Whether the variables that are said to activate our moral norms do so sequentially or simultaneously has been the subject of much debate. For example, Harland, Staats and Wilke (2007) conceptualise the model differently to Hunecke, Blobaum, Matthies and Hoyer (2001), even though the papers research the same topic (transport use).

A further criticism with the NAM is that it considers specific behaviours. The model does not include variables relating to more general beliefs or abstract concepts (e.g. our values) and therefore may struggle to explain a wider range of behaviours. To address some of the issues raised, particularly regarding formalising the structure of the model and its omission of more general beliefs, Stern, Dietz, Abel, Guagnano, and Kalof (1999) proposed a theory that, while strongly linked to the NAM, extended its scope; this is called Value-Belief-Norm theory.

1.2.3.3. Value-Belief-Norm Theory. Value-Belief-Norm Theory was first formalised by Stern, Dietz, Abel, Guagnano, and Kalof (1999). The theory suggests that moral norms are likely to be activated not only by altruistic motives as suggested in the NAM, but also by other personal values relevant to an individual. While values are introduced in more detail in section 1.3 of this chapter, briefly it is thought that values relating to self-interest (egoistic values), altruism towards other humans (altruistic values), and altruism towards the biosphere (biospheric values) are thought to bear most influence on environmental behaviour.

VBN theory suggests that these values influence our general beliefs. General beliefs represent an individual's ecological worldview, and go on to influence situation-specific beliefs (Dunlap, Van Liere, Mertig & Jones, 2000). The situation-specific beliefs are those variables previously outlined in the NAM. However, VBN theory also posits that the outcome variable (e.g. behaviour) may take different forms. For example, an individual who feels they have a moral obligation to be environmentally responsible may do so by engaging directly in a behaviour (e.g. recycling), or instead may engage in activism (e.g. protests, sign a petition), changing their political behaviour (e.g. voting green) or by joining an organisation (e.g. Greenpeace). A representation of the model, taken from Stern (2000), is presented in *Figure 1.1*.

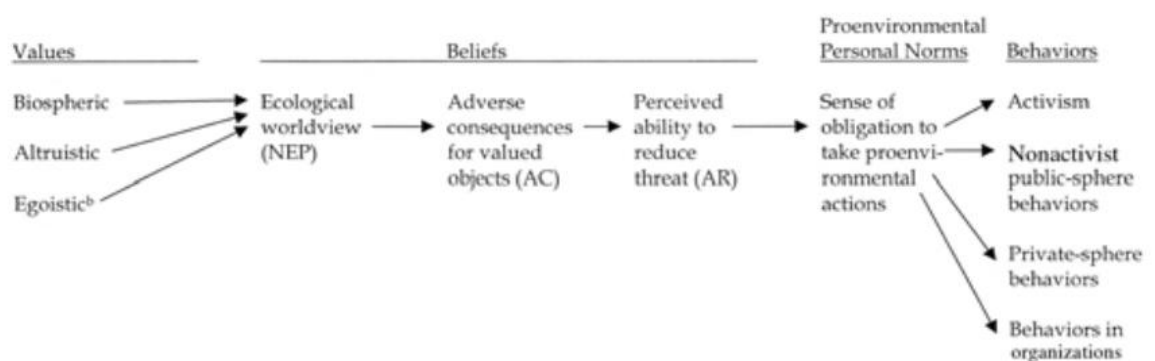


Figure 1.1. Representation of the VBN model proposed by Stern (2000).

While Stern and colleagues originally used VBN theory to consider social movements and non-activist behaviour (e.g. policy support; 1999; 2000), the theory has since been applied to explain a wide range of behaviours including: acceptability for environmentally friendly policies (Eriksson, Garvill & Nordlund, 2006, 2008; Steg, Dreijerink, & Abrahamse, 2005), household energy use (Abrahamse & Steg, 2011) and in papers considering multiple behavioural outcomes (e.g. recycling and driving in Kaiser, Hubner & Bogner, 2005).

By including more abstract variables, less proximal to behaviour, VBN theory offers wider scope than both the TPB and NAM when considering environmental outcomes. Also, despite values generally being regarded as predicting behaviour through a series of mediating variables, they have been shown to directly influence variables further along the causal chain. For example, Kaiser, Hubner and Bogner, (2005), found using a sample of over 31'000 from 27 countries, values (e.g. harmony) directly predicted recycling and car use.

Alongside behaviour, values have also been shown to predict proximal antecedents of behaviour. Steg, Dreijerink, and Abrahamse, (2005) found that while values predicted moral norms, some of the situation specific beliefs that are meant to mediate the relationship between values and moral norms (e.g. awareness of consequences) did not. Van Riper and Kyle (2014) offer further support that values may bypass general beliefs and directly influence moral norm activation. Their work on environmental behaviours performed at a national park in the Channel Islands found, that from a sample of 359 individuals, values related to self-transcendence had a positive direct effect ($\beta = .59$) on their moral obligation to protect the park (e.g. minimise impact on marine life, protect historical structures). They also noted that egoistic values (e.g.

protecting and enhancing resources for the self) had a negative direct effect ($\beta = -.17$). Given that this thesis aims to understand a broad range of environmental behaviours, values appear to be an appropriate basis on which to base this research.

1.3. Values

1.3.1. Definition. Values are “desirable trans-situational goals varying in importance, which serve as guiding principles in the life of a person” (Schwartz, 1992, p.21). Their abstractness and generalisability differentiate them from other situation-specific beliefs such as attitudes (Schwartz, 1992). Values reflect an individual’s belief about the desirability of an end-state or goal, as such individuals act upon their values based upon their preferences (Allport, 1963).

Values can predict both attitudes, behavioural intentions and behaviour (Seligman & Katz, 1996; Stern, 2000; Stern & Dietz, 1994), and guide the evaluation and justification of decisions and judgements (De Groot & Steg, 2007a; Schwartz, 1994). In any given situation, choices are made between competing values, with individuals acting upon the values considered most relevant to current goals (De Groot & Steg, 2007a). Unlike attitudes and other beliefs, the number of values an individual considers is relatively small and furthermore, they are relatively stable (Stern, Kalof, Dietz, & Guagnano, 1995; De Groot & Steg, 2007a). Values may be particularly relevant for understanding and shaping behaviour as they are likely to exist for longer periods of time than lower-order goals (e.g. wanting to go for a walk; Bateman, O'Neill, & Kenworthy-U'Ren, 2002). Consequently, values appear to be an efficient tool for understanding differences and similarities between groups (Rokeach, 1973).

1.3.2. Methodological issues. The following section outlines methodological issues relating to values that arise in the literature.

1.3.2.1. Measuring values. Schwartz's value survey (SVS; 1992, 1994) is one of the main means of collecting data relating to these values. In this survey, participants are asked to rate each value "as a guiding principle in their lives" on a 9-point scale ranging from: -1 (opposed to my values), 0 (not important), to 7 (extremely important). The advantages of incorporating a negative option allows participants to make a very clear distinction between something not important to them and something opposed to their values. However, this adds a degree of complexity to the questionnaire, thus the questionnaire may not be suitable for use with certain populations (e.g. children)³.

Another issue with the SVS is that the Cronbach's Alpha for some of the sub-scales do not demonstrate good reliability. Schwartz, Melech, Lehmann, Burgess, Harris, and Owens (2001) point out reliability of the different value sub-scales have ranged from as low as .45 to as high as .76, with a median of .66. An alternative scale to measure values was adapted by De Groot and Steg (2008). Reliability does not appear to be an issue for this version, and so this will be used in this thesis to measure values. The development of this scale is reported in *section 1.3.3.2*.

1.3.2.2. The generalisability of values. Schwartz (1994) demonstrated the replicability of the value structure he proposed by testing its robustness in 82 countries across all the inhabited continents of the Earth; with nationally representative samples in 37 countries (Bilsky, Janik & Schwartz, 2011). The findings suggest that the values structure Schwartz proposed is robust and replicable when comparing very diverse racial,

³ Schwartz (2001) suggests for these populations, alternative measures such as the portrait values questionnaire (PVQ) could be used. The PVQ uses vignettes describing people, who endorse a value, and then asks participants to rate how much the person described was like themselves. This method of assessing values appears to be simpler, and furthermore significantly shortened the length of the questionnaire from around 56 items to 29 items.

geographical, linguistic, cultural and religious groups, and that demographics do not appear to have any great influence on it (Schwartz, 1992; 1994).

However, replication has proven troublesome in sub-Saharan countries in Africa and in less developed nations. Moreover, while values are relatively stable, generalising across the life-span of an individual or from one generation to another may not be appropriate as personal experience or current social/economic climate can influence the importance individuals place on certain values.

1.3.2.3. Value conflict. Conflicting values are not easily identified in empirical work because individuals tend to rate many values as important to them. This can result in weak positive correlations between most values (Schwartz, 1994). Techniques, such as standardising participants' scores, can help show negative correlations between conceptually distinct domains. Including instructions for participants to vary their scores and only rate a few values as 'most important' may also help combat this. While this may be necessary to identify conflicting values, an issue may be that prompting participants or standardising scores may artificially inflate differences between values.

1.3.3. Background and context. Values have a rich history both in philosophical and economic literature. Allport (1963) took inspiration from German Philosopher Spranger who wrote a book discussing 'types of men' (Spranger, 1914). Spranger suggested there to be six types of people including the political (interested in power), the social (interested in love) and the economic (interested in time and resources).

At a similar time to Allport (1963), work originating from social dilemma research (e.g. prisoners' dilemma, dictator game), suggested the values people hold, may influence their decisions relating to economic outcomes (Messick & McClintock, 1968). Much like Allport (1963), Messick and McClintock (1968) also suggest 'types of people' exist,

including: pro-self individuals (e.g. competitors and individualists) and pro-social individuals (e.g. co-operators and altruists)⁴. Linking this to environmental outcomes, Joireman, Lasane, Bennett, Richards, and Solaimani (2001) demonstrated that, from 161 students, those with a greater pro-social disposition had increased environmental intentions than those with a greater pro-self disposition.

1.3.3.1. Schwartz's Theory of Basic Values. This widely cited theory was proposed by Schwartz (1992, 1994) who outlined a general classification of 56 values. To initially show support for this theory, samples from 20 countries were asked to complete a survey that inquired how important they deemed the 56 values proposed. Based on these responses, values that appeared to be similar to one another were grouped together using a Smallest Space Analysis (Guttman, 1968). This analysis considered how closely correlated the items (e.g. values) were; with those most similar placed closest to one another in a multi-dimensional space. Based upon how the values were clustered in the multi-dimensional space, ten value-domains were identified. Each of these domains contained between three and eight values, and was named based upon the values they represented, there were: Conformity, Tradition, Security, Power, Achievement, Hedonism, Stimulation, Self-Direction, Benevolence and Universalism.

As the domains consist of several values, they are regarded as more reliable than using a single value to predict attitudes and behaviour (Schwartz & Bilsky, 1987). Thus, using multi-item scales to measure value domains appears to be an appropriate way of

⁴ Messick and McClintock's (1968) social value-orientations suggested individualists are interested in maximising their own absolute benefits while they do not consider how this may impact others, while competitors, want to maximise their relative benefits, so consider the benefits they would receive relative to another person. Co-operators attempt to maximise the joint benefit, meaning while they still care for themselves they also consider the consequences for the other person. While, altruists look to maximise the benefits for others while caring relatively little for their own self-interest.

predicting behavioural outcomes. Although this is a large-scale, multi-location study, it is worth noting that most participants were either students or teachers which may have skewed the value domains. To avoid this potentially influencing the findings, this thesis tests both student and non-student samples.

According to Schwartz, when it is not logical nor practical to place high priority upon two or more domains simultaneously, they are classed as conceptually distinct. Conversely, when high priority can be placed simultaneously on two domains they are classified as conceptually close. Those values closest to one another (e.g. in adjacent domains) are likely to express common motivations (e.g. hedonism and stimulation may both motivate excitement seeking behaviour) while the opposite holds for values from opposing domains. However, the domains themselves are only partitioned as a convenient way of visualising where one 'fuzzy' set ends and another begins (Schwartz, 1994). Thus, given the continuous nature of the value domains, it should come as no surprise if certain values are found to arise in adjacent value domains in some empirical work. A depiction of the ten value domains from Schwartz (1992) can be found in figure 1.2.

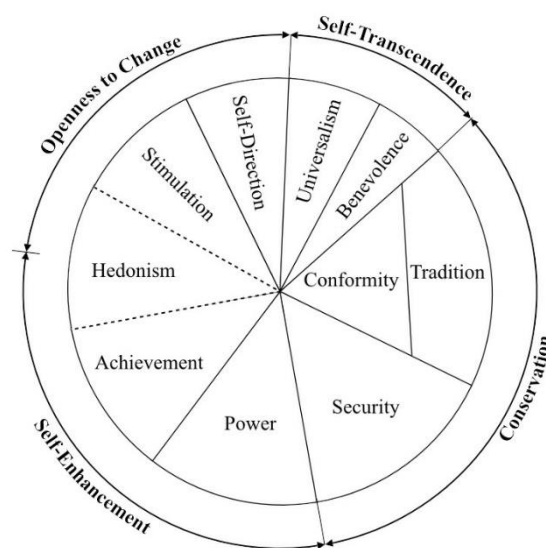


Figure 1.2. Value-domains and Value-types proposed by Schwartz (1992).

The circular structure outlined can be plotted in a two-dimensional space, comprising four higher order *value types*: conservation, openness to change, self-transcendence and self-enhancement (depicted around the edge of figure 1.2.). Schwartz suggests simultaneously endorsing values from both ends of a dimension will result in strong psychological conflict. The first-dimension places *conservation*, which comprises conformity, tradition and security, opposite *openness to change*, which includes stimulation and self-direction. The second-dimension places *self-transcendence*, which comprises benevolence and universalism, against *self-enhancement*, which includes values related to power and achievement.

Scholars have suggested this second dimension asserts the greatest influence on environmental decisions and actions (Nordlund & Garvill, 2002; Stern, 2000; Thøgersen & Ölander, 2002). Endorsing self-transcendence values is linked with holding pro-environmental attitudes and acting in a pro-environmental manner, whereas self-enhancement values tend to be related to negative environmental beliefs and behaviours (De Groot & Steg, 2007a; 2007b; 2008; Kalof, Dietz, Stern, & Guagnano, 1999; Nordlund & Garvill, 2002, 2003; Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005; Steg, Perlaviciute, van der Werff, & Lurvink, 2014; Stern, 2000; Stern, Dietz, & Guagnano, 1998; Stern, Kalof, Dietz, & Guagnano, 1995; Thøgersen & Ölander, 2002; Van Vugt, Meertens, & Van Lange, 1995). Thus, to understand environmental behaviour, this thesis will focus on values related to the self-transcendence versus self-enhancement dimension.

1.3.3.2. The development of a measure of biospheric, altruistic and egoistic values. A concern with using the self-enhancement versus self-transcendence value dimension, as originally conceived by Schwartz, is that there is an over emphasis of certain factors within the self-transcendence value-type. For example, Stern, Dietz, &

Guagnano (1998) noted that the self-transcendence value-type does not contain a fair proportion of environmental and non-environmental content.

To rectify this issue, Stern and colleagues (1998) proposed separate *biospheric* and *altruistic* scales. The former included self-transcendence's environmental items alongside extra items required to address the balance, while the latter included self-transcendence's non-environmental items. The biospheric values scale aimed to "reflect a concern for the quality of nature and the environment for its own sake," while the altruistic values scale sought to "reflect a concern with the welfare of other human beings" (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014; p.107). Biospheric values originated from various scholars arguing for greater emphasis on the intrinsic value of nature, in contrast to more benevolent/altruistic values (Leopold, 1949; Naess, 1989). Merchant (2005) suggested the term 'eco-centric ethic', suggesting all things within the ecosystem deserve moral consideration and have an intrinsic value. Alongside eco-centric ethic, Merchant discussed homocentric (or anthropocentric) ethics which focussed on maximising societal benefits. From this work, parallels can be drawn with the research of Stern (2000; Stern & Dietz, 1994; Stern, Dietz, & Kalof, 1993) discussed previously.

Some exploratory factor analyses had shown support for a distinction between the biospheric and altruistic values (PCA; García-Mira, Real-Deus, Durán, & Romy, 2003; Karp, 1996; Nilsson, Von Borgstede, & Biel, 2004). However, despite the conceptual sense of a distinction between them, De Groot and Steg (2007a; 2008) note that the two sub-scales had still not been demonstrated to consistently load as distinct factors in some empirical work (e.g. Bardi & Schwartz, 2003; Corraliza & Berenguer, 2000; McCarty & Shrum, 1994; Nordlund & Garvill, 2002; Stern & Dietz, 1994).

Building on the work of Stern (2000; Stern & Dietz, 1994; Stern, Dietz, & Kalof, 1993), De Groot and Steg (2008) tested a shortened version of Schwartz's Value Survey (SVS) to measure biospheric, altruistic and egoistic values. Egoistic values are akin to the self-enhancement values outlined by Schwartz as they relate to the personal costs and benefits for an individual (De Groot & Steg, 2008).⁵ A questionnaire containing 13 items was distributed to 489 respondents.⁶

To verify whether the data supported the proposed three-group solution, and particularly the distinction between biospheric and altruistic values, the Multi-Group Method (MGM), a simple type of confirmatory factor analysis, was employed (Nunnally, 1978). Using this method, De Groot and Steg (2007a) found distinctions between biospheric, altruistic and egoistic values in samples from five countries (Austria, Czech Republic, Italy, the Netherlands, and Sweden). Thus, this measure seems an appropriate choice for research considering the relationship between values and environmental behaviour, and will be used in this thesis.

1.3.3.3. Values and environmental behaviour. VBN theory, discussed in section 1.2.3.3, outlines the theoretical underpinning for how these values influence environmental behaviours, but empirical work, also offers support for the causal influence of values on environmental attitudes, intentions and behaviour (De Groot & Steg, 2007a; 2007b; 2008; Nordlund & Garvill, 2002, 2003; Schultz & Zelezny, 1998; Stern & Dietz, 1994; Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Thorgerson & Olander, 2006).

⁵ Although, some scholars have warned these do not necessarily map precisely on to one another (Corner, Markowitz & Pidgeon, 2014).

⁶ An initial pilot study containing 112 participants found the egoistic value orientation reliability was slightly low (.65) so an extra item was added. After re-testing, good reliability was demonstrated for the egoistic, altruistic and biospheric sub-scales (Cronbach's Alpha = .74, .73 and .86 respectively).

More specifically, empirical research has also shown values relating to biospheric and altruistic concerns *positively* relate to environmental outcomes, while values relating to egoistic concerns *negatively* relate to environmental outcomes (Kalof, Dietz, Stern & Guagnano, 1999; Milfont, Duckitt & Wagner, 2010; Nordlund & Garvill, 2002, 2003; Schultz, Goveia, Cameron, Tankha, Schmuck, & Franěk, 2005; Stern, Dietz, & Guagnano, 1998; Stern, Dietz, Kalof, & Guagnano, 1995; Thøgersen & Ölander, 2002).

The contrasting effect on environmental behaviour that is caused by endorsing either biospheric and altruistic values, or egoistic values, is not surprising given Schwartz (1992) suggests values at opposing ends of a dimension (e.g. self-transcendence and self-enhancement) should represent opposing ideas. His theory also postulates that pursuing behaviours derived from opposing values (e.g. wanting to save money, but also wanting to donate to charity) may cause some psychological conflict (e.g. stress).

However, a more recent review of research suggests it is the norm rather than the exception that individuals must manage multiple goals, which may stem from opposing value domains (Unsworth, Yeo & Beck, 2014; Vancouver, Weinhardt, & Schmidt, 2010). Occasionally endorsing values from opposing domains may not cause psychological conflict because individuals may manage to satisfy their personal norms by completing behaviours that are supported by both 'opposing' values. For example, within the environmental domain, walking instead of catching a bus is supported by egoistic values as it can save you money, *and* by biospheric values as it is better for the environment. Engaging in behaviours that allow the individual to pursue multiple goals resolves the conflict, however it may not always be feasible to find such a behaviour (Kopetz, Faber, Fishbach & Kruglanski, 2011). Therefore, depending on the environmental behaviour in

question, the effect of highly endorsing values from opposing domains may differ in whether it produces a conflict or not.

As values can be conceptualised as higher-order goals (DeShon & Gillespie, 2005), research relating to pursuing multiple goals is also of relevance to this thesis. Goal Framing Theory (Lindenberg 2001, 2006, 2008; Lindenberg & Steg, 2007) proposes that when considering environmental behaviours, *gain goals* which are associated with preserving time, finances and resources, are often in competition with *normative goals*, which are associated with acting in an appropriate manner and doing the right thing⁷ (Lindenberg & Steg, 2007; Nordlund & Garvill, 2003; Steg, Dreijerink & Abrahamse, 2005). This is because most environmental behaviours require some form of sacrifice. Thus, while normative goals may promote walking instead of driving to work, gain goals relating to saving time may persuade an individual to use their car (Steg, Bolderdijk, Keizer & Perlaviciute, 2014).

Concrete, specific and immediate goals (i.e. lower-order goals) sit at the bottom of the goal hierarchy, thus while they may be important ‘in the moment’, they are likely to foster less commitment than goals further up the hierarchy such as personal projects (Little, 1983), or achievement goals (DeShon & Gillespie, 2005). These longer-term goals may comprise several lower level goals (Unsworth et al., 2014).

Lower-order goals (e.g. simple tasks such as wanting to go for a walk) are thought to be activated by higher-order goals such as our values. Therefore an individual’s strength of feeling towards biospheric, altruistic and egoistic values is likely to impact on

⁷ Goal framing theory also suggests hedonic goals, associated with seeking pleasure, may also influence environmental behaviour. This is discussed in more detail in Chapter 3 when hedonic values are added to the segmentation model.

which environmental behaviours they choose to engage with⁸. Individuals who endorse different values are likely to reach different decisions based on what they prioritise. For example, Steg, Perlaviciute, Van der Werff, and Lurvink, (2014) found the strength with which individuals endorsed certain values (e.g. egoistic, biospheric) influenced restaurant choice. Their research found individuals prioritised different aspects of the restaurants such as whether it used organic products if they highly endorsed biospheric values, or whether it provided value for money if they strongly endorsed egoistic values.

Therefore, considering differences in the environmental behaviours performed by groups of people who either only highly regard values from one domain (e.g. highly endorse biospheric *or* egoistic values), or highly regard values from two conflicting domains (e.g. highly endorse biospheric *and* egoistic values) may further our understanding of the value-behaviour relationship. Particularly by revealing how endorsing conflicting values translates into environmental behaviour. This will also provide insight into which environmental behaviours are supported by both self-transcendence and self-enhancement related motivations. This thesis achieves this by considering the environmental outcomes of individuals who have been segmented into groups based upon the values they endorse.

1.4. Segmentation

1.4.1. Definition. Segmentation is the act of defining meaningful sub-groups from a given population which allow a researcher to reduce the number of entities being dealt with into manageable, mutually exclusive, and well-defined groups (Anable, 2005).

⁸ Goals may also be activated by bottom-up processes such as situational cues. For example, Kay, Wheeler, Bargh and Ross (2004) demonstrated that exposure to objects such as business suits, business cases or boardroom tables made people less normatively orientated than exposure to neutral objects (e.g. sheet music, whales and kites). This may have been caused by the increased salience of items relating to gain goals.

Segmentation can be completed based upon a cut-off point or category decided by the researcher (e.g. if an individual is above or below 40, or if they are male or female), but can also be driven by patterns in the data (Moscardo, Pearce, & Morrison, 2001).

1.4.2. Methodological issues. The following section will discuss methodological issues relating to segmentation approaches.

1.4.2.1. Data-driven versus researcher-led segmentation. Researcher led segmentation involves pre-defining cut-off points based upon previous theory or empirical work (e.g. over or under 1.4 metres tall). It is normally referred to a-priori segmentation and usually involves few, maybe only one, variable on which the segmentation is based (Anable, 2005). Whereas data-driven approaches employ software to find patterns in the data. This normally means more variables can be used as the basis of the segmentation, and the segments are defined after the analysis has been completed (e.g. post-hoc segmentation). However, this approach does not consider whether the groups identified make theoretical sense nor does it allow the author to have any great influence over the size of, or number of, groups. Because of this, researcher-led segmentation may provide less subjective groups.

However, this may limit the segmentation to categorical or relatively basic variables (e.g. age and gender), and the researcher may not be able to include more abstract variables (e.g. values) that do not have an obvious cut-off point to segment the sample. Also, when analysing large data sets researchers may struggle to spot complex patterns, whereas software may more effectively group the sample based upon a wide range of variables. So, using data-driven approaches may provide richer and more meaningful outcomes than researcher-led segmentations.

Thus, given the benefits of both approaches, it appears a compromise between the two approaches is required. Nguyen and Rayward-Smith (2008) note that once patterns have been identified from a data-driven approach, researchers may need to consider the trade-off between the interpretability of the groups, the differentiation between them, and the theoretical sense of the segmentation. Galloway (2010) notes there may need to employ an element of trial and error when judging the appropriateness of the number of groups based upon data-driven segmentation. In line with this work, this thesis will employ a data-driven segmentation approach but the number of groups will be reviewed by the author to ensure they make theoretical sense.

When using an initial data-driven segmentation, researchers must avoid conducting research with no theoretical underpinnings (Hastings, 2007). While it should be acknowledged that the flexibility of segmentation approaches may have increased the popularity of the method in both governmental (e.g. DEFRA, 2008^b) and non-governmental research (e.g. Crompton, 2010), employing a 'what-works' philosophy (i.e. purely data driven) may not be appropriate for scientific research. The current thesis aims to avoid these criticisms by drawing heavily on both theory (see *section 1.2.3.3* regarding VBN theory) and empirical research (see *section 1.3.3.3* regarding values and environmental behaviour) to explain why it utilises values as the basis of a segmentation approach to consider environmental behaviour and, later in this section, why a four-group segmentation may be most appropriate based upon the theory and empirical work reviewed.

1.4.2.2. Segmentation methods and software. Three popular statistical packages that can perform data-driven segmentation are K-means cluster analysis (often used in SPSS), Latent Class Analysis (offered by, amongst others, LatentGold 4), and Kohonen

mapping (Matlab 6.0). Eshghi, Haughton, Legrand, Skaletsky, and Woolford (2011), compared the three methods using the same data set of ten variables relating to the infrastructure, demographics, development and economics of 160 countries. They concluded that the traditional cluster analysis (K-means) provided the most homogeneous clusters and most effectively differentiated between the clusters. As a K-means cluster analysis appears to test favourably compared to other methods, and has been employed successfully in both the environmental domain (e.g. transport choice; Bosehans & Walker, 2016), and on topics outside of it (e.g. humour styles; Fox, Hunter & Jones, 2016) the author has selected this approach as the most appropriate to conduct the segmentation.

1.4.3. Background and context. Segmentation can be thought of as a tool to understand and shape behaviour, and has traditionally been used in commercial settings to segment consumers (Wind, 1978). However, it may also be used in social marketing. Social marketing can be defined as the systematic application of techniques to achieve specific behavioural goals relevant to the social (or common) good (Lazer & Kelley, 1973). Hastings (2007a) notes that, as the environment can provide many benefits to a great number of people (some of which are noted in the introduction to this chapter), then acting in an environmentally friendly manner can be considered as aiding social good. Thus, research relating to marketing social goods appears to be relevant to this thesis, and the techniques employed in this field, such as segmentation approaches, can be utilised to understand and shape environmental behaviour.

An issue with using segmentation for social good is that, unlike in business settings, psychological variables (e.g. values) are often not considered due to the lack of financial resources available to collect the data (Dibb & Carrigan, 2011; Dibb, 2014) or the

lack of skill and formal psychology training taken by people running the initiatives (Neiger, Thackeray, Barnes, & McKenzie, 2003; Tapp & Spotswood, 2013). Gummesson (1991) highlights that those involved in social marketing often have a health, public policy or sustainability background and tend to utilise variables such as demographics and geographical location (i.e. geo-demographics) ahead of psychological variables.

Using geo-demographics as the basis for segmentation has had some success. For example, Collins and Fairchild (2007) assessed, using A Classification of Residential Neighbourhoods (ACORN) segmentation, differences in food consumption at a sub-national level. ACORN classifies households, normally as postcode level, into 18 types based upon socio-demographic characteristics. However, ACORN may have been successful, not because geo-demographics are particularly useful in understanding food consumption, but because geo-demographic segmentation methods, such as ACORN, represent a proxy measure of other variables that may be harder to access and more predictive of behaviour (e.g. affluence, political preference; Mowen & Minor, 1997).

A further criticism is that while geo-demographic data (e.g. from public census records) may be more freely available than psychological variables, a comprehensive meta-analysis of 133 publications published between 1966 and 1995, show demographics to be inconsistent predictors of environmental behaviours (Diamantopoulos, Schlegelmilch, Sinkovics, & Bohlen, 2003). Consequently, geo-demographics seldom appear sufficient to be used as a basis to reliably understand environmental actions (Ukenna, Nkamnebe, Nwaizugbo, Moguluwa & Olise 2012). Instead, including psychological variables that have been shown to influence environmental behaviour, appears to be more appropriate for segmentation.

1.4.3.1. Segmentation and environmental behaviour. Theory-driven

environmental segmentation studies have been quite uncommon (Hine, Reser, Morrison, Phillips, Nunn & Cooksey, 2014). However, some psychological constructs including altruism, individualism, and collectivism have been used in segmentation models regarding environmental behaviour (Ukenna et al., 2012). More widely, psychological variables have been used to segment consumers in multiple cultures such as Asia (Chan, 2000), Europe (Yilmazsoy, Schmidbauer, & Rösch, 2015) and the US (Nie & Zepeda, 2011).

In the UK, one of the most publicised segmentation models was proposed by the Department for Environment, Food and Rural Affairs (DEFRA, 2008b). The national profile given to this model by the support it received from the government and local authorities has increased the awareness of segmentations strategies more generally, and has seen the model adopted by institutions and organisations (Horton & Doran, 2011), as well as academics (Miller, Rathouse, Scarles, Holmes, & Tribe, 2010). However, it has received some criticism for lacking clarity regarding its rationale and development, and its practicality in terms of how to target the different segments of people outlined in the framework (Darnton, 2013).

DEFRA's framework suggests that there are seven types of people based upon their attitudes and intentions towards environmental behaviour. While some groups are engaging well with environmental behaviours (e.g. *positive greens*), other groups appear to hold no motivation to engage with environmental issues (e.g. *honestly disengaged*). This latter group is of particular interest because this suggests there may be a substantial group of individuals (18% of the population) who have a genuine lack of interest or concern in environmental outcomes. DEFRA (2008b) report that this group are also

reasonably happy with their lifestyle and so 'soft measures' (e.g. providing information that highlights environmental or economic reasons to engage in environmental behaviour) may not be enough to change their behaviour. Instead 'hard measures' such as regulation may be more appropriate for this group of people.

Thus, the work of DEFRA alongside the literature previously reviewed relating to values, leads the author to suggest the possibility that at least four distinct groups of people exist, who through endorsing different values may engage in different levels of environmental behaviour. First, Schwartz suggests individuals are likely to prioritise either values related to self-transcendence (e.g. biospheric values which have been shown to *increase* a range of environmental behaviours) or values related to self-enhancement (e.g. egoistic values which have been shown to *inhibit* a range of environmental behaviours). Thus, from this, two groups of people may be identified: those who highly endorse biospheric and altruistic values, and a second group that highly endorse egoistic values. The group that highly endorse biospheric and altruistic values, are perhaps more likely to engage in environmental behaviour than the group that highly endorse egoistic values.

Other literature (e.g. Unsworth et al., 2014; Vancouver et al., 2010) suggests individuals may endorse multiple goals (in this case values) from conflicting domains (e.g. biospheric *and* egoistic values). This may represent a third group of people. These people may engage in a smaller range of environmental behaviours that are supported by both these values. Finally, DEFRA's work suggests a fourth group of people may exist that do not *highly* endorse any of these values enough for them to be motivated to engage in pro-environmental behaviour. Thus, from an initial review of the literature, there appears to be some theoretical and empirical support that four distinct groups may be found from

a values-based segmentation. The values-based segmentation performed in the empirical chapters of this thesis further explores this possibility.

1.4.3.2. Values-based segmentation and environmental behaviour. Empirical research combining values and segmentation strategies is in its infancy (Butler, Gordon, Roggeveen, Waitt & Cooper, 2016). To the author's knowledge, no segmentation study has set out with the *primary aim* of assessing how endorsing multiple, and sometimes conflicting values, influences environmental behaviour. However, there have been segmentation studies that have included values as part of a wider set of segmentation variables, and some segmentation studies that have focussed on values but not specifically to investigate environmental behaviour. Below, five papers that specifically outline the importance of using values in segmentation models are briefly explained.

1.4.3.2.1. Straughan and Roberts (1999). Using a convenience sample of 235 university students, the authors tested both psychological and demographic variables to understand which variables may best profile ecologically conscious consumer behaviour⁹. While they did not go on to perform the segmentation themselves, they did find, based on the regression co-efficient, that altruism is a particularly useful variable for considering ecological behaviour. Overall, they noted that psychological variables are more appropriate than demographic variables on which to base a segmentation model. While this study suggests altruistic values may be important to include in segmentation, it does not offer insight into biospheric or egoistic values.

1.4.3.2.2. Madrigal and Kahle (1994). This work is highly relevant to this thesis, as this work also sets out to *only* measure values as the basis of a segmentation. Thus, by

⁹ This was measured by a 30-item scale that had items relating to car-use, energy-use, recycling and pollution.

not including other variables in the segmentation this work supplies richer information as to the likely outcomes of a values-based segmentation. However, this work does not consider how values may influence environmental behaviour, but instead focuses on vacation choice (e.g. activity based vacation versus relaxed vacation). Nevertheless, based upon survey responses from a convenience sample of 394 English-speaking, mainly US tourists visiting Scandinavia, four clusters of people were found based upon their preferences for values relating to security, excitement, achievement and egoistic concerns.

However, the measure used to assess values, Kahle's List of Values (LOV) scale, did not include any values explicitly linked to the environment or altruism¹⁰. However, the study by Madrigal and Kahle (1994) does show that cluster groups can be found that score high on all values measured (segment two; not named) and that score 'low' (e.g. below the sample mean) on all values measured (segment three; not named). The study also found that a values-based segmentation could be used to find meaningful differences between the groups on an outcome measure. For example, differences were found between the groups regarding their physical exercise and wanting to be outdoors while on vacation.

1.4.3.2.3. Kamakura and Mazzon (1991). This study considers data-sets from previous work conducted in the US and Brazil ($n=800$) to consider segmenting individuals based upon a wide-range of values adapted from Rokeach (1973). Despite being chronologically earlier, this study includes a wider range of values than Madrigal and Kahle (1994) such as those relating to altruistic qualities (e.g. equality) and biospheric

¹⁰ The work does include a value listed as 'warm relationship with others' but the author feels this does not equate appropriately with altruistic values.

qualities (e.g. a world of beauty). Six groups are found from the segmentation. While 'true friendship' and 'mature love' were generally seen as the most important values by the groups identified from the segmentation, there were marked differences regarding the importance each of the groups attributed to values relating to biospheric, altruistic and egoistic motivations. Some segments (e.g. 'segment c') seemed to rate both 'accomplishment' and 'a world of beauty' as similarly important, while other segments appeared to prefer either the altruistic-biospheric related values (e.g. 'segment a') or the egoistic-related values (e.g. 'segment b'). Although, it should be noted that no formal analysis was presented in the paper to show whether these differences were statistically significant. Again, this research also demonstrated that these groups differ on an outcome variable, for this study it related to fashion (e.g. I always try to dress with class) and activities (e.g. I like to play cards).

1.4.3.2.4. *Blamey and Braithwaite (1997)*. A study of 1680 Australians chosen randomly from an electoral roll completed questionnaires on eco-tourism (e.g. would you take a holiday to increase your understanding of/spend time in nature). A Factor analysis reduced the values they had included into three factors relating to *development and control* (e.g. controlling nature and rewarding individual effort); *equality and harmony* (e.g. improving the welfare of all) and *rights* (e.g. having equal opportunities and preserving nature). Parallels can be drawn between the first factor with egoistic values, and the latter two factors with altruistic-biospheric values.

After conducting a cluster analysis, a four-group solution was deemed most appropriate. Their work found a group that scored high on all values (group c) and a group that scored low on all values (group b). The segmentation also found a group that scored high on *development and control* but low on *equality and harmony* (group a) and a

group that scored the opposite of this (group d). These groups have clear parallels to the four groups proposed by the author in this thesis. They found that when asked about how much they felt a moral obligation to recycle and buy environmentally friendly products (such as those made from recycled materials or that can easily be recycled), group c (who highly endorsed *all* values) scored significantly higher than group b (who scored low on *all* values). This suggests that highly endorsing values that may be associated with egoistic and biospheric concerns can still result in feeling a moral obligation to perform certain environmental behaviours. But not highly endorsing any of the values (as in group c) may result in feeling a lower moral obligation to act. This has parallels with the findings of DEFRA (2008b), who highlighted the ‘honestly disengaged’ as having the lowest willingness to engage in environmental behaviours.

1.4.3.2.5. Poortinga and Darnton (2016). In this study, 1538 interviews were conducted in which participants were asked about a wide range of environmental behaviours and antecedents of these. The segmentation variables related to attitudes towards climate change, views on sustainability, attitudes towards community and place, and, of particular relevance to this study, personal values. 23 items relating to the four high-order value types (e.g. Openness to change, conservatism, self-transcendence and self-enhancement) were measured. Six segments were found using a K-means cluster analysis.¹¹

The groups’ ratings of the values were significantly different, and ranged from the *Enthusiasts* who scored highest on self-transcendence to the *Aspirers* who scored highest on self-enhancement. The latter group also scored high (e.g. above the sample average)

¹¹ Hierarchical clustering was performed first to help assess the optimal number of segments. Ward's method with squared Euclidean distances was used to help identify an appropriate number of clusters.

on self-transcendence values. Again, this coupled with other findings seems to suggest that highly endorsing values from conceptually distinct domains is relatively common. The study also found the groups differed on a wide range on environmental behaviours such as recycling, car and energy use, and water use. However, as values were included alongside many other variables as part of the segmentation it is difficult to ascertain how useful these may be as the sole focus of a segmentation. Moreover, the study considers self-transcendence and self-enhancement values, but does not consider the components of these such as biospheric and altruistic concerns separately. Therefore, considering these values may offer further insight into if different motivations (e.g. helping others or helping nature) that fall within a broader remit (e.g. self-transcendence), influence environmental behaviour in similar or different ways.

1.5. Summary

This chapter has provided a *definition*, highlighted *methodological issues*, and discussed *background and context* for the three main topics the thesis will focus on: *environmental behaviour*, *values* and *segmentation*. It has explained how both theory (VBN theory, Goal Framing Theory) and literature relating to goals (e.g. Unsworth et al., 2014), values (e.g. Steg & De Groot, 2008), and segmentation (e.g. Poortinga & Darnton, 2016) provide a strong basis for why a values-based segmentation model may be a useful tool to understand environmental behaviour.

The work has a strong rationale given that understanding and ultimately increasing pro-environmental behaviour may help mitigate some of the troubling issues the Earth currently faces (e.g. global warming, rising sea temperatures). Slowing some of these trends may go some way to minimise the already large negative impact climate change is having on many lives (e.g. migration, rising food prices, destruction of natural

habitats), Moreover, understanding and shaping environmental behaviour may help ensure our quality of life, brought about by our environmental surroundings, does not suffer.

To briefly summarise the justification for the work, the following paragraphs provide a summary of the main arguments from the literature review. First, VBN theory (Stern, 2000) suggests values are an appropriate base on which to understand environmental behaviour, and empirical work has suggested values can directly influence both behaviour and antecedents of behaviour such as moral norms (Kaiser, Hubner & Bogner, 2005; Steg, Dreijerink, & Abrahamse, 2005; Van Riper & Kyle, 2014). More specifically, values relating to self-transcendence and self-enhancement are thought to exert the greatest influence on environmental behaviour (Nordlund & Garvill, 2002; Stern, 2000; Thøgersen & Ölander, 2002). Stern (1999) suggested that self-transcendence may need to be separated into environmental and altruistic content, and around a decade later, De Groot and Steg (2008) validated a questionnaire that did this which comprised biospheric, altruistic and egoistic value subscales.

Schwartz (1992; 1994) suggested that individuals are likely to highly endorse *either* biospheric-altruistic values *or* egoistic values, but research reviewing multiple goals suggests this may not be the case all the time: individuals may endorse multiple values from conflicting domains and complete behaviours that are supported by both ‘opposing’ values (Kopetz, Faber, Fishbach & Kruglanski, 2011). While these individuals may highly endorse values from opposing domains, the work of DEFRA (2008b) and Blamey and Braithwaite (1997) suggest that there may be another group of individuals who are honestly disengaged and do not highly endorse either biospheric-altruistic values or

egoistic values. Thus, from the literature it appears four distinct groups of people may emerge from a values-based segmentation.

Data driven segmentation seems an appropriate tool to explore this further as these methods can group individuals based upon multivariate responses relating to abstract concepts (e.g. our values). While there is a history of empirical work considering values, environmental behaviour and segmentation, no segmentation study the author is aware of, sets out with the primary aim of considering the impact of endorsing multiple, and sometimes divergent values, on environmental behaviour. Consequently, this work will enhance research on the value-behaviour relationship, and given the topical nature of the research, offer implications for policy makers and campaigners attempting to understand and ultimately increase pro-environmental behaviour.

1.5.1. Methodology used. Most empirical work in this thesis employs cross-sectional questionnaires to ascertain information about values and a range of environmental outcomes including recycling, purchasing 'green' products (e.g. those made from recycled materials or that can be easily recycled), reusing carrier bags, buying imperfect vegetables, reusing 'everyday' items (e.g. paper, jars), alongside intentions relating to reducing car use, and intentions relating to increasing sustainable energy use. In most chapters, regressions are employed to ensure the values proposed to be included in the segmentation model influence the environmental outcomes of interest, before a K-means cluster analysis is employed to segment the sample based upon the importance they attribute to biospheric, egoistic and altruistic values. Also, in some chapters, mediation analysis is explored to test whether moral norms mediate the link between cluster group membership (i.e. the 'segment' the group is placed in by the analysis) and environmental outcomes.

Most data presented in this thesis (five of the six empirical chapters) is data collected by the author, apart from chapter four which performs a secondary data analysis on existing data relating to sustainable energy and car use. Moreover, most chapters employ the segmentation model to *understand* behaviour, however the final empirical chapter attempts to use the segmentation model as a basis for *changing* behaviour. Unlike the other sections that are questionnaire based using correlational methods, this chapter employs a between-subjects experimental design.

1.5.2. Aims and summary of empirical chapters. The primary aim of this thesis is to evaluate whether a values-based segmentation model is a useful way of understanding environmental behaviour. This central aim provides a common thread to all the chapters in this thesis. As such, all chapters employ a values-based segmentation approach to investigate environmental behaviour, but each chapter develops this in a different way. The work of individual chapters will help answer the main research aim by answering the following questions:

- Which values should be included in a values-based segmentation? (Chapters 2, 3)
- Is a values-based segmentation approach replicable within and between cultures? (Chapters 3, 4).
- Do the groups found from the segmentation differ on a range of environmental outcomes, including:
 - Behaviours? (Chapters 2, 3, 5, 7).
 - Antecedents of Behaviour? (Chapters 4, 6).
 - Preferences for environmental communication? (Chapter 5).

The discussion section at the end of the thesis will review each of these questions in turn. Ultimately how the values-based segmentations model performs on these

questions will also determine the overall success of the approach. Thus, answering the questions outlined above will help the author in completing the primary aim of this thesis. In addition to this main aim, two further secondary questions will also be investigated, these are:

- Do moral norms mediate the relationship between cluster-group membership and behaviour? (Chapters 2, 3, 5).
- Can the segmentation model be used as a basis to shape behaviour? (Chapter 7).

While not central to the thesis, answering these questions may enhance literature surrounding the value-behaviour relationship (e.g. moral norms mediating the link between values and behaviour could offer support for VBN theory). While exploring if the values-based segmentation model could be used as a basis to *shape* as well as *understand* behaviour could carry implications for policy makers and offer an avenue for future work to pursue. Below, a brief explanation of each empirical chapter is outlined:

1.5.2.1. Chapter two. The first empirical chapter tests a values-based segmentation model of UK students to explain recycling behaviour. It considers how biospheric, altruistic and egoistic values can be used as the segmentation variables, and how moral norms may mediate the relationship between these and recycling behaviour.

1.5.2.2. Chapter three. This study expands the segmentation approach in three ways: First, it tests the inclusion of hedonic values as another variable on which to segment a sample. Second, it tests a second behaviour: green product purchase, and third, it tests the model in both the UK and in Brazil. This chapter also contributes to methodological literature by assessing the relationship between self-reported behaviour and social desirability.

1.5.2.3. Chapter four. The study presented in this chapter replicates the segmentation approach on an existing data-set shared with the author that is both larger (n=6045) and more representative than the author would otherwise be able to collect. Moreover, this data is from seven European countries, which allows the author to consider cross-country differences relating to values and environmental outcomes. The primary focus of this study relates to how the groups identified from the values-based segmentation perform on behavioural intentions relating to car and energy use, as well as considering differences in the demographic profile of the groups (e.g. age, gender, education and political preferences).

1.5.2.4. Chapter five. The two main contributions of this chapter are that, first, the groups found from the values-based segmentation are compared on a wider-range of environmental behaviours (i.e. six behaviours broadly related to waste management), and second, the groups' preferences for environmental communication that has been tailored to include both value-congruent and value-incongruent motives are investigated.

1.5.2.5. Chapter six. This chapter considers how the groups identified from the values-based segmentation perform on a range of antecedents of environmental behaviours; particularly those that are associated with other theoretical frameworks that have not been discussed in the previous chapters. This chapter aims explore whether the values-based segmentation could be successfully integrated into, or combined with, variables from other theories and models.

1.5.2.6. Chapter seven. The final empirical chapter tests whether the values based segmentation model can be used as a basis to shape environmental behaviour. Individuals from the groups identified were either given value-congruent or non-tailored information about recycling over a three-week period via a mobile application designed

and published by the author. Pre-and-post-measures of self-reported recycling behaviour are compared and implications for campaign designers are discussed.

1.5.2.7. Chapter eight. The final chapter brings together these findings by presenting an overview of the findings and discussing how these relate to previous literature. This chapter also outlines implications of this work for outside of academia, limitations, suggestions for future research, and ultimately answers the question of whether a values-based segmentation approach is useful for understanding environmental behaviour.

Chapter 2. An Initial Test of a Values-based Segmentation for Understanding Recycling Behaviour

Abstract

Biospheric, altruistic and egoistic values have been shown to predict environmental outcomes such as attitudes, norms, and in some cases, behaviour. However comparatively little research has considered the effect of highly endorsing multiple, and sometimes conflicting, combinations of these values on environmental outcomes. A questionnaire asked 284 student participants based at a UK university about their values, moral norms and self-reported recycling behaviour. Values were found to predict moral norms relating to recycling: $F(3,280) = 21.54, p < .001, R^2 = .188, R^2_{Adjusted} = .179$; but not recycling: $F(3,280) = 2.03, p > .05$. Segmenting the sample based upon their values they endorsed, led to four distinct groups of people being identified. These groups differed regarding their moral norms and recycling: $F(6,512) = 8.45, p < .001$; *Wilk's Λ* = .829, $\eta_p^2 = .09$. While endorsing conflicting values was not detrimental to environmental outcomes, not highly endorsing either biospheric, altruistic or egoistic values appeared to inhibit recycling. Finally, further analysis revealed that moral norms mediated the values-behaviour relationship.

2.1. An Initial Test of a Values-based Segmentation for Understanding Recycling Behaviour

2.1.1. Background to Study

This study tests whether a values-based segmentation can help explain recycling behaviour, and whether moral norms mediate the relationship between values and recycling behaviour. Value-belief-norm theory (VBN; Stern, 2000), which outlines a causal chain from our values to environmental behaviour, is used as the basis of this chapter. The theory, outlined in more detail in *section 1.2.3.3* of chapter one, suggests values influence behaviour through mid-range cognitions such as our moral norms (Steg, Dreijerink, & Abrahamse, 2005).

Moral norms are defined as ‘feelings of moral obligation to perform or refrain from specific actions’ (Schwartz & Howard, 1981, p. 191). These are the most integrated of norms; driven by our anticipated guilt, irrespective of the actions or beliefs of others and so, in the simplest terms, they are representations of our values for a given situation (Klockner, 2015). VBN suggests values may activate our moral norms, which then go on to drive behaviour. However, individuals may satisfy their moral norms in different ways; consequently, behaviour may take many different forms. For example, an individual with a strong moral obligation to help the environment may do this by recycling, but they could also sign petitions or lobby their Member of Parliament (MP).

Empirical work has shown VBN theory to be useful when considering a wide-range of behavioural intentions relating to the environment (Gärling, Fujii, Gärling, & Jakobsson, 2003; Joireman, Lasane, Bennett, Richards, & Solaimani, 2001) as well as explaining acceptability for environmentally friendly policies (Eriksson, Garvill & Nordlund, 2006, 2008; Steg et al., 2005), household energy use (Abrahamse & Steg, 2011) and recycling

and driving behaviours (Kaiser, Hubner & Bogner, 2005). Thus, this theory, and more specifically values seem an appropriate basis on which to investigate environmental behaviour.

2.1.2. The Effect of Endorsing Conflicting Values on Environmental Behaviour

Three values that appear to be particularly important when considering environmental behaviours are ones relating to self-interest (egoistic values), altruism towards other humans (altruistic values), and altruism towards the biosphere (biospheric values; Stern & Dietz, 1994). Endorsing biospheric and altruistic values appears to be associated with positive environmental outcomes, whereas endorsing egoistic values tends to be associated with negative environmental outcomes (De Groot & Steg 2007a; 2008; Kalof, Dietz, Stern, & Guagnano, 1999; Nordlund & Garvill, 2002, 2003; Schultz et al., 2005; Stern, 2000; Stern, Dietz, & Guagnano, 1998; Stern, Dietz, Kalof, & Guagnano, 1995). Thus, these values appear to be a stable basis on which to build a model to understand environmental behaviour.

According to Schwartz (1992; 1994) biospheric and altruistic values stem from an opposing value domain to egoistic values; thus, these values are likely to give rise to competing and conflicting motivations. However, more recent research suggests people may have to manage multiple goals that can potentially stem from opposing domains (Unsworth et al., 2014). Goal framing theory (Lindenberg 2001, 2006, 2008; Lindenberg & Steg, 2007) explains people manage to achieve this by making one goal focal at any one time. Thus, suppressing their other goals and concentrating on the dominant goal in given situation¹².

¹² The goal may become focal due to situational cues (bottom up activation).

An alternative explanation is that individuals may try and perform behaviours that satisfy all the multiple conflicting values they endorse; thus, resolving the conflict between competing values (Kopetz, Faber, Fishbach & Kruglanski, 2011). However, behaviours that are supported by egoistic, biospheric *and* altruistic values may be hard to find, particularly in the environmental domain. This is because most environmental behaviours that are congruent with biospheric and altruistic motivations, usually require some form of personal sacrifice (Steg, Bolderdijk, Keizer & Perlaviciute, 2014).

Individuals who highly endorse all three values may therefore perform a limited number of environmental behaviours compared to those individuals who only highly endorse biospheric and altruistic values. This may be because individuals who highly endorse conflicting values may not be able to identify as many behaviours that they are intrinsically motivated to perform, given that many behaviours may conflict with at least one set of their values (e.g. biospheric-altruistic values or egoistic values). Thus, fewer environmental behaviours may have high self-concordance for this group. Self-concordance is the “motivational propensity that derives from the degree to which a particular behavior is connected to the rest of the person’s goal hierarchy” (Unsworth & McNeill, 2017, p6).

For people who endorse multiple values, while some behaviours may be supported by all three values (e.g. walking instead of catching the bus may be supported by both egoistic, altruistic and biospheric motives), other behaviours are only likely to be supported by some values and be inhibited by others (e.g. buying organic produce may be supported by biospheric values, have no impact on altruistic values, but be inhibited by egoistic values due to the price).

Thus, finding behaviours that are supported by all the conflicting goals may limit which environmental behaviours individuals who endorse conflicting values may be willing to perform. Conversely, as biospheric and altruistic values are thought to positively relate to environmental behaviours, individuals who *only* highly endorse these values may find a greater range of pro-environmental behaviours have higher self-concordance, and so perform a greater number of these. Conversely, because of the personal sacrifices required to perform most pro-environmental behaviours, individuals who *only* highly endorse egoistic values, may find fewer of these possess high self-concordance.¹³

Generally, the impact of endorsing multiple and conflicting values receives little attention. Usually, studies investigating the impact of values on environmental behaviour do so by employing regressions that consider each of the values as a separate predictor of behaviour (e.g. Steg, 2007; 2008; 2014; Ojea & Loureiro, 2007). An alternative method that allows the researcher to consider the impact of multiple variables is employing a segmentation approach.

2.1.3. Conflicting Values and Segmentation

Segmentation, described in more detail in *section 1.4* of chapter one, is the act of defining meaningful sub-groups from a given population which allows a researcher to reduce the number of entities being dealt with into manageable, mutually exclusive, and well-defined groups (Anable, 2005). While a growing body of work considers segmentation and environmental outcomes (e.g. Anable, 2005; Awad, 2011; Bosehans & Walker, 2016; Chan, 2000; do Paco & Raposo, 2009; Gordon, Butler, Magee, Waitt & Cooper, 2015; Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011; Poortinga & Darnton,

¹³ This may change if the environmental behaviours were framed in ways to be more compatible with egoistic concerns (e.g. finances) but generally environmental reasons are normally given as to why people should engage in environmental behaviours.

2016), few of these explicitly consider values and segmentation. Studies that have, have found that individuals can highly endorse multiple values from conflicting domains (e.g. the ‘aspirers’ segment found in Poortinga & Darnton, 2016). Some studies have also offered support that individuals can value both the economic and environmental aspects of a behaviour (e.g. the ‘Value opportunists’ in Gordon, Butler, Magee, Waitt & Cooper, 2015). Yet, these studies also included other variables, and did not focus upon biospheric, altruistic and egoistic values. Consequently, no study to the author’s knowledge, has set out with the primary aim of performing a values-based segmentation approach to investigate the impact of endorsing multiple and conflicting values on environmental behaviour.

To achieve this a segmentation will be employed. A K-means cluster analysis will be performed, with biospheric, altruistic and egoistic values used as segmenting variables¹⁴. Participants will be allocated into groups by the cluster analysis based upon the importance they attribute to each of the values. Schwartz (1992; 1994) and Steg (2007; 2008; 2012) determine importance of a value by asking participants to rate how much they view the value as a guiding principle in their life¹⁵. While the number of groups found will be driven by the data, the author may consider multiple options (e.g. 3, 4 or 5) groups, to ensure the segmentation makes theoretical sense (Fox, Hunter & Jones, 2016).

Based upon the literature reviewed in chapter one, the author predicts a four-group solution may be most appropriate for theoretical reasons. While Schwartz (1992;1994) suggests that individuals are likely to either endorse biospheric and altruistic values (*group one*) or egoistic values (*group two*), research considering multiple goals, and

¹⁴ See *section 1.4.2.2* for why a K-means cluster analysis was selected to complete the segmentation.

¹⁵ More details concerning the questionnaire and methodological issues with this approach can be found in *section 1.3.2*.

previous segmentation models, suggest individuals may endorse values from opposing domains (*group three*; Blamey & Braithwaite, 1997; Gordon, Butler, Magee, Waitt & Cooper, 2015; Madrigal & Kahle, 1999; Poortinga & Darnton, 2016).

Another body of literature suggests a fourth group may be present. DEFRA (2008b) suggest around 18% of the population are 'honestly disengaged' and may not be willing to complete environmental behaviours for biospheric, altruistic or egoistic reasons. This may be the case because they do not highly endorse any of these values, so hardly any environmental behaviours will have high levels of self-concordance for this group. Consequently, a fourth group, that scores low on all values may perform worse on environmental outcomes than all other groups. In summary, a primary aim of this study is to consider how many groups are derived from a values-based segmentation and whether these groups differ in their environmental behaviour. This will allow the author to pass comment on the effect of endorsing multiple and/or conflicting values on environmental behaviour.

2.1.4. The Current Study

In this study, environmental behaviour will be measured by asking participants about their engagement with recycling over a 24-hour period. Recycling was selected as while this is a popular behaviour in the UK, as a nation we perform poorly compared with European counterparts. It has been suggested that around 60% of waste that ends up in landfill or sent for incineration could be recycled (Guides Network, 2017). Thus, the potential for individuals to make a significant contribution to mitigating climate change is also high: one person recycling their newspaper, magazines, plastic, glass, and metal for one year could save 231kg of carbon dioxide from going into the atmosphere.

This behaviour was also selected as values have been shown to influence recycling in previous empirical work. McCarty and Shrum (1994) found values relating to self-gratification and self-fulfilment were negatively related to holding positive recycling attitudes. A year previously, the same authors demonstrated that attitudes regarding the inconvenience of recycling mediated the value-behaviour relationship (McCarty & Shrum, 1993). This is consistent with theory that suggests values influence behaviour through a series of mid-range cognitions (Homer & Kahle, 1988; Stern, 1999; 2000).

However, some research has suggested that values may impact behaviour directly. For example, Kaiser, Hubner and Bogner, (2005), found values relating to harmony directly predicted recycling. However, other empirical research suggests values will influence behaviour through moral norms (e.g. Steg, Dreijerink, & Abrahamse, 2005; Van Riper & Kyle, 2014). Consequently, a secondary aim of this study will be to explore whether biospheric, altruistic and egoistic values directly influence recycling or whether moral norms mediate the relationship. When assessing whether values influence moral norms and/or behaviour, the findings will also allow the author to comment on the appropriateness of each of the values for use in the segmentation model. For example, if certain values are not significantly contributing to either of the outcome variables, the value may need removing from subsequent segmentations.¹⁶

A study that has investigated the link between moral norms and recycling was performed by Tonglet, Phillips and Read (2004). Their study of 191 participants in a local kerbside recycling scheme found moral norms correlated positively with both intention to

¹⁶ However, some leniency must be employed as while a certain value may not predict one behaviour (e.g. recycling) they may be of use in a different model predicting a different behaviour (e.g. energy use). Consequently, as the segmentation model is to be used to understand a range of environmental behaviours throughout this thesis, leniency will be applied when deciding whether to include or exclude a variable.

recycle, and holding positive attitudes regarding recycling. Their moral norm scale had good reliability (.74) and given that it has been tested on recycling behaviour, the scale seems appropriate for use in this study.

Finally, to segment the sample, a cluster analysis will be performed. K-means cluster analysis is preferable as it provides the most equally sized groups and best differentiates between clusters (Eshghi, Haughton, Legrand, Skaletsky, & Woolford, 2011). However, the output provided does not contain any measure of model quality. Thus, completing a two-step cluster analysis before completing the K-means analysis allows the author to compare different solutions (i.e. different numbers of groups) based upon their fit (Liu, Li, Dong, & Wen, 2013). The two-step method provides the *Akaike information criterion (AIC)*; a measure of the relative quality of statistical models. The AIC considers the information lost when a cluster group is removed (e.g. the information lost from only have two groups instead of three) but takes into the account the complexity of the model. Thus, the AIC statistic will be considered alongside theoretical considerations when selecting the number of groups.

2.1.5. Summary and Hypotheses

To summarise, this study will consider a values-based segmentation model to explain recycling behaviour. This approach will be taken as while previous literature has documented that values influence environmental behaviour little research has considered the impact of endorsing multiple and conflicting values. Segmentation models that have, show it is possible to highly endorse multiple values from conflicting domains (e.g. Blamey & Braithwaite, 1997), but these have so far either included a range of other factors alongside values (e.g. Poortinga & Darnton, 2016), or have conceptualised values differently (e.g. Gordon, Butler, Magee, Waitt & Cooper, 2015).

Thus, this study will contribute to existing literature regarding the value-behaviour relationship by investigating: a) Which values influence moral norms and recycling behaviour, and which values should be included in a values-based segmentation. b) How many distinct groups can be found based upon a segmentation approach using biospheric, altruistic and egoistic values as the segmentation variables? c) Are these groups meaningful, in the sense that they differ from one another regarding their moral norms relating to recycling, and their recycling behaviour? d) Once segmented, does membership of a group influence recycling behaviour directly or is this relationship mediated by moral norms?¹⁷. The following hypotheses are proposed for this study:

H₁: Consistent with VBN theory, biospheric (positive), altruistic (positive) and egoistic values (negative) will influence moral norms relating to recycling (H_{1A}) but not recycling behaviour directly (H_{1B}).

H₂: A values-based segmentation model will identify meaningful distinct groups that differ regarding their moral norms relating to recycling (H_{2A}) and their self-reported recycling behaviour (H_{2B}).

H₃: Consistent with VBN theory, moral norms will mediate the relationship between cluster group membership and recycling behaviour.

2.2. Method

2.2.1. Participants

Participants for the study were all undergraduate students attending a UK university. In total, 284 participants completed the questionnaire, of which 176 (62%)

¹⁷ As values determine cluster group membership, cluster group membership is essentially a categorical proxy variable for holding different values. Thus, testing whether cluster group membership influences recycling behaviour directly or indirectly, is essentially testing whether moral norms mediate the value-behaviour relationship as specified by VBN theory.

were female. Participants ranged from 18 years to 51 years old ($M = 19.20$ years, $SD = 2.31$). Participants were primarily recruited from a course-credit scheme in which psychology students participated in research in return for receiving credit towards a first-year undergraduate module.

2.2.2. Design

The study employed a cross-sectional survey design. The data analysis section of this study is presented in three sections; each relating to one of the hypotheses. In the first section, two multiple regressions investigated whether values (biospheric, altruistic and egoistic) predicted moral norms and recycling behaviour. Second, a K-means cluster analysis segmented the sample based upon the three values¹⁸. An independent samples MANOVA was employed to test whether the cluster groups (IV) differed in terms of their moral norms (DV 1) and recycling behaviour (DV 2). Finally, multi-categorical mediation analyses considered whether moral norms mediated the relationship between the cluster groups (IV) and recycling behaviour (DV).

2.2.3. Materials

The complete questionnaire used for this study can be found in Appendix A. The questionnaire comprised three sections, values, moral norms (which in the questionnaire to avoid using technical terms were called 'attitudes') and recycling behaviour.

2.2.3.1. Values. Biospheric, altruistic and egoistic values were assessed by a scale developed by De Groot and Steg (2007a, 2008). The scale is an adapted shortened version of Schwartz's value questionnaire (Schwartz's Value Survey; 1992, 1994) and builds upon the foundations of Stern (1999). The scale contains 13 items: four measuring biospheric

¹⁸ While it is unknown how many groups will be derived from the cluster analysis, the author has outlined that at least four groups may be possible from reviewing previous literature. A two-step cluster analysis will first be performed to aid in group selection.

values (preventing pollution, respecting the earth, unity with nature, and protecting the environment), four measuring altruistic values (equality, a world at peace, social justice, helpful), and five measuring egoistic values (social power, wealth, authority, influential and ambition). Consistent with the recommendations of Schwartz (1992; 1994) Respondents rated the importance of the items as 'a guiding principle in their lives' on a 9-point scale ranging from -1 'opposed to my values' to 7 'of supreme importance'. The scale was labelled at points: 0 (not at all important), 3 (important) and 6 (very important). In line with previous work, participants were asked to vary their responses and only select a small number of values as 'of supreme importance'.

2.2.3.2. Moral norms. This scale was taken from Tonglet, Phillips and Read (2004) and measures moral norms relating to recycling. It contained four items: 'I feel I should not waste anything if it could be used again', 'I would feel guilty if I did not recycle', 'it would be wrong of me not to recycle', and 'not recycling goes against my principles'. Participants rated how much they agreed with the items on a 7-point Likert scale, running from strongly disagree to strongly agree.

2.2.3.3. Recycling behaviour. Recycling behaviour was measured by a single item. Respondents were asked: 'Please indicate to the best of your knowledge, how many items you estimate you have recycled in the past 24 hours?'.

2.2.4. Procedure

Participants completed the pen and paper questionnaire in a lab at a UK university in isolation. Participants signed up for the study as part of a course requirement in which student's complete research projects in return for course credit. Standard BPS ethical procedures were followed and the study was approved by Keele University Ethics

Committee (see Appendix B for the ethics approval letter, and Appendix C for the information sheet, consent form and debrief sheet).

2.3. Results

2.3.1. Data Preparation

A Confirmatory Factor Analysis (CFA) was performed to check whether the scale items relating to biospheric, altruistic or egoistic values loaded as expected. Two items, 'Ambition,' and 'Influence' failed to load on the egoistic subscale and instead correlated more strongly with altruistic values.¹⁹ While Schwartz (1992) states that values may be found in adjacent domains in empirical work, egoistic and altruistic values are generally not considered conceptually close enough for this to happen. Thus, the items were removed, reducing the egoistic scale to three items. All other items loaded as expected. The internal reliability of the sub-scales for moral norms and the biospheric, altruistic, and egoistic subscales were .83, .87, .66 and .72. All scales had good reliability apart from altruistic values which was slightly below the recommendation of .7.

2.3.2. Data Analysis

The data analysis section is split into three sections each relating to one of the hypotheses.

2.3.2.1. Hypothesis one. This states that biospheric (positive), altruistic (positive) and egoistic values (negative) will influence moral norms relating to recycling (H_{1A}) but not recycling behaviour directly (H_{1B}).

¹⁹ The multi-group method (MGM) was performed (Nunnally, 1978); having previously been employed by the scales creators (De Groot & Steg, 2007; De Groot & Steg, 2008). The strength of the correlation between an item and the hypothesised subscale it should load on is compared with the strength of the correlation between an item and all other subscales. If an item most strongly correlates with the hypothesised subscale then it is deemed to have loaded as expected, but if an item correlates more strongly with another subscale then it should be removed. To control for self-correlation between an individual item and its expected subscale, Nunnally (1978) suggests comparing each individual item to the respective subscales without including the item itself in any of the scales.

Descriptive statistics revealed that overall altruistic values ($M=5.55$, $SD=.94$) were rated as most important, followed by biospheric values ($M=4.4$, $SD=1.37$) and egoistic values ($M=2.36$, $SD=1.37$). It appears participant's moral norm to recycle was strong, on average participants scored 4.51 ($SD=1.25$) out of 7. Finally, participants recycling varied considerably, with individuals indicated they had recycled between 0 (minimum) and 20 (maximum) items. On average, participants had recycled 4.27 items ($SD=4.12$) in the past 24 hours.

To ascertain whether biospheric, altruistic and egoistic values predicted moral norms and recycling, two multiple regressions were conducted using the Enter method. Before completing the analysis, relevant assumption checks were performed, and were met (see Appendix D). The first regression demonstrated that values predicted moral norms: $F(3,280) = 21.54$, $p < .001$, $R^2 = .19$, $R^2_{Adjusted} = .18$. The analysis indicated that biospheric values positively predicted moral norms ($\beta = .36$, $t(276) = 5.78$, $p < .001$) and egoistic values negatively predicted moral norms ($\beta = -.142$, $t(276) = 2.60$, $p < .001$). Altruistic values were not a significant predictor of moral norms at the $\alpha=0.05$ level, however were approaching significance ($\beta = .105$, $t(276) = 1.685$, $p = .09$). A second regression equation found values did not predict environmental behaviour: $F(3,280) = 2.03$, $p > .05$.

The findings partially support hypothesis 1a: both egoistic and biospheric values, but not altruistic values predicted moral norms. The findings also support hypothesis 1b: values do not directly predict behaviour. Despite not being statistically significant, altruistic values were approaching significance, and given the previous literature showing they influence environmental behaviour were retained as a segmentation variables.

2.3.2.2. Hypothesis two. This states that a values-based segmentation model will identify meaningful distinct groups that differ regarding their moral norms relating to recycling (H_{2A}) and their self-reported recycling behaviour (H_{2B}).

To facilitate the interpretation of the segmentation, participants' mean raw scores regarding biospheric, altruistic and egoistic values were transformed into z scores. A two-step cluster analysis was performed, the author compared the Akaike's Information Criterion (model fit) statistics for segmentations that contained between three and fifteen groups. A sharp drop of model fit occurred beyond five groups (see Appendix E). Thus, three, four and five group solutions were explored further using a K-means cluster analysis. The four-group solution contained the three groups also found in the three-group solution, and had more homogeneous group sizes than the five-group solution. Thus, a four-group solution was judged to be the most appropriate based upon theoretical considerations alongside interpretability and group size. As is common practise, each cluster group was given a descriptive name to reflect the relationship with the segmentation variables:

Cluster 1 – *Non-engagers*: Comprising 21% ($n=59$) of the sample, who scored below average on all three values.

Cluster 2 – *Self-enhancers*: Comprising 24% ($n=68$) of the sample, who scored above average regarding egoistic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprising 30% ($n=87$) of the sample, who scored below average regarding egoistic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprising 25% ($n=70$) of the sample, who scored above average on all three values.

To better understand how the groups' differ in their regard for the three values, *Table 2.1* provides the mean values scores for each of the groups. As the values scores from the participants have been standardised to aid interpretation, a score of 1 or -1 indicates that the group scored one standard deviation above or below the sample mean. A score of zero indicates the group scored the same as the sample average. As an example, taking the Non-engagers: the group scored 1.75 standard deviations below average on biospheric values, nearly half a standard deviation below average on altruistic values, and .86 below average on egoistic values. Consequently, this group do not appear to attribute great importance to any of the values.

Table 2.1
Standardised values scores for each of the cluster groups

Cluster Groups	Biospheric	Altruistic	Egoistic
Non-engagers	-1.75	-0.48	-0.86
Self-enhancers	-0.72	-0.77	0.74
Value opportunists	1.12	0.57	1.50
Selfless contributors	0.85	0.46	-1.20

The descriptive statistics relating to the groups' moral norms and recycling are shown in *Table 2.2*. From considering the means, it appears both the groups that highly endorse biospheric and altruistic values (i.e. the Value opportunists and Selfless contributors) have higher moral norms than the other groups (i.e. the Non-engagers and Self-enhancers). While the Non-engagers appear to have recycled fewer items than all other groups. The large standard deviations associated with the recycling measure are

also noteworthy; suggesting in all groups individuals differed considerably in how many items they had recycled in 24 hours.

Table 2.2

Means (and standard deviations) of moral norms and recycling for the cluster groups

	Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Moral Norms	3.92 (1.24)	4.22 (1.12)	4.74 (1.25)	4.96 (1.13)
Recycling	2.97 (2.40)	4.46 (4.70)	4.30 (3.99)	4.97 (4.57)

To statistically assess differences between the groups, an independent samples MANOVA was employed. Assumptions checks were performed relevant to this test (see Appendix F). Of note, 21 outliers were removed mainly due to their self-reported recycling scores, and the assumption of equality of variance was not met. Consistent with Dean and Voss (1999), a transformation was not performed as the variance ratio between groups did not exceed 3:1. All other assumptions were met.

Ratings of moral norms and recycling significantly differed between the groups: $F(6,512) = 8.45, p < .001$; $Wilk's \Lambda = .829, \eta_p^2 = .09$. More specifically, the analysis indicated that cluster group membership had a statistically significant effect on both moral norms: $F(3,257) = 15.64, p < .001, \eta_p^2 = .15$, and recycling $F(3,257) = 4.20, p = .006, \eta_p^2 = .05$. Post-hoc tests, with a Bonferroni correction employed for multiple comparisons, found that the *Value opportunists* and *Selfless contributors* reported significantly higher moral norms than the *Non-engagers* and *Self-enhancers*. While for recycling, the *Selfless contributors* recycled significantly more items in the 24-hour period than the *Non-engagers*. These findings support hypothesis 2a and 2b as the groups identified from the segmentation differed in their regard for both moral norms and recycling.

2.3.2.3. Hypothesis three. This states that moral norms will mediate the relationship between cluster group membership and recycling behaviour. As the cluster groups were based upon an individual's endorsement of biospheric, altruistic and egoistic values, using cluster group membership as a categorical predictor variable allows the author to assess the impact of endorsing different levels of the three values. For example, the effect of 'moving' from the *Non-engagers group* to the *Self-enhancers group* is equivalent to assessing the effect of an individual moving from *not highly endorsing any values* to *highly endorsing egoistic values*. Equally the effect of moving from the *Value opportunists group* to the *Selfless contributors group*, is equivalent to the effect of an individual *no longer highly endorsing egoistic values while still highly endorsing biospheric and altruistic values*. Thus, group membership acts as a proxy variable, which will be used to test whether endorsing different combinations of values impacts upon recycling directly or is mediated by moral norms.

PROCESS, an add-on for the statistical computer-based package SPSS, was used for the mediation analysis. A total effects model, which considers both the potential direct and indirect effects, concluded that cluster group membership did impact upon recycling: $F(3,280) = 21.54, p = .036$. To investigate whether this effect was direct or indirect, bootstrapping was performed. Estimates of the beta co-efficient and standard error of the possible paths (e.g. direct versus indirect) were calculated. Lower limit and upper limit confidence intervals were calculated to denote whether a path is significant. If the lower and upper limit confidence intervals do not contain zero then a path is significant. Table 2.3 shows which paths were significant.

Table 2.3

The Direct and Indirect Effects of Cluster Group Membership on Recycling Behaviour

Cluster Group Comparison (The effect of moving from <i>Group A</i> to <i>Group B</i>)	Direct Effect β (Standard Error) [LLCI – ULCI]	Indirect Effect via Moral Norms β (Standard Error) [LLCI – ULCI]
Non-engagers to Self-enhancers	NS	NS
Non-engagers – Value opportunists	NS	.32 (.21) [.01 – .87]
Non-engagers – Selfless contributors	1.60 (.72) [.18 – 3.02]	NS
Self-enhancers – Selfless contributors	NS	.29 (.19) [.01 – .75]
Self-enhancers – Value opportunists	NS	.21 (.14) [.01 – .53]
Value opportunists – Selfless contributors	NS	NS

The table shows that no significant differences exist in recycling due to the direct effect, or indirect effect of values, when assessing the effect of moving from the *Non-engagers* to the *Self-enhancers*, or the *Value opportunists* to the *Selfless contributors*. This finding is consistent with the MANOVA presented earlier that found no differences between these groups. The table also shows that cluster group membership directly effects recycling when comparing the *Non-engagers* to the *Selfless contributors*. In other words, we could expect to see an increase in recycling if an individual went from not highly endorsing any values (i.e. is a non-engager) to highly endorsing biospheric and altruistic values (i.e. is a selfless contributor).

In all other cases where a significant effect exists, the effect of moving from one group to another is mediated by moral norms. For example, taking the case that compares the *Self-enhancers* to the *Selfless contributors* it appears that the effect of no

longer highly endorsing egoistic values and instead highly endorsing biospheric and altruistic values strengthens an individual's moral norm to recycle. It appears it is this increased feeling of a moral obligation to act that increases the individuals recycling. This offers partial support for hypothesis 3, as moral norms mediated the relationship between cluster group membership and behaviour for some, but not all cases.

2.4. Discussion

2.4.1. Summary of Findings

The findings indicate that values influence our moral norms but do not directly influence recycling. This finding is consistent with VBN theory (Stern, 2000) and partially supports hypothesis one which stated values will predict moral norms (1a) but not recycling behaviour (1b). The hypothesis was only partially supported as altruistic values were not significantly related to moral norms. However, biospheric values positively influenced moral norms while egoistic values negatively influenced moral norms.

The segmentation based upon biospheric, altruistic and egoistic values found a four-group solution to be most appropriate. This was based on a measure of model fit (AIC), homogeneity of group size, and theoretical interpretation. The four groups appeared to match suggestions from previous literature regarding the different values individuals may endorse. Schwartz (1992; 1994) suggested that individuals are unlikely to endorse conflicting values as this will give rise to psychological conflict (e.g. stress) and so are like to either only highly endorse biospheric and altruistic values (i.e. Selfless contributors) *or* highly endorse egoistic values (i.e. Self-enhancers). However, when reviewing literature relating to multiple goals, Unsworth et al. (2014) suggests it may be the norm rather than the exception that individuals have multiple competing goals (i.e. Value opportunists). Finally, previous segmentation models by Blamey and Braithwaite

(1997) also find a group that score below average on all values (i.e. the Non-engagers). This final group account for 21% of the sample, which is only slightly higher than the percentage (18%) that DEFRA (2008) estimate to be 'honestly disengaged'.

The four groups identified were found to differ in their regard for moral norms and recycling. This supports hypothesis two. From completing post-hoc tests, it was revealed that both the *Selfless contributors* (who scored high on biospheric and altruistic values and low on egoistic values) and *Value opportunists* (who scored high on all values) reported stronger moral norms relating to recycling than both the *Self-enhancers* (who scored low on biospheric and altruistic values and high on egoistic values) and *Non-engagers* (who scored low on all values).

This means that the two groups that scored highest on moral norms, were also the two groups that scored highest on biospheric and altruistic values. This is consistent with previous research that has found biospheric and altruistic values to be positively related to moral norms (e.g. Steg, Dreijerink, & Abrahamse, 2005; Van Riper & Kyle, 2014) and more generally, VBN theory (Stern 1999; 2000) which states values activate moral norms.

Post-hoc tests also revealed that the *Selfless contributors* recycled significantly more items in a 24-hour period than the *Non-engagers*. Moral norms are thought to influence environmental behaviour, consequently as the Selfless contributors had the highest moral norms and Non-engagers the lowest, it is not surprising that the Selfless contributors group would go on to recycle more than the Non-engagers.

As the regression revealed values did not influence recycling directly, but did influence moral norms, multi-categorical mediation analyses were performed to investigate whether moral norms mediated the relationship between cluster group membership and recycling. The analysis indicated that cluster group membership

influenced recycling both directly and indirectly depending on what values were being considered. The effect of group membership on recycling was direct when comparing the *Non-engagers* and the *Selfless contributors*, but was indirect when comparing the *Non-engagers* with the *Value opportunists*; the *Self-enhancers* with the *Selfless contributors*, and the *Self-enhancers* with the *Value opportunists*.

This implies that, at least in some cases, the effect of endorsing values on recycling behaviour is mediated by an individual's moral norm. However, the mediation analysis suggests that values may also have a direct effect on behaviour in specific cases. This perhaps explains why the value-behaviour relationship has been suggested to be both direct (e.g. Kaiser et al., 2005) and indirect (Stern, 1999; 2000). As moral norms mediated the relationship on some but not all occasions, hypothesis three, which stated moral norms would mediate the relationship between cluster group membership and recycling, was partially supported.

2.4.2. Contribution to Existing Literature

In terms of contributing to the literature, this study offers further support that values influence environmental outcomes and, more specifically, that biospheric values positively relate to environmental outcomes (e.g. moral norms), while egoistic values are negatively related to these outcomes (e.g. De Groot & Steg, 2008; Nordlund & Garvill, 2002, 2003; Schultz & Zelezny, 1998; Stern & Dietz, 1994; Stern, Dietz, Abel, Guagnano, & Kalof, 1999).

However, altruistic values were not found to be a significant predictor of moral norms in this study. This is somewhat surprising given that altruism has been highlighted as an important determinant of environmental behaviour, particularly for use in segmentation studies (Straughan & Roberts, 1999). However, altruistic values may be less

directly relevant to recycling than both biospheric and egoistic values. This is because biospheric values are the only values with explicit links to the environment, and recycling requires the individual to suppress egoistic concerns (Steg, Bolderdijk, Keizer & Perlaviciute, 2014).

The study also contributes to the recently expanding body of literature that considers segmentation approaches and environmental outcomes (e.g. Anable, 2005; Awad, 2011; Bosehans & Walker, 2016; Gordon et al., 2016; Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011; Poortinga & Darnton, 2016). However, unlike some of the studies which consider a specific regional problem (e.g. Bosehans & Walker, 2016; cycling around the University of Bath), the use of values as the basis for segmentation means the cluster groups found in this study may have meaning across multiple sustainability and/or behavioural domains (Poortinga & Darnton, 2016) and when using diverse racial, geographical, linguistic, cultural and religious samples (Schwartz, 1992; 1994). Therefore, the segmentation approach used in this study may have increased applicability for policy makers who may want to employ a segmentation approach that can be adapted for use in understanding many different behaviours. Of course, this latter point needs further exploration.

In terms of how the values loaded, biospheric and altruistic values were closely linked, loading together in all cases for the four cluster groups (i.e. if a group scored high on biospheric values, they also scored high on egoistic values). This is not surprising given that they both stem from the self-transcendence domain (Schwartz, 1992; 1994; Stern, 1999) and have previously been shown to correlate (De Groot & Steg, 2007a). For two of the groups, *Selfless contributors* and *Self-enhancers*, egoistic values loaded in the opposite direction than both biospheric and altruistic values. To clarify, for *Selfless*

contributors, individuals scored high on biospheric and altruistic values and low on egoistic values, while for Self-enhancers the pattern was reversed. Theoretically this makes sense as these values stem from conflicting domains, and so it would not be surprising if individuals only highly regarded values from one of the domains (Schwartz, 1992).

However, for two of the groups, the *Value opportunists* and the *Non-engagers*, all three values loaded in the same direction. This meant the *Non-engagers* scored low on all values, while the *Value opportunists* scored high on all values. Considering this latter group, provides a unique contribution to the literature, as it provides insight into environmental outcomes if an individual highly endorses conflicting values; something that is typically not considered when values are assessed as separate predictors of behaviour in regressions (Ojea & Loureiro, 2007).

2.4.3. Endorsing Conflicting Values

Findings suggest that in terms of moral norms relating to recycling, the *Value opportunists* group (who endorse conflicting values) are no different to the Selfless contributors group (who only highly endorse biospheric and altruistic values). Moreover, no significant differences are found between these two groups when considering recycling. This appears to suggest highly endorsing egoistic values *alongside* biospheric and altruistic values has no detrimental effect on moral norms or recycling. One interpretation of this finding is that the impact of endorsing values which positively relate to environmental outcomes (e.g. biospheric and altruistic values) negates any negative impact of highly endorsing egoistic values. This suggests endorsing conflicting values does not inhibit recycling or feelings of a moral obligation to act environmentally friendly.

A possible reason no differences were found between the Value opportunists and Selfless contributors is that recycling is a relatively easy behaviour to complete: most people have the knowledge and resources to do it. Moreover, while recycling may not bring any egoistic benefits, it is not a costly behaviour; for example, generally there are no direct financial costs for performing the behaviour. So, while the *Value opportunists* performed as well as *Selfless contributors* on this behaviour, investigating 'harder to perform' environmental behaviours which require larger personal sacrifices (e.g. financial cost) may reveal differences between the groups.

These findings have consequences for both policy makers and campaign designers. While previous work has suggested endorsing egoistic values has a negative impact on environmental outcomes, this study offers a slightly more lenient and optimistic interpretation. These findings suggest holding egoistic values may not be detrimental to environmental behaviour providing the individual also holds biospheric and altruistic values in high regard. Campaigners considering the groups found from the segmentation may not need to shy away from highlighting egoistic benefits to performing a behaviour when targeting the Value opportunists as this does not seem to be detrimental for this group.

While the Value opportunists endorse conflicting values, a more challenging group to understand may be the Non-engagers. This group performed worst on both moral norms and recycling. Moreover, as this group appear to have no affinity to any of the values considered, increasing the self-concordance of environmental behaviour may be challenging. Unsworth and McNeill (2017) show this can be achieved by highlighting how performing a behaviour may aid an individual in achieving their goals. However, increasing connections between recycling and these values is unlikely to be effective as

this group do not believe these values to be of great importance. Consequently, further investigation into groups that highly endorse conflicting values, or do not highly endorse any values, may be needed to better understand how these groups perform when considering other environmental behaviours.

In summary, the study provides further evidence of the efficacy of using values in environmental research and offers a unique perspective into the effects of endorsing conflicting values. The findings suggest for the Value opportunists group policy makers and campaign designers may not need to play down or ignore egoistic concerns, but instead acknowledge them and potentially utilise them to increase the appeal of a campaign. Finally, as the findings show that moral norms play an important mediating role between values and recycling behaviour, policy makers and campaign designers may wish to attempt to increase an individual's feelings regarding their moral obligations to recycle.

2.4.4. Limitations

First, the sample used for this study consisted of students attending a UK university. While Schwartz (1992; 1994) demonstrated that demographics do not tend to influence the general structure of values, it is possible that age of the sample may have influence how important certain values were rated. For instance, Schwartz, Burgess, Harris and Owens (2001) found self-transcendence (e.g. biospheric and altruistic values) positively correlated with age, whilst self-enhancement (egoistic) values negatively correlate with age. Consequently, this 'young' sample may be more inclined to report higher levels of biospheric and altruistic values, and lower levels of egoistic values than a comparable sample of older adults. This may have influenced the 'average' score for each value, and thus the profile and size of the cluster groups. Because of this, considering

whether a four group solution replicates on a second sample appears to be of importance.

When discussing how values 'predict' behaviour, caution also needs to be taken. As this study was a cross-sectional survey, it is not possible to directly infer causation from this work alone. However, well established theories such as VBN theory (Stern, 1999; 2000) clearly document the causal chain from values to behaviour. This suggests that the interpretation put forward in this chapter, although not statistically proven by a longitudinal analysis or experiment, makes theoretical sense.

Another issue worthy of note from this study is that the internal reliability of the altruistic values subscale was not above Cronbach's alpha of .7 (altruistic values = .66). Whilst not ideal, the Cronbach's alpha found is akin to the median reliability found in studies using Schwartz Value Survey (Schwartz, 2001). Moreover, researchers have described alphas of under .6 as satisfactory. For example, Schmitt (1996) suggests .5 may be useful at indicating reasonable uni-dimensionality. Furthermore, the alpha level found in this study for altruistic values, is akin to reliabilities used in other published segmentation studies (e.g. Poortinga & Darnton, 2016) and higher than the Cronbach's alpha found in some published studies in the field (e.g. Cronbach's $\alpha = 0.5$ for a recycling behaviour sub-scale in Sidique, Lupi & Joshi, 2010).

It should also be noted that the behavioural measure used in this work was self-reported. While self-report is the most commonly used method of collecting behavioural information in the environmental literature (Steg & Vlek, 2009), there are some criticisms of how well it reflects actual behaviour as individuals may inflate normative behaviour (Barr, 2007, Fuj, Hennessy, & Mak, 1985; Geller, 1981; Warriner, McDougall, & Claxton, 1984). Yet, as other options are resource demanding, self-report mains a necessity for

many researchers. As self-report is used throughout this thesis, a secondary aim of the next chapter will be to consider how social desirability is related to self-report.

A second issue to stem from measuring recycling behaviour is that many outliers were found in the data, and the standard deviation was relatively large. The author speculates this may due to the open-ended nature of the measure. While asking people to report how many items they had recycled in the past 24 hours adding greater specificity than asking about their recycling behaviour in general (e.g. such as a Likert scale anchored by never and always), it seemed to cause large variation in people's answers.

It may be possible that while some people were reporting items they had consumed and recycled themselves, others may have included items consumed by others (e.g. family members, friends, flat mates) but that were recycled by them. As such, while some people may have recycled everything they could, they may have recycled a lower number of items than other people because others had access to more items (e.g. because they lived with others).

Consequently, while this measure does not appear to have had a significant detrimental effect on the study's ability to consider how values and moral norms impact on recycling, for the reasons outlined above, it is less than ideal for use in future studies. Consequently, while general measures of environmental behaviour reported on Likert scales (e.g. anchored by 'never' and 'always') are far from perfect, they perhaps provide the fairest method of assessing behaviour when using self-report surveys.

In terms of other methodological points, while the flexibility and degree of freedom a cluster analysis affords the researcher can be viewed as a strength, there are some questions over its potential lack of theoretically-driven justifications. This is because

while the variables entered to be used as the basis for the segmentation were derived from theoretical foundations, the cluster analysis only reveals patterns in the data. Therefore, while in this study the clusters and their impact on environmental outcomes make theoretical sense, caution must still be taken when basing findings on a data-driven method such as this. Furthermore, as this study employed a post-hoc cluster analysis approach, the group sizes could not be known until the data collection was complete. Given this, the group sizes were relatively equal, and far more homogeneous in terms of group size than other studies that have been published. For example, Anable (2005) found one group that was ten times smaller than another group.

Finally, two of the items that were meant to be associated with the egoistic values scale, 'ambition' and 'influence', failed to load as expected. While this isn't particularly uncommon in empirical work, the author speculates that the type of individuals surveyed may have influenced this. One plausible interpretation as to why the items loaded on to the altruistic values subscale rather than the expected scale is how university students may conceptualise *ambition* and *influence*. The author speculates that the participants could have seen altruistic qualities in these values, as with ambition and influence, the individual could achieve social good and benefit others. Following these lines of logic, the sample may have considered these values in a similar vein to 'being helpful' or other such altruistic sentiments. Of course, this is just the author's suggestion; but future replications using this survey with a student population may paint a clearer picture as to how these values load with such a demographic.

2.4.5. Future Research

First, there is a need to ensure findings can be replicated (Wagenmakers, Wetzels, Borsboom, van der Maas & Kievit, 2012). Consequently, while improvements can be

made to this work, an initial replication with only minor tweaks may help demonstrate the replicability of the findings regarding the amount of cluster groups, the importance they attribute to biospheric, altruistic and egoistic values, and the differences found between the groups on environmental outcomes. Future research may also want to consider expanding the model to include other values that have been shown to influence environmental outcomes (e.g. hedonic values).

Further study into whether the cluster groups behave in a similar manner when a different behaviour is considered would also be useful. This would offer further insight into whether a different behaviour elicits differences between the *Value opportunists* and the *Selfless contributors*. The inclusion of a behaviour that has a larger impact upon egoistic concerns (e.g. spending money) may result in differences between the two groups.

2.4.6. Conclusion

Individuals can be segmented into groups based upon their regard for biospheric, altruistic and egoistic values, and these groups differ regarding their moral norms and recycling. One of the groups, the Value opportunists, endorse multiple values from conceptually distinct domains, and so hold a high regard for conflicting values. Yet, this does not seem to have detrimental impact on environmental behaviour compared with individuals who highly endorse biospheric and altruistic values. This finding is somewhat surprising given that egoistic values have traditionally been thought to have a negative association with environmental outcomes.

Whether values influence behaviour directly or indirectly also appears to vary when considering different combinations of values. While in one case cluster group membership directly influenced behaviour, in three cases the effect was mediated

through moral norms. While limitations exist with the work, this research offers initial support regarding the efficacy of a values-based segmentation model for understanding environmental behaviour, and thus provides a strong foundation on which to rest future work.

Chapter 3. Replicating and Enhancing a Values-Based Segmentation Model in the UK and in Brazil

Abstract

Initial support has been found for a four-group segmentation based upon biospheric, altruistic and egoistic values. This study aims to test whether this is replicable on two samples: In the UK ($n=371$) and in Brazil ($n=239$). This study develops the model in two ways: by testing whether hedonic values should be included as a segmentation variable, and investigating differences between the groups on recycling and a second behaviour: purchasing 'green' products. The study also considers a methodological issue: the relationship between self-reported behaviour and social desirability. Based upon questionnaire responses relating to how important participants found the values, a K-means cluster analysis identified the same four groups as found in the previous study (*Non-engagers, Self-enhancers, Selfless contributors and Value opportunists*). However, the inclusion of hedonic values was only supported in the UK and not Brazil. Differences regarding moral norms and environmental behaviours were found between the cluster groups in the UK: $F(9,866) = 7.31, p < .001$; *Wilk's* $\Lambda = .837, \eta_p^2 = .06$, but only differences between moral norms and green product purchasing were found in Brazil: $F(9,553) = 4.55, p < .001$; *Wilk's* $\Lambda = .840, \eta_p^2 = .06$). Consistent with VBN theory, moral norms mediated the relationship between cluster group membership and behaviour. Finally, a significant positive correlation was found between recycling and social desirability.

3.1. Replicating and Enhancing a Values-Based Segmentation Model in the UK and in Brazil

This chapter, like its predecessor, tests a values-based segmentation model. However, this chapter aims to develop the model in three ways, which relate to: testing whether previous findings are replicable both within and across cultures; investigating whether the model differentiates between groups when considering a second behaviour, and exploring whether hedonic values should be used as an additional variable for segmentation. A secondary aim of this chapter is to explore the accuracy of self-report measures by considering how self-reported environmental behaviour relates to social desirability. The following section discuss each of these aims.

3.1.1. Testing whether the Previous Findings are Replicable within and across Cultures

In a recent report by the Open Science Framework (2015), it was found that of 100 experimental and correlational studies, 97% had reported statistically significant results. However, upon replication, only 36% had statistically significant results. Thus, in recent years the replicability of psychological research has increasingly been questioned (Yong, 2012). The inability to replicate has been labelled as a 'crisis' (Earp & Trafimow, 2015; Maxwell, Lau & Howard, 2015). While Asendorpf and collaborators (2013) suggest replicating early findings before publication may be one way to help tackle the problem. With this in mind, this chapter aims to test the replicability of the work outline in chapter two on both another UK sample, but also on a sample from Brazil.

While evidence exists regarding how values are structured across cultures (e.g. Fontaine & Schwartz, 1996; Oishi, Schimmack, Diener & Suh, 1998; Spini, 2003), cultural differences are thought regarding the importance of specific values (Milfont, Duckitt & Cameron, 2006). This can be thought of as a national norm, or central tendency of a given

nation. For example, Schultz and Zelezny (2003) discuss 'American values' and how they may differ from other countries; including more emphasis on competition and individualism. Differences between cultures are thought to be most apparent when comparing the US and Western Europe with Asia and Latin America (Schwartz, 2001). Focussing on the latter culture, Bechtel, Corral-Verdugo and Pinheiro (1999) found that while westernised cultures tend to consider human development (e.g. progress in technology) as negatively related to environmental protection, people from Brazil found these views compatible. In Brazil, while individuals may recognise the need for human development, they may not think this needs to be at the cost of the environment (Bechtel et al., 1999).

In another study it was found that unlike in Western countries, altruistic values had a negative total effect on ecological behaviour and self-enhancement had a positive effect (Milfont, Duckitt & Wagner, 2010). Again, these findings suggest a different pattern of beliefs to that commonly associated with these values in Western countries; particularly that self-enhancement may not be viewed as necessarily in conflict with environmental concerns. It is also possible that in rapidly developing countries such as Brazil, there are more competing trade-offs between benefitting the community (e.g. building new roads) and protecting nature. This may explain why altruistic values were negatively related to environmental behaviour in the reviewed study.

Response tendencies may also vary across cultures. For example, Schultz, Gouveia, Cameron, Tankha, Schmuck and Franek (2005), found Brazilians tended to rate many values, even conflicting ones such as biospheric, altruistic and egoistic values, as more important than European counterparts from Germany and the Czech Republic. In the same study, Schultz et al., (2005) found that while in Europe biospheric concerns

(positively) and egoistic concerns (negatively) correlated with environmental behaviour the relationship was not statistically significant in Brazil.

Given the evidence outlining differences between cultures, and particularly between Western Europe and Brazil, it seems appropriate to test whether the groups arising from the values-based segmentation approach can be replicated, and whether the groups found differ regarding their moral norms and environmental behaviour in a similar fashion in both the UK and in Brazil. By doing so, the research will be able to further assess the replicability and the generalisability of a segmentation model.

3.1.2. The Inclusion of Hedonic Values

So far, this thesis has considered egoistic, altruistic and biospheric value orientations as these have consistently been used in the literature in relation to environmental attitudes, beliefs and behaviour (Stern & Dietz, 1994; Stern, 2000; De Groot & Steg, 2007a; 2008). However, hedonic values have also been shown to be a negative predictor of environmental outcomes in empirical work (e.g. Steg, Perlaviciute, van der Werff & Lurvink, 2014).

Originally derived from the pleasure associated with fulfilling basic organismic needs, hedonic values relate to the goal of achieving pleasure or gratification for oneself (Schwartz, 1992). Much like egoistic values, hedonic values focus on the self, however unlike egoistic concerns they do not promote motivation for competition. Instead hedonic values appear to convey an individual's desire for arousal as a motivational force (e.g. doing exciting things, pleasure, and gratification).

According to Schwartz (1992; 1994) hedonic values straddle both the *self-enhancement* and *openness to change* value-types, and so some overlap exists between hedonic values and egoistic values. Research from 40 samples in twenty countries found

in 33 samples, achievement values (which contribute to egoistic values) were compatible with hedonic values. Thus, as hedonic values relate to the goals involving the self, they tend to conflict with biospheric and altruistic values (Schwartz, 1992; Steg, Perlaviciute, van der Werff & Lurvink, 2014).

Both theory and empirical research suggest hedonic values negatively impact upon environmental behaviour. According to Goal Framing Theory, hedonic concerns relate to the goal of achieving gratification for oneself; and so are often in opposition to normative goals such as acting environmentally (Lindenberg & Steg, 2007; Steg et al., 2014a). As most environmental behaviours require some form of personal sacrifice, environmental behaviour is likely to be negatively related to hedonic concerns (Lindenberg & Steg, 2007; Nordlund & Garvill, 2003; Samuelson, 1990; Steg, Dreijerink & Abrahamse, 2005; Steg & Nordlund, 2012).

As a specific example of empirical work, using data collected by an online survey company for 305 Dutch individuals, Steg et al. (2014b) found hedonic values to be related to car use frequency and having a higher mileage driven. While Miao and Wei (2013) found hedonic values to exert the largest influence on environmental behaviour in a hotel setting.²⁰ Consequently, given the evidence that hedonic values may influence environmental outcomes, this study will test whether hedonic values should also be included as a variable for segmentation.

3.1.3. Purchasing 'Green' Products

In the previous study, no differences were found between the Value opportunists and the Selfless contributors regarding their moral norms or recycling behaviour. This was

²⁰ But not in home-settings, where biospheric values were the most important predictor.

despite the Value opportunists highly endorsing egoistic values. The author speculated that no differences were found because the behaviour measured, recycling, did not require enough of a personal sacrifice for the value-opportunist's egoistic values to have a detrimental impact on their willingness to recycle.

To test this notion, a second behaviour, thought to be costlier will also be included in this study: purchasing 'green' products. 'Green' products have been conceptualised differently across studies, for example Bei and Simpson (1995) refer to products made from recycled materials, Laroche, Bergeron and Barbaro-Forleo (2001) refer to only buying products from companies that are not polluters, Kareklas, Carlson and Muelling (2014) consider 'green' products to be organic, while Blamey and Braithwaite (1997) suggest 'green' products are ones that can be readily recycled (e.g. not crisp packets that have many layers of plastics that cannot be separated). For the current study, 'green' products are considered to be products that are made from recycled materials or products that can be readily recycled.

While products made from recycled materials are better for the environment as they generally require less energy to make than products made from virgin materials, the process to recycle them involves extra steps (such as collection and recovery, and contamination removal). This can increase productions costs, and so recycled products can cost more than products that aren't made from recycled materials (Recyclebank, 2016). This premium requires greater financial sacrifice to buy 'green' products, which may not be compatible with egoistic values. Moreover, locating products that can be recycled (e.g. when shopping checking labels) can also be time consuming so is also likely to be in opposition with hedonic values. Thus, investigating this second behaviour that

requires relatively high self-sacrifice (in both finance and time) to perform, may help highlight further differences between the groups found from the segmentation.

3.1.4. Self-report and Social Desirability

As acting environmentally is seen a positive thing to do, there is some concern that people may simply report they are acting in such a manner to preserve self-image, but fail to go on to complete the action (Felonneau & Becker, 2008). For example, Beckmann (2005) questions “who actually would dare to admit disinterest or even anti-environment attitudes?” (p.281). Consequently, participants giving socially desirable answers may be a problem for researchers in the environmental field (Milfont, 2009).

Felonneau and Becker (2008) found that compared to when participants were asked to complete an environmental concern scale as honestly as possible, participants tended to report more ecological concern when explicitly asked to ‘appear to be a good person’. This suggests participants could consciously manipulate responses. While this was manipulated by the experimenter, other people may wish to present themselves as more ecologically motivated to (appear to) conform to the norms of society without changing their behaviour.

This socially desirable responding is formally defined as “the tendency of subjects to attribute to themselves... personality statements with socially desirable scale values, and to reject those with socially undesirable scale values” (Edwards, 1957 p.vi) and has been identified as one of the most common types of response bias (Paulhus, 1991). In the environmental domain, impression management is thought to be a key motivating factor as to why individuals may respond with socially desirable answers, even if promised anonymity (Paulhus, 1984).

Previous work has indeed found some association, albeit yielding a weak or only marginal effect, between social desirability and environmental attitudes, beliefs or behaviour. For example, Kaiser et al. (1999) found social desirability positively correlated with environmental attitudes, intentions and behaviour relating to acting in an ecologically friendly manner, while Hartig, Kaiser, and Bowler (2001), Schahn (2002) and Wiseman and Bogner (2003) found significant correlations between social desirability and environmental attitude and behaviour. As such, the accuracy of self-report measures when compared to objective measures has been brought into question.

Discrepancies have been found between self-report behaviour and objective behaviour in studies relating to both water consumption (Hamilton, 1985) and energy conservation (Fuj et al., 1985). Within the recycling literature, which is particularly relevant to this study, Corral-Verdugo, Bernache, Encinas, and Garibaldi (1994) found the association between self-reported and observed levels of recycling to be weakly correlated ($r = .08$). Corral-Verdugo (1997) also observed that the self-reported frequency of performing recycling, and self-reported quantity of recycling were only weakly correlated with observed behaviour ($r=.14$ and $r=.16$ respectively).

In a meta-analysis considering 6260 individuals from 15 studies that investigated differences between self-report and objective behaviour, Kormos and Gifford (2014) found that, a large effect size ($r = .46$) for the association between the two measures. While this indicates that self-report measures are reasonably highly associated with objective measures, 79% of the variance in the association between self-reported and objective behaviour remains unexplained.

While the effect size of the association between self-report and objective measures was deemed large, the descriptive terms 'small,' 'medium,' and 'large' are

relative, not only to each other, but to the specific content and research method being employed (Cohen, 1988). Therefore, while an effect size of .46 may be considered excellent for how well a psychological construct can explain a behaviour, it appears to be considerably less impressive given that it would be expected that, if reported accurately, self-reported behaviour and actual behaviour should result in the exact same figures.

The meta-analysis also concluded that out of the behaviours considered, the validity of self-reports was greatest for energy usage ($r = .61$), followed by food selection ($r = .31$), transportation ($r = .30$), and water usage ($r = .29$), whereas behaviour related to waste was ranked lowest ($r = .28$). Thus, the self-reported environmental behaviour collected in this study should be carefully scrutinised. To help better understand if response biases such as desirability impact upon self-report behaviour, a measure of social desirability will be included in this study.

3.1.5. The Current Study

The current study aims to further develop a values-based segmentation model by testing: whether hedonic values should be included in the segmentation process, whether the groups differ on an additional behaviour (purchasing green products), and whether the model is broadly replicable across cultures. A secondary aim of the study will also be to consider methodological issues such as the links between social desirability and self-report behaviours.

As the previous study had some issues with the varied responses caused by using an open-ended measure of behaviour (the number of items recycled in the past 24 hours), this study will employ more traditional measures of environmental behaviours such as Likert scales. The measure of recycling behaviour is taken from the previously published and widely cited work of Nigbur, Lyons and Uzzell (2010).

This measure was selected as the authors performed a literature review to select measures that were most appropriate based on use in previous work. The scale items relating to recycling originally derived from items put forward in Cheung, Chan and Wong (1999) and Terry, Hogg, and White (1999). The scale used focussed upon intention to recycle, consequently, these were adapted to consider current recycling behaviour for this study. For example, the item “I will recycle my household waste wherever possible in the future” was adapted to “I recycle my waste wherever possible”. The scale was also selected as for its high internal reliability ($\alpha=0.86$).

After reviewing items used in previous work relating to buying recycled products and products made from recycled materials the author was not satisfied that existing scales mapped on to these behaviours appropriately for this study. For example, some scales were generic to ‘consumer behaviour’ and so lacked specification (e.g. I feel an obligation to buy environmentally friendly products; Blimey & Braithwaite, 1997), while others seemed to be too specific to the study in question (e.g. When buying something wrapped, I check that it is wrapped in paper or cardboard made of recycled materials; Laroche, Bergeron, & Barbaro-Forleo, 2001).

The author felt it more appropriate to devise two items that were better suited to this specific study. Therefore, green product purchase will be evaluated by two items: ‘When available, I select products that can be recycled ahead of equivalent products that cannot be recycled’ and “When available, I select products made from recycled materials ahead of equivalent products made from non-recycled materials”. Including the words ‘when available’ and ‘equivalent’ is an attempt by the author to account for the quality and availability of the product. For example, an equivalent product made from recycled materials may not exist or be available, thus, specifying these conditions should allow the

author to obtain a 'cleaner' measure of green product purchase that excludes variance caused by the availability or quality of products. An exploratory factor analysis and internal reliability checks will be performed to test whether these two items both contribute to 'green product purchase' or are conceptualised as measuring two unrelated behaviours.

The hypotheses derived for this study, its format and the analysis performed, largely follow the same format and reasoning as the previous study. Thus, the justifications for some decisions common between the previous study and the current study (e.g. using a K-means cluster analysis, to test the mediating effect of moral norms) will not be repeated. To test whether the values-based segmentation approach is replicable in the UK and Brazil, the study will ask participants to rate the importance of biospheric, altruistic, egoistic and hedonic values, alongside their moral norms, self-reported recycling behaviour and their green product purchase behaviour. To conduct research in Brazil the questionnaire was translated into Portuguese.

The questionnaire was translated into Brazilian-Portuguese using the bilingual committee approach. This approach has been advocated by Van de Vijver and Leung (1997) and Brislin (1970). This approach has also been used in other cross cultural environmental psychology research using English-speaking and Portuguese-speaking participants (e.g. Milfont, Duckitt & Wagner, 2010).

The committee approach was deemed preferable in comparison with back-translation method by the author; in line with recommendations by Russell and Sato (1995). These researchers recommended the committee approach when the content of a questionnaire is particularly sensitive to conceptualisation and interpretation by individuals, such as including abstract terms (e.g. values) rather than containing concrete

content (e.g. a table). Moreover, Epstein, Osborne, Elsworth, Beaton and Guillemin (2013) found translations completed by a bilingual committee approach had better validity and accuracy than scales translated using the back-translation method. They also concluded the scales tended to have better fit indices when run in confirmatory factor analysis models when the committee approach was adopted.

Another aim of the study is to explore the links between social desirability and environmental behaviour. The Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) was employed. A 13-item shortened form of the scale as developed by Reynolds (1982) was used. This scale was selected as it appears to have been evaluated and cross validated (Li & Sipps, 1985), is widely cited (over 2000 times) and has previously been employed by researchers in the field (e.g. Schwartz, Verkasalo, Antonovsky, & Sagiv, 1997).

To check whether each of the values, particularly hedonic values, should be included in the segmentation model, the study will first check whether these values predict moral norms. Those that do, will be carried forward to be used as the basis of the segmentation.²¹ As hedonic values share common motivations with egoistic values, it is thought that these values will load in a similar way. For example, individuals who highly endorse egoistic values will also highly endorse hedonic values. Thus, due to the previous findings outlined in chapter one and theoretical reasons, a four-group solution is still expected to be most appropriate.

²¹ As in chapter one, some leniency is required when deciding which values to retain for the segmentation. As, while the values may not predict one of the behaviours included in this study, they may be useful in explaining different environmental behaviour to be studied in subsequent studies.

3.1.6. Summary and Hypotheses

To summarise, this study will consider a values-based segmentation model to explain recycling behaviour and green product purchase. This approach as values appear to be consistent predictors of environmental behaviour (VBN theory; Stern, 1999; 2000). Values can influence behaviours either directly (e.g. Kaiser, Hubner & Bogner, 2005) or indirectly through moral norms (e.g. Steg, Dreijerink & Abrahamse, 2005; Stern, 2000), and so the mediating effect of moral norms will once again be tested. Hedonic values will also be tested alongside egoistic, biospheric and altruistic values. Based upon previous research, hedonic values are thought to negatively influence environmental outcomes (Miao & Wei, 2013; Steg, Perlaviciute, van der Werff & Lurvink, 2014).

The study will be completed both in the UK and Brazil. While research suggests there may be cultural differences in the importance attributed to the values (e.g. Bechtel, Corral-Verdugo & Pinheiro, 1999; Milfont, Duckitt & Cameron, 2006; Schultz & Zelezny, 2003), the general structure of values is thought to be relatively consistent (Fontaine & Schwartz, 1996; Oishi, Schimmack, Diener & Suh, 1998; Spini, 2003). Thus, while the author expects, consistent with Schultz et al. (2005), the absolute importance attributed to the values will be higher in Brazil than in the UK sample, it is expected that the four ‘types’ of people found from the segmentation approach may be replicable.

The study will further contribute to literature considering endorsing multiple and conflicting values. Previous segmentation models, included the one performed in the previous study have found that a group of individuals may highly endorse multiple values from conflicting domains (e.g. Blamey & Braithwaite, 1997), but so far, this group (the Value opportunists) have not differed from a group that only highly endorse biospheric and altruistic values (Selfless contributors) in terms of performance on environmental

outcomes. This study includes a second behaviour, 'green' product purchase, which due to it requiring greater self-sacrifice, may tease out differences between these two groups. Finally, consistent with suggestions from research (e.g. Beckmann, 2005; Felonneau & Becker, 2008) it is suspected that individuals may inflate their self-reported environmental behaviour. As a means of exploring this, and thus also making a contribution to methodological literature, this study will assess whether a positive relationship is found between self-reported environmental behaviour and social desirability.

Thus, this study will contribute to existing literature regarding the value-behaviour relationship by investigating: a) Do hedonic values also influence moral norms and recycling behaviour, and thus should these values be included in a values-based segmentation alongside egoistic, biospheric and altruistic values? b) Is the four group solution found in the previous study replicable within and between cultures? c) Are these groups meaningful, in the sense that they differ from one another regarding their moral norms relating to recycling, their recycling behaviour, and green product purchase? d) Can the inclusion of a costlier behaviour reveal further differences between the groups? e) Once segmented, consistent with VBN theory, is the effect of cluster group membership on environmental behaviour mediated by moral norms?²² f) Is there a link between self-reported environmental behaviour and providing socially desirable answers?. Based upon the literature outlined above and in chapters one and two, the following hypotheses are proposed:

²² As outlined in chapter one: As values determine cluster group membership, cluster group membership is essentially a categorical proxy variable for holding different values. Thus, testing whether cluster group membership influences recycling behaviour directly or indirectly, is essentially testing whether moral norms mediate the value-behaviour relationship as specified by VBN theory.

H₁: Consistent with Schultz et al., (2005) the sample in Brazil will rate all values as more important than the sample from the UK.

H₂: Consistent with VBN theory, biospheric (positive), altruistic (positive) and egoistic values (negative) and hedonic (negative) will influence moral norms (H_{2A}) but not recycling behaviour directly (H_{2B}) or green product purchase (H_{2C}).

H₃: The same four distinct groups as found in the previous study will be found to be replicable in both the UK (H_{3A}) and in Brazil (H_{3B}).

H₄: Overall the groups identified from the values-based segmentation will differ regarding their moral norms (H_{4A}), their self-reported recycling (H_{4B}) and their green product purchase (H_{4C}). Of specific note, it is predicted that the *Selfless contributors* will outperform the *Value opportunists* on green product purchase (H_{4D}) but not recycling (H_{4E}).

H₅: Consistent with VBN theory, moral norms will mediate the relationship between cluster group membership and recycling (H_{5A}) and between cluster group membership and product purchase behaviour (H_{5B}).

H₆: A positive relationship will be found between social desirability and both recycling (H_{6A}) and green product purchase (H_{6B})

3.2. Method

3.2.1. Participants

Participants for the study were all undergraduate students attending either a UK or Brazilian university. In the UK, 371 participants completed the questionnaire, of which 276 (74.4%) were female. Participants ranged from 18 years to 56 years old ($M = 19.39$ years, $SD = 2.83$). In Brazil, 239 participants completed the questionnaire, of which 163

(68.2%) were female. Participants ranged from 18 years to 41 years old ($M = 22.03$ years, $SD = 4.32$).

For the UK sample, participants completed the questionnaire in response to course credit, while in Brazil participants were asked to complete the questionnaire voluntarily after classes had finished. In Brazil, participants were both from undergraduate and postgraduate classes and were a mixture of psychology and engineering students. In total, the full sample consisted of 610 individuals ($M=20.42$, $SD=3.71$) comprising 72% ($n=439$) females.

3.2.2. Design

The study employed a cross-sectional survey design. The data analysis section will be split into six parts, each relating to one of the hypotheses. In the first section, an independent samples t-test considered how the two groups (UK or Brazil) differed in terms of the importance they attributed to biospheric, altruistic, egoistic and hedonic values. In the second section of the data analysis, multiple regressions were employed to ascertain whether values (biospheric, altruistic, hedonic and egoistic) predicted moral norms and (did not predict) recycling behaviour and green product purchase. The third section of the analysis uses values as the basis for segmentation. Two K-means cluster analyses were employed to segment the samples from the UK and Brazil. In the fourth section of the analysis, two (UK and Brazil) independent samples MANOVAs were employed to consider differences the effect of cluster group membership (IV) on moral norms (DV1), recycling (DV2) and green product purchase (DV3). In the fifth section of the data analysis, multi-categorical mediation analyses were used to determine whether moral norms mediate the relationship between the cluster group membership and both environmental behaviours. Finally, in section six of the data analysis, correlations

explored the relationship between social desirability and self-reported environmental behaviours.

3.2.3. Materials

The questionnaires used for both the UK sample and the Brazilian sample can be found in Appendix G.

3.2.3.1. Values. Biospheric, altruistic, egoistic and hedonic values were assessed by a questionnaire adapted by Steg et al. (2014b) from the scales developed by De Groot and Steg (2008). The items, format, and scale, are identical to those described in the materials section of chapter two apart from the addition of three extra items measuring hedonic values: *Enjoying life*, *Self-indulgent*, and *Pleasure*.

3.2.3.2. Moral norms. The measure used was identical to that described in the materials section of chapter two.

3.2.3.3. Environmental behaviour. A three-item recycling scale was adapted from Nigbur et al. (2010) to measure recycling behaviour. The three items were 'I recycle my waste wherever possible,' 'Separating items for recycling is something I always do' and 'Providing the facilities are available, I try to recycle'.

The second measure of environmental behaviour concerned green product purchase and contained two items: 'When available, I select products that can be recycled ahead of equivalent products that cannot be recycled' and 'When available, I select products made from recycled materials ahead of equivalent products made from non-recycled materials'.

Participants rated both the environmental behaviours on a 6-point Likert scale anchored by 'Strongly Disagree' and 'Strongly Agree'.

3.2.3.4. Social desirability. This was measured using a short version of the Marlowe-Crowne Social Desirability Scale (as cited in Reynolds, 1982). The scale contained 13-items required participants to answer 'true' or 'false' to each. An example item is "I'm always willing to admit it when I make a mistake". Participants are given a score of one for every item they answer in the socially desirable manner. Thus, they can score a maximum of 13 (provided all socially desirable answers) and a minimum of 0 (provided no socially desirable answers).

3.2.3.5. Translation of materials. The questionnaire was first translated from English to Brazilian-Portuguese by an individual fluent in both languages. The translation was then scrutinised and amended using a bilingual committee approach, consisting of bilingual Brazilian academics, bilingual students, and the author (who is most certainly, despite best efforts, not bilingual). The translated questionnaire was further scrutinised by a group of bilingual academics external to the translation process ($n \sim 10$) who were fluent in both languages. These individuals provided further feedback to the author, from which final changes were made by the committee. Both the English and Portuguese versions of the questionnaire followed the same format.

3.2.4. Procedure

Participants in both the UK and Brazil completed the questionnaires by hand with pen and paper. In the UK, this was completed in isolation in a lab, while in Brazil this was completed in a classroom. Although participants were encouraged not to talk and were told to move if necessary to have their own space to fill in the questionnaire. In the UK, a written information sheet and debrief was provided to participants while in Brazil the information sheet, contents of the consent form, and debrief were presented orally by an individual fluent in both languages based upon the English language version (Appendix H).

The study was approved by Keele University Ethics Committee and standard BPS ethical procedures were observed (Appendix I).

3.3. Results

3.3.1. Data Preparation

3.3.1.1. UK sample. A Confirmatory Factor Analysis (CFA) using the Multi-Group Method proposed by Nunnally (1978) was performed to check whether the scale items relating to biospheric, altruistic, egoistic and hedonic values loaded as expected. The analysis revealed that 'ambitious', an item on the egoistic value-orientation, did not load as expected. The item correlated with both the altruistic sub-scale (.381) and the hedonic sub-scale (.383) more than the hypothesised egoistic sub-scale (.357). As the item did not load as expected, and appeared to share similarities with multiple scales, it was removed from the analysis.

A factor analysis was also performed to ensure that the two behavioural measures, recycling behaviour and green product purchase, although thought to be related, were indeed two distinct behaviours. The necessary assumption checks were completed and met (see Appendix J). The output indicated that two distinct factors were found. This conclusion was reached as only two factors had eigenvalues above 1, and this was further evidenced as the scree plot showed a marked levelling-off from the variance explained by the factors after the first two factors. In total, 64.51% of the variance was explained by the rotated two-factor solution, with factor one accounting for 39.62% and factor two accounting for 24.89%. From the rotated factor matrix, it was found that the three items that were expected to relate to recycling behaviour all loaded together on factor one, while the two items expected to relate to green product purchase all loaded

together on factor two. This provides further evidence of the viability of a two-factor solution, suggesting the items contribute to two distinct, albeit related, behaviours.

Finally, the internal reliabilities for all sub-scales were assessed. The Cronbach's alpha for the altruistic, biospheric, hedonic and egoistic value subscales were deemed satisfactory achieving .765, .890, .774 and .729 respectively. The internal reliability of the moral norms subscale (.785) and the recycling behaviour subscale (.850) were also above the .7 cut-off, however the 'green' product purchase scale fell just short (.681).

3.3.1.2. Brazilian sample. Like the UK sample, a CFA was performed to confirm that the items all loaded as expected on the value-orientations. For the Brazilian sample, all items loaded as expected so were retained. A factor analysis was performed to ensure that recycling behaviour and 'green' product purchase were indeed two distinct behaviours. The factor analysis assumptions were once again checked and met (see Appendix J). The output indicated that two distinct factors were found. This conclusion was reached as only two factors had eigenvalues above 1, and this was further evidenced as the scree plot showed a marked levelling-off of the variance explained by the factors after the first two factors. In total, 63.60% of the variance was explained by the rotated two-factor solution, with factor one accounting for 38.75% and factor two accounting for 24.84%. From the rotated factor matrix, it was found that the three items that were expected to relate to recycling behaviour all loaded together on factor one, while the two items expected to relate to green product purchase all loaded together on factor two. This provides further evidence of the viability of a two-factor solution, suggesting the five items contribute to two distinct, albeit related, behaviours.

Finally, the internal reliabilities for all sub-scales were assessed. The Cronbach's alpha for the altruistic, biospheric, hedonic and egoistic value subscales were .677, .840,

.614 and .683 respectively. In all cases where the Cronbach's alpha did not reach .7, there were no items that could have been removed to increase the internal reliability of the scales. For the moral norms subscale, the Cronbach's alpha was below .7 (.664), however items could be removed to increase reliability. The item 'I feel I should not waste anything if it can be used again' was removed, increasing the reliability to .736. Finally, for the behavioural outcomes, satisfactory internal reliability was found (.72 and .71 respectively). Once again, like the UK sample, some items did not have internal reliability of greater than .7; the ramifications of this are discussed later in this chapter.

3.3.2. Data Analysis

3.3.2.1. Hypothesis one. This states the sample in Brazil will rate all values as more important than the sample from the UK.

Descriptive statistics indicated tentative support for the hypothesis (see *Table 3.1*). Participants in the Brazilian sample scored higher on biospheric, altruistic and hedonic values but scored slightly lower than the UK sample on egoistic values. Overall, both samples rated altruistic values as most important, followed by hedonic values, biospheric values and then egoistic values.

Table 3.1.

Mean values scores (and standard deviations) for the UK and Brazilian samples

	Biospheric	Altruistic	Egoistic	Hedonic
UK	4.19 (1.59)	5.42 (1.11)	3.00 (1.29)	4.82 (1.23)
Brazil	5.47 (1.32)	5.97 (1.00)	2.79 (1.23)	5.61 (1.05)

A series of independent samples t-tests were conducted to explore differences between the UK and Brazilian samples regarding their values. As multiple comparisons were made, the alpha level to denote significance was altered in accordance with employing a Bonferroni correction, thus the significance threshold was set to $p < .0125$ to

maintain an overall alpha of 0.05. The Brazilian sample were found to attribute greater importance to biospheric, $t(608)=10.42, p<.0125$, altruistic, $t(608)=6.21, p<.0125$ and hedonic values, $t(608)=3.30, p<.017$. However no significant differences were found between the samples regarding egoistic values, $t(608)=1.93, p>.0125$. This indicated that the Brazilian sample rated three of the four values as significantly more important, and so offers partial support for hypothesis one.

3.3.2.2. Hypothesis two. This states that biospheric (positive), altruistic (positive) and egoistic values (negative) and hedonic (negative) will influence moral norms (H_{2A}) but not recycling behaviour directly (H_{2B}) or green product purchase (H_{2C}).

Descriptive statistics (see *Table 3.2*) revealed that across the two samples engagement with recycling was higher than purchasing green products. The UK participants seem to recycle more than the Brazilian sample, however the Brazilian sample appear to buy more 'green' products. Moral norms seem to be similar; with the UK sample reported a slight stronger moral obligation than those in Brazil.

Table 3.2.

Mean scores (and standard deviations) for the three environmental outcomes for the UK, Brazilian and combined samples

	Moral Norms	Recycling	Green Product Purchase
UK	4.22 (1.09)	4.15 (1.08)	2.57 (1.07)
Brazil	3.97 (1.00)	3.65 (1.02)	3.41(1.10)
Combined	4.12 (1.06)	3.95 (1.08)	2.90 (1.16)

To assess whether values predicted the three environmental outcomes, three multiple regressions were conducted using the Enter method for each sample. For all regressions assumptions checks were tested and were met (see Appendix K).

3.3.2.2.1. UK sample: Values predicting moral norms. A significant regression equation was found showing that values predict moral norms: $F(4,366) = 24.91, p < .001$,

$R^2 = .463$, $R^2_{Adjusted} = .214$. The analysis indicated that biospheric values positively predicted moral norms relating to recycling ($\beta = .408$, $t(361) = 7.30$, $p < .001$), while egoistic values negatively predicted moral norms relating to recycling ($\beta = -.106$, $t(361) = 2.025$, $p < .05$). Altruistic values were not found to be a significant predictor of moral norms at the $\alpha = 0.05$ level, however they were approaching significance ($\beta = .098$, $t(361) = 1.757$, $p = .08$), whereas hedonic values were not a significant predictor of moral norms ($\beta = -.087$, $t(361) = -1.66$, $p = .10$).

3.3.2.2.2. UK sample: Values predicting recycling. A significant regression equation was found showing that values predict recycling: $F(4, 366) = 14.88$, $p < .001$, $R^2 = .374$, $R^2_{Adjusted} = .140$. The analysis indicated that biospheric values positively predicted recycling ($\beta = .312$, $t(361) = 5.34$, $p < .001$), while egoistic values negatively predicted recycling ($\beta = -.127$, $t(361) = 2.320$, $p < .05$). Altruistic values were not found to be a significant predictor at the $\alpha = 0.05$ level ($\beta = .077$, $t(361) = 1.32$, $p = .19$), however hedonic values were a significant negative predictor ($\beta = -.112$, $t(361) = -2.03$, $p < .05$).

3.3.2.2.3. UK sample: Values predicting green product purchase. A significant regression equation was found, showing that values predict green product purchase: $F(4, 365) = 17.21$, $p < .001$, $R^2 = .398$, $R^2_{Adjusted} = .15$. The analysis indicated that biospheric values positively predicted green purchasing behaviour ($\beta = .396$, $t(360) = 6.83$, $p < .001$), and hedonic values negatively predicted green product purchase ($\beta = -.232$, $t(360) = 4.25$, $p < .001$). Altruistic values ($\beta = -.066$, $t(360) = 1.14$, $p = .26$) and egoistic values ($\beta = .053$, $t(360) = .971$, $p = .332$) were not found to be significant predictors at the $\alpha = 0.05$.

3.3.2.2.4. Brazilian sample: Values predicting moral norms. A significant regression equation was found showing that values predicted moral norms: $F(4, 234) = 13.53$, $p < .001$, $R^2 = .433$, $R^2_{Adjusted} = .188$. The analysis indicated that biospheric values

($\beta = .323$, $t(229) = 4.60$, $p < .05$) altruistic values ($\beta = .151$, $t(229) = 2.160$, $p = .05$) positively predicted moral norms, while egoistic values negatively predicted moral norms ($\beta = -.129$, $t(229) = 2.116$, $p < .05$). However, the hedonic values were not a significant predictor of moral norms ($\beta = -.033$, $t(229) = -.519$, $p = .604$).

3.3.2.2.5. Brazilian sample: Values predicting recycling. A significant regression equation was found showing that values predict recycling: $F(4, 234) = 4.57$, $p = .001$, $R^2 = .269$, $R^2_{Adjusted} = .057$). The analysis indicated that biospheric values positively predicted recycling ($\beta = .206$, $t(229) = 3.52$, $p = .001$). However, neither egoistic values ($\beta = -.072$) altruistic values ($\beta = -.018$), or hedonic values ($\beta = -.074$) were significant predictors.

3.3.2.2.6. Brazilian sample: Values predicting green product purchase. A significant regression equation was found showing that values predicted Green Product Purchase: $F(4, 234) = 6.82$, $p < .001$, $R^2 = .323$, $R^2_{Adjusted} = .104$. The analysis indicated that biospheric values positively predicted Green Product Purchase ($\beta = .187$, $t(229) = 2.56$, $p < .05$), while egoistic values negatively predicted the behaviour ($\beta = -.241$, $t(229) = 3.77$, $p < .001$). However, both altruistic values ($\beta = -.05$), and hedonic values ($\beta = .02$) were not significant predictors at the $\alpha = 0.05$ level.

The data offers partial support for hypothesis two as values predicted moral norms, however, unlike in the previous study values also directly predicting recycling and green product purchases. The values, when significant, had the hypothesized relationship with environmental outcomes: biospheric (positive), altruistic (positive) and egoistic values (negative) and hedonic (negative). Biospheric values predicted all environmental outcomes. While both egoistic, hedonic and altruistic values were less consistent.

3.3.2.3. Hypothesis three. This states that the same four distinct groups, as found in the previous study, will be replicable in both the UK (H_{3A}) and in Brazil (H_{3B}).

For the UK sample, given that biospheric, altruistic, hedonic and egoistic values were either significant or, in the case of altruistic values predicting moral norms, approaching significance, all four values were retained for cluster analysis. For the Brazilian sample, egoistic, biospheric and altruistic values have significantly contributed to at least one of the three DVs. However, hedonic values did not predict, or were not approaching significance, for any of the environmental outcomes. Consequently, for the data relating to the sample collected in Brazil, hedonic values will not be included in the cluster analysis.

For each sample a non-hierarchical K-means cluster analysis was used to identify categories of people grouped by distinct patterns of scores on the four values for the UK and on three values for Brazil. Participants' mean raw scores on each of the biospheric, altruistic, egoistic (and for the UK, hedonic) values were transformed into z-scores to facilitate interpretation of the results.

3.3.2.3.1. UK sample. A K-means cluster analyses was tested. Four groups were specified to test whether the same solution as the previous could be replicated. The same four groups were identified by the analysis:

Cluster 1 – *Non-engagers*: Comprising 14% ($n=49$) of the sample, who scored below average on all four values.

Cluster 2 – *Self-enhancers*: Comprising 18% ($n=67$) of the sample, who scored above average regarding egoistic and hedonic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprising 24% ($n=91$) of the sample, who scored below average regarding egoistic and hedonic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprising 44% ($n=164$) of the sample, who scored above average on all four values.

To better understand how the groups' differ in their regard for the values, *Table 3.3* provides the mean values scores for each of the groups. As the values scores from the participants have been standardised to aid interpretation, a score of 1 or -1 indicates that the group scored one standard deviation above or below the sample mean. So, considering the table, the Non-engagers score nearly one standard deviation below the sample mean on hedonic values. Hedonic values appear to load in a similar manner to egoistic values. While altruistic and biospheric values also appear to be similar. As was found in the previous study, Value opportunists scored highest on biospheric values.²³

Table 3.3.

Standardised values scores for each of the cluster groups found in the UK sample

	Biospheric	Altruistic	Egoistic	Hedonic
Non-engagers	-1.21	-1.54	-0.93	-0.99
Self-enhancers	-0.83	-0.72	0.56	0.39
Value opportunists	0.74	0.53	0.48	0.61
Selfless contributors	0.59	0.41	-0.76	-0.85

3.3.2.3.2. Brazilian sample. A K-means cluster analyses was again employed to test whether the same solution as found in the UK in both the previous chapter and the current chapter could be replicated on a different culture. The analysis revealed this was possible as the same four groups were identified by the analysis:

Cluster 1 – *Non-engagers*: Comprising 14% ($n=34$) of the sample, who scored below average on all three values.

²³ A more comprehensive comparison of how the cluster loadings differed between each of the studies is provided in the general discussion.

Cluster 2 – *Self-enhancers*: Comprising 15% ($n=36$) of the sample, who scored above average regarding egoistic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprising 34% ($n=81$) of the sample, who scored below average regarding egoistic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprising 37% ($n=88$) of the sample, who scored above average on all three values.

To better understand how the groups' differ in their regard for the values, *Table 3.4* provides the mean values scores for each of the groups. While the same groups were found in Brazil in the sense that whether they scored 'high' or 'low' on values matched the UK, there was contrasts between their scores. For example, the Non-engagers in Brazil scored a whole standard deviation lower on altruism than those in the UK. The Brazilian sample also seemed more extreme than the UK when considering the Self-enhancers. This group scored half a standard deviation lower regarding biospheric values in Brazil and in the UK. However, despite some differences between the standardised scores, the overall pattern of which group endorse which values remained consistent in both samples. This offers support for hypothesis 3a and 3b as the four-group segmentation was replicable in both the UK and in Brazil.

Table 3.4.

Standardised values scores for each of the cluster groups found in the Brazilian sample

	Biospheric	Altruistic	Egoistic	Hedonic
Non-engagers	-1.52	-2.61	-0.51	-1.72
Self-enhancers	-1.23	-0.76	0.19	0.11
Value opportunists	0.57	0.48	0.62	0.53
Selfless contributors	0.27	0.26	-0.84	-0.49

3.3.2.4. Hypothesis four. This states that overall the groups identified from the values-based segmentation will differ regarding their moral norms (H_{4A}), their self-reported recycling (H_{4B}) and their green product purchase (H_{4C}) and of specific note, it is predicted that the *Selfless contributors* will outperform the *Value opportunists* on green product purchase (H_{4D}) but not recycling (H_{4E}).

3.3.2.4.1. UK sample. First, descriptive statistics are provided in *Table 3.5* relating to the UK groups' moral norms, recycling and green product purchasing behaviour. From considering the means, it appears both the groups that highly endorse biospheric and altruistic values (i.e. the *Value opportunists* and *Selfless contributors*) have higher moral norms than the other groups (i.e. the *Non-engagers* and *Self-enhancers*). For all three environmental outcomes, the *Selfless contributors* perform best, followed by the *Value opportunists*, followed by the *Non-engagers*, followed by the *Self-enhancers*.

Table 3.5.

Means (and standard deviations) of moral norms, recycling and green product purchase for the cluster groups in the UK

	Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Moral Norms	3.84 (.97)	3.69 (1.00)	4.38 (1.11)	4.55 (1.00)
Recycling	3.91 (1.04)	3.71 (1.19)	4.27 (1.08)	4.43 (.88)
Green Product Purchase	2.34 (1.07)	2.20 (.99)	2.56 (1.09)	2.98 (.98)

For the UK sample, a MANOVA was employed to compare the cluster groups regarding their moral norms, recycling and green product purchase behaviour. The MANOVA was considered appropriate as all dependent variables were thought to be related, which was further confirmed by correlational analyses: Moral norms and recycling: $r(369) = .53, p < .01$; moral norms and green product purchase: $r(369) = .44, p <$

.01; and green product purchase and recycling $r(369) = .30, p < .01$. The necessary assumption for the analysis were tested, and met (see Appendix L).

The MANOVA output indicated that moral norms, recycling behaviour and 'green' product purchase differed significantly across the cluster groups: $F(9,866) = 7.31, p < .001$; *Wilk's Λ* = .837, $\eta_p^2 = .06$. More specifically, the analysis indicated that cluster group membership had a statistically significant effect on moral norms: $F(3,358) = 16.67, p < .001, \eta_p^2 = .12$; recycling: $F(3,358) = 9.88, p = .001, \eta_p^2 = .08$; and green product purchase behaviour: $F(3,358) = 11.26, p = .001, \eta_p^2 = .09$. These findings offer support for hypotheses 4a, b and c, as the groups differ on all environmental outcomes.

Post-hoc tests were employed to further investigate the differences between groups for all dependent variables. All post-hoc comparisons were completed at $\alpha = .05$ level with a Bonferroni correction employed for multiple comparisons. Both *Value opportunists* and *Selfless contributors* were found to have significantly higher moral norms than both *Non-engagers* and *Self-enhancers*. Both the *Value opportunists* and *Selfless contributors* were also found to have recycled more than the *Self-enhancers*. The *Selfless contributors* also differed significantly from the *Non-engagers*, with the *Selfless contributors* reporting greater levels of recycling.

Finally, in terms of product purchase behaviour, the *Selfless contributors* reported purchasing significantly more green products than all other groups. Also, the *Value opportunists* reported significantly more green product purchase behaviour than the *Self-enhancers*. The finding that the *Selfless contributors* purchased significantly more 'green' products than the *Value opportunists* supports hypothesis 4d. Moreover, as the groups did not differ on regarding recycling, hypothesis 4e is also supported.

3.3.2.4.2. Brazil sample. Descriptive statistics are provided in *Table 3.6* relating to the groups' moral norms, recycling and green product purchasing behaviour. From considering the means, it appears both the groups that highly endorse biospheric and altruistic values (i.e. the Value opportunists and Selfless contributors) have higher moral norms than the other groups (i.e. the Non-engagers and Self-enhancers). Identical to the UK, for all three environmental outcomes, the Selfless contributors perform best, followed by the Value opportunists, followed by the Non-engagers, followed by the Self-enhancers.

Table 3.6.
Means (and standard deviations) of moral norms, recycling and green product purchase for the cluster groups in the Brazil

	Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Moral Norms	3.84 (.97)	3.69 (1.00)	4.38 (1.11)	4.55 (1.00)
Recycling	3.91 (1.04)	3.71 (1.19)	4.27 (1.08)	4.43 (.88)
Green Product Purchase	2.34 (1.07)	2.20 (.99)	2.56 (1.09)	2.98 (.98)

For the Brazilian sample, correlation analyses revealed significant correlations between: Moral norms and recycling: $r(237) = .37, p < .01$; moral norms and green product purchase: $r(237) = .28, p < .01$; and green product purchase and recycling $r(237) = .18, p < .01$. As all DV's were related a MANOVA was employed. The necessary assumption checks were performed and met (see Appendix L).

The MANOVA output indicated that the moral norms, recycling behaviour and green product purchase differed significantly across the cluster groups: $F(9,553) = 4.55, p < .001$; *Wilks's* $\Lambda = .840, \eta_p^2 = .06$. More specifically, the analysis indicated that cluster group membership had a statistically significant effect on moral norms relating to

recycling: $F(3,229) = 9.34, p < .001, \eta_p^2 = .11$, and green product purchase behaviour: $F(3,229) = 6.27, p = .001, \eta_p^2 = .08$; but not recycling: $F(3,229) = 2.06, p > .05, \eta_p^2 = .03$. These findings offer support for hypotheses 4a and 4c as the cluster groups differ regarding their moral norms and green product purchase, but not hypothesis 4b as the groups did not differ regarding recycling.

Post-hoc tests with a Bonferroni correction were employed to further investigate the differences between groups for moral norms and green product purchase. It was found that *Value opportunists* and *Selfless contributors* reported significantly higher moral norms than the *Non-engagers* and *Self-enhancers*. In addition, the *Selfless contributors* reported purchasing more green products than the *Value opportunists* and the *Self-enhancers*. The finding that the *Selfless contributors* purchased significantly more 'green' products than the *Value opportunists* supports hypothesis 4d. Moreover, as the groups did not differ on regarding recycling, hypothesis 4e is also supported.

3.3.2.5. Hypothesis five. This states moral norms will mediate the relationship between cluster group membership and recycling (H_{5A}) and between cluster group membership and product purchase behaviour (H_{5B}).

3.3.2.5.1. UK sample. As VBN theory states values are thought to influence behaviour indirectly, multi-categorical mediation analyses were used to test whether moral norms mediate the relationship between cluster group membership and both self-reported environmental behaviours. A total effects model, which considers both the potential direct and indirect effects, concluded that cluster group membership did impact upon recycling: $F(3,367) = 7.46, p = .001, R^2 = .24, R^2_{Adj} = .06$. To investigate whether this effect was direct or indirect, bootstrapping was performed. Estimates of the beta coefficient and standard error of the possible paths (e.g. direct versus indirect) were

calculated. Lower limit and upper limit confidence intervals were calculated to denote whether a path is significant. If the lower and upper limit confidence intervals do not contain zero then a path is significant. *Table 3.7* shows which paths were significant.

Table 3.7.

The direct and indirect effects of cluster group membership on recycling for the UK sample

Cluster Group Comparison*	Direct Effect β (Standard Error) [LLCI – ULCI]	Indirect Effect β (Standard Error) [LLCI – ULCI]
From Non-engagers to Self-enhancers	NS	NS
From Non-engagers to Value opportunists	NS	.27 (.08) [.13 – .45]
From Non-engagers to Selfless contributors	NS	.36 (.09) [.18 – .54]
From Self-enhancers to Selfless contributors	NS	.43 (.09) [.24 – .60]
From Self-enhancers to Value opportunists	NS	.34 (.09) [.18 – .51]
From Value opportunists to Selfless contributors	NS	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

The table shows that no significant differences were found regarding recycling behaviour when comparing the *Non-engagers* to the *Self-enhancers*, or when considering the *Value opportunists* and the *Selfless contributors*. However, for the remainder of the comparisons, moral norms mediate the impact of values on behaviour. This implies that the differences between the values endorsed by the cluster groups impacts upon moral norms. These then impact upon recycling. A second mediation analysis considers cluster group membership, moral norms and green product purchasing behaviour. A total effects model, which considers both the potential direct and indirect effects, concluded that

cluster group membership did impact upon recycling: $F(3,367) = 8.39, p < .001 R^2 = .25$,

$R^2_{Adjusted} = .06$. Table 3.8 summarises whether these effects were direct or indirect.

Table 3.8.

The direct and indirect effects of cluster group membership on green product purchase for the UK sample

Cluster Group Comparison*	Direct Effect β (Standard Error) [LLCI – ULCI]	Indirect Effect β (Standard Error) [LLCI – ULCI]
From Non-engagers to Self-enhancers	NS	NS
From Non-engagers to Value opportunists	NS	.22 (.07) [.10 – .38]
From Non-engagers to Selfless contributors	.39 (.17) [.02 – .70]	.29 (.08) [.15 – .45]
From Self-enhancers to Selfless contributors	.44 (.16) [.12 – .75]	.35 (.07) [.22 – .51]
From Self-enhancers to Value opportunists	NS	.28 (.07) [.16 – .41]
From Value opportunists to Selfless contributors	.35 (.13) [.10 – .60]	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

The table shows that no significant differences were found regarding green product purchase behaviour when comparing the *Non-engagers* to the *Self-enhancers*. The table also shows there is a direct effect of cluster group membership when comparing the *Value opportunists* to the *Selfless contributors*. In all other cases where a significant difference exists between the groups, the effect of values on behaviour is mediated by moral norms. Yet in two of the cases, when comparing the *Non-engagers* to the *Selfless contributors*, and when comparing the *Self-enhancers* to the *Selfless contributors*, a direct effect of cluster group membership is present alongside the indirect effect mediated by moral norms. This suggests that values are influencing product

purchase behaviour in two ways: directly and indirectly through their effect on moral norms. The following section repeats the mediation analyses for both behaviours when considering the sample from Brazil.

3.3.2.5.2. Brazil sample. A total effects model, which considers both the potential direct and indirect effects, concluded that cluster group membership did impact upon recycling: $F(4, 234) = 9.23, p = .001, R^2 = .37, R^2_{Adjusted} = .14$. Table 3.9 summarises whether these effects were direct or indirect. The table shows that no significant differences were found regarding recycling behaviour when considering the case that compares the *Non-engagers* with the *Self-enhancers*, or when considering the case that compares the *Value opportunists* to the *Selfless contributors*.

Table 3.9.
The direct and indirect effects of cluster group membership on recycling for the Brazilian sample.

Cluster Group Comparison*	Direct Effect β (Standard Error) [LLCI – ULCI]	Indirect Effect β (Standard Error) [LLCI – ULCI]
From Non-engagers to Self-enhancers	NS	NS
From Non-engagers to Value opportunists	NS	.18 (.08) [.04 – .34]
From Non-engagers to Selfless contributors	NS	.21 (.09) [.07 – .43]
From Self-enhancers to Selfless contributors	NS	.26 (.09) [.13 – .48]
From Self-enhancers to Value opportunists	NS	.26 (.08) [.09 – .40]
From Value opportunists to Selfless contributors	NS	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

The table shows, as identical to the UK sample, where a significant difference in behaviour exists between two groups, the effect of values is mediated by moral norms. A final mediation analysis considers the direct and indirect impact of values on green product purchase. A total effects model demonstrated there was a significant effect of cluster group on green product purchase behaviour: $F(4,234) = 8.14, p < .001, R^2 = .35, R^2_{Adjusted} = .12$. Table 3.10 summaries the direct and indirect effects.

Table 3.10.

The direct and indirect effects of cluster group membership on green product purchase for the Brazilian sample

Cluster Group Comparison*	Direct Effect β (Standard Error) [LLCI – ULCI]	Indirect Effect β (Standard Error) [LLCI – ULCI]
From Non-engagers to Self-enhancers	NS	NS
From Non-engagers to Value opportunists	NS	.13 (.06) [.03 – .25]
From Non-engagers to Selfless contributors	NS	.15 (.07) [.05 – .32]
From Self-enhancers to Selfless contributors	.64 (.22) [.21 – 1.06]	.18 (.07) [.07 – .36]
From Self-enhancers to Value opportunists	NS	.16 (.06) [.06 – .32]
From Value opportunists to Selfless contributors	.45 (.16) [.13 – .77]	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

The table shows that no significant differences were found due to either the direct or indirect effect of cluster group membership on green product purchase when comparing the *Non-engagers* to the *Self-enhancers*. However, there was a direct effect of cluster group membership when comparing the *Value opportunists* to the *Selfless contributors*. In all other cases where a significant difference exists, the effect of values is

mediated by moral norms. Yet in one of the cases, when comparing the *Self-enhancers* to the *Selfless contributors*, a direct effect of cluster group membership is present alongside the indirect effect mediated by moral norms. These results mirror the UK sample, apart from in one case, as, in the UK sample, a direct effect of cluster group was found when comparing the *Non-engagers* and *Selfless contributors*.

Overall, these findings offer partial support for VBN theory and hypothesis 5a and 5b which state that moral norms will mediate the relationship between cluster group membership and environmental behaviour. In both the UK and Brazil the effect of cluster group membership (essentially a categorical variable comparing endorsing different combinations of values) was found to impact behaviour indirectly. However, occasionally the impact of values was direct. For example, moving from the Value opportunists (high on all values) to the Selfless contributors (only high on biospheric and altruistic values) had a direct effect on behaviour. Moreover, it appears when moving from the Self-enhancers (who only highly endorse egoistic values) to the Selfless contributors group (who only highly endorse biospheric and altruistic values) the effect of this change is both direct on behaviour, and indirect via moral norms.

3.3.2.6. Hypothesis six. This states that a positive relationship will be found between social desirability and both recycling (H_{6A}) and green product purchase (H_{6B}).

The scores relating to how participants answered the Marlowe-Crowne social desirability scale were summed out of a possible 13. This maximum score denotes that participants answered in a socially desirable manner to all statements. Considering the descriptive statistics, it appears the UK sample ($M=5.95$, $SD=2.71$) gave more socially desirable answers than the Brazilian sample ($M=5.05$, $SD=2.64$). An independent samples t-test confirmed this difference was significant: $t(606)=4.05$, $p<0.05$.

A series of correlations were performed analysing the association between an individual's score on a social desirability scale and both their recycling and green product purchase behaviour. For the UK sample, a significant positive correlation was found between recycling and social desirability $r(367)=.16, p=.002$. This indicates that those who tended to report they recycled more, also tended to give more socially desirable answers. However, no significant correlation was found between green product purchase and social desirability: $r(367)=.01, p>.05$.

The same associations were found for the sample from Brazil, where an increase in self-reported recycling tended to be associated with an increase in giving socially desirable responses: $r(237)=.19, p=.003$. While no association existed between green product purchase behaviour and social desirability: $r(237)=.02, p>.05$. These findings support hypothesis 6a that self-reported recycling behaviour is positively associated with providing socially desirable answers, but the findings do not support hypothesis 6b that suggested the same relationship to exist between green product purchase and social desirability.

3.4. Discussion

3.4.1. Summary of Findings

The findings from the study indicate that the UK and Brazil attribute different levels of importance to biospheric altruistic and hedonic values. Consistent with hypothesis one and previous literature (e.g. Schultz et al., 2005) participants in Brazil rated these values as significantly more important. However, no differences were found between the countries regarding the importance of egoistic values.

In line with previous research (e.g. De Groot & Steg, 2007a; 2008) values were found to predict environmental outcomes. Consistent with VBN theory values influenced

moral norms, but, unlike in the previous study, values also had a direct influence on both recycling and green product purchase in the UK and Brazil. The influence of some values appeared to differ between countries, for example, hedonic values predicted both recycling and green product purchase in the UK, but impacted upon neither in Brazil. Whereas some values appeared to be consistent predictors across both cultures. For example, biospheric values predicted all environmental outcomes in the UK and Brazil. The findings offer some support for hypothesis two that that stated values will predict environmental outcomes, however, they fail to show that certain values (e.g. hedonic, altruistic) are reliable predictors of all outcomes.

When values were used as the basis of a segmentation model, the same groups found in study one were replicated within and across cultures; supporting hypothesis three. Moreover, consistent with hypothesis four, differences were found between the groups regarding nearly all environmental outcomes, however no differences were found between the groups in Brazil when assessing recycling. However, for the other outcomes, in both the UK and Brazil the Value opportunists and Selfless contributors had stronger moral norms than the Self-enhancers and Non-engagers, and in both cultures, the Selfless contributors purchased more green products than both the *Value opportunists* and the *Self-enhancers*. In the UK the Selfless contributors also purchased more green products than the Non-engagers. In terms of recycling, in the UK, the *Value opportunists* and *Selfless contributors* recycled more than *Self-enhancers*, while in Brazil, no significant differences were found between the groups.

Green product purchasing, unlike recycling, seems to highlight differences between the Selfless contributors and the Value opportunists. This supports the notion that the Value opportunists (who highly endorse biospheric, altruistic and egoistic values)

may engage in lower cost behaviours (e.g. recycling) as much as the group who only endorse biospheric and altruistic values (i.e. the Selfless contributors), but will not engage as much as this group in higher cost behaviours that require greater personal sacrifice (e.g. green product purchase) This is consistent with hypotheses 4d and 4e that stated differences would be found between the Value opportunists and Selfless contributors regarding green product purchasing but not recycling.

As the cluster groups were segmented based on their values, the finding that in Brazil the cluster groups did not differ regarding recycling suggests values may have little *direct* effect on recycling. This was also supported by a regression that found only biospheric values predicted recycling in Brazil. However, the mediation analysis revealed that when moral norms were included as a mediator, cluster group membership did influence values indirectly. This suggests, consistent with VBN theory, the effect of values on behaviour is mediated through mid-range cognitions. However, in some cases values did also directly influence behaviours, suggesting values may have both direct and indirect influence. These findings offer support for hypothesis five that predicts moral norms to mediate the relationship between values and both environmental behaviours.

Finally, social desirability was found to positively correlate with recycling behaviour in both the UK and Brazil, but no relationship was found between social desirability and green product purchase. This suggests those who reported have recycled the most, also provided the most socially desirable answers. These findings partially support hypothesis six. The following sections will answer the main questions raised in the introduction section, relate these findings to previous literature, and discuss the implications and limitations of the work.

3.4.2. Are the Previous Findings Replicable within and across Cultures?

To try and increase the replicability rates found in psychological science, Asendorpf and collaborators (2013) suggest replicating initial findings on a second sample before considering publications. Thus, this study represents a partial replication across two cultures of the study presented in the previous chapter. Many findings have been replicated: Both in the UK and in Brazil the same four-groups could be found from the segmentation. Moreover, in both cultures the groups differed in the same way regarding their moral norms (both Value opportunists and Selfless contributors had stronger moral norms than Non-engagers and Self-enhancers). Also, in both cultures the Selfless contributors scored highest on both environmental measures followed by the Value opportunists, Non-engagers and finally the Self-enhancers. Consequently, this work offers a small contribution in following some of the recommendations outlined to combat the current ‘replicability crisis’ within the discipline of Psychology (Open Science Framework, 2015).

Values have been tested extensively in many countries (e.g. Fontaine & Schwartz, 1996; Oishi, Schimmack, Diener & Suh, 1998; Spini, 2003), with some cultures often rating different values as more (or less) important than other cultures (e.g. Schultz and Zelezny, 2003). This study found similar effects; with three of the four values (all apart from egoistic values) rated as more important by those in Brazil than in the UK. As Schwartz (1992; 1994) and Goal Framing Theory (Lindenberg & Steg, 2007) suggests hedonic values provide opposing motivations to biospheric and altruistic values, this suggests in Brazil, ‘conflicting’ values are both rated as important. One reason this may be is that the distinction between biospheric-altruistic and egoistic-hedonic values is less striking than

in the UK. For example, in Brazil, Bechtel, Corral-Verdugo and Pinheiro, (1999) found human progress was not viewed as incompatible with protecting nature.

While differences such as the importance attributed to values existed between samples, overall a very similar pattern of results were found between these two studies and the previous study reported in chapter two. Of particular importance is that the same four groups were found. This suggests while the importance attributed to specific values may alter between samples, the 'types' of people to be found within and across cultures may be similar.

Another common finding between the samples from all the studies is that moral norms mediate the relationship between cluster group membership and behaviour. While it was most common for values to indirectly influence environmental behaviours, when considering specific groups both in the UK and Brazil, it appears the influence of values can be only direct (e.g. moving from the Value opportunists to the Selfless contributors) or both direct and indirect (e.g. moving from the Self-enhancers to the Selfless contributors). The finding that values can influence behaviour both directly and indirectly may go some way into explaining why some studies using VBN theory have found values to directly predict behaviours (Kaiser, Hubner & Bogner, 2005), while others have found values to influence behaviour via moral norms (Steg, Dreijerink, & Abrahamse, 2005).

In summary, while the author notes that only two countries were tested, the findings offer some encouragement that a values-based segmentation model could be used across a wide variety of settings and countries. Although some differences exist between and within cultures when comparing each of the findings from the different samples, the segmentation appears to identify the same groups which seem to perform relatively consistently across studies regarding environmental outcomes. Thus, the

values-based segmentation approach seems broadly replicable within and between cultures.

3.4.3. Should Hedonic Values be included as a Variable for Segmentation?

The use of hedonic values in environmental research has not been consistent, possibly because hedonic values were conceptualised by Schwartz (1992, 1994) to span two dimensions: Openness to Change and Self-Enhancement. Consequently, as the self-enhancement versus self-transcendence axis is thought to exert most influence on environmental outcomes (Nordlund & Garvill, 2002; Stern, 2000; Thøgersen & Ölander, 2002), hedonic values have sometimes been included to represent self-enhancement (e.g. Steg, Perlaviciute, van der Werff & Lurvink; 2014b), whereas other times they have not (e.g. Ojea & Loureiro, 2007). The inconsistent use of hedonic values in research means they are not as widely researched as egoistic values, yet are thought to have a similar negative influence on environmental outcomes (Lindenberg & Steg, 2007; Nordlund & Garvill, 2003; Steg, Dreijerink & Abrahamse, 2005; Steg & Nordlund, 2012).

Indeed, this study shows partial support for this notion as hedonic values were found to be negative predictor of both environmental behaviours in the UK sample. However, in Brazil, hedonic values appeared to have no significant influence on either recycling or 'green' product purchase. The author speculates that this may be because hedonism may be conceptualised different in Western European and Latin American countries. For instance, the relative wealth of many western countries and the relative ease at which luxuries and convenience such as takeaways, taxis and holidays can be acquired, may mean hedonistic actions have far greater negative consequences on the environment in the UK than in Brazil. Thus, in Latin American countries valuing

hedonism may not be so incompatible with valuing the environment as it could be in the UK

The findings in the UK are consistent with other studies that have found hedonic values to negatively predict environmental behaviours (e.g. Maio & Wei, 2013; Steg et al., 2014b). However, as no significant relationship was found in Brazil, hedonic values were not included in the cluster analysis that followed. Consequently, there is still a lack of clarity regarding their usefulness in contributing to a segmentation model in the environmental domain especially across different cultures. Thus, hedonic values will once again be tested in in a future study.

3.4.4. Do the Groups Differ on a Second Behaviour?

Alongside assessing cultural differences, a second behavioural measure was also included in this study to further assess the generalisability of the model. As the model is based upon relatively abstract variables (e.g. values), it is more likely the segmentation model will be appropriate for use across a greater number of behaviours, than models containing specific factors more proximal to a certain behaviour (e.g. situational factors; Poortinga & Darnton, 2016; Sütterlin, Brunner, & Siegrist, 2011).

Indeed, when comparing the groups identified from the cluster analysis, the similarities and differences between the groups changed when comparing the two behaviours. This is promising as despite values often being considered 'distant' from behaviours, in terms of how they are conceptualised in a causal chain (such as that presented in VBN theory), the segmentation model proposed by the author still teases apart differences between groups when considering different, albeit related, behaviours. This reflects other work such as Steg, Dreijerink, and Abrahamse (2005) and Jansson,

Marell, and Nordlund (2010) who both found that values, despite being most abstract, still influenced behaviour directly.

Of particular interest is that when assessing green product purchase the Value opportunists differed from the Selfless contributors. This is the first time these two groups have been found to be significantly different, having previously scored similarly with recycling and their moral norms. The author speculated this may be the case as green product purchase may require greater self-sacrifice to perform (e.g. finances, time, effort), than recycling. The author suggested while highly endorsing egoistic values may not be detrimental to lower-cost behaviours, egoistic concerns may not be so easily suppressed when the behaviour requires greater resources.

Conceptualising the findings in an alternative way, it may be that for those individuals who highly endorse conflicting values (i.e. the Value opportunists) a smaller number of environmental behaviours have high self-concordance. While recycling may have relatively high self-concordance as performing the behaviour is compatible with biospheric goals, and (at best) may be largely unrelated to egoistic goals, green product purchase may have a much lower self-concordance as it is incompatible with egoistic motives. Consequently, the inclusion of a second behaviour serves two purposes: it shows the values-based segmentation model to be generalizable beyond recycling, and highlights that different behaviours are likely to be performed to different extents by the groups.

3.4.5. Is Self-Report Behaviour Accurate?

People may inflate normative behaviours when using self-report (Fuj, 1985; Hamilton, 1985) to make themselves appear to be a 'good person' (Felonneau & Becker, 2008). This is a form of impression management (Paulhus, 1991) and can make self-report

measures less accurate. In the current study, participants in the UK tended to give significantly more socially desirable answers than the participants from Brazil. Moreover, in both countries, a significant, albeit relatively weak, positive correlation was found between answering in a socially desirable manner and self-reported recycling behaviour. One possible interpretation of this is that people who wanted to present a socially desirable image of themselves reported higher recycling figures. This may mean there is the potential that, in both samples, individuals may have inflated their recycling behaviour. Of course, as a correlational design was employed, these suggestions are no more than one interpretation by the author who acknowledges that it is not possible to ascertain cause-and-effect in this circumstance. However, the plausibility of this interpretation is supported by previous literature that has found social desirability to have a weak effect on environmental attitudes (e.g. Milfont, 2009).

While it does not seem that social desirability has a large impact on self-report responses, the relationship between social desirability and recycling should mean these findings are interpreted with necessary caution. While far from ideal, the costs associated with collecting objective data makes self-report an appealing option for many researchers. Thus, while self-report is far from inaccurate, the influence of social desirability should be considered when interpreting findings derived from such methods.

3.4.6. Limitations and Recommendations for Future Research

Many of the limitations that were discussed in the previous chapter can apply to some extent to this study. First, the generalisability of the findings is still in question given that undergraduate students were used for both studies; that said, using a cross-cultural sample has shown that the segmentation model can be used outside of the UK, albeit also on a student sample.

Secondly, as in the last study, self-report measures were used and as such caution must be taken when considering the findings. Third, the reliabilities of some of the scales used were below the threshold of Cronbach's alpha of .7 for internal reliability. However, all scales had internal reliability of above .6, which has been regarded as satisfactory within the literature (Aron & Aron, 2003; Schwartz, 2001).

Another issue was that, as in the previous study, the egoistic value-orientation scale items did not all load as expected. Once again 'ambitious' failed to load on the hypothesised scale, and was subsequently removed from the analysis. As mentioned in the previous discussion section, the author speculates that while ambition was originally conceptualised as a personal motivation and related to self-enhancement, people may be ambitious in order to reach a position of responsibility or power to achieve social change or help others. When conceptualised in this way, it is perhaps less surprising that the item has a stronger correlation with altruism than egoism. It is also worth noting that while the author has commonly discussed how values may 'predict' behaviour, due to the cross-sectional design of this research it is not possible to infer cause-and-effect.

Some limitations raised in the last study were addressed in this work. Most notably, the behavioural measure used for recycling was altered from an open-ended question relating to how many items an individual has recycled in a given period, to an anchored Likert scale format. This reduced the ambiguity of the question, and the number of outliers identified in the UK sample; dropping from 21 individuals in the previous work to only 9 in this study. Alongside this, a measure of social desirability was included, so as to further investigate the link between self-reported environmental behaviours and answering in a socially desirable manner. While again this relationship was determined by correlation and so cannot provide definitive evidence regarding the

nature of this relationship, it has allowed the author to comment on the validity of self-report.

Future research may want to consider the following recommendations to further enhance the study of a values-based segmentation model. First, testing the segmentation model on a sample of non-students may help determine whether any effect of education of age influences the groups that are identified. Having replicated the model on two fairly modest samples, repeating the segmentation on a significantly larger and more representative sample may provide further evidence of the generalisability of the model. Second, the inclusion of different environmental behaviours or intentions may highlight further differences between the groups identified and test whether the segmentation model can be applied in other environmental domains (e.g. car use, or energy use). Third, investigating the demographic profile of the cluster groups would provide further information to policy makers and environmental campaigners as to the 'types' of people found in each of the groups. This may be particularly important as values may be difficult to measure, geo-demographic data may be free to access (e.g. through census records). Thus, having an awareness of the demographic profile of each of the groups may allow policy makers to more effectively target specific groups.

3.4.7. Implications and Contribution

This research may be useful for policy makers and campaign designers who may want to consider tailoring messages towards different groups. For example, it appears that the Value opportunists are more likely to engage in low-cost rather than high-cost behaviours, so in order to make campaigns most efficient, low-cost but high-impact behaviours should be focussed upon. Whereas for the Selfless contributors, as this group seem more committed, they could be encouraged to attempt costlier, more advanced,

behaviours. More of challenge appears to be the Non-engagers and the Self-enhancers. For the latter group, targeting behaviours that could also carry economic as well as environmental benefit may help shape their behaviour. In the next chapter, two measures that have clear financial consequences (car use and energy use) are considered.

In terms of contribution, this study offers further support that values influence environmental outcomes, and consistent with VBN theory, suggests moral norms may mediate this relationship. The work offers insight into the likely environmental outcomes for an individual who highly endorses conflicting values: it appears they may engage more with lower-cost than higher-cost behaviours. An interpretation of this, linking the finding to existing literature on multiple goals and self-concordance (e.g. Kopetz et al., 2011; Unsworth et al., 2014; Unsworth & McNeill, 2017) is outlined. This study also provides a contribution to literature relating to cross-cultural aspects of values and environmental behaviour, suggesting differences may exist regarding the importance attributed to values across cultures, but finding the 'types' of people may be consistent within and between countries. Finally, the work offers a contribution to literature relating to methodological issues within the environmental domain; suggesting that a significant but weak correlation exists between social desirability and recycling, but not social desirability and green product purchase.

3.4.8. Conclusion

Despite some limitations, the findings are generally positive in terms of the appropriateness and usefulness of a value-based segmentation model across cultures. The study has demonstrated that a four-group solution can be replicated both in the UK and in Brazil. Moreover, this study has shown that the groups behave differently depending on the behaviour, suggesting that values can have a varying (direct and

indirect) impact on environmental behaviours. The study has also shown that hedonic values appear to predict environmental norms and behaviours in the UK but not in Brazil, and that in both countries, social desirability appears to be significantly, albeit weakly, positively correlated with self-reported recycling behaviour. In summary, the findings offer promise that a value-based segmentation approach is a worthwhile pursuit, yet future work is required to consider if the segmentation model is replicable on a significantly larger sample size and to investigate differences between the groups when considering other behaviours from different environmental domains.

Chapter 4. The Profile of the Segmented Groups: Investigating the Geodemographic Differences between Segmentation Groups

Abstract

Previous chapters have considered the values-based segmentation approach for understanding recycling and green product purchasing behaviour in both Brazil and in the UK. However, these findings have been based upon modestly sized samples of student participants. Moreover, little is known about the geodemographic profiles of the segmentation groups, and their feelings towards other environmental behaviours outside those related to waste management. To address these issues, this study will: explore whether the same segmentation groups can be replicated using a much larger and more representative data set ($n=6045$); investigate differences between the groups regarding age, gender, education, geographical location and political preferences; and consider how the groups perform on intentions towards sustainable energy use and car use. The findings suggest that the segmentation groups can be replicated on a much larger and more representative sample, and that the groups differ from one another in terms of the geo-demographic profiles *and* their behavioural intentions. The research has implications for policy makers and environmental campaigners, who, by understanding differences between the groups, may be able to better tailor communication to them.

4.1. The Profile of the Segmented Groups: Investigating the Geodemographic Differences between the Segmentation Groups

4.1.1. Background to the Study

The previous research covered in chapters two and three of this thesis have tested and replicated a segmentation model both in the UK and in Brazil. By doing so, they have offered support for the usefulness of a value-based segmentation approach, and the reliability of four types of people based upon the values they endorse. The findings so far have shown that, generally, these groups differ on their moral norms, recycling behaviour, and green product purchase. However, when considering the UK and Brazil, there have been conflicting findings regarding the inclusion of hedonic values in the segmentation model. Moreover, as the behavioural measures have so far been focussed on waste-related behaviours such as recycling and green product purchase, it is still unknown how the cluster groups will perform on other environmental indicators (e.g. car use and energy consumption). Furthermore, the studies so far have had modest sample sizes and have consisted only of student participants, which raises concerns about the wider generalisability of the cluster groups found.

To address these concerns, the current study takes the following steps: First, to further show generalisability beyond UK and Brazilian students, a significantly larger sample size ($n=6045$) comprising data from seven European countries will be analysed in this study. Second, behavioural intentions relating to car use and energy use will be considered to test whether the segmentation approach is appropriate across multiple environmental behavioural domains other than those already studied. Third, the dataset used in this study also contains a wider range of demographic variables, which will allow the author to comment on the geodemographic profile of each of the groups regarding

their age, gender, education, geographical location and political preferences. This may be particularly useful information for policy makers and environmental campaigns when tailoring messages to the groups, as this will provide richer data for profiling the groups. Finally, hedonic values will again be analysed to test their appropriateness for inclusion in the model. The following sections will discuss these key issues.

4.1.1. Generalisability and Replicability of the Segmentation Model

So far, the segmentation model has been tested on three modestly-sized samples of students. However, a larger and more representative sample is required to assess whether the segmentation model can be applied more widely. To achieve these aims the author uses a data set collected in relation to the 'barriers for energy changes among end consumers and household' (BAREENERGY) project. This project, funded by the EU, sought to investigate the barriers that may inhibit people from changing energy-related behaviours to adopt more sustainable alternatives. A market research company was responsible for collecting data relating to these barriers in seven countries: France, UK, the Netherlands, Greece, Switzerland, Norway and Hungary. Part of this data was analysed by Steg in 2009, the resulting data from this part of the project has been shared with the author of this thesis. This chapter reports a secondary analysis conducted on this dataset. The data relevant to this study contains information relating to demographic information, values, and two measures of environmental intentions (energy use and car use) from a total of 6045 individuals.

Research relating to the BAREENERGY project has previously been published. An overview of the project can be found in Emmert, Van De Lindt, and Luiten (2010). Research from specific countries that contributed to the dataset can be found relating to: policy acceptability in the Czech Republic (Kyselá, 2016), electricity consumption in

Norway (Stø & Strandbakken, 2009; Throne-Holst, Heidenstrøm, Stø, & Strandbakken, 2010), values in Hungary (De Groot, Steg, Keizer, Farsang, & Watt; 2012) and transport use in Switzerland (Sadeghi & Lüthi, 2009). However, to the author's knowledge, no published study from the dataset has considered how a values-based segmentation could be implemented, and whether the segmentation groups differ in their intention to use sustainable energy (in preference to less sustainable energy) and reduce their car use.

Using secondary data sets is becoming increasingly common in psychology, and has recently been actively encouraged by the UK's Economic and Social Research Council (ESRC) through research grants to ensure the most is made from data collected inside and outside of the academic community. Sharing data is also one of the recommendations of the Open Science Framework (2015), as they believe this good practice will further increase the standard of work completed by researchers and ultimately contribute to tackling the replication crisis facing the field. Data sharing also affords more junior researchers, and those with fewer resources to collect large-scale data, the opportunity to test hypotheses with a sample size that would otherwise be unattainable.

If the four groups identified in previous values-based segmentations in this thesis (Non-engagers, Self-enhancers, Value opportunists and Selfless contributors) can also be identified on a larger and more representative sample, this will provide further evidence of the reliability of these groups. Moreover, it will offer further support that these 'types' of people exist within and across countries.

4.1.2. Considering Different Environmental Outcomes

Considering different behaviours, other than those related to waste-management (e.g. recycling, purchasing green products), is another key aim of this study. Poortinga and Darnton (2016) highlight that values are less proximal to behaviour than situation specific

variables, thus a values-based segmentation may be able to span multiple behaviours. This may be beneficial to policy makers who can implement one model across many domains, rather than explore many different models for different environmental outcomes. Thus, while two different waste-related behaviours have been considered in the previous chapters, testing whether the segmentation can identify groups that differ on other environmental outcomes will help show the generalisability of the model. Given that this is a secondary analysis, the author could only consider the environmental outcomes measured in the original project. Thus, as behavioural measures were not included in the data set shared with the author, in this study intentions rather than behaviour are considered.

Intentions have been conceptualised as a determinant of behaviour (e.g. Theory of Planned Behaviour; Azjen, 1991), however, often a 'gap' between intentions and behaviour is found, suggesting that good intentions do not always translate into actions (e.g. Godin, Conner, & Sheeran, 2005). However, intentions have been suggested to be a better predictor of behaviour than some other psychological constructs (e.g. subjective norms; Armitage & Conner, 2001) and so investigating intentions will still offer insight into the likely environmental behaviours of the groups. The two intentions that will be considered are sustainable energy use and car use.

4.1.2.1. Sustainable energy use. Sustainable energy, based upon the definition of sustainability from Keeble (1988) is energy that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs. By this definition, solar and renewable energy can be classed as forms of sustainable energy. Understanding if people intend to use more sustainable energy is important as it can have serious consequences on biospheric, altruistic and egoistic

concerns. For example, using sustainable energy can reduce emissions which can help increase environmental quality (benefitting the planet and other humans) and can increase energy price stability which may help people manage their finances more efficiently (Union of Concerned Scientists, 2013). However, using renewable energy may not be congruent with holding egoistic values as it can be costly, and price appears to be a deciding factor when choosing between energy sources (e.g. solar power or fossil fuels; Keizer, 2014)²⁴. This coupled with the significant perceived effort required to switch energy suppliers suggests that egoistic and hedonic values will negatively relate to increasing the use of sustainable energy, over and above less sustainable energy. For environmental and altruistic reasons derived from acting pro-environmentally, it is expected that biospheric and altruistic values will positively relate to intentions to increase what proportion of energy use is sustainable.

4.1.2.2. Car use. Intention to reduce car use is also important to investigate because this too can have consequences related to biospheric, altruistic and egoistic concerns. For example, reducing car use could encourage people to walk or ride a bike more, increasing activity and contributing to health benefits. This can also have wider financial implications for society as currently physical inactivity is thought to cost over £6.5 billion per year through its impact on tackling obesity (e.g. through the National Health Service needing to modify transport to accommodate obese individuals; Mackett & Brown, 2011). Thus, reducing car use appears to be a way in which to tackle wider societal problems and environmental issues and so biospheric and altruistic values may positively predict intention to reduce car use.

²⁴ Although the price of renewable energy can differ country to country, and so could alter how congruent using this energy is with endorsing egoistic values.

Conversely, feelings of comfort, status, and luxury, associated with car use may make reducing car use incongruent with economic and hedonic concerns (Steg et al., 2014b). Dittmar (1992) found that cars may be purchased based upon their hedonic value, so people may derive pleasure from a car like they would from another product (Ellaway, Macintyre, Hiscock, & Kearns, 2003). Steg et al. (2014b) found that hedonic values predicted car use frequency ($r = .16, p = .003$) and car-use duration (e.g. mileage; $r = .16, p = .004$). Therefore, it is expected that egoistic and hedonic values will negatively predict intentions to reduce car use.

4.1.3. The Geodemographic Profile of the Cluster Groups

Schwartz (1992; 1994) demonstrated that demographics do not tend to influence the general structure of the values circle, but it is possible that demographics are related to the importance attributed to specific values. The exploration of these groups in relation to a range of geodemographic variables will help present a clearer profile as to what type of person is likely to be in each of the groups. Gaining a richer understanding of some of the demographic differences between the groups may help policy makers better tailor campaigns to fit the group. Moreover, as geodemographic information may be more readily available than value measures, through census, other public records, or through marketing databases (e.g. Experian database), understanding more about these behaviours may eventually allow companies and local authorities use geodemographic information as a proxy to estimate which of the cluster groups an individual belongs to.

The BARENERGY data set contains information relating to the age, gender, education, geographical location and political preferences of all participants, and so offers the possibility of exploring how the segmentation groups differ regarding these variables.

The following section outlines previous literature that demonstrates how geodemographic are likely to influence environmental behaviour and our values.

4.1.3.1. Age. Age has been found to be an important predictor of environmental behaviour. For example, Straughan and Roberts (1999) found age to be a stronger (positive) predictor than other demographic variables, like income. Relationships between age and values have also been investigated. Self-transcendence related values (e.g. biospheric, altruistic) have been shown to positively correlate with age, while self-enhancement related values (e.g. egoistic) are have been shown to negatively correlate with age (Schwartz et al., 2001). Age has also been found to negatively relate to hedonic values (Feather, 1975; Rokeach, 1973), possibly because people are less exposed to new and exciting challenges as they get older (Tyler & Shuller, 1991).

Based on these previously reported patterns, it can be predicted that younger people may be more likely to highly endorse egoistic and hedonic values, while older people may be more likely to attribute greater importance to biospheric and altruistic values. Because of this, it is predicted that those who only highly endorse egoistic and hedonic values and score low on biospheric and altruistic values (i.e. the Self-enhancers) may be of a significantly younger age than those who only highly endorse biospheric and altruistic values and score low on egoistic and hedonic values (i.e. the Selfless contributors).

4.1.3.2. Gender. Eagly (1987) suggested that women, through more carefully considering the implications of their actions, will engage in more pro-environmental behaviour than men. However, contradictory findings exist between scholars who find an effect of gender on pro-environmental behaviour (e.g. Hounshell & Liggett, 1973; Roberts, 1996; Stern et al., 1993; Van Liere & Dunlap, 1981), and those who find no

gender differences (e.g. Arbuthnot, 1977; Brooker, 1976; Samdahl & Robertson, 1989; Tognacci, Weigel, Wideen, & Vernon, 1972).

A meta-analysis by Diamantopoulos, Schlegelmilch, Sinkovics and Bohlen (2003) suggested the relationship between gender and environmental outcomes to be complex, concluding that males appear to have greater environmental knowledge but females report more environmentally friendly attitudes and behaviour. This suggest that females may have greater intentions than males to engage in environmental behaviour. Because of this, it predicted that when the segmentation analysis is performed, a disproportionately higher number of males will be found in the groups that tend to perform less pro-environmental behaviour (e.g. Self-enhancers and Non-engagers). Conversely, it is predicted that a disproportionately high number of females will be found in the groups who engage in more pro-environmental behaviour (e.g. Value opportunists and the Selfless contributors).

4.1.3.2. Education. Research has found that education is positively linked to environmental behaviour (e.g. Aaker & Bagozzi, 1982; Leonard-Barton, 1981; McEvoy, 1972; Tognacci et al., 1972; Van Liere & Dunlap, 1981). Therefore, it is to be expected that the groups who perform the most pro-environmental behaviour (e.g. the Selfless contributors and Value opportunists) will contain a disproportionately higher number of individuals who have been educated to a higher level, than other groups. Following this logic, it is also predicted that the group who have performed the least pro-environmental behaviour in previous studies (e.g. the Self-enhancers and Non-engagers) may contain a higher number of individuals who have a lower-level of education.

4.1.3.3. Geographical location. Geographical location will be considered as participants from all seven countries will be represented in one segmentation model.

European countries tend to distinguish between biospheric, altruistic and egoistic values in a relatively similar manner, at least more similarly than when comparing Europe to other continents (De Groot & Steg, 2007a). Because of this it is thought there will be a broadly even split of people from all countries in each of the segmentation groups.

However, some differences may arise if a country's government prioritises the environment more than other countries, as it may shape how people in that country act towards the environment (Esty, Levy, Srebotnjak & De Sherbinin, 2005). Moreover, national norms in some countries are more likely to favour greater environmental concern than in other countries. For example, De Groot, Steg, Keizer, Farsang and Watt (2012) suggest that the historical socialist influence associated with Eastern Europe may mean individuals from these countries prioritise altruism more than Western European counterparts. The Selfless contributors highly endorse altruism; thus, it is predicted that the representation of people from post-socialist countries such as Hungary may be higher in the Selfless contributors group given the political history of this country compared with the others considered in this project.

4.1.3.4. Political preferences. Political preferences have also been shown to influence environmental outcomes. Generally, right-wing beliefs are associated with acting in a less environmentally friendly manner. For example, lower environmental concern tends to be reported by those with conservative political views (e.g. Schultz & Stone, 1994). Moreover, supporting free-market conditions (a measure associated with a right-wing political stance; Gifford & Nilsson, 2014) has been linked with lower environmental concern, along with believing technology will solve environmental problems, and believing economics provides the best measure of a nation's progress, (Heath & Gifford, 2006; Kilbourne, Beckmann & Thelen, 2002).

Conversely, those with left-wing or liberal political views tend to provide greater commitment to the environment (Hine & Gifford, 1991) and are more likely than conservatives to report engagement in environmental issues as an issue of morality (Feinberg & Willer, 2013). Based upon this, it would be expected that more individuals with left-wing political preferences will be found in the Selfless contributors group, as these individuals tend to engage most in pro-environmental behaviour).

4.1.4 The Inclusion of Hedonic Values

Literature suggests hedonic values bear a negative influence on most environmental behaviours (Lindenberg & Steg, 2007; Steg, Perlaviciute, van der Werff & Lurvink, 2014). However, in the previous study of this thesis, their inclusion as a variable in the segmentation model was only partially supported: in the UK, hedonic values were a significant negative predictor of both recycling and green product purchase, but they were not significantly related to any of these variables in Brazil.

To further assess the appropriateness of including hedonic values in a values-based segmentation model, in this study, their ability to predict environmental outcomes will once again be tested. As this study considers seven European countries, it is thought the findings will be more akin to those found in the UK rather than Brazil. Consequently, it is expected that hedonic values will be a significant negative predictor of the environmental intentions considered in this chapter.

4.1.5. The Current Study

The dataset includes participants from France, Norway, the UK, the Netherlands, Hungary, Greece and Switzerland, and so will offer insight into whether the groups found previously can be replicated on a sample from multiple countries. In previous chapters, the total of 894 participants from the UK and Brazil who have taken part in the research

have all been university students (Chapter 2: $n=284$; Chapter 3: $n=610$). This chapter seeks to test whether similar findings can be found with a sample that represents a broader cross-section of society.

Rather than running the segmentation analysis seven times, once for each country, one segmentation model will be considered consisting of all participants. Differences between how many individuals from each country are in each of the groups identified will then be explored as part of the analysis on geographical location, alongside differences between the demographic profile of the cluster groups relating to age, gender, education and political preferences.

The current study will also test whether the groups found differ on variables related to energy use and car use, rather than waste behaviours considered in previous chapters (recycling products, buying recyclable products). This will show whether the values-based segmentation can be generalised to other environmental outcomes. Finally, the inclusion of hedonic values will once again present the opportunity to consider whether these values should be included in future values-based segmentation models designed to understand environmental behaviour.

Due to the similarity in the analytical tests performed in this and the previous chapters, the hypotheses derived for this study are similar in format to those outlined in chapters two and three, as is the layout of the data analysis section. However, no variable relating to moral norms was shared with the author, and so the multi-categorical mediation analysis element of the previous study cannot be replicated in this chapter.

4.1.6. Summary and Hypotheses

In summary, this study will test whether the values-based segmentation model can be applied to environmental outcomes relating to energy and car use. The study will

also consider whether the groups found from the segmentation have different geoprofiles regarding age, gender, education, geographical location and political preferences. Finally, hedonic values will be tested and their suitability for inclusion in a segmentation model assessed.

This study will contribute to the literature by answering the following questions: a) Do hedonic values influence environmental outcomes relating to energy and car use, and thus should these values be included in a values-based segmentation alongside egoistic, biospheric and altruistic values? b) Is the four group solution found in the previous studies involving students in the UK and Brazil, replicable on a significantly larger and more representative sample? c) Is a values-based segmentation model useful in understanding other environmental outcomes not related to recycling, i.e. are meaningful groups found that differ from one another regarding intentions relating to car use and energy use?, and d) Do people who endorse different values differ in terms of their demographic profile relating to age, gender, education, political preferences and geographical location?

Based upon the literature outlined above and previous literature reviewed in the thesis, the following hypotheses are proposed:

H₁: Biospheric (positive influence), altruistic (positive influence), egoistic (negative influence) and hedonic (negative influence) values will predict intentions to increase sustainable energy use (H_{1A}) and intentions to reduce car use (H_{1B}).

H₂: The same four distinct segmentation groups, as found in the previous studies, will be found to be replicable on a larger more representative sample.

H₃: The segmentation groups will differ in their intentions to increase sustainable energy use (H_{3A}), and intentions to reduce car use (H_{4B}).

H₄: The groups will differ regarding in gender profile (H_{4A}). The Self-enhancers group is expected to contain a disproportionately higher number of males (H_{4B}) and the Selfless contributors group a disproportionately higher number of females (H_{4C}).

H₅: The groups will differ in age (H_{5A}). The Self-enhancers are expected be younger than the Selfless contributors group (H_{5B}).

H₆: The groups will differ regarding their education level (H_{6A}). The Self-enhancers group is expected to contain a disproportionately higher number of lower-educated people (H_{6B}) and the Selfless contributors group a disproportionately higher number of higher-educated people (H_{6C}).

H₇: The groups will differ in geographical location (H_{7A}). The Selfless contributors group will contain more individuals from Hungary (the post-socialist country included in this study), as community concern and altruism may be viewed as more important to this group (H_{7B}).

H₈: The groups will differ in political preferences (H_{8A}). The Self-enhancers group is expected to hold more right-wing preferences than the Selfless contributors group (H_{8B}).

4.2. Method

4.2.1. Participants

A market research company was responsible for data collection in the spring of 2009. Data from 7 countries was collected: France, UK, the Netherlands, Greece, Switzerland, Norway and Hungary. In total 6045 people completed the full questionnaire to a satisfactory standard and were included in the main analysis for original report. Participants collected were generally evenly split between the countries; the lowest percentage were from the Netherlands ($n=756$; 12.5%) while the largest group were from Switzerland ($n=943$; 15.6%). The participants were originally selected based upon a

number of stratification criteria including gender, age, household income, education level, marital status, and household composition, in an attempt to create samples that were representative of each country. Slightly over half of the participants (50.8%) were female ($n=3072$) and the mean age of participants was 44.03 years ($SD= 14.78$).

4.2.2. Design

The study employed a cross-sectional survey design. The full questionnaire for BARENERGY contained around 120 questions focussing on different aspects of environmental behaviour (see Emmert, Van De Lindt, & Luiten, 2010). However, the secondary analysis reported in the current study focuses on a smaller subset of the questionnaire item, relating to: Values (16 items), environmental intentions (reducing car use, and increasing sustainable energy use), and demographic variables (age, gender, education, geographical location and political preferences).

The data analysis will consist of two stages. The first considers a correlational design and employs multiple regressions to ascertain whether values (biospheric, altruistic, hedonic and egoistic) predict either of the two environmental intentions. The second analysis stage will be the cluster analysis. A K-means cluster analysis will use the values as the basis for forming groups. These groups will be used as the independent variable in a MANOVA. The MANOVA will be employed to consider differences between the groups on the two measures of environmental intentions (DV 1: Intention to reduce car use, DV 2: Intention to increase sustainable energy). Differences between the groups regarding their demographic profile will also be assessed. A Chi-square will investigate differences between the groups regarding gender and geographical location, while one-way ANOVA will consider differences between groups regarding age, education and political preference.

4.2.3. Materials

As this was a secondary analysis, the author only had access to the data and not a hard copy of the original questionnaire. Therefore, while the full questionnaire is not outlined in the Appendix, each of the measures used are outlined below.

4.2.3.1. Values. The measure was identical to that described in chapter three of this thesis.

4.2.3.2. Environmental intentions. Two single-item measures of environmental intentions were included in the analysis. The two behaviours related to intention to reduce car use and intention to increase use of sustainable energy. The first asked participants to rate the statement 'I intend to decrease the percentage of journeys I make by car in the upcoming year' on a scale of 1 (strongly disagree) to 7 (strongly agree), while the second asked participants to rate 'How likely is it that your household will use more sustainable energy in the next year' on a scale of 1 (very unlikely) to 7 (very likely).

4.2.3.3. Demographics. Standard demographics such as age, geographical location and gender were measured alongside political preferences and education level. Political preferences were measured on a scale from 1 to 10 with 1 anchored by 'left/liberal political preference' and 10 representing the 'right/conservative political preference'. Education level was split into five groups: No education/primary school, secondary education, high school, vocational education, and university.

4.2.4. Procedure

As the data for this study was already collected there was no procedure taken by the author in terms of data collection. However, ethical considerations were considered. The author obtained permission from the Principal Investigator to use and refer to this data set in this thesis. The author notes this permission only extends to use in this thesis

and not for publication purposes. In the data collection phase of the original study, permission was sought from participants that the data could be archived and used for use on future projects such as this.

4.3. Results

4.3.1. Data Preparation

A Confirmatory Factor Analysis (CFA) using the Multi-Group Method proposed by Nunnally (1978) was performed to check whether the scale items relating to biospheric, altruistic, hedonic and egoistic values loaded as expected. All items relating to the four values loaded as expected and so no items were removed. The internal reliabilities for all sub-scales were also assessed. The Cronbach's alpha for the altruistic, biospheric, hedonic and egoistic value subscales were deemed satisfactory achieving Cronbach's alpha of .745, .892, .727 and .778 respectively.

4.3.2. Data Analysis

The data analysis section is split up into four sections, each relating to one of the hypotheses outlined.

4.3.2.1. Hypothesis one. This states that Biospheric (positive), altruistic (positive), egoistic (negative) and hedonic (negative) values will influence intentions to increase sustainable energy use (H_{1A}) and intentions to reduce car use (H_{1B}).

Descriptive statistics revealed that, consistent with previous findings in chapters two and three, overall altruistic values ($M=5.00$, $SD=1.23$) were rated as most important, followed by biospheric values ($M=4.80$, $SD=1.47$), hedonic values ($M=4.04$, $SD=1.41$) and egoistic values ($M=3.06$, $SD=1.33$). In terms of environmental intentions, people's intention to reduce car use ($M=3.76$, $SD=1.33$) was slightly higher than their intention to

increase their use of sustainable energy ($M=3.32$, $SD=1.84$), but neither intention was particularly high (scored out of seven).

Two multiple regressions were employed each using the Enter method to investigate whether values predicted these intentions. The first considers intention to reduce car use. Assumptions checks for this test, and all the assumptions relating to the analyses performed in this chapter, are reported in Appendix M). A significant regression equation was found showing that values predicted intentions to reduce car use $F(4,6040) = 92.19$, $p < .001$, $R^2 = .24$, $R^2_{Adj} = .06$. The analysis indicated that biospheric values positively predicted intention to reduce car use ($\beta = .22$, $t(6035) = 12.78$, $p < .001$), as did altruistic values ($\beta = .07$, $t(6035) = 2.60$, $p < .01$). Hedonic values were also found to be a significant predictor of intention to reduce car use but were a negative predictor ($\beta = -.03$, $t(6045) = 2.06$, $p < .05$). Finally, egoistic values were not found to be a significant predictor ($\beta = -.02$, $t(6045) = 1.03$, $p = .31$).

A second multiple regression was performed to assess which values predicted intention to increase use of sustainable energy. Once again assumptions checks were performed and met (see Appendix M). A significant regression equation was found showing that values predicted intentions to increase use of sustainable energy $F(4,6040) = 38.61$, $p < .001$, $R^2 = .16$, $R^2_{Adjusted} = .02$. The analysis indicated that altruistic values were not a significant predictor ($\beta = .02$, $t(6045) = 1.11$, $p = .27$). However, all other values positively predicted intention to increase use of sustainable energy: biospheric values ($\beta = .08$, $t(6035) = 4.52$, $p < .001$), egoistic values ($\beta = .07$, $t(6035) = 4.48$, $p < .01$) and hedonic values ($\beta = .05$, $t(6045) = 3.53$, $p < .001$).

These findings partially support hypothesis one. Biospheric values were found to be a positive predictor of both intentions, but altruistic values only predicted intentions

to reduce car use. Egoistic values, contrary to the hypothesis, positively predicted intentions to increase sustainable energy use, but failed to predict intentions relating to car use. Finally, hedonic values, as hypothesised negatively predicted intention to reduce car use, but had no relationship with sustainable energy intentions.

4.3.2.2. Hypothesis two. This states that the same four distinct groups, as found in the previous studies, will be found to be replicable on a larger more representative sample

A non-hierarchical k-means cluster analysis was used to identify categories of people grouped by distinct patterns of scores on the four values. Participants' mean raw scores on each of the biospheric, altruistic, hedonic and egoistic value-orientation scales were transformed into z scores to facilitate interpretation of the results. The author specified a four-group solution to see whether the groups from previous work could be replicated. The same four groups were found, as outlined below:

Cluster 1 – *Non-engagers*: Comprising of 20% ($n=1213$) of the sample, who scored below average on all four values.

Cluster 2 – *Self-enhancers*: Comprising 24% ($n=1430$) of the sample, who scored above average regarding egoistic and hedonic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprising 27% ($n=1671$) of the sample, who scored below average regarding egoistic and hedonic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprising 29% ($n=1731$) of the sample, who scored above average on all four values.

As a four-group segmentation approach identified the same groups found previous in samples based in the UK and Brazil, the replicability of these groups is supported. This offers support for hypothesis two. To further understand how the groups' rate the importance of the four values, the cluster scores for the values are reported in *Table 4.1*.

Table 4.1.
The standardised values scores for each of the cluster groups

	Biospheric	Altruistic	Egoistic	Hedonic
Non-engagers	-0.70	-0.85	-1.26	-1.24
Self-enhancers	-0.65	-0.68	0.50	0.58
Value opportunists	0.91	0.91	0.77	0.76
Selfless contributors	0.25	0.41	-0.45	-0.55

As in previous studies, the Value opportunists attribute most importance to biospheric values, however they also attribute most importance to all other values. Consequently, this group endorse conflicting values from opposing domains. As the values scores from the participants have been standardised to aid interpretation, a score of 1 or -1 indicates that the group scored one standard deviation above or below the sample mean. So, considering the table, the Self-enhancers score half a standard deviation above the sample mean on egoistic values.

4.3.2.3. Hypothesis three. The groups identified from the values-based segmentation will differ regarding their intentions to increase sustainable energy use (H_{3A}), and intentions to reduce car use (H_{4B}).

Descriptive statistics are presented in *table 4.2* regarding the intentions for all four groups. From the table, it appears the Value opportunists have the greatest intentions to reduce car use and the greatest intentions to increase their use of sustainable energy. In

terms of car use, the Selfless contributors had the next largest intentions followed by the Self-enhancers and the Non-engagers. The Non-engagers also had the lowest intention to increase sustainable energy use. However, somewhat surprisingly, the Self-enhancers (who highly endorse egoistic and hedonic values) reported greater intentions to increase sustainable energy use than the Selfless contributors (who highly endorse biospheric and altruistic values).

Table 4.2.

Means (and standard deviations) of intentions relating to car use and sustainable energy use for the cluster groups identified from the values-based segmentation

	Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Car use	3.29 (1.76)	3.37 (1.74)	4.12 (1.85)	4.08 (1.82)
Sustainable energy	2.98 (1.74)	3.28 (1.72)	3.67 (1.91)	3.25 (1.87)

A MANOVA was employed to compare differences between the cluster groups regarding their intentions to increase sustainable energy use and reduce car use. The MANOVA was considered appropriate as all dependent variables were related: $r(6044) = .14, p < .01$. Once the MANOVA was employed, the output indicated that intentions to increase sustainable energy use and reduce car use differed across the cluster groups $F(6,12080) = 58.91, p < .001$; Wilk's $\Lambda = .944, \eta_p^2 = .03$. More specifically, the analysis indicated that cluster group membership has a statistically significant effect on intention to reduce car use $F(3,6041) = 90.98, p < .001, \eta_p^2 = .04$, and intention to increase use of sustainable energy $F(3,6041) = 35.94, p < .001, \eta_p^2 = .02$.

Post-hoc tests were employed to further investigate the differences between groups for both dependent variables. All post-hoc comparisons were completed at $\alpha = .05$ level with a Bonferroni correction employed for multiple comparisons. In terms of intention to reduce car use, both the *Value opportunists* and the *Selfless contributors*

reported higher intentions than both the *Non-engagers* and the *Self-enhancers*. While for intentions to increase use of sustainable energy, the *Non-engagers* reported lower intentions than both the *Self-enhancers* and the *Selfless contributors*. Yet none of these groups reported intentions as high as the *Value opportunists*; who reported significantly higher intentions to increase their use of sustainable energy than all other groups. These findings support hypothesis three as differences were found between the groups identified by the segmentation analysis for both dependent variables.

4.3.2.4. Hypothesis four. This states that the groups will differ regarding their profile relating to gender (H_{4A}). The Self-enhancers group is expected to contain a disproportionately higher number of males (H_{4B}) and the Selfless contributors group a disproportionately higher number of females (H_{4C}).

Figure 4.1 shows the split between males and females for each group, given as a percentage. It shows that two groups, the Non-engagers and Self-enhancers have more males than females, while the opposite holds for the Value opportunists and Selfless contributors. Considering the differences for each of the groups, it appears gender differences are minimal for the Value opportunists and to some extent the Non-engagers. However, the Self-enhancers appear to have a disproportionately high number of males, while the Selfless contributors have a disproportionately high number of females. A chi-square revealed gender differences to be found across the four groups $\chi^2 = 99.07$, $df = 3$, $p < .001$. This supports hypothesis 4a. Based upon analysis of the standardised residuals from the chi-square it was found that the Self-enhancers group (and the Non-engagers group) contained a disproportionately higher number of males (based on upon the ratio of males to females across the sample). This supports hypothesis 4b. Finally, the Selfless contributors group consisted of a disproportionately higher number of females. This

supports hypothesis 4c. No significant gender differences were found in the Value-opportunists group.



Figure 4.1. *Proportion of males and females in each of the cluster groups.*

4.3.2.5. Hypothesis five. This states that the groups will differ regarding their profile relating to age (H_{5A}). The Self-enhancers group is expected be younger than the Selfless contributors group (H_{5B}).

Descriptive statistics relating to the ages of each of the groups show that Selfless contributors are the oldest group ($M= 46.74$, $SD= 13.87$), followed by the Non-engagers ($M= 44.02$, $SD= 14.91$), the Value opportunists ($M= 43.54$, $SD= 14.43$), and the Self-enhancers ($M= 41.45$, $SD= 15.60$). This suggests that when considering a representative sample, some variety in mean age (of around 5 years) may occur between groups.

A statistically significant effect of group membership was found on age: $F(3,6041) = 34.36$, $p < .001$. This supports hypothesis 5a. Post-hoc comparisons employing a Bonferroni correction found members of the Selfless contributors group were significantly older than both the Value opportunists and the Non-engagers. While, consistent with hypothesis 5b, the Self-enhancers were significantly younger than the Selfless

contributors. The Self-enhancers were also found to be significantly younger than the Value opportunists and the Non-engagers.

4.3.2.6. Hypothesis six. This states that the groups will differ regarding their profile relating to education (H_{6A}). The Self-enhancers group is expected to contain a disproportionately higher number of lower-educated people (H_{6B}) and the Selfless contributors group a disproportionately higher number of higher-educated people (H_{6C}).

Figure 4.2 shows the percentages relating to highest level of education for each of the cluster groups. While a similar pattern is found across most groups, perhaps the most noticeable difference is that the proportion of people who attended university appears to be greater in the Self-enhancers group and to some extent the Non-engagers group, compared with the Selfless contributors group.

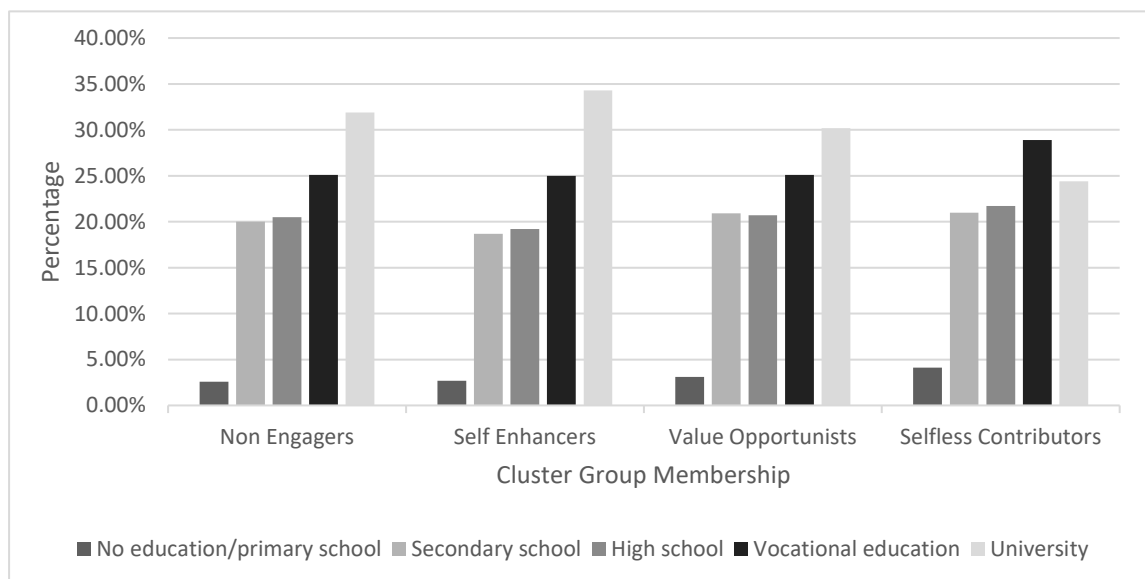


Figure 4.2. The percentages showing the highest education level taken of members in each of the cluster groups.

To explore these differences formally, a chi-square was performed. Differences in the highest level of education taken were also found between the groups, $\chi^2 = 46.60$, $df = 12$, $p < .001$. This supports hypothesis 6a. From considering the standardised residuals, it

was found that significantly more university-level educated people were found in the Self-enhancers group than expected and significantly less university-level educated people were found in the Selfless contributors group. The Selfless contributors group consisted of significantly more people than expected who either had no education or only a primary school education, and those who had taken a vocational education. These findings go against hypotheses 6B and 6C, finding the reverse pattern as to what was predicted.

4.3.2.7. Hypothesis seven. This states that the groups will differ regarding their profile relating to geographical location (H_{7A}). It is also hypothesised that the Selfless contributors will contain more individuals from the post-socialist country included in this study, Hungary, as community concern and altruism may be viewed as more important to this group (H_{7B}).

Figure 4.3 shows the percentages of people associated with each cluster group in the seven countries studied. Initially, the figure suggests France and Switzerland seem relatively neutral regarding the balance of cluster group members, Greece appears to contain a high ratio of Value opportunists, the UK and the Netherlands seem to have the highest rates of Non-engagers, while Hungary has the highest rates of Selfless contributors. A chi-square formally assessed these differences.

Differences were found between the groups regarding the location of the participants, $\chi^2 = 337.18$, $df = 18$, $p < .001$. This supports hypothesis 7a. While no differences were found for Switzerland and France regarding how their people split across the groups, significant differences were found for the five other countries. The UK had more Non-engagers and Self-enhancers but less Value opportunists and Selfless contributors than proportional. The Netherlands had more Non-engagers and less Value opportunists than proportional, while Norway had more Self-enhancers and less Value

opportunists than proportional and Greece had less Non-engagers and Self-enhancers but more Value opportunists than expected. Finally, consistent with hypothesis 7b, Hungary had less Self-enhancers and more Selfless contributors than expected.

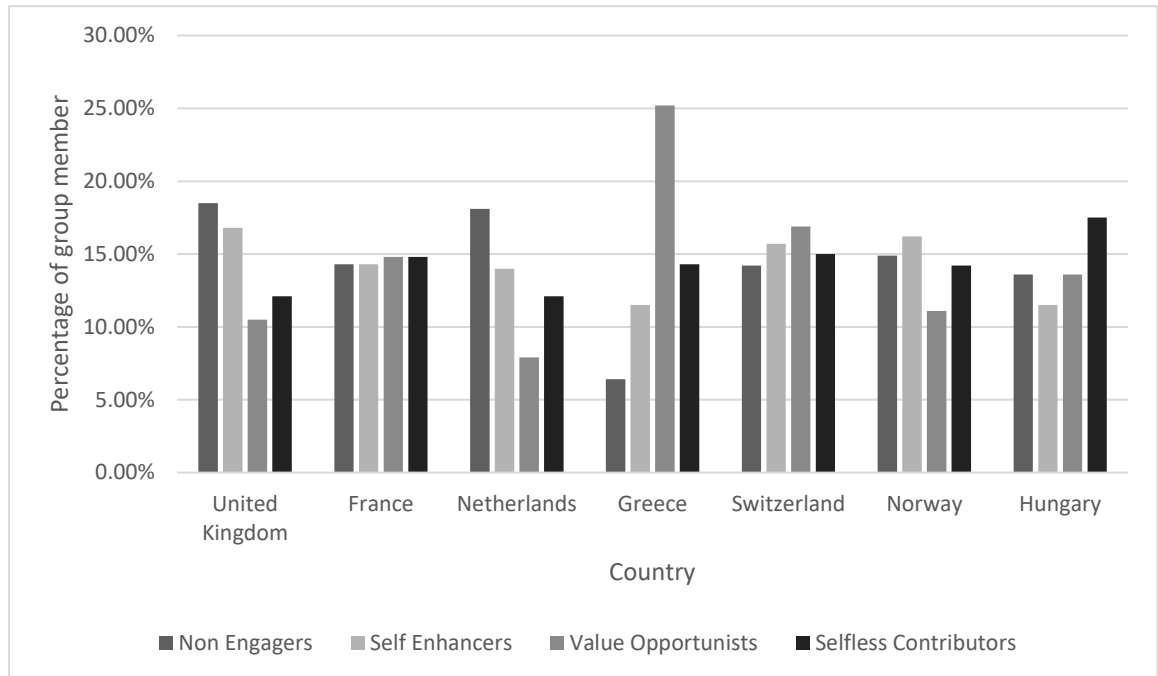


Figure 4.3. The percentages of people associated with each cluster group in each country.

4.3.2.8. Hypothesis eight. This states that the groups will differ regarding their political preferences (H_{8A}). The Self-enhancers group is expected to have more right-wing preferences than the Selfless contributors group (H_{8B}).

For this measure, a value of one represented left-wing preferences and 10 represented right wing preferences. Descriptive statistics for the Selfless contributors group show them to be the most left-wing ($M = 46.74$, $SD = 13.87$), followed by the Value opportunists ($M = 5.37$, $SD = 2.25$), the Non-engagers ($M = 5.53$, $SD = 2.20$), and the Self-enhancers ($M = 5.61$, $SD = 2.15$). The analysis revealed significant differences were found between the groups regarding their political preferences $F(3, 6041) = 43.36$, $p < .001$. Post-hoc analyses found Selfless contributors to hold more left-wing beliefs ($M = 4.79$, $SD = 2.25$) than all other groups. This offers support for hypothesis 8b.

4.4. Discussion

4.4.1. Overview of the Findings

The findings suggest that a values-based segmentation approach is useful in distinguishing meaningful groups that differ in terms of their intentions relating to car use and energy use, and in their demographic profile. The study supports the use of a four-group solution, and by identifying the same groups when using a significantly larger and more representative sample from seven countries, offers further support regarding the replicability of the segmentation model proposed in previous chapters.

Showing that values predict environmental outcomes relating to behaviours other than recycling also demonstrates the usefulness of the segmentation model across different behavioural domains. Furthermore, analysis of the geodemographic data revealed that the cluster groups differ in terms of their age, gender, education, geographical location and political preferences. Finally, the inclusion of hedonic values was supported in the segmentation model on this occasion as these values contributed to predicting sustainable energy intentions and car use. Each of these points are discussed in more detail below.

4.4.2. Are the Cluster Groups Replicable on a Larger and More Representative Sample?

The secondary data analysis allowed the author to test the segmentation model on a much larger, and far more representative sample, containing individuals from seven European countries. Without access to this dataset, testing the replicability of the segmentation approach on such a large and representative sample would have been far beyond the scope of this thesis. The ability of the author to conduct this analysis supports the position of the Open Science Framework (2015), which highlights the advantages of researchers making their data available to others.

The cluster groups found in previous work were replicated on this sample, suggesting these 'types' of people appear within and across countries and cultures. Previously, the segmentation approach had only been tested on students, but finding the same clusters on a seven-country sample containing non-students, provides some cause for optimism of the replicability of a values-based segmentation approach in different populations.

4.4.3. Do the Groups Differ Regarding their Intentions Relations to Car and Energy Use?

It was expected that the groups would differ on these variables, as values had previously been shown to influence these outcomes. As predicted, biospheric values positively influenced both intentions, but altruistic values only positively predicted an intention to reduce car use. Consistent with previous literature and the hypothesis of this study, hedonic values were found to negatively relate to intentions to reduce car use. However, somewhat surprisingly they were found to positively relate to intentions to increase sustainable energy.

One possible reason for this surprising finding is that people can derive pleasure from acting green, or as Taufik, Bolderdijk and Steg (2014) suggest, elicit a warm glow from acting environmentally. Consequently, as people with hedonic values seek pleasure, they may perform environmental behaviours to achieve this. However, this alone would not explain why hedonism would positively predict this environmental behaviour but not others. One possibility is that as receiving sustainable energy does not require day-to-day effort and so may be less costly in terms of inhibiting the individual's comfort and pleasure in everyday life. Consequently, people who endorse hedonic values may be more willing to complete this behaviour than other environmental behaviours that require day-to-day management (e.g. recycling).

Incongruent with the initial hypothesis, egoistic values were also positively related to intentions to increase sustainable energy use. While it has been reported that sustainable energy can cost more, although this largely depends on the country, an advantage of using sustainable energy is that the pricing can be more consistent. This can carry egoistic-related advantages as an individual may be able to budget their resources more and thus make better use of finances and their time. Moreover, egoistic concerns are not purely financial. If an individual is comfortable in terms of finances, they may still highly endorse egoistic values, but these may be represented in other ways (Keizer, 2014). For example, the individual may become more protective over other resources such as time or effort. Consequently, the advantages of having consistent energy prices and not having to consider the eventuality of an unexpected price rise, may make sustainable energy appealing for egoistic reasons.

It was found that the groups identified from the segmentation analysis differed on both measures of intentions. These findings indicate that once again, in general, *Selfless contributors* and *Value opportunists* appear to be more 'green' in terms of their environmental intentions than *Non-engagers* and *Self-enhancers*²⁵. The findings indicate that different behaviours seem to tease apart differences between the groups. For example, while the *Selfless contributors* and the *Value opportunists* report similar levels of intentions relating to reducing car use, they differ regarding sustainable energy: The *Value opportunists* report a greater intention to increase their sustainable energy use than the *Selfless contributors*.

²⁵ Although for intentions to increase sustainable energy the self-enhancers performed equally as well as the selfless contributors.

Intentions to increase sustainable energy is the first measure on which the *Value opportunists* out-perform the *Selfless contributors*. This is of note as it is the *Value opportunists* group who endorse multiple values from conflicting domains, including those which have been traditionally associated with acting less environmentally friendly, such as egoistic values (De Groot & Steg, 2008; Schultz & Zelezny, 1999; Stern, 2000; Stern et al., 1995).

One plausible explanation of this is that, as this group values both biospheric, altruistic, egoistic and hedonic related values, they can see multiple benefits to performing certain behaviours which they judge to be compatible with all these values. For example, they may consider both the economic and environmental benefits of adopting sustainable energy. Thus, when environmental and economic benefits can be derived from a single behaviour, this group may have more motivation ('double the reasons') to act than other groups. This suggests for this group increasing their sustainable energy use is a behaviour that carries high self-concordance, as it appears to be supported by many of the values they endorse. This reasoning is further supported by the regression analysis finding that both hedonic and egoistic values were significant positive predictors of intention to increase use of sustainable energy.

However, another possible interpretation of this finding is that the *Selfless contributors* reported lower intentions to increase their use of sustainable energy because they were already acting in this manner, and so did not need to increase this behaviour further. As no behavioural measure was taken, it is not possible to consider how their past or current behaviour may have influenced their future intentions. Still, the finding that egoistic and hedonic values were both positive predictors of this environmental intention is noteworthy as it is inconsistent with previous literature, which

tends to documents a negative relationship between self-enhancement related values and environmental outcomes (e.g. De Groot & Steg, 2008; Steg et al., 2014b).

4.4.4. Do the Groups Found in the Segmentation have Different Demographic Profiles?

All five demographic outcomes differed across the groups. This section of the discussion will briefly consider each of these demographic outcomes

4.4.4.1. Age. As predicted, the Self-enhancers were found to be younger than the Selfless contributors, and in fact, all other groups. This is consistent with previous research documenting the relationship between values and age (Rokeach, 1973; Schwartz, 2001). An implication of this finding is the possibility that individuals may change into different groups over the course of their lifetime. This means that there may be a 'time-span' of how relevant information relating to an individual's values is for policy makers. For example, if an individual becomes less hedonistic as they age, communication that may have been appealing to them in their younger years may be viewed as less appealing in later years. However, while values may change over time (Gouveia, Vione, Milfont & Fischer, 2015) they still may provide a far more stable basis on which to perform a segmentation than other, more volatile, variables, such as income.

4.4.4.2. Gender. The two groups who reported the least intentions to act in an environmentally friendly manner (i.e. the Non-engagers and Self-enhancers) were also the two groups who contained a disproportionately high number of males. Conversely, one of the groups who were considered as most environmentally friendly, the Selfless contributors, contained more females than expected. This is consistent with previous research that has suggested females tend to engage in more environmentally friendly behaviour, attitudes, intentions and beliefs than males (e.g. Roberts, 1996; Straughan & Roberts, 1999).

A potential reason that, at least partially, explains why the groups would be split in this way, is provided by Schwartz and Rubel-Lifschitz (2009). Based upon an evolutionary reasoning, they propose that men inherently value power more than women. The Self-enhancers group highly regard egoistic values, some of which stem from the 'power' domain in Schwartz's Theory of Basic Human Values. Therefore, this is a plausible reason why more men were in this group than expected by proportions. The same logic would explain why more females than expected were found in the *Selfless contributors* group. Once again implications from this finding may help campaign designers better tailor campaigns. For example, campaign designers may wish to consider placing different posters in different sections of a store (e.g. menswear versus womenswear) emphasising different motives for engaging in a pro-environmental behaviour.

4.4.4.3. Education. Differences found in the groups' education levels were not consistent with previous literature that suggested environmental behaviour was positively associated with an increase in education (e.g. Aaker & Bagozzi, 1982; Leonard-Barton, 1981; McEvoy, 1972; Tognacci et al., 1972; Van Liere & Dunlap, 1981). In this study, the Self-enhancers performed worst in terms of environmental intentions, but contained more people than proportional who were educated to a higher standard (e.g. university educated). Moreover, the Selfless contributors, who performed best in terms of environmental intentions,) contained a higher number of people than expected who had only a primary school education or who chose a vocational education route. As this is inconsistent with previous research, this finding may require further investigation as education may be closely tied to other factors such as geographical location or income, the latter of which was not measured in this study. Controlling for these other variables in future studies may lead to different findings.

4.4.4.4. Geographical location. Unlike the previous chapter where two separate segmentation models were completed for each country, in this study, one segmentation containing all the participants from all countries was employed. While each country was represented in the four groups, significant differences were found regarding how many people from each country were in each of the groups.

The differences may offer some insight into the culture of the countries; for example, Hungary seemed to have more individuals than proportional who were found in the Selfless contributors group. Possible associations between acting for the community and their traditions of socialism may explain this (De Groot, Steg, Keizer, Farsang & Watt, 2012). Alternatively, more recent initiatives by the Hungarian government such as spending more gross domestic product per capita on pollution control and other environmental amenities than countries such as the Netherlands, Belgium and the United Kingdom (Esty et al., 2005), may have set a wider precedence for the importance of valuing the environment.

Meanwhile, the economic downturn in the late 2000's may account somewhat for the imbalance of Non-engagers and Self-enhancers found in the data set for some countries (e.g. the UK). This may be explained as during the financial crash people may have switched to looking inwardly to protect their own resources, as money and security became particularly salient. Longitudinal research considering how the population is represented in these cluster groups over time may provide further insight into whether major world events shape the number of people found within each of these groups.

4.4.4.5. Political preferences. Consistent with previous literature, *the Selfless contributors*, who highly endorse biospheric and altruistic values, reported more left-wing preferences than any of the other groups. This is not surprising given that endorsing

values related to self-transcendence is associated with more left-wing political beliefs (Swami, Chamorro-Premuzic, Snelgar, & Furnham, 2010) and that previous literature has linked left-wing beliefs with a belief that environmental behaviours are a moral issue (Feinberg & Willer, 2012).

As politics may be a particularly emotive topic, highlighting links between performing certain behaviours and the goals of a political party may encourage some people to further engage in pro-environmental behaviours. Policy makers could consider framing the behaviours in terms of how they are congruent with political preferences. Alternatively, policy makers may wish to use political preference alongside the demographic variables investigated as a means to identify which cluster group an individual may belong to²⁶.

4.4.5. Should Hedonic Values be Included as a Segmentation Variable?

This study provided further support for the usefulness of including hedonic values in the segmentation model, in the light of the mixed findings reported in the previous study. In the previous chapter, hedonic values were found to predict environmental behaviours for the UK sample but not for the Brazilian sample. However, in this study the influence of hedonic values more consistent as they were found to predict intentions relating to both car use and energy use; negatively predicting intention to reduce car use and positively predicting intention to increase use of sustainable energy.

These findings support their inclusion in future segmentation models, and are consistent with previous literature, which has found that hedonic values influence

²⁶ An initial informal test of this idea using a discriminant classification found when using age, gender, political preference and education, only 33% of the sample were classified into the correct group (e.g. only 33% of non-engagers were classed as non-engagers when using these variables to predict group membership). Consequently, this initial investigation which is not reported in this thesis, suggests that these demographics alone are not suitable on which to attempt to find these cluster groups.

environmental outcomes (e.g. Dittmar, 1992; Lindenberg & Steg, 2007; Maio & Wei, 2013; Steg et al., 2014b). However, as the relationship between hedonic values and one intention was positive, and between hedonic values and the other negative, this finding suggests they may influence different behaviours in contrasting ways. Investigating this further may offer an interesting avenue for future research to take.

4.4.6. Limitations and Future Research

As already mentioned in this discussion section, the findings are open to many interpretations, as behavioural intentions were measured, rather than behaviour. One finding which could be interpreted in a number of ways is the Selfless contributors group reporting lower intentions than the Value opportunists group regarding increasing sustainable energy use. One plausible explanation for this is that the Selfless contributors genuinely have lower intentions of increasing sustainable energy use than the Value opportunists. An alternative explanation is that they feel they are already acting sufficiently in this manner and so do not need to change their behaviour. While it is not possible to reject either of these explanations, it does suggest that when measuring intentions, these need to be put into context by understanding an individual's current behaviour.

Also, it is of note that self-reported behavioural intentions fall foul of some of the same criticisms reported in previous chapters surrounding self-report measures of environmental behaviour; such as being susceptible to social desirable responses. Moreover, as a gap has been found between intentions and behaviour, it is also plausible that these measures of intentions may not translate into actions (Godin, Conner, & Sheeran, 2005).

While throughout this chapter, the author may have implied causation through suggesting that values predict intentions or behaviour, it is not possible to confirm this due to the methodology employed. The theoretical underpinnings of the research suggest that the relationship between values and intention would indeed be in this direction, but the cross-sectional survey design employed does not allow the author to ratify this claim.

The author also notes that while values predicted intentions, the effect sizes found in this chapter are smaller than those found when considering values and behaviour. For example, the effect sizes from the MANOVA (e.g. the η_p^2) where cluster group membership predicted intentions were .04 (car use) and .02 (energy use). In the previous chapter, the effect size from the MANOVA where cluster group membership predicted recycling was .12. These findings can be interpreted in one of two ways. One possibility is that values and cluster group membership may be more appropriate at predicting recycling than outcomes relating to car use or sustainable energy. Alternatively, values and cluster group membership may be more appropriate at predicting behaviours than behavioural intentions.

Both interpretations are possible. However, intentions seem to be more associated with rational choice approaches (e.g. TPB) and so this may explain why values are not so predictive of intentions. Alternatively, the low-cost hypothesis (Diekmann & Preisendörfer, 2003) suggests individuals are more likely to translate moral considerations into actions when this is of relatively low cost to them. Recycling may be considered a lower-cost behaviour than reducing car use, so this interpretation may also explain why differences were found between the effect sizes relating to the current and the previous study. It is also possible that a combination of both of these factors contributed to the small effect sizes found in this study when considering how values and

cluster group membership impact upon intentions. Future research may want to explore this line of thought further.

In terms of secondary analysis, while obvious advantages exist in the approach, such as being able to access data sets far larger than those that could be obtained solely by the author alone, an element of control is lost when doing so. Consequently, in this analysis, it was not possible to consider whether moral norms once again mediated the relationship between values and environmental outcomes. This had been the case in the previous studies, however this measure was not included in the data set shared with the author. Moreover, this study due to the variables in the data set considered intentions rather than behaviour. That said, the use of secondary analysis to complement an author's own data as part of a larger research agenda such as a thesis, provides many advantages both in terms of saving resources but also supporting transparency and openness in terms of data sharing within the academic community.

There appears to be a solid theoretical basis for the segmentation approach, and the groups found appear to be relatively stable and replicable across different samples. Additionally, the measures used in this and previous studies have allowed the author to build up a profile of the groups and present a great deal of evidence regarding their intentions and behaviours. However, there has been little assessment of how the groups may respond to 'real-life' environmental appeals, thus researchers may want to consider more applied aspects relating to this work in future research. For example, considering how the groups respond to environmental content akin to that used in real-life campaigns, such as leaflets, posters or online/mobile applications, may demonstrate how the segmentation approach may be used as a practical tool to improve environmental campaigns. Such investigation may be particularly useful in terms of its implications for

policy makers and environmental campaigners and will offer insight into the feasibility of how the value-based segmentation model could be used to not only *understand* behaviour, but also as a basis to *change* behaviour.

4.4.7. Conclusions

The proposed value-based segmentation model appears to be replicable on a large and representative sample that spans seven European countries. Once again, a four-group solution was found to be most appropriate. Biospheric, altruistic, egoistic and hedonic values were found to predict environmental intentions relating to car use and energy use, and as such provide further evidence for their appropriateness as a basis for the segmentation model.

The groups found in the cluster analysis differ on geo-demographics and environmental intentions, but like in the previous chapter, how the groups differ is not consistent across behaviours. This, along with the regression analysis reported in this chapter, suggests that values influence different environmental behaviours in different ways.

The study also found that endorsing values from conflicting domains (e.g. biospheric and egoistic values) does not appear to be detrimental to an individual's intention to reduce car use. Moreover, endorsing values linked with self-enhancement alongside those linked with self-transcendence, appears to result in a greater intention to increase sustainable energy use. Findings such as this, offer a novel perspective into how endorsing multiple values may translate into behavioural outcomes. Finally, to further this line of enquiry, research investigating how the groups differ on a greater range of behaviours and regarding preference for environmental communication would provide further insight into the usefulness of a value-based segmentation approach.

Chapter 5. Extending a Values-Based Segmentation Model: The Inclusion of a Wider Range of Environmental Outcomes and Group's Preferences for Tailored Communication

Abstract

Values-based segmentation appears to be a useful tool to help understand why people differ regarding environmental outcomes, however so far only two *behaviours* have been tested. Also, it has not been explored how useful the segmentation approach may be in helping environmental campaign designers *shape* behaviour rather than simply *understand* behaviour. To this end, a questionnaire study of 331 participants from the UK, considers: how the segmentation groups perform on a wider range of behavioural outcomes broadly related to waste management, and how the groups differ in their preferences for a water conservation poster that has been tailored to emphasise different motivational reasons for engaging in the behaviour derived from different values. The findings indicate that differences exist across the segmentation groups regarding all six environmental behaviours tested: $F(21,692) = 5.79, p < .001$; Wilk's $\Lambda = .63, \eta_p^2 = .14$. Also, of most importance, a significant interaction was found between *cluster group membership* and *which values the poster was congruent with* regarding the *appeal* of the posters: $F(8.03, 765.32) = 2.77, p < .005, \eta_p^2 = .03$, and the *motivation* provided the posters: $F(7.59, 723.65) = 3.57, p < .001, \eta_p^2 = .04$. The study offers further support that the segmentation approach can be used to understand multiple behaviours, and suggests that tailoring environmental communication to be congruent with different values is important as the groups hold contrasting preferences for posters that emphasise different motivational reasons for engaging in water conservation.

5.1. Extending a Values-Based Segmentation Model: The Inclusion of a Wider Range of Environmental Outcomes and Groups' Preferences for Tailored Communication

5.1.1. Background to the Study

This study evaluates the usefulness of a value-based segmentation approach for identifying groups, and considers how these groups differ in terms of environmental behaviours, and preferences towards tailored environmental communication. The two main contributions of this chapter are that: The current study increases the number of behavioural outcomes considered (from two to six) thus further tests the usefulness of the segmentation model in explaining a wider variety of behaviours and secondly, it begins to develop reasoning as to how the segmentation model could ultimately be used by campaign designers and policy makers as a tool to help *shape* behaviour. Thus, considering how the groups respond to posters akin to those they may encounter in everyday campaigns is the first step towards translating the research outlined in this thesis into applied settings that demonstrate the links between theory and practice.

5.1.2. Considering a Greater Range of Environmental Behaviours

Thus far, the studies outlined in the previous chapters have considered two behaviours: recycling (chapter two and three) and 'green' product purchase (chapter three). These cover the start (product purchase) and end (recycling) points for the consumer in their use of most goods. However, considering a greater range of behaviours may provide further insight into the usefulness of using the value-based segmentation approach on a wider variety of environmental outcomes.

Values are outlined in VBN theory (Stern, 2000) as the least proximal predictor of behaviour. While this means that they may possess less predictive power than some more proximal variables, an advantage of using them in segmentation is that values

transcend specific situations and so should help explain a wide range of behaviours. This may be particularly useful policy makers who, with one segmentation, can understand a greater range of behaviours rather than have multiple segmentation models for different outcomes (Poortinga & Darnton, 2016). The inclusion of four additional behaviours in this study will be able to further test this.

While because of this it is expected that a values-based segmentation approach will be useful in explaining wide variety of behaviour, there is a possibility that values may be too abstract to explain some behaviours. For example, two people motivated by egoistic concerns may still reach differing conclusions. Taking the example of travel mode choice, one individual may be motivated by egoistic concerns to take the bus to save money, while another individual may be motivated by egoistic concerns to take the car to save time and enhance their status. This is because individuals who endorse the same values may act in different ways depending on how they interpret them (Anable, 2005). The VBN alludes to this by suggesting that an individual moral norm could be satisfied in a number of ways (Stern et al., 1999; Stern, 2000). Consequently, testing whether the values-based segmentation model produces meaningfully different groups when considering varied environmental outcomes will provide evidence regarding the breadth of behaviours the segmentation model can assess.

In keeping with waste related behaviours discussed so far (e.g. recycling and 'green' product purchase) this chapter will also consider four additional behaviours. These were selected to be in keeping with contemporary issues in modern society and considerations as to how they may be influenced by our values. The behaviours selected were: reusing 'everyday' items, using re-usable cups ahead of disposable cups, buying imperfect produce (e.g. 'wonky' vegetables), and re-using carrier bags. These behaviours,

while linked by the common thread of waste management, span actions that can be completed at home, at work or while out shopping, and also cover behaviours that need some form of planning (e.g. remembering to take carrier bags to the shop) and behaviours that can be completed ‘in the moment’ (e.g. re-using plastic takeaway containers). This represents a cross-section of waste-related behaviours and will allow the author to pass comment on the usefulness of the segmentation model when considering a wider range of environmental outcomes. The following sections briefly review these four additional behaviours.

5.1.2.1. Reusing ‘everyday’ items. Reusing everyday items such as paper, cardboard jars and pots can make a difference to the environment by increasing the life-span of these products, which can minimise the need for new products to be made from virgin materials, or energy being used on recycling these items. Consequently, reuse behaviour is conceptualised as preferable to recycling. Moreover, reusing may have some economic benefit as individuals may not have to buy ‘new’ items as often²⁷.

However, campaigns sometime treat the issue of waste as a combined one, thus differences between people’s recycling and reuse behaviours are often not considered independently (Barr, Gilg & Ford, 2001). In the same paper, through a cluster analysis, the authors show that different groups participate in recycling and re-use behaviour to differing extents: engaging frequently in recycling does not always mean engagement with reusing paper, tubs and bottles. Consequently, considering recycling and reuse as two different behaviours in this study may offer further insight into differences between these behaviours and the extent to which the groups perform them. Given the

²⁷ Although some individuals may choose to buy new products ahead of reuse materials not because of economic or environmental motivations, but because of a lack of knowledge as to what products can be safely reused (Brewer, Edlefsen & Russon, 1995).

environmental and economic consequences it is expected that both biospheric and egoistic values will positively predict reuse behaviour, while altruism and hedonism are likely to have little impact on this behaviour.

5.1.2.2. Using re-usable cups ahead of disposable cups. Worldwide it is estimated that Starbucks sell 671,391,071 cups of coffee a year (Saito, 2017). Together with the impact of other high-street coffee shops, this means millions of hard-to-recycle or impossible-to-recycle disposable cups are used. Using re-usable cups may be one way to reduce the environmental impact caused by disposable cups.²⁸ Investigating differences between the groups in their use of reusable (permanent) cups over disposable cups may help explain how our values influence this behaviour.

While environmental benefits may exist from using permanent cups, economic advantages may also stem from this behaviour. For example, some coffee outlets offer a discount if you bring your own cup (Moorhouse, 2017). Therefore, multiple values may drive this behaviour. Consequently, it is expected that groups who endorse these values to different extents will behave differently regarding their use of 'permanent' versus disposable cups. Given the economic and environmental advantages to using a reusable cup it is expected that biospheric values and egoistic values will positively predict this behaviour. However, due to practicalities of having to carry around a permanent cup rather than take-and-throwaway a disposable one, it is thought hedonic values will negatively predict this behaviour. Finally, altruistic values may not impact upon this behaviour.

²⁸ Although a permanent cup must be used regularly for the benefits to outweigh using disposable cups. For example, a ceramic cup would need to be used 39 times before it has an environmental benefit over using disposable paper cups (Institute for Life-cycle Energy Analysis (1994).

5.1.2.3. Buying imperfect vegetable produce. Around 800 million people worldwide are thought to suffer from hunger, while at the same time 2.9 trillion pounds of food is wasted before it is sold: enough to feed all of them for a year - twice over (Food and Agriculture Organisation of the United Nations, cited in Royte, 2016). It has been claimed this is because of a “cult of perfection” that has developed in society that promotes unrealistic cosmetic standards for our food (Goldenberg, 2016). One way that may somewhat aid this issue is to buy the imperfect or misshapen produce to prevent it being wasted.

Buying imperfect vegetable produce has recently been encouraged by the cross-party Environment, Food and Rural Affairs committee (2017), and since, many major supermarkets have started ‘wonky veg’ schemes (e.g. Asda, 2016). Alongside environmental benefits, economic benefits are also presented as imperfect produce can cost up to 30% less than the standard equivalent product (Smithers, 2016a). Consequently, similarly to using permanent cups it is expected that multiple values will predict the behaviour. Given the economic and environmental advantages of buying imperfect produce it is expected that biospheric and egoistic values will positively predict this behaviour. Hedonic values and altruistic values are not thought to influence this behaviour.

5.1.2.4. Reusing carrier bags. October 2015 saw the introduction of a charge for carrier bags in England, following the example set originally set by Wales (see Poortinga, Whitmarsh & Suffolk, 2013). In the year that followed, an 85% drop in the use of carrier bags was recorded, slashing the number of single-use bags handed out from 7 billion to 500 million in the first 6 months (Smithers, 2016b). This reduction may go some way in reducing the 8 million tons of plastic that ends up in the oceans every year (Parker, 2015)

Over ten years, these changes are likely to save the UK £60 million is cleaning up carrier bags from streets and parks and will raise up to £730 million pounds for good causes (from the charge; Parker, 2015).

Consequently, clear biospheric and altruistic related benefits can stem from the introduction of this charge. On first inspection, it may also seem that the economic cost may also motivate some people to engage in this behaviour. However, Poortinga, Whitmarsh and Suffolk, (2013) suggest that the carrier bag charge may act as a 'habit breaker' (see habit discontinuity; Verplanken, Walker, Davis & Jurasek, 2008) rather than an economic motivation. This notion is further supported by Jackovcevic et al. (2014), who found most consumers cited *environmental* reasons not *economic* reasons for performing the behaviour. Thus, while the behaviour appears to be consistent with egoistic values, egoistic concern alone may not be sufficient to perform this behaviour as much as individuals who highly endorse biospheric values.

This can be tested by comparing the Self-enhancers with the Selfless contributors regarding their carrier bag use. Based upon this research, it is expected that biospheric values will positively predict reuse of carrier bag, while hedonic values (due to the planning required) may negatively relate to reusing carrier bags. In line with research that suggests the behaviour is driven by environmental not economic motives, egoistic values (and altruistic values) are not expected to influence this behaviour.

5.1.3. Groups' Preferences towards Environmental Communication

In previous chapters, differences between the regarding environmental norms, intentions, behaviours and demographics have been assessed. While useful, limitations exist with some of these measures such as the accuracy of self-report, and whether rating relatively abstract terms on a scale (e.g. the importance of 'preventing pollution') can

best represent how individuals may respond to more specific stimuli they may encounter in everyday life (e.g. environmental news, posters etc.).

Consequently, this chapter aims to contribute a more applied element to this body of research by assessing how the groups found in the segmentation analysis respond to environmental communication. More specifically, this study will consider how the groups respond to a poster that has been tailored to either relate to: no values in particular (Value-Neutral), biospheric and altruistic values (Value-Bio/Alt), egoistic and hedonic values (Value-Ego/Hed) or a mixture of all four values (Value-Combined).

This analysis will be particularly useful for policy makers and campaign designers as tailoring communication to better fit the characteristic of a group has been suggested as an effective method of shaping behaviour (Corner & Randall, 2011). Consequently, this research begins to bridge the gap between theory and practice by offering insight into how the segmentation approach can be used to not only *understand* behaviour, but to also *shape* behaviour.

5.1.4. Tailoring Communication

It is thought that to be effective, communication must not only interest people enough for them to attend to the message but also ensure they process the message in a manner which optimises the likelihood of them taking the desired action (Petty & Wagener, 1998). One method to achieve this, proposed by Unsworth, Dmitrieva and Adriasola (2013) may be to highlight the self-concordance of a behaviour. In other words, an individual has not got to endorse biospheric values to perform behaviours that benefit the environment. Highlighting how environmental behaviours relate to their values (whatever they may be e.g. egoistic values) may also result in them performing the desired action. For example, if values relating to altruism are strongly endorsed by a

group, then devising a message that links environmental behaviours with 'helping others' may be most appropriate for creating a behaviour change in this segment of the population. Whereas for groups that endorse egoistic values highlighting how the behaviour relates to economic benefits may result in the same behaviour being performed; albeit for different reasons.

Some evidence exists that this approach may be beneficial, for instance Bain, Hornsey, Bongiorno, and Jeffries (2012) found linking climate change to societal progress affected the intentions of climate change sceptics who were otherwise not motivated by biospheric motives. While, Unsworth and McNeill (2017) found that asking individuals to consider how engaging in specific environmental behaviours could help them accomplish their personal goals led to an increase in participants' intentions to perform those behaviours, compared with both a control group, and a group that focussed solely upon environmental considerations linked to climate change mitigation.

Thus, campaigns that tailor their message to promote behaviours as being congruent with achieving the values people endorse are likely to be more successful in changing behaviour than campaigns that fail to establish an association between important values and performing a specific action. This is consistent with previous research which has found value-congruent messages to be more effective than value-incongruent messages at persuading people to consider changing behaviour (Bolderdijk, Gorsira, Keizer, & Steg, 2013; Gromet, Kunreuther & Larrick, 2013; Johnson & Eagly, 1989; Jost, Federico, & Napier, 2009; Kidwell, Farmer, & Hardesty, 2013; Schwartz, 1994).

This may be because value-congruent messages have been found to increase an individual's involvement with the message's information. This effect has been named value-relevant involvement (Johnson & Eagly, 1989; Maio & Olson, 1995). Value-

congruent messages are likely to be reported as providing participants with greater motivation to act as it has been found that when individuals performed behaviours that are related to the activation of higher-order goals (e.g. values), they were more likely to pursue the behaviour (Shah & Kruglanski, 2003). Further evidence is supplied by Fishbach, Shah, and Kruglanski, (2004), who found that engaging in behaviours that were linked with an important goal resulted in individuals reported increased positive affect. This in turn was found to lead to further motivation (Louro, Pieters & Zeelenberg, 2007).

More generally, different forms of tailoring messages have been successful at increasing pro-environmental behaviour; possibly as the tailored messages possess greater self-relevance to recipients (Dijkstra, 2008), and cause the individual to elaborate on the message for longer which may increase their persuasion (Nelson & Garst, 2005; Updegraff, Sherman, Luyster, & Mann, 2007).

Within the environmental domain, reviews indicate that tailoring information has reduced household energy consumption (Abrahamse, Steg, Vlek & Rothengatter, 2005; Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Stern, 1992) and energy consumption at work (Daamen, Staats, Wilke, & Engelen, 2001). Moreover, tailoring home audits, in which an expert provides individuals with information about the efficiency of their household's current behaviours, have resulted in an increased knowledge for participants (e.g. Winett, Leckliter, Chinn, Stahl, & Love, 1985). Tailoring, albeit in a different form, has also proven a useful tool in persuading individuals to adopt sustainable behaviour. A study of 500 households in Kentucky by Kidwell, Farmer, and Hardesty (2013) found framing messages to be congruent with an individual's political ideology was successful in creating a behaviour change relating to recycling over a 14 week period.

The use of tailored communication appears to be warranted as providing information alone does not necessarily result in action (Petty & Wegener, 1998). For example, there appears to be a gap between behaviour and reported knowledge and attitudes (Kollmuss & Agyeman, 2002; Wood, Tam, & Witt, 2005). Consequently, the strategic use of persuasive communication by tailoring and framing messages may help ensure participation in the desired behaviours (Rothman & Salovey, 2007).

5.1.5. The Current Study

Building on the work outlined above, this study will consider framing communication to be congruent with the values that are endorsed by the four segmentation groups. As previously mentioned, participants will be presented with posters tailored in four ways: Value-Neutral, Value-Bio/Alt, Value-Ego/Hed, Value-Combined. These posters match the values endorsed by the four groups found in the previous segmentation models: Non-engagers (Value-Neutral), Selfless contributors (Value-Bio/Alt), Self-enhancers (Value-Ego/Hed), and Value opportunists (Value-Combined). The Non-engagers are matched with the value-neutral poster as they do not show an affinity towards any of the values considered in this thesis.

It is thought that when rating each of the posters, ones that display messages congruent with the values of the participant (i.e. promote that the behaviour has high self-concordance), are likely to be rated as more appealing and as providing greater motivation to act. More specifically, it is expected that compared to all other posters, the Value opportunists will prefer the value-combined poster, Selfless contributors will prefer the Value-Bio/Alt poster, and the Self-enhancers will prefer the Value-Ego/Hed poster. Finally, it is expected that the Non-engagers will show no preference between any of the posters and the value-neutral poster as they have no particular affinity to any of the

values. Hypothesis 9-13 relate to these predictions. If supported in this study, promoting the self-concordance of a behaviour by highlighting how it is congruent with values the individual endorses used as the basis for attempting to change behaviour in future work.

A particularly interesting aspect of the current study relates to the Value opportunists, who, from findings in previous studies, appear to highly endorse values related to both self-enhancement and self-transcendence. Thus, the environmental communication that is congruent with this group (ego/hed and bio/alt) is essentially the combination of communication tailored to the Self-enhancers (ego/hed) and the Selfless contributors (bio/alt); this is referred to a 'double-framing'.

Double framing, while at face value may seem like it should be more successful - as it provides double the reason to act - has actually proven to be less successful than single-framed messages. For example, Deci and Ryan (2008) found double-framing both intrinsic and extrinsic motivations led to lower scores on a range of environmental outcomes than intrinsically framed messages alone. Evans, Maio, Corner, Hodgetts, Ahmed and Hahn (2013) also make a short but compelling case regarding the dangers of concentrating on only self-interest, or combining self-interest with biospheric-altruistic motives when promoting environmental behaviours. They put forward that providing information linked with self-transcendence motives is the only method that carries the possibility of achieving spill-over effects where individuals go on to also increase other behaviours that were not targeted in the original communication. They found double-framed messages and single-framed messages only focussing on economic reasons had a much lower rate of causing spill-over.

More recently, a study by van den Broek, Bolderdijk and Steg (2017) found that single-framed value-congruent appeals led to greater levels of persuasion than double-

framed appeals (although it should be noted that this was concluded from an implicit, not an explicit, measure of persuasion). Taking these studies together, it appears using messages that combine both self-enhancement related motives (e.g. egoistic and hedonic values) and self-transcendence related motives (e.g. biospheric and altruistic values) risk not having a greater effect than single-framed appeals, or worse still having a detrimental effect on the targeted behaviour and other behaviours via spillover.

However, to the author's knowledge, no study has isolated the impact of double-framing messages when considering individuals who highly endorse values linked with both self-enhancement and self-transcendence (i.e. the Value opportunists group). Consequently, this study may offer a slightly different perspective as to whether combining messages (e.g. double framing) is always a negative thing for campaigners to attempt, or whether for this segment of the population, this may be an effective approach. As all the groups found in the segmentation analysis will rate all posters, this study will also offer the opportunity for the author to discuss the potential impact of individuals receiving both value-congruent, value-incongruent, combined (double framed), and value-neutral communication.

Finally, this study uses the website *Prolific Academic* as the source of the participants. The site allows researchers to access willing participants who, in return for completing studies, receive a small payment. Some criticisms have been raised at such websites as this means the participants are self-selecting, however an advantage is researchers can fairly easily access populations they would otherwise not be able to reach. This relative ease means these sites offer an alternative to using undergraduate students as the basis of study. While some limitations exist with using this platform, a recent paper by Peer, Samat, Brandimarte, and Acquisti (2016) compare Prolific Academic

favourably to other crowd-sourcing websites such as Mechanical Turk and CrowdFlower. Thus, Prolific Academic will be used for gathering participants for this study.

5.1.6. Summary and Hypotheses

This chapter build upon previous research in chapters two, three and four by testing the efficacy of the values-based segmentation model on a wider range of topical behaviours and considering how the model could be used to shape behaviour. This second aim is achieved by assessing the groups' preferences for tailored posters that are likely to manipulate how self-concordant a behaviour is viewed as by each of the groups.

Thus, this study will enhance research into the values, environmental behaviour and segmentation by assessing the following: a) Do biospheric, altruistic, egoistic and hedonic values predict a wide range of behaviours broadly related to minimising waste? b) Do the groups identified from the segmentation differ in their regard for all six of these behaviours? c) Does manipulating the self-concordance of a behaviour through highlighting which values it relates to impact upon an individual's preferences of environmental communication? d) Consistent with VBN theory do moral norms mediate the relationship between cluster group membership and behaviour? In relation to these questions the following hypotheses were derived from the reviewed literature:

H₁: Values will predict recycling (1a). Based upon the findings from chapter three, biospheric values will be a positive predictor (1b), while egoistic values (1c) and hedonic values (1d) will be negative predictors.

H₂: Values will predict 'green' product purchase (2a). Based upon the findings from chapter three, biospheric values will be a positive predictor (2b) while egoistic values (1c) and hedonic values (1d) will be negative predictors.

H₃: Values will predict reuse of carrier bags (3a). More specifically, biospheric values will be a positive predictor (3b) while hedonic values (3c) will be a negative predictor.

H₄: Values will predict reuse of 'everyday' items (4a). More specifically, biospheric values will be a positive predictor (4b) as will egoistic values (4c).

H₅: Values will predict the use of permanent cups over disposable cups (5a). More specifically, biospheric values will be a positive predictor (5b) as will egoistic values (5c). While hedonic values (5d) will be a negative predictor.

H₆: Values will predict purchasing imperfect vegetable produce (6a). More specifically, biospheric values (6b), and egoistic values (6c) will be positive predictors.

H₇: The same groups found in previous work will be replicated (7a) and differences will be found between these groups regarding their moral norms (7b), recycling (7c), green product purchase (7d), reuse of carrier bags (7e), reuse of everyday items (7f), use of permanent cups over disposable cups (7g), and the purchase of imperfect vegetable produce (7h).

H₈: Moral norms will mediate the relationship between the cluster groups and recycling (8a), green product purchase (8b), reuse of carrier bags (8c), reuse of everyday items (8d), use of permanent cups over disposable cups (8e), and the purchase of imperfect vegetable produce (8f).

H₉: Selfless contributors will rate the Value-Bio/Alt poster as more appealing (9a) and as providing a greater motivation to act (9b) than the other posters.

H₁₀: Value opportunists will rate the Value-Combined poster as more appealing (10a) and as providing a greater motivation to act (10b) than all other posters.

H₁₁: Self-enhancers will rate the Value-Ego/Hed poster as more appealing (11a) and as providing a greater motivation to act (11b) than the other posters.

H₁₂: Non-engagers will rate all posters as equally appealing (12a) and as providing a greater motivation to act (12b).

5.2. Method

5.2.1. Participants

For this study participants were recruited from the website Prolific Academic in return for a nominal fee (£0.75). Participants were all from the UK and students were filtered out of the participant pool as this group had been investigated in both chapter two and three. But aside from this, their employment status (employed, not employed, self-employed or retired) was not filtered. A total of 331 participants completed the questionnaire, of which 180 (54.4%) were female. The mean age of the participants was 29.78 years ($SD=9.48$).

5.2.2. Design

The study employed a cross-sectional survey design. As the data analysis for this study comprised multiple tests, the results will be reported in subsections relating to the hypotheses. First, after completing the necessary data preparation, six regressions were employed to ascertain whether values (biospheric, altruistic, hedonic and egoistic) predicted the behavioural outcomes. Subsequently a K-means cluster analysis segmented the sample based upon their values. A between-subjects MANOVA was employed to consider the effect of cluster group membership (IV) on the six behavioural measures (DVs).

In the third phase of the analysis, multi-categorical mediation analyses determined whether moral norms mediated the relationship between the cluster groups

(predictor variable) and the six behaviours (outcome variables). Finally, in the last part of the data analysis, two 4 (cluster group; between subjects) x 4 (poster-type; within subjects) mixed ANOVAs considered the effect of tailoring environmental communication. The ANOVAs considered the effect of cluster group and poster-type on the appeal (ANOVA 1) and motivation provided by (ANOVA 2) posters relating to water conservation.

5.2.3. Materials

The following section outlines the items used to measure the variables discussed previously, and provides further information regarding the tailored posters. The questionnaire was performed online, however a hard copy of the items asked can be found in Appendix N.

5.2.3.1. Values. Biospheric, altruistic, egoistic and hedonic values were assessed by a questionnaire adapted by Steg, Perlaviciute, van der Werff and Lurvink (2014) from the scales developed by De Groot and Steg (2007a). The items, format, and scale, are identical to those described in the materials section of chapter three.

5.2.3.2. Moral norms. As the previous moral norm measure was specifically related to recycling, a wider-ranging scale that relates to moral norms regarding environmental behaviours more widely was employed. The scale published by de Leeuw, Valois, Ajzen and Schmidt (2015) consists of 6-items and, in their study, had a Cronbach's alpha of .84. An example item taken from the scale is "I have a moral obligation to adopt pro-environmental behaviours on a regular basis".

5.2.3.3. Environmental behaviour. Several self-report measures of environmental behaviour were used. The first two, measuring recycling behaviour and 'green' product purchase contained multiple items and have been described in the materials section of chapter 3. An additional four single item behavioural measures were also included these

related to: *re-using everyday items* (I try to re-use 'everyday' items such as paper, cardboard, jars and pots) *using 'permanent' cups ahead of disposable cups* (I take a reusable vessel (e.g. cup/mug/glass) with me rather than accept a disposable vessel [e.g. from a coffee shop]) *purchasing imperfect vegetable produce* (I buy imperfect vegetable produce such as those from a 'wonky' veg box) and *carrier bag use* (I re-use carrier bags when I go shopping). Participants rated the items on a 6-point Likert scale anchored by 'Strongly Disagree' and 'Strongly Agree'.

5.2.3.4. Environmental communication. Four posters promoting environmental behaviour were presented on screen to the participants in a random order. To ensure previous sections of the questionnaire did not influence participants in any way, the posters focused upon a different environmental behaviour, namely water conservation. The four posters were designed to relate to the values found to be endorsed by groups in previous cluster analyses: Value-Neutral, Value-Bio/Alt, Value-Ego/Hed, Value-Combined.

All posters urged participants to 'Save Water' but were tailored in different ways. The Value-Neutral poster stated: 'An unused drop from your tap, is a drop wasted. Save water by turning off your taps.' The Value-Bio/Alt poster stated: 'An unused drop from your tap leads to unnecessary energy use. Saving water has positive consequences for plants, animals and communities around the world. Save water by turning off your taps'. The Value-Ego/Hed poster stated: 'An unused drop from your tap can increase your water costs. Saving water has positive consequences for your finances, allowing you to spend your money on more enjoyable things. Save water by turning off your taps'. Finally, the Value-combined poster stated: 'An unused drop from your tap leads to unnecessary energy use and can increase your water costs. Saving water has positive consequences for your finances, allowing you to spend your money on more enjoyable things, whilst also

benefiting plants, animals and communities around the world. Save water by turning off your taps’.

The font used and font size was identical for all posters, and minimal changes were made to the layout (some were necessary given that some posters contained more text than others). Finally, pictures accompanying the text were included in each poster. These were tailored to each poster, for example a picture of nature (sunflowers) was included in the Bio/Alt poster, while a picture of money was included in the Ego/Hed poster.

After seeing each poster, participants were asked to rate how much the poster appealed to them and how motivated they were to save water based upon the poster. Both were on a scale of 1 to 5. In both cases 5 was the most positive e.g. ‘very appealing’ or ‘very motivating’ while 1 was the most negative e.g. ‘not appealing at all’ or ‘not motivating at all’. It should be noted that there was no aim to make the posters particularly appealing or motivating but rather ensure there was clear distinction between the posters. To do this, it was decided to keep the posters very simple so participants could quickly identify differences between them. Consequently, the absolute scores relating to appeal and motivation are of little interest compared with the relative scores a poster receives compared to another poster.

The posters were created by the author, and were informally rated regarding how well each poster represented biospheric, altruistic, hedonic and egoistic values by a group of undergraduate students ($n=10$). The posters were awarded a percentage score for how appropriately they were framed in relation to the chosen values, which were defined to the group. All posters were deemed to be at least 88.5% appropriate for the values they were meant to represent. For a copy of the posters see Appendix O.

5.2.4. Procedure

Participants had to be signed up on the website 'prolific academic' to complete the questionnaire. Participants can see how much they will be awarded for completing the questionnaire and how long it is likely to take them (predicted by the website). After signing up, participants completed basic demographic information, and then rated statements relating to their values, statements concerning their moral norms, statements relating to self-reported behaviours, before finally rating the posters. The study was approved by Keele University Ethics Committee (see Appendix P) and standard ethical procedures were followed (see Appendix Q).

5.3. Results

5.3.1. Data Preparation

A Confirmatory Factor Analysis was performed to check whether the scale items relating to biospheric, altruistic, hedonic and egoistic values loaded as expected. Please see the 'Data Preparation' section for procedural details. Consistent with findings from chapters two and three, the item 'ambitious', which is expected to load on the egoistic value-orientation did not load as predicted. The item correlated with the altruistic sub-scale (.424) more than the hypothesised egoistic sub-scale (.374). As the item did not load as expected, and appeared to share similarities with multiple scales, it was removed from the analysis.

A Factor Analysis (FA) was also performed to ensure that the two behavioural measures with more than one item were two distinct behaviours. Before completing the factor analysis, assumptions were checked. The assumption checks for this test, and the others completed in this chapter, can be found in Appendix R. The output indicated the two distinct factors were found, this conclusion was reached as only two factors had

eigenvalues above 1, and this was further evidenced as the scree plot showed a marked levelling-off from the variance explained by the factors after the first two factors.

In total, 81.17% of the variance was explained by the rotated two-factor solution, with factor one accounting for 47.57% and factor two accounting for 33.60%. From the rotated factor matrix, it was found that the three items that were expected to relate to recycling all loaded together on factor one, while the two items expected to relate to 'green' product purchase all loaded together on factor two. This provides further evidence of the viability of a two-factor solution, suggesting the items contribute to two distinct, albeit related, behaviours.

Finally, in terms of data preparation, the internal reliabilities for all sub-scales were assessed. The Cronbach's alpha for the altruistic, biospheric, hedonic and egoistic value subscales were deemed satisfactory achieving .78, .92, .74, and .80 respectively. The internal reliability of the moral norms subscale (.92), the recycling behaviour subscale (.88) and the 'green' product purchase (.76) also indicated good internal reliability.

5.3.2. Data Analysis

The data analysis section will be split into four parts. The first part relates to hypotheses 1-6, the second relates to hypothesis 7, the third relates to hypothesis 8 and the final section relates to hypotheses 9-12.

5.3.2.1. Hypotheses 1-6. These hypotheses relate to how values predict the six behavioural measures included in this study. An investigation to the descriptive statistics found that altruistic values were rated as most important ($M=5.20$, $SD=1.35$), followed by hedonic values ($M=4.52$, $SD=1.37$), biospheric values ($M=4.50$, $SD=1.72$) and finally

egoistic values ($M=2.68$, $SD=1.64$). Figure 5.1 shows how the sample performed on the six behavioural outcomes.

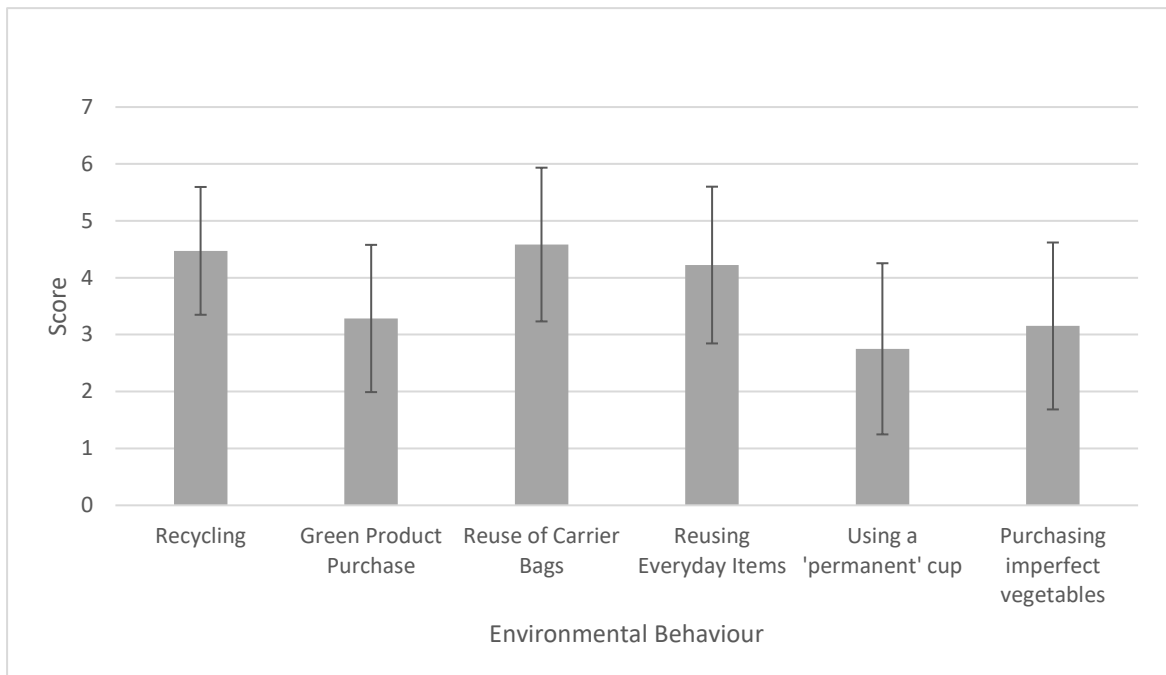


Figure 5.1. Mean and standard deviation of the sample's performance of six environmental behaviours.

The figure shows that reuse of carrier bags, recycling and reusing everyday items were the behaviours that the sample performed the most. Purchasing green products and purchasing imperfect vegetables were next, while using a 'permanent' cup rather than accepting a disposable cup was the least widely performed behaviour.

To ascertain whether values predicted these behaviours six multiple regressions were conducted using the Enter method. A significant regression equation was found for all behaviours showing that values predicted recycling: $F(4,324) = 19.67$, $p < .001$, $R^2 = .195$, $R^2_{Adjusted} = .185$; 'green' product purchase behaviour: $F(4,324) = 34.77$, $p < .001$, $R^2 = .300$, $R^2_{Adjusted} = .292$; reuse of carrier bags: $F(4,324) = 10.38$, $p < .001$, $R^2 = .369$, $R^2_{Adjusted} = .136$; reusing everyday items: $F(4,263) = 9.09$, $p < .001$, $R^2 = .348$, $R^2_{Adjusted} = .121$; using permanent vessels: $F(4,263) = 12.26$, $p < .001$, $R^2 = .157$, $R^2_{Adjusted} = .144$, and buying

imperfect vegetables ($F(4,263) = 15.71, p < .001, R^2 = .193, R^2_{Adjusted} = .181$). These findings support hypotheses 1a, 2a, 3a, 4a, 5a, and 6a.

To further investigate which values predicted which behaviours, the Beta value and t -statistic were consulted. These are reported in table 5.1. The table indicates that consistent with hypothesis 1b, biospheric values predicted recycling. However, contrary to hypotheses 1c, and 1d, egoistic and hedonic values were not found to be significant predictors. For green product purchase, biospheric were found to be a positive predictor (supporting hypothesis 2b) and hedonic values were found negative predictor supporting hypothesis 1d. However, egoistic values, contrary to the prediction, were found to be a *positive* predictor. Moreover, altruistic values were found to be a negative predictor of this behaviour.

For carrier bag use, only biospheric values were found to be a positive predictor. This supports hypothesis 3b but does not offer support for hypothesis 3c that suggested hedonic values would negatively predict this behaviour. For reusing everyday items, consistent with hypothesis 4b, biospheric values were found to be a positive predictor, however contrary to hypothesis 4c, egoistic values were not a significant predictor of this behaviour. Regarding using a permanent cup instead of accepting a disposable one, biospheric values and egoistic values were found to be positive predictors supporting hypotheses 5b and 5c. However, no relationship was found between this behaviour and hedonic values, leading to the rejection of hypothesis 5d. Finally, as predicted in hypotheses 6b and 6c, both biospheric and egoistic values were found to be positive predictors of purchasing imperfect vegetables.

Of note is that biospheric values were the only values to have a consistent (positive) influence on all behaviours. Also of interest was that, as hypothesised, egoistic

values did not predict reuse of carrier bags despite the explicit monetary consequences of this behaviour. Also notable was that altruistic values *negatively* predicted green product purchase. Finally, egoistic values, that negatively predicted green product purchase in the previous study, were found to be a positive predictor in this. These key findings are considered in further detail in the discussion.

Table 5.1.

Beta co-efficients to show the strength of the effect of values on six environmental behaviours

	Altruistic	Biospheric	Hedonic	Egoistic
Recycling	-.01	.45***	-.03	-.10 [#]
Green Product Purchase	-.16**	.60***	-.14**	.11*
Reuse of Carrier Bags	.04	.35***	-.13 [#]	-.01
Re-using Everyday Items	.07	.31***	-.07	-.03
Re-Usable Cups	-.02	.30***	-.12 [#]	.27***
Imperfect Vegetables	-.02	.39***	-.03	.18**

[#] = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$

5.3.2.2. Hypotheses 7. This states that the same groups found in previous work will be replicated from the segmentation (7a) and differences will be found between these groups regarding their moral norms (7b), recycling (7c), green product purchase (7d), reuse of carrier bags (7e), reuse of everyday items (7f), use of permanent cups over disposable cups (7g), and the purchase of imperfect vegetable produce (7h).

A non-hierarchical K-means cluster analysis was used to identify categories of people grouped by distinct patterns of scores on the four values. Participants' mean raw scores on each of the biospheric, altruistic, hedonic and egoistic value scales were transformed into z-scores to facilitate interpretation of the results. A four-cluster solution was specified, and upon further inspection the groups found in previous work were replicated:

Cluster 1 – *Non-engagers*: Comprised 16% ($n=53$) of the sample, who scored below average on all four values.

Cluster 2 – *Self-enhancers*: Comprised 29% ($n=95$) of the sample, who scored above average regarding egoistic and hedonic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprised 28% ($n=92$) of the sample, who scored below average regarding egoistic and hedonic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprised 27% ($n=91$) of the sample, who scored above average on all four values.

The replication of these groups supports hypothesis 7a. To better understand how the groups differ in their regard for the values, *Table 5.2* provides the mean values scores for each of the groups. While the groups follow the same patterns in terms of the values they score high or low on, differences exist between the exact importance they attribute to different values from study to study. As a specific example, in this study the Value opportunists score approximately one standard deviation above the sample mean, while in chapter three, this figure was only half of this. Consequently, while broadly the segmentation approach is replicable nuanced differences may exist between a ‘value-opportunist’ from one sample and a ‘value-opportunist’ from another.

Table 5.2.

Standardised values scores for each of the cluster groups

	Biospheric	Altruistic	Egoistic	Hedonic
Non-engagers	-1.41	-1.02	-0.92	-0.69
Self-enhancers	-0.16	-0.72	0.38	0.38
Value opportunists	0.70	0.85	0.91	1.03
Selfless contributors	0.46	0.64	-0.69	-0.66

Descriptive statistics are also presented in *Table 5.3* to show each group's performance on the six environmental behaviours and general moral norms towards environmental behaviour were investigated. The Non-engagers and the Self-enhancers score lowest on all behaviours and moral norms: the Non-engagers scored lowest on moral norms, reusing everyday items and buying imperfect vegetables, while the Self-enhancers scored lowest on the other four measures. Generally, the Selfless contributors scored highest on all behaviour and moral norms followed by the Value opportunists. However, there were two notable exceptions. Regarding not accepting disposable cups and on buying imperfect vegetables the Value opportunists outperformed the Selfless contributors.

Table 5.3.
Segmentation groups' mean score (and standard deviation) on environmental behaviours and moral norms

Environmental Outcomes	Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Recycling	4.14 (1.18)	3.90 (1.12)	4.83 (.97)	4.89 (.92)
Green Product Purchase	2.82 (1.24)	2.78 (1.25)	3.64 (1.38)	3.72 (1.00)
Reuse of Carrier Bags	4.26 (1.47)	4.09 (1.36)	4.86 (1.22)	4.91 (1.26)
Reusing Everyday Items	3.80 (1.45)	3.83 (1.40)	4.49 (1.36)	4.53 (1.21)
Reusing Cups	2.43 (1.24)	2.36 (1.45)	3.30 (1.61)	2.73 (1.45)
Imperfect Vegetables	2.61 (1.11)	2.62 (1.29)	3.75 (1.55)	3.33 (1.47)
Moral Norms	3.82 (1.00)	4.31 (.92)	4.88 (.89)	4.93 (.78)

A MANOVA was employed to compare differences between the cluster groups regarding their moral norms and self-reported environmental behaviours. The MANOVA

was considered appropriate as all dependent variables were thought to be related, which was further confirmed by correlation analyses. The output indicated that differences existed across the cluster groups regarding their environmental norms and behaviour: $F(21,692) = 5.79, p < .001$; Wilk's $\Lambda = .63, \eta_p^2 = .14$. More specifically, the analysis indicated that cluster group membership had a statistically significant effect on moral norms: $F(3,247) = 21.31, p < .001, \eta_p^2 = .21$; recycling: $F(3,247) = 13.73, p = .001, \eta_p^2 = .14$; 'green' product purchase behaviour: $F(3,247) = 13.21, p = .001, \eta_p^2 = .14$; reusing carrier bags: $F(3,247) = 10.16, p = .001, \eta_p^2 = .11$; re-using everyday items: $F(3,247) = 11.66, p = .001, \eta_p^2 = .12$; using 'permanent' cups rather than disposable cups: $F(3,247) = 6.85, p = .001, \eta_p^2 = .08$, and buying imperfect vegetables: $F(3,247) = 15.95, p = .001, \eta_p^2 = .16$. These support hypotheses 7b – 7h.

Post-hoc tests were employed to further investigate the differences between groups for all dependent variables. All post-hoc comparisons were completed at $\alpha = .05$ level with a Bonferroni correction employed for multiple comparisons. For moral norms and all behaviours apart from using 'permanent' cups, both *Value opportunists* and *Selfless contributors* scored significantly higher than both *Non-engagers* and *Self-enhancers*. In terms of using reusable cups, the *Value opportunists* scored more than the *Self-enhancers*, *Selfless contributors* and the *Non-engagers*.

These findings suggest that overall the groups perform consistently across behaviours related to waste-management: the groups that score higher on recycling also score higher on reusing carrier bags. However, it does appear that values may influence different behaviours differently as when considering using 'permanent' cups instead of disposables cups differences were found between the *Value opportunists* and *Selfless contributors* that weren't present when considering other behaviours.

5.3.2.3. Hypothesis 8. This states that moral norms will mediate the relationship between the cluster groups and recycling (8a), green product purchase (8b), reuse of carrier bags (8c), reuse of everyday items (8d), use of permanent cups over disposable cups (8e), and the purchase of imperfect vegetable produce (8f).

As in previous chapters PROCESS, an add-on for the statistical computer-based package SPSS, was used for the mediation analysis. A summary of the total effects models for all behaviours, concluded that overall there was a significant effect of cluster group (predictor variable) on: recycling: $F(4,246) = 22.65, p < .001, R^2 = .52, R^2_{Adjusted} = .27$; green product purchase: $F(4,246) = 22.18, p < .001, R^2 = .51, R^2_{Adjusted} = .27$; carrier bag use: $F(4,246) = 9.52, p < .001, R^2 = .36, R^2_{Adjusted} = .13$; reusing materials: $F(4,264) = 16.82, p < .001, R^2 = .45, R^2_{Adjusted} = .20$; using re-usable cups: $F(4,264) = 13.77, p < .001, R^2 = .42, R^2_{Adjusted} = .17$, and buying imperfect produce: $F(4,264) = 15.26, p < .001, R^2 = .43, R^2_{Adjusted} = .19$.

While the total effects model suggests there is an effect it does not demonstrate whether the effect is direct or indirect. To assess this, the Beta values, standard errors and upper and lower limit confidence interval are presented in *Table 5.4* (for recycling, green product purchase and re-using carrier bags) and *Table 5.5* (for reusing everyday items, using a reusable cup, and buying imperfect produce).

From the tables, it is possible to conclude that no significant differences were found from being in the *Value opportunists* group compared with being in the *Selfless contributors* group apart from when considering using reusable vessels and buying imperfect produce. When considering these two behaviours a direct effect of group membership influenced environmental outcome.

Table 5.4.

Beta (β) coefficients showing the direct and Indirect effects of cluster group membership on recycling, green product purchase and re-use of carrier bags

Cluster Group Comparison*	Recycling		'Green' Product Purchase		Reusing Carrier Bags	
	Direct Effect	Indirect Effect	Direct Effect	Indirect Effect	Direct Effect	Indirect Effect
From Self-enhancers to Non-engagers	.53 (.17) [.18 – .87]	-.17 (.08) [-.35 – -.03]	NS	-.21 (.10) [-.41 – -.02]	NS	-.18 (.07) [-.36 – -.05]
From Self-enhancers to Value opportunists	.62 (.16) [.30 – .93]	.29 (.08) [.15 – .49]	.67 (.20) [.30 – .93]	.36 (.09) [.21 – .59]	.56 (.22) [.13 – .99]	.21 (.07) [.09 – .41]
From Self-enhancers to Selfless contributors	.60 (.16) [.29 – .90]	.27 (.08) [.04 – .13]	.60 (.16) [.29 – .90]	.33 (.10) [.16 – .58]	.60 (.22) [.17 – 1.03]	.22 (.08) [.10 – .40]
From Non-engagers to Selfless contributors	NS	.44 (.10) [.28 – .65]	NS	.55 (.12) [.35 – .81]	NS	.40 (.10) [.21 – .62]
From Non-engagers to Value opportunists	NS	.47 (.10) [.30 – .71]	NS	.58 (.11) [.37 – .80]	NS	.38 (.10) [.20 – .60]
From Value opportunists to Selfless contributors	NS	NS	NS	NS	NS	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

Values in parentheses represent Standard Error, while values in square brackets represent confidence intervals [LLCI – ULCI]

Table 5.5.

Direct and Indirect effects of cluster group membership on Re-use of everyday items, using re-usable cups, and buying imperfect vegetables.

Cluster Group Comparison*	Reusing Everyday Items		Using Reusable Cups		Buying Imperfect Vegetables	
	Direct Effect	Indirect Effect	Direct Effect	Indirect Effect	Direct Effect	Indirect Effect
From Self-enhancers to Non-engagers	NS	-.29 (.12) [-.58 – -.10]	NS	-.28 (.12) [-.54 – -.08]	NS	-.23 (.11) [-.48 – -.06]
From Self-enhancers to Value opportunists	NS	.34 (.11) [.16 – .59]	.61 (.24) [.14 – 1.08]	.33 (.10) [.17 – .59]	.89 (.23) [.41 – 1.31]	.27 (.09) [.12 – .48]
From Self-enhancers to Selfless contributors	NS	.37 (.11) [.19 – .60]	NS	.35 (.11) [.19 – .59]	NS	.29 (.10) [.13 – .51]
From Non-engagers to Selfless contributors	NS	.66 (.15) [.41 – 1.04]	NS	.63 (.15) [.37 – 1.00]	NS	.53 (.15) [.28 – .86]
From Non-engagers to Value opportunists	NS	.63 (.15) [.39 – .96]	NS	.60 (.14) [.36 – .91]	.64 (.27) [.11 – 1.17]	.50 (.14) [.29 – .83]
From Value opportunists to Selfless contributors	NS	NS	-.60 (.22) [-1.04 – -.17]	NS	-.44 (.21) [-.86 – -.02]	NS

*The cluster group comparison represents the effect of moving from *the group on the left* to *the group on the right*.

Values in parentheses represent Standard Error, while values in square brackets represent confidence intervals [LLCI – ULCI]

When assessing the effect of group membership for all other cases, it appears its effect on all the environmental outcomes is mediated by moral norms. In some cases, for example for five of the six behaviours when considering the effect of group membership between the Self-enhancers and the Value opportunists, direct effects appear to be present alongside these indirect effects. Support is shown for all hypotheses as indirect effects of cluster group membership on environmental behaviour through moral norms are present in all cases apart from for Green Product Purchase. Consequently, hypothesis 8c is rejected.

5.3.2.4. Hypotheses 9-12. These hypotheses relate to which posters the groups will find most appealing and regard as providing the greatest motivation to act. Two one-way ANOVAs were performed to consider differences between the cluster groups regarding the appeal of, and motivation provided by, the environmental communication that was tailored in one of four ways: Value-Neutral, Value-Bio/Alt, Value-Ego/Hed, Value-Combined. It is expected that, for both appeal and motivation, the Value opportunists will prefer the Value-Combined poster, the Selfless contributors will prefer the Value-Bio/Alt poster, the Self-enhancers will prefer the Value-Ego/Hed and the Non-engagers will have no preference for any of the posters.

5.3.2.4.1. The appeal of the communication. When testing the assumptions of this analysis it was revealed the assumption of sphericity has been violated $\chi^2(5) = 58.15, p < .001$, consequently a Greenhouse-Geisser correction was employed. In terms of the appeal of the posters, a 4 (cluster group membership; between subjects) x 4 (poster-type; within subjects) mixed ANOVA revealed a main effect of cluster group: $F(3, 286) = 5.85, p = .001, \eta_p^2 = .06$; a main effect of poster-type: $F(2.68, 765.32) = 31.82, p < .001, \eta_p^2 = .10$,

and a significant interaction effect between poster-type and cluster group: $F(8.03, 765.32) = 2.77, p < .005, \eta_p^2 = .03$.

Further analysis, all using Bonferroni corrections for multiple comparisons revealed that overall, regardless of tailoring, the posters were found more appealing by the Value opportunists ($M=3.42, SD=.86$) than the Non-engagers ($M=2.84, SD=.79$; $p<0.01$). This is perhaps unsurprising as three of the four posters had some content congruent with the values the Value opportunists endorsed, while the Non-engagers have consistently shown no affinity to any of the values included in the study.

In terms of the posters, the Value-Bio/Alt poster ($M=3.40, SD= 1.08$) and the Value-Combined poster ($M=3.38, SD=1.27$), were rated significantly more appealing than the Value-Ego/Hed poster ($M=3.01, SD = 1.27$). Additionally, all three of these posters, were rated as significantly more appealing than the Value-Neutral poster ($M= 2.77, SD =1.27$).

Most important and relevant to the aims of this chapter, is the interaction between Cluster Group Membership and Poster-type as this will explore how each of the groups responded to the tailoring. To better understand how each group rated each of the poster in terms of appeal, *Figure 5.2* shows the mean (and standard deviations) scores each group awarded the posters.

The figure suggests some optimism for the effect of value-congruent tailoring as it appears both the Selfless contributors and the Value opportunists rate the poster that is best matched to their respective values as most appealing. However, the Self-enhancers group and to some extent the Non-engagers group appear to have little preference between the value-combined, value-bio/alt and value-ego/hed posters. Initially this

suggests tailoring may be important to the Selfless contributors and Value opportunists, but less so for the Non-engagers and Self-enhancers.

The relative scores that each group attributes to the posters may be of more relevance than the absolute scores. For instance, for the Selfless contributors tailoring is very important as the *difference* between the appeal they attribute to the value-bio/alt poster and the value-ego/hed poster is substantial. In comparison, tailoring to the Self-enhancers appears to be less crucial, as the difference in appeal they attribute to the value-bio/alt poster and the value-ego/hed poster is minimal.

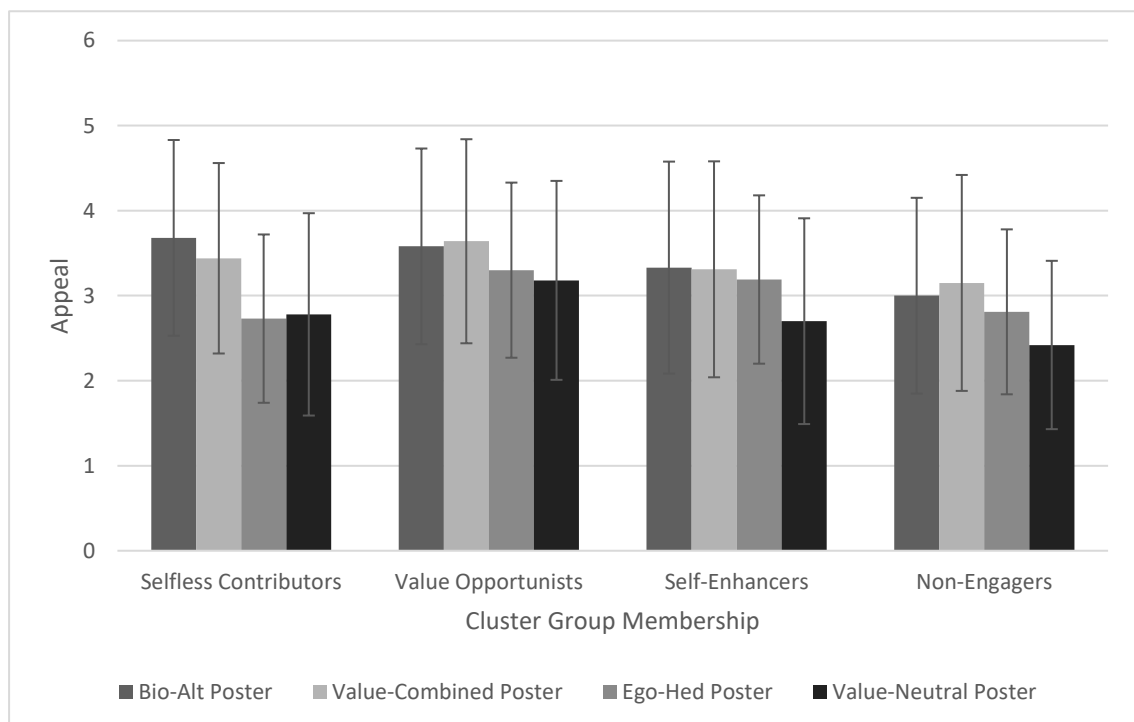


Figure 5.2. Means (and standard deviation) showing the appeal of the tailored posters as rated by the four segmentation groups.

To formally analyse these differences post-hoc comparisons with Bonferroni correction revealed that, the *Selfless contributors* group rated the Value-Bio/Alt poster as more appealing than all other posters. A post-hoc t-test found a significant difference between this poster ($M=3.68$, $SD=1.15$) and the poster they rated as second most

appealing (the Value-Combined poster, $M=3.44$, $SD=1.15$; $t(1,81)= 1.97$, $p<.05$). Since this represented the smallest difference in terms of the appeal of the posters, it follows that the Selfless contributors rated the Value-Bio/Alt poster as more appealing than both the Value-Ego/Hed poster ($M=2.73$ $SD=1.24$) and the Value-Neutral poster ($M=2.78$, $SD=1.15$). This supports hypothesis 9a.

In terms of the *Value opportunists*, the means revealed they rated the Value-Combined poster as most appealing ($M= 3.64$ $SD=1.20$). This was the poster that best matched their values. However, upon completion of a post-hoc t-test comparing this poster with the poster they rated as second most appealing, the Value-Bio/Alt poster ($M=3.58$, $SD=1.12$), no significant differences were found: $t(1,79)= .42$, $p>0.05$. However, further analysis did reveal that the Value opportunists rated the Value-Combined poster as more appealing than the Value-Ego/Hed poster ($M=3.30$, $SD=1.27$; $t(1,79)= 3.31$, $p<0.005$) and, inferred from the means, the Value-Neutral poster ($M=3.18$, $SD=1.27$). This suggests the poster that appeared to be most suited to their values was rated as joint most appealing by this group, thus this offers partial support for hypothesis 10a.

In terms of the *Self-enhancers*, the Value-Ego/Hed poster was expected to best match their values. However, when comparing their preferences for the Value-Ego/Hed poster ($M=3.19$, $SD= .99$) with the Value-Bio/Alt poster ($M=3.33$, $SD= .99$; $t(1,79)= .42$, $p>0.05$) and with the Value-Combined poster ($M=3.31$, $SD=1.03$; $t(1,79)= 1.12$, $p>0.05$), no significant differences were found regarding their appeal. However, this group did find the Value-Ego/Hed poster more appealing than the Value-Neutral poster ($M= 2.70$, $SD=.97$, $t(1,79)= 3.19$, $p<0.005$). This suggests that this group had no preference towards the poster that was tailored to reflect their values compared to two other posters. Consequently, these findings fail to support hypothesis 11a.

Finally, the Non-engagers found the Value-Neutral poster ($M=2.42$, $SD=.99$) as less appealing than the Value-Ego/Hed poster ($M=2.81$, $SD=1.21$; $t(1,47)= 1.99$, $p>0.05$). Since this represented the smallest difference between posters, it follows that the Value-Neutral was also rated as less appealing than both the Value-Bio/Alt poster ($M=3.00$, $SD=1.19$) and the Value-Combined poster ($M=3.15$, $SD=1.17$). Consequently, while this group do not appear to highly endorse any of the values considered in this study, they do appear to rate posters that provide a reason for engaging in saving water relating to any values as more appealing than the poster that does not relate to any of the values. This suggests any reason is better than no reason for this group; but no specific reason was found to be more appealing. This partially supports hypothesis 12a.

5.3.2.4.2. Motivation to act provided by the communication. In terms of the motivation to act provided by the posters, assumptions checks revealed that once again the assumption of sphericity has been violated $\chi^2(5) = 85.01$, $p < .001$, consequently a Greenhouse-Geisser correction was employed. The 4 (cluster group membership; between subjects) x 4 (poster-type; within subjects) ANOVA revealed a main effect of cluster group on motivation: $F(3, 286) = 9.90$, $p < .001$, $\eta_p^2 = .09$; a main effect of poster on motivation: $F(2.53, 723.65) = 25.80$, $p < .001$, $\eta_p^2 = .08$, and most importantly to this research a significant interaction effect of Poster-type and Cluster Group Membership on motivation: $F(7.59, 723.65) = 3.57$, $p < .001$, $\eta_p^2 = .04$.

Further analyses, all using Bonferroni corrections for multiple comparisons revealed that overall, regardless of tailoring, the posters provided less motivation to act for the Non-engagers ($M=2.59$, $SD=.86$) than for all other groups: Value opportunists ($M=3.41$, $SD=.86$), Selfless contributors ($M=3.21$, $SD=.85$) or Self-enhancers ($M=3.09$, $SD=.87$). No other significant differences were found between the groups. This is perhaps

unsurprising as the Non-engagers had consistently shown no affinity to any of the values included in this study and had performed less environmental behaviour than the other groups on many measures in previous work.

In terms of the posters, the Value-Neutral poster ($M= 2.78$, $SE=1.27$) was rated as providing significantly less motivation to act than all the other posters: Value-Bio/Alt ($M=3.40$, $SE= .06$, $p<.001$), Value-Ego/Hed ($M=3.01$, $SD=1.27$, $p<.023$) and Value-Combined ($M=3.38$, $SE=.07$, $p<.001$). Additionally, the Value-Ego/Hed poster ($M=3.01$, $SD=1.27$) was found to provide less motivation to act than the Value-Bio/Alt poster ($M=3.40$, $SD= 1.09$, $p<.001$) and the Value-Combined poster ($M=3.38$, $SD=1.27$, $p<.001$).

Of most importance to the research aims of this chapter, is the interaction between Cluster group membership and Poster-type. To better understand how each group rated each of the posters in terms of motivation provided, *Figure 5.3* shows the mean (and standard deviations) scores each group awarded the posters. The figure again suggests some optimism for the effect of value-congruent tailoring as it appears the Selfless contributors rate the poster that is best matched to their values as most motivating. However, tailoring appears to be somewhat less important for the Value opportunists and the Self-enhancers. However, a marked difference between the motivation provided to the Non-engagers by the posters exists: the value-ego/hed poster appears to provide this group with far more motivation than the others.

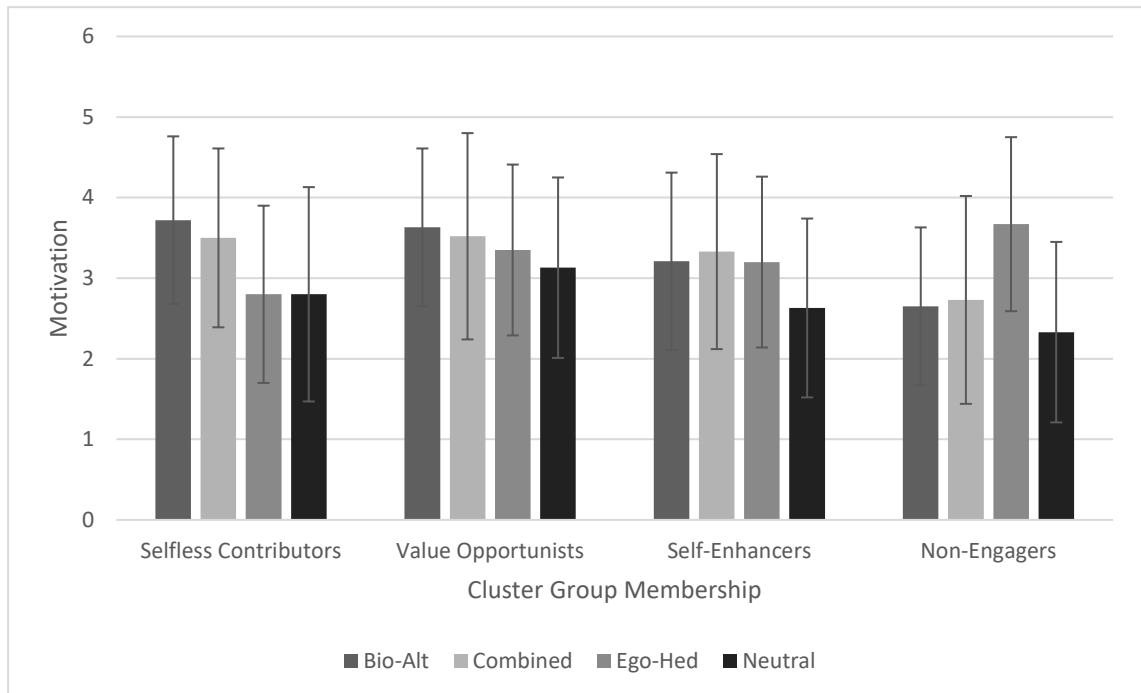


Figure 5.3. Means (and standard deviation) showing the motivation provided by the tailored posters as rated by the four segmentation groups.

Further analysis was performed to formally analyse the differences between the groups. First, the *Selfless contributors* group were thought to best matched to the Value-Bio/Alt poster. However, it was found that this poster ($M=3.72$, $SD=1.04$) provided no more of a motivation to act than the Value-Combined poster ($M=3.50$, $SD=.98$; $t(1,81)=1.82$, $p>.05$). However, this group did rate the Value-Combined poster as providing a greater motivation to act than the Value-Neutral poster ($M=2.80$, $SD=.98$; $t(1,81)=4.77$, $p<.001$) or the Value-Ego/Hed poster ($M=2.80$, $SD=1.10$; $p<.001$). Consequently, inferred from the means, the Selfless contributors group are provided with a greater motivation to save water based upon either the Value-Bio/Alt poster or the Value-Combined poster than the other two posters. This means they rate the poster that was thought to be best tailored to their values as joint most motivating. This partially supports hypothesis 9b.

In terms of the *Value opportunists* group, the Value-combined poster was thought to be the best match with their values. However, this poster ($M=3.52$, $SD=1.28$) provided them with no more of a motivation to act than the Value-Ego/Hed poster ($M=3.35$, $SD=1.21$; $t(1,79)= 1.60$, $p>.05$) or the Value-Bio/Alt poster ($M=3.63$, $SD=1.11$; $t(1,79)= .67$, $p>.05$). However, they did report a greater motivation to act based upon the Value-Combined poster than the Value-Neutral poster ($M=3.13$, $SD=1.29$; $t(1,79)= 2.34$, $p>.05$). As they showed no preference between their poster and two others, this fails to support hypothesis 10b.

The Self-enhancers group were thought to be best matched with the Value-Ego/Hed poster. However, this group were equally motivated by this poster ($M= 3.20$, $SD=1.06$) and the Value-Combined poster ($M=3.33$, $SD=1.06$; $t(1,79)= 1.40$, $p>.05$) and, inferred from the means, the *Selfless contributors* ($M=3.21$, $SD=1.10$). Yet, the group did report a greater motivation to act based upon the Value-Ego/Hed poster than the Value-Neutral poster ($M=2.63$, $SD=1.08$; $t(1,79)= 3.74$, $p<.05$). Again, as this group rated three posters as equally motivating this finding fails to support hypothesis 11b.

Finally, the Non-engagers rated the Value-Neutral poster ($M=2.33$, $SD=1.12$) which, like them showed no affinity to any of the values, as providing less of a motivation to act than the Value-Bio/Alt poster ($M=2.65$, $SD=1.33$; $t(1,47)= 2.70$, $p<.01$). Given the means, it can also be inferred that they also found the Value-Neutral poster as providing less of a motivation to act than the Value-Ego/Hed poster ($M=3.67$, $SD=1.11$) and the Value-Combined poster ($M=2.73$, $SD=1.12$). This suggests that providing this group with any reason to act is better than providing them no reason to act, but no specific reason relating to any of the values elicited a preference from this group. This partially supports hypothesis 12b.

In summary, the analysis of the posters offers some partial support for the hypothesis 9-12: both in terms of appeal and motivation to act, some groups rated the poster that was thought to be best matched to the values they highly endorsed as either outright or joint favourite. This effect seems most pronounced when considering the Selfless contributors who rated their matched poster as outright most appealing and joint most motivating. However, other groups, especially the Non-engagers did not seem to have any preferences as to what poster they received. Consequently, while there is reason for some optimism for the usefulness of tailoring, its usefulness may depend on the group being targeted.

5.4. Discussion

5.4.1. Summary of Findings

The findings from this chapter provide further evidence, along with the previous empirical chapters, that values predict a range of environmental outcomes including norms and behaviours. Moreover, the findings again suggest that a value-based segmentation model appears to be an appropriate approach in distinguishing meaningful groups which differ in their actions across multiple behaviours. This finding further evidences the usefulness of the segmentation model when considering a wide range of environmental outcomes and further supports the use of the four group-solution proposed in the three previous studies. Once again, moral norms appear to be a mediating factor between cluster group membership and five of the six environmental behaviours measured; consistent with VBN theory.

This chapter also offers some encouragement for the use of tailoring in environmental campaigns for certain groups, but presents mixed results for others. The Selfless contributors appear to have a relatively strong preference for communication

that contains value-congruent information, while the effect is less pronounced for the Self-enhancers and Non-engagers. Consequently, while there appears to be some reason for optimism regarding the approach, at least in comparison to value-neutral information, the effectiveness of tailoring may still need further exploration. The following sections relate to the main aims of this chapter which were to test the usefulness of the segmentation model in explaining a wider variety of behaviours and secondly, to consider how the segmentation model could ultimately be used by campaign designers and policy makers as a tool to help *shape* behaviour.

5.4.2. Which Values are Appropriate at Explaining a Wide Range of Environmental Behaviours Broadly Related to Waste Management?

Before using a values-based segmentation to explain behaviour, it is important to consider if, and if so which, values are appropriate to include as the basis of the segmentation. This study surpasses previous work in this thesis by including a greater range of behavioural measures to further understand the influence of values across multiple behaviours. Across the six behaviours measured, values were found to be a predictor of all behaviours, however only biospheric values were found to be a consistent positive predictor for all six. This is consistent with previous literature that has shown a connection between biospheric values and pro-environmental attitudes, beliefs, intentions and behaviour (De Groot & Steg, 2007a; 2008; Nordlund & Garvill, 2002; Schultz et al., 2005; Stern, 2000).

Egoistic, altruistic and hedonic values predicted some but not all behaviours. However, this is not surprising as, out of the four values included, it is only biospheric values that have an explicit link with environmental actions. Whereas, the other values may have a greater or lesser influence on environmental behaviour depending on how

individuals interpret their relationship with environmental outcomes. For example, hedonism was found to only have a significant negative influence on green product purchase. The author speculates this may likely be due to the time it may take to locate and research 'green' products. As this task of deciding whether a product is 'green' (e.g. checking labels or researching brands) may not be the most enjoyable. This is supported by research that suggests effort and convenience impact upon environmental product purchase (Ramayah, Lee, & Mohamad, 2010).

Perhaps more surprisingly, egoistic values were found to have a significant positive effect on three of the six behaviours: green product purchase, using re-usable cups (e.g. flasks), and buying local/imperfect produce. While traditionally egoistic values are thought to exert a negative influence on PEB, previous research has shown it is possible for egoistic values to positively impact environmental behaviour (De Groot & Steg, 2007a; Ojea & Loureiro, 2007). The author proposes that for these three behaviours egoistic values may have had a positive association, as economic benefits could be obtained for completing the environmentally friendly behaviour.

For instance, in relation to not using disposable cups, some outlets (e.g. Starbucks) offer a financial incentive for individuals to use a re-usable vessel rather than take a disposable cup, while other reward customers in other ways (e.g. café Nero offers double reward points). Furthermore, in relation to buying 'wonky' vegetables, supermarkets tend to offer imperfect produce at a discounted rate compared with typically shaped fruit and vegetables. As such, the three behaviours that egoistic values positively predicted may carry economic benefits. Future research may want to gather firmer evidence as to whether these types of schemes do make a difference for individuals who highly endorse egoistic values.

One point of note was that egoistic values did not predict carrier bag use. This is interesting as, in the UK, there is a charge for taking a carrier bag from the supermarket. Given how egoistic values positively predicted other environmental behaviours that have financial consequences for the individual (e.g. reusable cups, imperfect vegetables and buying green products) it is intriguing that they would not also influence carrier bag use given the obvious financial implications. However, as only biospheric values influence this behaviour, it appears reusing carrier bags, despite the charge, may not be financially driven. This is consistent with other commentaries that have suggested that the behaviour change associated with the 5p charge may not be economically motivated, but instead through other mechanisms such as the charge being a habit disruptor (e.g. Jackovcevic et al., 2014; Poortinga, Whitmarsh & Suffolk, 2013).

Perhaps the most surprising finding from the regressions of values on environmental behaviours was that altruistic values were a *negative* predictor of green product purchase. This is contrary to the prediction of this study and previous literature that associates both biospheric and altruistic values with environmental intentions, attitudes and behaviour (e.g. De Groot & Steg, 2007a; 2008). While this finding may require more investigation, one possible reason may be that as green products tend to focus on environmental benefits, those individuals who strongly endorse altruistic values may instead prioritise other types of products that may have more influence on other humans (e.g. fair-trade). Consequently, when faced with a choice between competing products, more altruistic-minded individuals may actively select other products that better address altruistic concerns ahead of those which address environmental issues (e.g. 'green' products) resulting in the negative relationship between altruistic values and 'green' product purchase.

5.4.3. Do the Groups Identified from the Values-Based Segmentation Differ on a Wider Range of Environmental Outcomes?

Aside from the differences regarding which values predict the environmental behaviours, differences were also found between the groups identified from the segmentation model. For all behaviours, apart from using reusable cups, both *Value opportunists* and *Selfless contributors* self-reported engaging in the behaviour more than both the *Non-engagers* and *Self-enhancers*. While in terms of using reusable cups, the *Value opportunists* engaged significantly more than the *Self-enhancers*, *Selfless contributors* and the *Non-engagers*. Generally, these findings are in keeping with those of previous chapters that found little difference between the *Selfless contributors* and *Value opportunists*; however, unlike in chapter three, this study found no significant difference between the two groups regarding green product purchase.

Using re-usable cups is the first *behaviour* where the author has found the *Value opportunists* outperforming the *Selfless contributors* (this was also the case for intentions relating to increasing sustainable energy in the previous chapter). The author speculates that the potential financial benefits brought about by using reusable cups rather than disposable ones may mean there is an added incentive for those who value both environmental and economic outcomes to take part in this behaviour. This is further evidenced as egoistic values positively predicted this behaviour. As suggested earlier, future research may want to further probe this relationship, however based upon the regression analyses it appears that egoistic values had a greater effect on this behaviour ($\beta=.27$) than any other behavioural measure included in this study.

The six behaviours studied all broadly related to waste management, so it is perhaps not surprising that for five of the six behaviours the groups differed in the same

way: Selfless contributors and Value opportunists tend to be more environmentally friendly than the Non-engagers and the Self-enhancers. Future research may want to probe this further by considering behaviours that are far removed from 'waste' related behaviours, for example donating to environmental charities, reducing meat consumption and transport choice. Overall, the findings suggest that the groups identified from the values-based segmentation model differ on a wide range of environmental behaviours, and so the model is useful in explaining differences between people's environmental actions.

5.4.4. Do Moral Norms Mediate the Values-Behaviour Relationship for all Behaviours Measured?

VBN theory suggests moral norms may mediate the relationship between values and behaviour (Stern, 2000). This has been supported in both chapters two and three. In this chapter, broadly this is supported as moral norms mediate the relationship between cluster groups membership and environmental behaviour for all behaviours apart from Green Product Purchase. Of note is that the mediation analysis suggests there is variation in the process by which the differences occur between the groups.

The author notes that there appears to be *four* different mechanisms by which endorsing different values goes on to influence environmental behaviour. The four different mechanisms seem to show that values influence behaviour: directly (1), indirectly (2), both directly and indirectly with both effects working in the same direction (3), or both directly and indirectly but with the two effects working in opposing directions (4). The first scenario, illustrated by the mediation analysis considering the Selfless contributors and the Value opportunists and their engagement with reusable cups, appears to show differences between the groups is a result of group membership alone.

As group membership was derived from values-based segmentation, the difference between the groups can be attributed to the differences concerning which values they prioritise. Thus, in this first scenario values appear to have a direct effect on behaviour; while no other effect (e.g. indirect effects of moral norms) exists.

The second scenario, illustrated when considering the Selfless contributors' and the Non-engagers' carrier bag use, shows differences in behaviour to be a result of the indirect influence of cluster group membership, through the mediator. So, in this scenario values appear to have an indirect effect on behaviour through moral norms; while no other effect (e.g. direct effect of group membership) exists. The third scenario illustrated by considering the Self-enhancers and Value opportunists and their green product purchase behaviour can also be found. This time group membership appears to have a direct effect on behaviour, but also an indirect effect on behaviour through moral norms. Thus, in this case, values appear to have both a direct and indirect effect on behaviour but both effects work in the same direction (e.g. in this case the effect of cluster group membership on behaviour when moving from the Self-enhancers to the Value opportunists is positive, as is the indirect effect on behaviour that is mediated by moral norms).

Finally, the mediation analysis reveals a fourth scenario, illustrated when comparing the Self-enhancers and Non-engagers and their recycling behaviour. This is perhaps the most complex scenario when considering differences between the groups. Overall, it appears that there are no differences between these groups regarding recycling behaviour. For example, by consulting the post-hoc tests following the MANOVA no significant differences between these groups were found. However, the mediation

analysis demonstrates this 'non-effect' is the combination of two effects cancelling each other out.

The mediation analysis shows that group membership has a positive direct effect on recycling, so this suggests moving from the Self-enhancers group to the Non-engagers group increases recycling. However, this positive effect is cancelled out because moving from the Self-enhancers group to the Non-engagers group also appears to have a negative indirect effect on recycling, through moral norms. Consequently, while it appears there are no differences between the groups regarding recycling, there are differences between the groups regarding the determinants of the behaviour, but the two effects (direct effect of values and indirect of moral norms) are working in opposing directions. As the MANOVA concluded no differences existed between the groups regarding recycling, being able to understand the mechanisms behind this is only possible due to the mediation analysis. Given the further insight offered by this, it seems particularly useful to include this technique in future work to better understand the process by which the behaviour occurs.

One interpretation of the effect of a move from the Self-enhancers to the Non-engagers group is that lowering the extent to which an individual endorses egoistic and hedonic values may have a positive influence on their recycling as the individual may be more willing to make some self-sacrifices now they no longer value egoistic and hedonic values so much. However, not highly endorsing *any* values may result in lower levels of intrinsic motivation because the individual has no strong drive to achieve these high-order goals. As, according to VBN theory, these values start the process which activates a personal (moral) norm, without highly endorsing any of these values moral norms relating to acting in an environmentally friendly manner may not be activated, causing a decrease

in recycling behaviour. This description is one interpretation of what may be happening set out by the author, however future research may want to consider these specific cases where the direct effects and indirect effects of values on environmental behaviour are in opposing direction.

5.4.5. Can Value-Congruent Tailoring Increase the Appeal and Motivation of Environmental Communication?

The findings from the environmental communication section of the analysis offers some support for tailoring, but does not present a clear picture that allows definitive conclusions to be made. Only one of the groups, the Selfless contributors, rated their value-congruent poster (Value-Bio/Alt) as outright most appealing, in all other cases if the value-congruent poster was preferred it was as joint favourite with another. Also, there were occasions, especially involving the Non-engagers and Self-enhancers where value-congruent tailoring had little impact. The following sections briefly outline the effectiveness of the tailoring for each group.

5.4.5.1. Selfless contributors. It appears that for the Selfless contributors, value-congruent tailoring appears to be very important, as they showed a clear preference for the value-congruent poster in terms of its appeal and rated the poster as joint most motivating along with the value-combined poster. The value-combined poster contained value-congruent and value-incongruent information for this group, this suggests that while this group may find combined appeals less appealing, they may not be detrimental to their motivation to act. The poster that contained value-incongruent information (the Value-Ego/Hed poster) was rated significantly worse on both measures, thus it appears for policy makers and campaign designers for this group only emphasising economic or hedonism related motives will not be successful.

5.4.5.2. Value opportunists. For the Value opportunists tailoring appears to be slightly less important than for the Selfless contributors, but still preferable. This group seemed equally motivated by the poster that was double-framed to contain messages relating to both self-transcendence and self-enhancement (Value-Combined), as well as single framed posters relating to only one of these (e.g. the Value-Bio/Alt poster or the Value-Ego/Hed poster). However, in terms of appeal, it appears either a double-framed message or one that only focuses on biospheric and altruistic concerns is preferable to one that focuses solely on egoistic and hedonic concerns. Consequently, it appears that, at least in this specific scenario, while double-framing does not have any negative impact, it also does not appear to increase motivation compared to single-framed communication. Thus, policy makers may want to focus solely on environmental or altruistic motivations for this group, or combine these with egoistic-hedonic reasons, but should not provide egoistic-hedonic motivations alone.

5.4.5.3. Self-enhancers. For the Self-enhancers, tailoring appears to be less important. This group did not find the poster that was congruent with their values (Value-Ego/Hed) any more appealing or motivating than the double-framed (Value-Combined) or the single-framed value-incongruent (Value-Bio/Alt) posters. The latter finding is interesting as this suggests for this group tailoring to egoistic and hedonic values, is no better (or no worse) than traditional environmental campaigns which tend to focus on biospheric and altruistic values. Consequently, it appears tailoring has little impact on this group.

5.4.5.4. Non-engagers. The Non-engagers preferred posters that contained motivational content linked with the four values over a poster that instructed people to perform a message with no motivational reason as to why; but the group did not appear

to demonstrate any preference as to whether this content contained only biospheric and altruistic motivations, only egoistic and hedonic motivations, or a combination of both (e.g. double-framed). These findings once again suggest that more research is required to better understand this group, and that possibly, as none of the values included in this study appear to resonate with them, a markedly different strategy may be required to change their behaviour.

In terms of relating this work to the wider literature, the findings offer partial support for the premise of tailoring, which has been seen to be successful in the field (e.g. Daamen, Staats, Wilke, & Engelen, 2001; Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Winett, Leckliter, Chinn, Stahl, & Love, 1985). More so, it offers support for the notion that designing information to relate to the values (higher-order goals) an individual endorses may impact upon their motivation to act (e.g. Louro, Pieters & Zeelenberg, 2007; Shah & Kruglanski, 2003; Unsworth & McNeill, 2017).

However, further research would be needed to ascertain a clearer picture regarding the value of this approach for use with the groups identified. As based on this research, it does not appear that value-congruent tailoring, such as highlighting higher order goals an individual may have, is effective or efficient for all cases, but, as suggested by previous work, does appear to have some potential (e.g. Bain, Hornsey, Bongiorno, & Jeffries, 2012 ; Gromet et al., 2013; Johnson & Eagly, 1989; Jost et al., 2009; Kidwell et al., 2013; Schwartz, 1994; Unsworth & McNeill, 2017).

Finally, this work shows that, at least for some groups there is no detrimental effect from 'double framing' messages, at least in terms of the appeal or motivation to perform a targeted behaviour derived from an environmental campaign, however, it is

important to also consider how such approaches may impact on long term behavioural outcomes (Deci & Ryan, 2008; Evans, Maio, Corner, Hodgetts, Ahmed & Hahn, 2013).

5.4.6. Limitations and Suggestions for Future Research

As with previous work, this study once again uses self-report measures of behaviour, and while widely regarded as the next-best alternative to collecting an objective measure some limitations including potential response biases relating to social desirability may exist. Moreover, while every effort was made to collect a different demographic of individuals than students that were used in chapters two and three, the average age of participants was still relatively young (30.1 years). Consequently, future research may wish to further test the generalisability of the segmentation model with an older sample of adults.

While the posters provided a different perspective into how the groups may react to different environmental campaigns, there were some limitations with their creation and use. While the posters were devised to target values, were viewed and approved by the author, his supervisory team, and a panel of 10 psychology students for their appropriateness, there is always a possibility that the people viewing the posters did not believe they portrayed what they were intended to represent. Consequently, it could be argued that it is not possible to guarantee the posters were 'value-congruent' as the content may have been interpreted as not representing that value. Moreover, no explicit measure of value-congruency, or if the posters had any influence on participant's beliefs regarding the self-concordance of water conservation were taken. Future studies may want to include explicit measures of these concepts.

As values are abstract individuals may also have a personal interpretation of them. For example, asking people to act in a manner congruent with biospheric values may

result in different behaviours. Consequently, while the Value-Bio/Alt poster was designed to refer to the biosphere, it did so in a general context by mentioning both nature, as in plants and trees, but also animals. However, recent work suggests that a 'concern for animals' dimension may be distinct from other personal values such as biospheric values (Dietz, Allen & McCright, 2017). Consequently, depending if individuals differ in terms of what biospheric concerns they have (e.g. relating to animals or plants) they may have differing beliefs in how value-congruent the posters were.

Another point of note is that participants were required to self-report the appeal and motivation provided by the posters; both measures were explicit. Consequently, it is possible that participants did not want to admit they had been motivated by a poster or did not consciously realise if they had. This has been highlighted as an issue in advertising, and thus future research may want to consider implicit measures to avoid these issues (e.g. such as used by van den Broek, Bolderdijk & Steg, 2017).

Another limitation with the study is that the posters were a one-time measure, designed for use in this study. Consequently, they were not subject to the rigorous process other campaigns and adverts may pursue to ensure the output is as aesthetically pleasing as possible. Therefore, campaigns that have greater resources to ensure the posters contained greater artistry, may realise different findings. More so, as noted in the materials section, the posters were not designed with the purpose of being particularly appealing or motivating, they were designed to be markedly different from one another to have the best chance of showing the effect of value-congruency. Consequently, this purpose is likely to differ from the aims of environmental campaigners making a poster.

Also, as the posters were only presented once to the participant, they differ from environmental campaigns that could either leave a poster in place for a longer period, or

alternatively attempt to engage with the individual in a different way; perhaps using more innovative and interactive communication methods. Employing more innovative methods that allow greater interaction with the individual and/or that allow the communication to be more sustained than a one-time poster, may improve the effect of the tailoring and the improve the overall appeal and motivation of the communication. Future research may want to consider novel and more modern methods of communication such as mobile applications that would allow the messages to be sent directly to the user. This may promote greater levels of interaction between the user and the content, and would allow researchers to increase the length of the intervention period by sending frequent messages for a specified period.

Future research may want to consider other possible mediators or other factors that may influence the value-behaviour relationship. While moral norms have been shown to be an important mediating factor so far, considering other variables that have been shown to influence environmental behaviour (e.g. perceived behavioural control) may help investigate whether a more comprehensive segmentation that includes multiple mediators, could further increase the explanatory power of the model. Moreover, investigating how the segmented groups perform on different determinants of behaviour may be particularly useful in further understanding the Non-engagers group.

The Non-engagers seem to hold no particular affinity towards any of the values considered in this work. Considering other behaviours, not related to the environment (e.g. applying for promotion, acceptance of technology), may shed more light into whether the lack of strong endorsement of a value(s) impacts on other areas of a Non-engagers' life. Also, researching how the Non-engagers endorse other values not covered in this research (e.g. conservation, openness to change) may offer a better understanding

of if they do strongly endorse any other high-order goals that fall outside the remit of egoistic, hedonic, biospheric and altruistic values. Alternatively, considering other mechanisms that may determine environmental behaviour (awareness of consequences, social norms, perceived behavioural control) may offer more insight into which variables may be most successful at understanding, and potentially shaping, the behaviour of this group.

5.4.7. Conclusion

This study provides further evidence of the replicability of the segmentation when considering a sample of non-students; once again supporting a four-group solution. The study also evidences the usefulness of the segmentation model at explaining a wide range of environmental behaviours as significant differences were found between the groups across all six outcomes measured. Through mediation analysis, the study also offers insight into the mechanism by which these differences occur; showing values can have a direct effect, indirect effect through moral norms, or both, depending on the behaviour and groups in question. The study also offers some support for the premise of tailoring, finding an interaction between how communication is tailored and cluster group membership. However, this was not conclusive in all cases, and future research may wish to consider if an improvement in the communication method (e.g. more sustained intervention, more modern methods, more interaction between the users and communication) would further aid the effect of tailoring. Overall, these findings once again provide a reason for cautious optimism regarding the use of a value-based segmentation model to better understand environmental behaviour.

Chapter 6. Integrating Theoretical Approaches: How the Segmentation Groups Perform on Determinants of Environmental Behaviour Proposed by Other Models

Abstract

Previously the segmentation groups have been shown to differ regarding moral norms and a range of environmental behaviours and intentions. However, norm-based determinants of environmental behaviour (e.g. moral norms) may only explain a proportion of environmental behaviour, especially low-cost rather than high-cost behaviour. Thus, it may be useful to consider how the segmentation groups also perform on other variables (e.g. those associated with rational choice models), as these may be more predictive of some behaviours. To this end, this study tests how values predict, and how the segmentation groups perform on, six key determinants of recycling: moral norms, perceptions of situational barriers, perceived behavioural control, awareness of consequences, community concern and conformity (recycling to 'fit in'). Values were found to predict all six determinants of recycling, and the segmentation groups were found to differ on all determinants apart from perceptions of situational barriers. The findings suggest that including additional variables from other theoretical frameworks may increase the predictive power of the values-based segmentation model. The findings also have implications for policy makers and campaign designers, as certain determinants of environmental behaviour appear to have more relevance for some groups compared to others.

6.1. Integrating Theoretical Approaches: How the Segmentation Groups Perform on Determinants of Environmental Behaviour Proposed by Other Models

6.1.1. Background to the Study

So far, the studies reported in previous chapters have employed variables relating to VBN theory (e.g. values and moral norms) to understand environmental behaviour. However, variables not included in VBN theory may also help explain certain behaviours. Therefore, understanding how the segmentation groups perform on variables not so far covered in this thesis, may offer further insight into which of these may increase the explanatory power of the values-based segmentation model in future work. Tonglet, Phillips and Read (2004) outline key determinants of recycling, that include variables linked with group influence (e.g. social norms, conformity), morality (e.g. moral norms and community concern), the Norm Activation Model (e.g. awareness of consequences) and the Theory of Planned Behaviour (e.g. perceived behavioural control). This study will consider how values predict each of these and whether the segmentation groups differ on these. If values do predict these determinants, it may be that some of these key determinants should be included in future work as possible mediators of the values-behaviour relationship.

6.1.2. Considering Variables from Other Theoretical Frameworks

So far in this thesis, comparisons between the segmentation group's performance on many different environmental behaviours (e.g. recycling, product purchasing behaviour, carrier bag use, using reusable vessels), behavioural intentions (e.g. intention to reduce car use, increase use of sustainable energy) have been made. For many of these outcome measures, the mediating role of moral norms has shown to be a pivotal link between values and behaviour. Supporting the position of VBN theory (Stern, 2000).

However, variables included in other theories (e.g. Theory of Planned Behaviour and the Norm Activation Model) may also mediate the link between more general beliefs and our environmental behaviours or intentions (Ajzen, 1991).

Thus, considering some of these variables may ultimately increase the explanatory power of the segmentation model. For example, variables associated with TPB have been used to successfully explain behaviours both *inside* the environmental domain (e.g. Bamberg & Schmidt, 2003; Harland, Staats, & Wilke, 1999; Heath & Gifford, 2002; Verplanken, Aarts, Van Knippenberg, & Moonen, 1998) and *outside* of it, such as investment decisions, (East, 1993) and dishonest actions (Beck & Ajzen, 1991).

Understanding how additional variables are linked with the segmented groups may promote the use of the values-based segmentation approach to authors who employ different theoretical frameworks, or authors who plan to extend one framework by including variables from another (e.g. integrating values into a rational choice model). Integrating variables from one theoretical framework has been successful previously. For example, studies have included elements from norm-based theories (e.g. VBN) to increase the explanatory power of rational choice models (e.g. TPB; Bamberg & Schmidt, 2003; Chu & Chiu, 2003; Chen & Tung, 2010; Harland, Staats & Wilk, 1999). Also, some theories have explicitly combined variables from previous models to create more comprehensive accounts of behaviour (e.g. the Comprehensive Action Determination Model (Klöckner, 2013; Klöckner & Oppedal, 2011; Sopha & Klöckner, 2011).

Depending on the behaviour being considered, there may be a need to consider other variables as the mediating link between general beliefs and an outcome variable. For instance, some environmental behaviours such as reducing car use may be highly dependent on situational context (e.g. are there other modes of transport that go to my

home/work/school?), whereas other behaviours, such as signing an online petition, may be less dependent on situational context.

Considering situation context, and variables derived from rational choice theories, may be particularly important when considering high-cost behaviours. This is because rational choice models tend to explain these behaviours better than normative models (Bamberg & Schmidt, 2003; De Groot & Steg, 2007b; Guagnano, Stern, & Dietz, 1995; Hunecke et al., 2001; Steg et al., 2005). The notion that higher cost behaviours may be better explained by rational choice models relates to the low-cost hypothesis (Diekmann & Preisendörfer, 2003), which states that people are more likely to convert normative considerations into behaviour when doing so is not costly.

Abrahamse and Steg (2009) support this hypothesis by suggesting that the NAM may be more successful at explaining low cost behaviours such as voting for an environmentally friendly candidate (e.g. Garling, Fujii, Garling, & Jakobsson, 2003), or supporting environmentally friendly policies (e.g. Steg, Dreijerink, & Abrahamse, 2005). Conversely, when considering higher cost behaviours, such as changing transport choice (e.g. bus versus car), variables linked with rational choice theories may be more appropriate (Bamberg & Schmidt, 2003).

One reason for this distinction may be because people play down their own feelings of moral obligation in high-cost scenarios as a means of self-serving denial (Schwartz & Howard, 1981; Lindenberg & Steg, 2007; Steg & Vlek, 2009). Thus, understanding how the segmentation groups differ in their regard for a wider range of variables may allow researchers in future studies to consider the segmentation approach alongside variables that best explain a specific behaviour they wish to study.

6.1.3. Combining Values with Determinants of Recycling

Little research explicitly conceptualises how the link between values and variables associated with other theoretical frameworks is formed. However, one study has explicitly combined values and variables associated with the TPB. De Groot and Steg (2007b) considered how egoistic, altruistic and biospheric values predicted intention to use a park-and-ride facility, and if variables such as perceived behavioural control and social norms mediated this relationship. Their findings show that it was only egoistic values that significantly predicted any of the mediating variables derived from the TPB. But importantly, did show the premise of linking values to variables derived from other frameworks is possible.

In a similar vein, Tonglet, Phillips and Read (2004) also considered combining variables from different theories to predict recycling. This study did not explicitly include values but did include both norm-based (e.g. moral norms) and rational-choice-based variables (e.g. perceived behavioural control). Their study suggests that moral norms, situational barriers, awareness of consequences, perceived behavioural control, and concern for the community may all influence environmental behaviour. Thus, this study will consider whether values predict these determinants of recycling, and how the segmentation groups perform on these. This may offer insight into whether future studies should consider additional mediators of the values-behaviour relationship to better explain recycling (or other behaviours).

The current study will also extend this enquiry to consider conformity as a motivation to engage in environmental behaviour. Shackelford (2006) made the case that from an evolutionary perspective, humans often adapt their behaviour to fit in with those around them. Therefore, should an individual perceive that people around them are

recycling, they may recycle just to 'fit in'. As endorsing egoistic values may make an individual concerned with their status in a social group, it is thought that highly endorsing these values may make an individual more likely to be motivated to recycle for reasons linked with conformity.

6.1.4. The Current Study

This study will consider whether values, and the values-based segmentation approach, can explain a wider range of determinants of recycling. To achieve these aims, the values proposed by De Groot and Steg (2007a; e.g. egoistic, altruistic and biospheric values) will be used as the foundations for a segmentation model, much like in chapter two. First, regressions will consider which values relate to these determinants, before a values-based segmentation, based upon the questionnaire responses of 222 UK university students, considers how the segmentation groups perform on these determinants.

Given the reliable findings so far from the analysis, it is expected that once again the Non-engagers, Self-enhancers, Value opportunists and Selfless contributors will be the four groups found. Based upon the key determinants outlined by Tonglet et al., (2004) this current study will consider how the groups perform on moral norms, situational barriers, perceived behavioural control, awareness of consequences, and concern for the community. The study will also consider reasons relating to conformity as a determinant of recycling.

6.1.4.1. Moral norms. Moral (personal) norms are defined as "feelings of moral obligation to perform or refrain from specific actions" (Schwartz & Howard, 1981, p. 191). They have already been covered in the previous chapters of this thesis and have been shown to mediate the relationship between cluster group membership and environmental behaviours. Based upon the previous findings in chapters two, three, and

five, it is expected that biospheric values will positively predict moral norms, while egoistic values will negatively predict moral norms. Based upon the findings in previous chapters, it is not expected that altruistic values will predict moral norms.

6.1.4.2. Situational barriers. These are likely to impact upon the convenience of performing an environmental action (Boldero, 1995). Tonglet et al. (2004) suggest these are an important variable to include as they take into account the environmental conditions in which the behaviour is being performed. They distinguish situational barriers from perceived behavioural control by only including physical (concrete) issues that may influence recycling, such as: the time it takes, the space it requires, and how complicated it is to perform. It is predicted that individuals who highly endorse egoistic values, and so highly value their time and effort, are more likely to notice (and therefore report) situational barriers. McCarty & Shrum (1994) find individuals who prioritise individual goals over group goals tend to find recycling more inconvenient. Based upon this, it is hypothesised that egoistic values will positively relate to perceiving situational barriers, while biospheric and altruistic values will negatively relate to perceiving situational barriers.

6.1.4.3. Perceived behavioural control. PBC is more subjective than situational barriers, as it is not only influenced by operational factors such as the practical aspects of recycling (e.g. resources, facilities) but also internal factors such as one's own ability (e.g. knowledge of how to recycle; Tonglet et al., 2004). According to Vermeir and Verbeke (2006), individuals may invest cognitive effort into learning behaviours that help them satisfy their personal motivations. As a motivation provided by biospheric and, to an extent, altruistic values is to protect nature, it is predicted that individuals who highly endorse these values will have increased knowledge regarding recycling. Conversely, as

egoistic values do not promote recycling, it is expected that individuals who highly regard these values, will have less knowledge about how to recycle. Therefore, it is predicted that biospheric and altruistic values will positively predict PBC and egoistic values will negatively predict PBC. It is not thought altruistic values will influence this variable.

6.1.4.4. Awareness of consequences. Without knowledge of the impact an individual's actions are having, they may not be aware of any need to alter their behaviour (Klockner, 2015). Therefore, items relating to the consequences of recycling behaviour were included to measure the cognitive (knowledge-based) component of attitudes, as recommended by Tonglet et al., (2004). VBN theory (Stern, 2000) states that values are likely to predict an individual's awareness of consequences for environmental behaviours. Therefore, consistent with this research, it is expected that biospheric and altruistic values will positively relate to having an awareness of the consequences of recycling, while egoistic values will negatively relate to having an awareness of consequences of recycling.

6.1.4.5. Community concern. Research from Tonglet et al. (2004) identified a new factor: 'community concern' from an exploratory factor analysis. They found two items that appeared to relate to the altruistic motives of recycling: 1) maintaining a nice place to live, and 2) health and wellbeing benefits for the community. Given these variables' explicit links with being motivated to help other people, it is expected that altruistic values will positively relate to community concern. Also, maintaining a nice place to live is likely to help the environment, it is expected that biospheric values may also positively relate to community concern. Given egoistic values promote the self rather than the community, it is expected that egoistic values will negatively relate to community concern.

6.1.4.6. Social conformity. Fornara, Carrus, Passafaro and Bonnes (2011) discuss the concept of recycling in terms of normative social influence and conformity. They postulate that in certain communities where recycling is particularly prevalent, or where acting in a pro-environmental way is established as a norm, some individuals may only act in this way to be accepted by a community. Shackelford (2006) supports this by explaining from an evolutionary perspective, there may be advantages for humans adapting their behaviour to 'fit in' with those around them, such as increasing their status in a group. Thus, *conformity* may lead to recycling, rather than moral reasoning. Status is driven by egoistic values; therefore, it is expected that egoistic values will positively predict recycling for conformity reasons. For similar reasons, as biospheric and altruistic values are likely to provide internal motivation that does not require social approval, it is expected that biospheric values will negatively relate to recycling for conformity reasons.

6.1.5. Summary and Hypotheses

Previous research has outlined a range of key determinants of recycling behaviour. The main aim of this study is to investigate whether values, and segmentation groups based upon values, help explain these determinants of recycling. This may be useful for researchers, as specific behaviours may be better explained by determinants relating to rational-choice models; especially those which require greater personal sacrifice. Considering which determinants from other models are influenced by values and cluster group membership may offer insight into which additional variables should also be considered as mediators of the values-behaviour relationship. Each of the following hypotheses relates to a key determinant of recycling behaviour:

H₁: Values will predict *moral norms* (1a). Biospheric values will be a positive predictor (1b) and egoistic values will be a negative predictor (1c).

H₂: Values will predict perceptions of *situational barriers* (2a). Biospheric values and altruistic values will be a negative predictors (2b) and egoistic values will be a positive predictor (2c).

H₃: Values will predict *perceived behavioural control* (3a). Biospheric and altruistic values will be positive predictors (3b) while egoistic values will be a negative predictor (3c).

H₄: Values will predict *awareness of consequences* (4a). Biospheric and altruistic values will be positive predictors (4b) while egoistic values will be a negative predictor (4c).

H₅: Values will predict *community concern* (5a). Biospheric and altruistic values will be positive predictors (5b) while egoistic values will be a negative predictor (5c).

H₆: Values will predict *conformity as a motivation to recycle* (6a), Biospheric values and altruistic values will be a negative predictors (2b) and egoistic values will be a positive predictor (2c).

Additionally, based on the replicability of the cluster groups found in the previous chapters, it is predicted that:

H₇: The four-groups identified from the values-based segmentation in previous research will be replicated in this study.

H₈: Differences will be found between the groups regarding their scores on determinants of recycling relating to moral norms (8a), situation factors (8b), perceived behavioural control (8c), awareness of consequences (8d), community concern (8e) and social conformity (8f).

6.2. Method

6.2.1. Participants

Participants for the study were all undergraduate students attending a UK university. In total, 222 participants completed the questionnaire, of which 114 (51%) were female. Participants ranged from 18 years to 30 years old ($M = 18.80$ years, $SD = 1.26$). Participants were primarily recruited from a course-credit scheme in which psychology students participated in research in return for receiving credit towards a compulsory first year module, but were also recruited on a voluntary basis after lectures on a physics course.

6.2.2. Design

The study employed a cross-sectional survey design. The questionnaire comprised elements from previously published work relating to values, six determinants of recycling, and demographic information (age and gender). In the first part of the analysis multiple regressions are employed to assess if values predict the determinants of recycling. In the second part of the analysis, a K-means cluster analysis segmented the sample based upon their values. Finally, a series of one-way ANOVAs were employed to consider differences between the cluster groups regarding the determinants of recycling.

6.2.3. Materials.

6.2.3.1. Values. Biospheric, altruistic and egoistic values were assessed by a questionnaire developed by De Groot and Steg (2007a), the details of which are in chapter two of this thesis.

6.2.3.2. Determinants of recycling. Participants rated all measures described below on a 7-point Likert scale stating how much they agreed with the item. The scale was anchored by 'strongly disagree' at one end and 'strongly agree' at the other.

6.2.3.2.1. Moral norms. The variable was assessed by four items: 'I feel I should not waste anything if it could be used again', 'I would feel guilty if I did not recycle', 'it would be wrong of me not to recycle', and 'not recycling goes against my principles'.

6.2.3.2.2. Situational barriers. This variable was operationalised by three items: 'Recycling is too complicated', 'Recycling takes up too much room' and 'Recycling takes up too much time'.

6.2.3.2.3. Perceived behavioural control (PBC). This was operationalised by six items: 'I have plenty of opportunities to recycle', 'Recycling is easy', 'I have satisfactory resources to recycle', 'I know what items can be recycled', 'I know how to recycle my waste', and 'I know where to take my waste for recycling'.

6.2.3.2.4. Awareness of consequences. This variable was operationalised by three items: 'recycling saves money', 'recycling creates a better environment for future generations' and 'recycling saves energy'.

6.2.3.2.5. Concern for the community. This variable was operationalised by two items: 'I am concerned with maintaining a good place to live' and 'I have a strong interest in the health and well-being of the community in which I live'.

6.2.3.2.6. Conformity. This variable was operationalised by two items: 'I only recycle because I want to be accepted and liked by others' and 'I only recycle to fit in with others'.

6.2.4. Procedure

Participants completed the questionnaire online in a room at the university in isolation if they signed up to the study through the course-credit scheme. Alternatively, students completed the questionnaire in a lecture hall. Participants were asked to remain silent during the process and not discuss with the questionnaire with others while

completing it. The study was approved by Keele University Ethics Committee following an amendment of a previous study to extend data collection and to also include these determinants of recycling (see Appendix S). Finally, standard BPS ethical procedures were observed (see Appendix T for information sheet, consent form and debrief).

6.3. Results

6.3.1. Data Preparation

A factor analysis was performed to confirm all items loaded as expected onto the factors associated with the determinants of recycling. This was shown to be the case and so all were included in the analysis. The output indicated that six distinct factors were found, this conclusion was reached as only six factors had eigenvalues above one. In total, 53.40% of the variance was explained by the rotated six -factor solution, with PBC accounting for most variance (16%), and community concern accounting for the least (6%). Sub-scale reliability was also assessed. Cronbach's alpha was recorded for each of the factors. Most factors had good reliability ($\alpha > .7$), however 'awareness of consequences', and 'community concern' only had satisfactory reliability ($\alpha > .6$).

6.3.2. Data Analysis

The data analysis section will be split into three parts. The first part relating to hypotheses 1-6, the second relating to hypothesis 7, and the third relating to hypothesis 8.

6.3.2.1. Hypotheses 1-6. These hypotheses relate to how values predict the six determinants of recycling included in this study. An investigation into the descriptive statistics regarding the importance attributed to the values found that altruistic values were rated as most important ($M=5.52$, $SD=.92$), followed by biospheric values ($M=4.33$, $SD=1.33$) and finally egoistic values ($M=3.28$, $SD=1.05$). *Figure 6.1* shows how the sample performed on the six determinants of recycling.

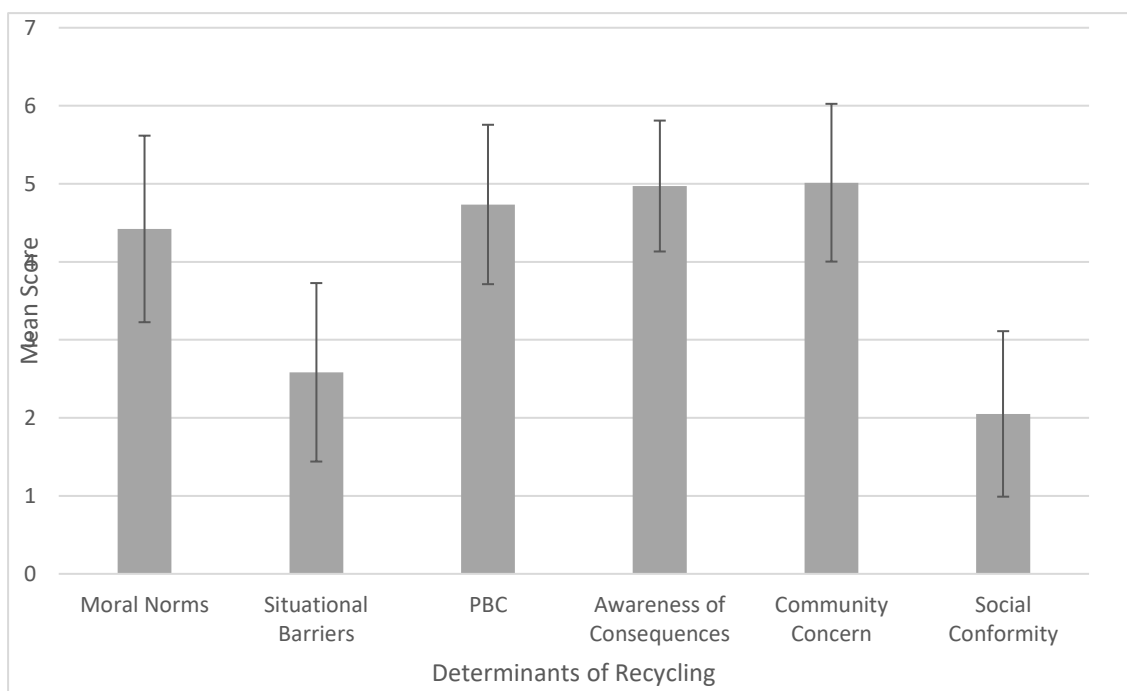


Figure 6.1. *The sample's scores relating to six determinants of recycling behaviour.*

Generally, community concern, moral norms, perceived behavioural control and having an awareness of the consequences relating to recycling all seem relatively high, this suggests that the participants had a good awareness of the impact that recycling may have, felt strongly about moral and altruistic reasons to recycle, and felt relatively in control of their performance of the behaviour. Perhaps linked to this, it also appears participants did not perceive there to be strong situational barriers to prevent them recycling, nor did they report that they only recycled to conform with others. The low score the conformity measure, and the high score on the moral norms measure suggest for most of the sample, intrinsic motivation to recycle is stronger than external motivation related to 'fitting in' with others.

To ascertain whether values predicted these determinants of recycling six multiple regressions were conducted using the Enter method. A significant regression equation was found for all determinants of recycling, showing that values predicted moral norms:

$F(3,218) = 12.10, p < .001, R^2 = .14, R^2_{Adj} = .13$; situational barriers: $F(3,218) = 3.08, p < .05, R^2 = .04, R^2_{Adj} = .03$; PBC: $F(3,218) = 4.81, p < .01, R^2 = .06, R^2_{Adj} = .05$; awareness of consequences: $F(3,218) = 5.45, p < .01, R^2 = .07, R^2_{Adj} = .06$; community concern: $F(3,218) = 20.44, p < .001, R^2 = .22, R^2_{Adj} = .21$, and conformity: $F(3,218) = 6.59, p < .001, R^2 = .08, R^2_{Adj} = .07$. These findings support hypotheses 1a, 2a, 3a, 4a, 5a, and 6a.

It is perhaps not surprising that values best explain determinants linked with morality and normative outcomes such as moral norms and community concern, and appear to explain a much smaller amount of the variance associated with variables linked with rational choice models (e.g. perceived behavioral control). The directionality and strength of the influence of each of the values was also assessed by considering the beta-coefficients. These are reported in *Table 6.1*.

Table 6.1.

Beta-coefficients for values when predicting determinants of recycling.

	Biospheric	Altruistic	Egoistic
Moral Norms	.37***	.05	-.12 [#]
Situational Barriers	-.23**	.06	.08
Awareness of Consequences	.21***	.06	.06
Community Concern	.41***	.12 [#]	-.12 [#]
PBC	.28***	-.07	-.05
Conformity	-.15 [#]	-.15*	.20**

*** $p < 0.001$, ** $p < .01$, * $p < .05$, [#] $p < .1$

The table suggests that, consistent with previous findings, biospheric values have a consistent impact upon environmental outcomes; predicting all but one. These values were a positive predictor of factors thought to increase recycling (e.g. moral norms) and a negative predictor of those determinants thought to decrease recycling (e.g. perceptions of situational barriers). This offers partial support for hypotheses 1b, - 5b, as while biospheric values were shown positively predict these determinants, altruistic values did

not. The findings also only offer partial support for hypothesis 6b as biospheric values were not found to negatively relate to recycling for reasons linked with conformity, but altruistic values were. This suggests altruistic values may promote intrinsic motivations to recycle, rather than motivations dependant on the attitudes of other people (e.g. to 'fit in').

Finally, as hypothesised in 6c, egoistic values were positively related to only recycling to be accepted or liked. This suggests egoistic values may promote recycling through concerns relating to monitoring the influence of external factors (e.g. status, popularity) rather than internal motivations (e.g. morality). However, this was the only variable egoistic values did predict, leading to the rejection of 1c to 5c. Overall, this section of analysis suggests while values predict all determinants, the extent to which they do varies substantially. Normative and moral-based determinants seem to be influenced most by values. Biospheric values seem to be the most useful individual predictor, however both altruistic and egoistic values do predict environmental conformity.

6.3.2.2. Hypothesis seven. This states that the four-groups identified from the values-based segmentation in previous research will be replicated in this study.

A non-hierarchical k-means cluster analysis was used to identify categories of people grouped by distinct patterns of scores on the three value-orientations. Participants' mean raw scores on each of the biospheric, altruistic and egoistic value-orientation scales were transformed into z scores to facilitate interpretation of the results. Once again, a four-cluster solution was found, and upon further inspection the groups found in previous work were replicated:

Cluster 1 – *Non-engagers*: Comprising 23% ($n=51$) of the sample, who scored below average on all values.

Cluster 2 – *Self-enhancers*: Comprising 23% ($n=51$) of the sample, who scored above average regarding egoistic values, and below average regarding biospheric and altruistic values.

Cluster 3 – *Selfless contributors*: Comprising 28% ($n=62$) of the sample, who scored below average regarding egoistic values, and above average regarding biospheric and altruistic values.

Cluster 4 – *Value opportunists*: Comprising 26% ($n=58$) of the sample, who scored above average on all values.

This supports hypothesis 7. To provide more detail about how the groups scored on the three values measured, *Table 6.2* provides the standardised value scores for the four groups. As found in previous studies, it is the Value opportunists who score highest on all values. Differences in these standardised value scores between samples suggest that while the groups are replicable between samples, differences may occur between samples regarding the exact importance each of the groups attributes to each of the values.

Table 6.2.
Standardised values scores for each of the cluster groups

	Biospheric	Altruistic	Egoistic
Non-engagers	-1.14	-1.01	-0.74
Self-enhancers	-0.35	-0.67	0.71
Value opportunists	0.97	0.81	0.87
Selfless contributors	0.32	0.39	-0.79

6.3.2.3. Hypothesis eight. This states that differences will be found between the groups regarding their scores on all determinants of recycling.

Figure 6.2 provides a representation of the means and standard deviations scored for each of the determinants of recycling rated by each of the groups. The figure shows some revealing patterns about how the determinants may impact upon the groups. First a distinct pattern can be found when considering moral norms: the groups from the Non-engagers (on the left of the figure), through the Self-enhancers, to Value opportunists, and finally the Selfless contributors (on the right) progressively rate having stronger moral norms to recycle.

Other patterns also emerge, for example, it appears Value opportunists and Selfless contributors score similarly on community concern and PBC. While the Value opportunists seem to possess most awareness regarding the consequences of recycling. Interestingly the Self-enhancers and the Non-engagers both score highest on one variable each: the Non-engagers seem to believe there are more situational barriers stopping them recycling than the other groups, while the Self-enhancers score highest on the conformity measure; suggesting this group are more likely than the others to recycle to 'fit in', be accepted, and to be liked.

Considering correlations between the determinants of recycling revealed that not all variables were related to one another; for example, no correlation was found between awareness of consequences and recycling for reasons relating to conformity. Consequently, a series of one-way ANOVAs were performed rather than a MANOVA to consider differences between the groups regarding the six variables. Significant differences were found between the groups regarding their awareness of consequences: $F(3, 219) = 3.49$, $p < 0.05$, community concern: $F(3, 219) = 10.28$, $p < 0.05$, perceived behavioural control: $F(3, 219) = 3.12$, $p < 0.05$, moral norms: $F(3, 219) = 7.63$, $p < 0.05$, and conformity relating to

recycling: $F(3, 219) = 3.69, p < 0.05$, but not regarding situational barriers: $F(3, 219) = .82, p > 0.05$.

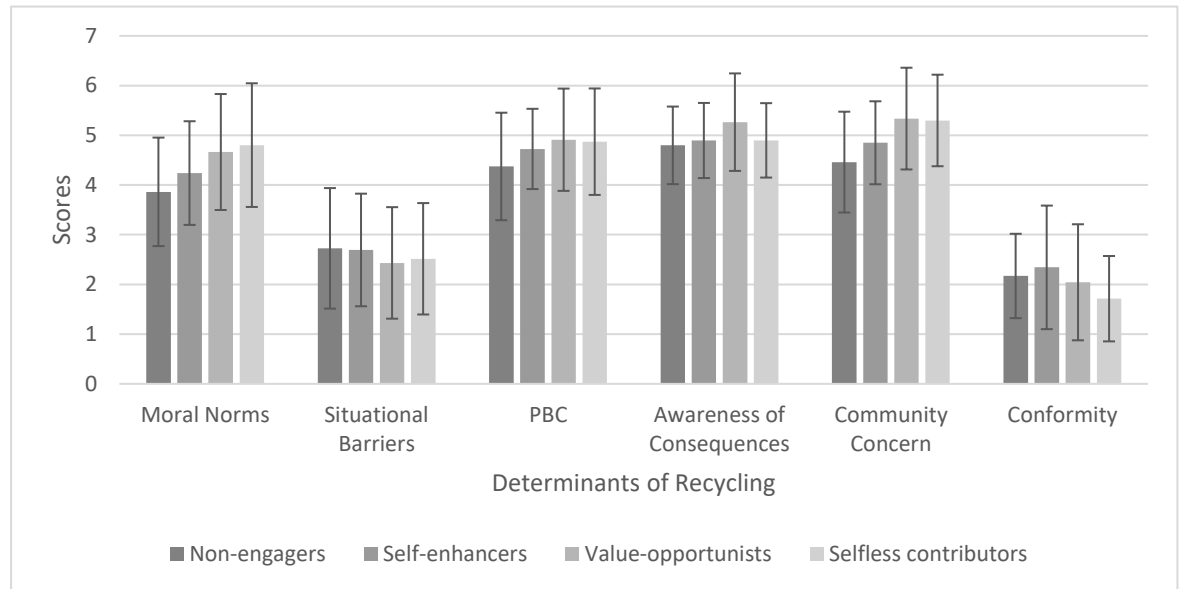


Figure 6.2. Scores on the determinants of recycling from the four segmented groups.

Post-hoc tests were employed to further investigate the differences between groups for all dependent variables. All post-hoc comparisons were completed at $\alpha = .05$ level with a Bonferroni correction employed for multiple comparisons. The tests revealed that the Value opportunists reported higher levels of awareness of consequences, community concern, perceived behavioural control and moral norms than the Non-engagers. While the Selfless contributors also scored significantly more than the Non-engagers on community concern and moral norms. Finally, the Selfless contributors reported being significantly less likely to recycle due to conformity (e.g. recycling to 'fit in') than the Self-enhancers.

6.4. Discussion

6.4.1. Summary of Findings

This study aimed to test whether values, and the segmentation approach, could be used to explain other key determinants of recycling not previously considered in this thesis. The findings offered some reason for optimism regarding combining the segmentation approach with variables from other theoretical frameworks. Values were found to influence all six determinants of recycling, and differences were found between the groups identified from the values-based segmentation on five of the six determinants. Values were found to, not surprisingly, explain more of the variance relating to normative concepts such as moral norms and community concern, rather than variables more often associated with other theoretical frameworks (e.g. PBC associated with the TPB). However, certain determinants (e.g. conformity, PBC) not generally associated with norm-based models (e.g. VBN theory), should be considered further, as these may help policy makers target groups that may not respond to moral incentives (e.g. the Self-enhancers).

Finding differences between the groups on these variables which are associated with other theoretical frameworks suggests this segmentation approach could be utilised alongside other theories and models, expanding its scope and potential for use in future research projects. Moreover, the insight provided from this study regarding how the segmented groups perform on a range of determinants of environmental behaviour may aid campaign designers to better tailor communication to make future interventions more effective.

6.4.2. Which Values are Most Useful when Predicting Determinants of Recycling?

Consistent with previous findings, this study finds that biospheric values were most useful at predicting determinants of recycling. Biospheric values were the only one

of the three values measured that predicted moral norms, perceptions of situational barriers, awareness of consequences, community concern and PBC. Moral norms and community concern were best explained by values. More specifically with community concern, it may be that participants conceptualised *community* as a 'place' rather than *community* as in the 'people within a place'. This would offer some explanation as to why it was biospheric, and not altruistic values this determinant of recycling.

Biospheric values were also found to be a positive predictor of perceived behavioural control. One interpretation of this finding is that an increased concern for the environment may cause individuals to research how to better help the environment. Thus, they may have an increased knowledge regarding how to recycle. Tonglet et al., (2004) suggest that this increased knowledge could lead an individual to feel they have more control over performing this behaviour.

In terms of determinants other values predicted, egoistic and altruistic values were both significant predictors of conformity relating to recycling. Egoistic values were a positive predictor, while altruistic values were a negative predictor. Consistent with the argument put forward by Shackelford (2006), it may be that personal benefits can be derived from conforming, such as being liked, accepted and to 'fit in'. As endorsing egoistic values are likely to increase the importance of concerns relating to status (Lindenberg & Steg, 2007), it follows that those individuals who highly endorse egoistic values may recycle for reasons relating to conformity as a method of maintaining or increasing status within a group.

Altruistic values were a significant negative predictor of environmental conformity, and biospheric values were also approaching significance. This suggests that individuals who endorse these values are less likely to recycle for social approval or to be

accepted, and given that these variables also tend to positively predict norm-based factors, are more likely to recycle due to feeling moral obligation to do so. Therefore, promoting reasons to engage in environmental behaviour associated with biospheric or altruistic concerns may lead to more intrinsic forms of motivation.

Overall this work suggests that while values explain the most variance when relating to norm-based factors such as moral norms and community concern, they do also seem to explain some variance in other antecedents of recycling not considered in VBN theory. However, as biospheric values appear to be the primary predictor of these determinants, the importance of including altruistic and egoistic values is still somewhat unclear.

6.4.3. How do Segmentation Groups Differ on Determinants of Recycling Behaviour?

The groups differed on all determinants apart from perceptions of situational barriers. One finding was that Value opportunists reported they felt more control over performing recycling than the Non-engagers, however these groups did not differ regarding their perception of situational barriers. The author proposes that while all individuals may share similar views on the situational barriers (e.g. objectively, the facilities may not be of a high standard and so all groups may rate these similarly), certain groups of individuals may be more affected by these contextual conditions than other groups. This could manifest itself in the perceived behavioural control variable. For example, the Non-engagers may have less internal motivation to recycle, so given a lack of facilities, may report recycling not to be easy (a measure of PBC). Conversely, the Value opportunists may have higher internal motivation to recycle, and so, while they too note there are many situational barriers (and so rate them as the other groups do), they may not let this deter them from recycling.

These lines of argument have parallels to an article by McCarty and Shrum (2001), who suggest an individual's locus of control may influence their likelihood of finding recycling inconvenient. This suggests that while situational barriers may be assessed somewhat objectively, perceived behavioural control is far more dependent on everyone's *interpretation* of a situation: those with greater internal motivation to recycle will report feeling more control over doing so, despite situational barriers being present.

Two other variables of interest, which both seem to stem from normative concerns, are *moral norms*, which have been discussed extensively in previous studies in this thesis, and *concern for the community*. The Selfless contributors (who highly endorse biospheric and altruistic values) scored significantly higher than the Non-engagers on both variables. Given the moral and altruistic links to these factors, it is not surprising that this was the case. Therefore, campaign designers may want to focus on factors such as these when targeting the Selfless contributors. However, for other groups such as the Self-enhancers, the moral motives for acting environmentally do not appear to be as strong. Having a greater understanding as to what motivates this group is of importance when considering how best to increase their willingness to perform pro-environmental behaviours.

One avenue of interest that has become apparent from this study is that the Self-enhancers appear to be significantly more likely than the Selfless contributors to recycle for reasons relating to conformity (e.g. to fit in). As alluded to previously, this appears to fit in with egoistic concerns such as increasing and maintaining status within social circles (Lindenberg & Steg, 2007). Future research may want to consider ways in which this could be incorporated into behaviour change campaigns. For example, highlighting how many other people are performing the behaviour may aid the effectiveness of the intervention

as this group may want to 'fit in' with those around them. However, Nigbur, Lyons and Uzzell (2010) provide a note of caution when promoting a norm in the hope that individuals adopt it. They found that group norms were only internalised when individuals identified strongly with the group in question. This suggests that the ability for social norms to influence an individual's behaviour may be moderated by how much an individual feels some attachment to the group performing the norm.

Finally, as the Non-engagers still scored relatively low on many of the determinants of environmental behaviour, it is still difficult to suggest a feasible strategy that might be most effective for this group. As none of the values considered in this thesis appear to be highly endorsed by them, using motivations derived from these values as a means of increasing this group's behaviour may be unsuccessful. Instead, as DEFRA (2008) suggested, it may only be regulation that ultimately encourages this group to engage in more pro-environmental behaviour.

6.4.4. Can the Segmentation Model be used in Conjunction with Variables from Other Models?

Exploring factors linked with other theoretical frameworks is important as values and moral reasoning appear to only explain a portion of environmental behaviour, specifically low-cost behaviours that involve good intentions (Nordlund & Garvill, 2003; Steg & Vlek, 2009). When considering higher cost behaviours, factors relating to the TPB may be more powerful in explaining the behaviour (Bamberg & Schmidt, 2003). Thus, depending what behaviour is of interest, researchers may want to consider including additional variables that increase the explanatory power of the model; potentially by mediating the values-behaviour relationship.

This study also offers insight into how researchers may go about including some of the factors traditionally associated with other theories alongside a values-based segmentation. Doing so may add some specificity to an otherwise broad model. A values-based segmentation model may transcend specific situations and produce meaningful groups across multiple sustainability and/or behavioural domains (Poortinga & Darnton, 2016). Including factors more proximal to behaviour may help increase the predictive power of the model. As such, combining variables from different theories may expand the generalisability and usefulness of the model. This adds to a growing body of literature that considers models combining variables from multiple theories (e.g. Harland & Wilke, 1999; Klöckner, 2013; Klöckner & Oppedal, 2011; Sopha & Klöckner, 2011). However, ultimately a trade-off may occur between how many factors should be included in a model and the increase in predictive power. A more formal test of the model fit when combining additional variables may be a fruitful avenue for future research. In summary, based on these findings, integrating variables associated with other theories and models appears to be plausible, and may, depending on the behaviour being considered, add increased explanatory power to the model.

6.4.5. Suggestions for Future Research

Future work may wish to consider utilising these additional variables to aid the effectiveness of behaviour change campaigns. For example, communication which promotes reasons to recycle linked with conformity, could be incorporated into behaviour change campaigns for the Self-enhancers group. This would allow researchers to further increase the 'tailored' aspect of campaigns by concentrating on different determinants of behaviours for different groups; potentially increasing the effectiveness of the intervention.

As suggested in this discussion section, more formally testing whether these additional variables mediate the values-behaviour is required. This study shows that values can predict these determinants, but as no behaviour was measured, cannot go on to test whether these variables could be used as mediators in future work. Finally, including a wider range of values, such as those related to *openness to change* may expand the model further, and in doing so, may offer insight into groups that have remained harder to understand (e.g. the Non-engagers).

6.4.6. Conclusion

This study offers support for using determinants of behaviour derived from other theoretical frameworks in combination with a values-based segmentation approach. The findings suggest this is plausible, but it is norm-based determinants that seem best explained by values. The findings also have implications for policy makers, who may wish to focus on the most relevant determinants of behaviour when attempting to shape a group's behaviour. For example, while focussing on normative concerns may be relevant for the Selfless contributors, focussing on reasons relating to conformity may be more effective for other groups. Ultimately, researchers who want to adopt this approach in the future, may have to decide whether they want to employ a broader or more specific model, and also decide which, if any of these additional variables, are most appropriate to be included based on the behaviour(s) they aim to understand.

Chapter 7. Utilising the Segmentation Approach in an Applied Setting: An Intervention to Increase Recycling

Abstract

The studies outlined in the previous chapters have used a values-based segmentation model to *understand* beliefs, intentions and behaviour relating to the environment. However, the use of the model in an applied setting, such as to *shape* behaviour, has not been considered. This study goes some way into exploring this possibility, by considering how an intervention to increase recycling behaviour may be built upon the values-based segmentation approach. For a three-week period, 58 participants were sent messages through a mobile application designed by the author. Using a between-subjects experimental design, half the participants received value-congruent messages based upon which cluster-group they were assigned to, while in the other condition, participants were sent non-matched message. The findings demonstrate that those participants who received value-congruent messages significantly increased their recycling: $t(1,56) = 2.28, p < .05$, and rated the mobile application as significantly more useful: $t(1,56) = 2.71, p < .01$, than those who received the non-tailored messages. This study offers promise that the values-based segmentation approach can be used to shape, as well as understand behaviour. Furthermore, the study demonstrates one method of translating psychological theory into practice. Finally, consequences for policy makers and environmental campaigners are discussed alongside suggestions for future research.

7.1. Utilising the Segmentation Approach in an Applied Setting: An Intervention to Increase Recycling

7.1.1. Background Literature

The study presented in this chapter outlines how the segmentation approach could be utilised when considering applied research such as field studies. Specifically, this study considers how the segmentation approach could be utilised by researchers to increase recycling through tailoring information to be congruent with the group's values. This extends the research covered in previous chapters as it suggests the segmentation approach is not only a tool for *understanding* behaviour, but also can be used as a basis to *shape* behaviour.

Demonstrating one method that links the segmentation approach to a practical intervention to change behaviour is an important step, as there is a need to show how theory can translate into practice (Michie, Johnston, Abraham, Lawton, Parker & Walker, 2005). The following sections discuss behaviour change strategies more generally, before considering how providing value-congruent messages may shape behaviour.

7.1.2. Behaviour Change Strategies

Previous literature in this thesis has considered research focussed on understanding environmental behaviour, however many strategies have also been employed with the aim of *shaping* environmental behaviour. The use of different strategies often comes with differing levels of success, each with their own strengths and weaknesses (Abrahamse, Steg, Vlek & Rothengatter, 2005; Steg & Vlek, 2009). Most of the strategies documented share some common features, for instance it is widely accepted that all strategies need careful planning to maximise their chances of success (Gardner & Stern, 2002). However, there is also great variation in their approaches. For

example, strategies can be categorised into those which are information-based and those which are structural-based (Steg & Vlek, 2009), and further distinguished between those that are antecedent to the behaviour and those which are consequential (Katzev & Johnson, 1987; Lehman & Geller, 2004).

Information based strategies provide people with new knowledge relating to the behaviour such as potential benefits that may arise from them performing the behaviour, or knowledge about the attitudes and behaviours of other people. In contrast, structural strategies may involve physical changes to the environment, such as painting recycling bins to increase visibility. These can also be more complex such as changing the market conditions, for example increasing the price of one behaviour and lowering the cost of another. Antecedent strategies involve interventions that precede the target behaviour, whereas consequence strategies are implemented once the behaviour has occurred (e.g. rewards or punishment).

Hence, four types of strategies can be identified: information-antecedent (e.g. prompts), information-consequential (e.g. feedback), structural-antecedent (e.g. minimising situational barriers such as providing people with a recycling bin) and structural-consequential (e.g. altering the market price based upon consumers behaviour, for example, a green loyalty card; Rowley, 2011). Generally, information approaches are often termed 'soft measures' while structural changes are termed 'hard measures' (Steg & Vlek, 2009). The key difference is that hard measures often involve changes in policies, law, incentives or technology which are then enforced, whereas soft measures are, in general, implemented without any penalty for those who do not follow them.

Both approaches have value: soft measures, usually in the form of information strategies, can be more accessible to smaller organisations that may have limited

budgets. As such, compared to structural changes, they may be quicker and easier to initiate. However, usually this comes at the cost of not being able to reach a wider audience for a sustained period due to a lack of formal support in the form of law or policy changes.

Conversely, hard measures, frequently delivered in the form of structural strategies, are often supported by people in positions of influence and power (e.g. councils and governments). Unlike soft measures, hard measures that involve structural changes can come at a significantly higher cost. Moreover, because they need to gather support, both figuratively and financially from institutions and authorities, hard measures can often take longer to implement. Nonetheless, once they are implemented, hard measures can have a wider and more sustained impact and can usually rely on legislation to ensure people comply with the changes. In recent years, this is perhaps best evidenced by the introduction of the 5p carrier bag charge in the UK. This was delivered in the form of a structural change to market pricing (see Poortinga et al., 2013).

With hard measures often requiring substantial support, information based strategies may be more appropriate for most environmental campaigns and so will be the focus of this chapter. To better understand some of the most widely used behaviour change strategies, the following section reviews seven methods, prevalent within the literature, before discussing the approach that will be taken in this study. These approaches are: feedback, rewards and punishments, commitment, minimising barriers, goal-setting, social norms, and prompts.

7.1.2.1. Feedback. Feedback approaches have found to be relatively successful in terms of shaping environmental behaviour, particularly in energy conservation, where savings of up to 15% have been demonstrated (Ehrhardt-Martinez, 2011). Successful

implementation has also been reported in other settings. For example, Katzev and Mishima (1992) found that posting the weight of paper collected from the previous day above a recycling container increased the level of recycling from approximately 9 lbs per day to around 15 lbs. Another relatively simple intervention was completed by Schultz, Nolan, Cialdini, Goldstein and Griskevicius (2007) who found that using emoticons as feedback to emphasise an injunctive norm relating to the approval or disapproval of a household's energy use (e.g. a smiley face or sad face) increased energy conservation behaviour in a field-experiment involving 290 houses.

However, it is somewhat difficult to assess the impact of feedback in isolation as it is often combined with another strategy, for example feedback has been combined with: goal setting (Needleman & Geller, 1992); providing information (Foxx & Schaeffer, 1981); social norms (e.g., Midden, Meter, Weening, & Zieverink, 1983) and commitment (e.g. McCalley & Midden, 2002; Pallak & Cummings, 1976). Moreover, when comparing the effects of commitment and feedback on recycling amongst college students, De Leon and Fuqua (1995) found only a combined intervention significantly improved performance i.e. feedback alone was not sufficient to change behaviour.

One study that did consider feedback in isolation was completed by Staats, van Leeuwen, and Wit (2000). The authors found both group-level and individual-level feedback to be somewhat succesful regarding persuading people to lower the temperature of their radiator in a large shared office. This success is encouraging because in a review of tools for behaviour change, Timlett and Williams (2008) found feedback to be the most cost-effective solution for increasing recycling rates. The study found feedback to cost around 50p per household to implement compared to £11.40 when using rewards and incentives.

A problem with feedback strategies, however, is that when the feedback stops, the behaviour tends to slip back towards baseline levels (Katzev & Mishima, 1992). This may be because monitoring behaviour can be somewhat superficial, and not driven by internal goals. Consequently, while feedback may help shape one behaviour, it may be less likely to have spillover effects in which the intervention also shapes other behaviours.

7.1.2.2. Rewards and punishments. Extrinsic consequences based upon performance have been shown to be an effective method of increasing pro-environmental behaviour (PEB). Success from these types of interventions has a long history, for instance, Geller, Chaffee and Ingram (1975) and Witmer and Geller (1976) found the reward of free lottery tickets for people who participated in a recycling scheme increased both participation and the weight of recyclables by 80%. However, rewards may 'crowd out' intrinsic motivation and so people may participate in behaviour change to reap the reward rather than because of personal conviction (Steg & Vlek, 2009).

Consequently, rewards may have short-term consequences, as, in a similar vein to feedback, when the reward is removed, behaviour may return to baseline levels. This may be because short-term reward strategies change an individual's behaviour but fail to change their attitude regarding the behaviour (Katzev & Johnson, 1984; Diamond & Loewy, 1991). In this way, rewards can cause the individual to focus on the reward itself rather than the behaviour (e.g. Amabile, Hennessey, & Grossman, 1986; Eisenberger & Armeli, 1997). Thus, the individual's goal may be to gain a reward rather than complete the PEB.

This appears to relate to a wider point regarding the dangers of linking PEB directly to external motivations such as money. To mitigate this danger, other non-financial consequences could be employed such as praise, compliments, privileges and

recognition (Steg & Vlek, 2009). These could potentially increase PEB without engendering individuals to consider financial gain (Heyman & Ariely, 2004). For example, Fisher and Ackerman (1998) found that the promise of *recognition* could increase pro-social behaviour (e.g. volunteering rates).

Using external motives to encourage individuals to engage in PEB may also be effective as cognitive dissonance may arise when individuals start performing a behaviour they do not necessarily believe is worthwhile (e.g. they may just be doing so for the reward; Festinger, 1957). This tension between one's attitudes and one's behaviour can be utilised as it can cause an individual to alter their attitudes to reduce the disparity between their beliefs and actions. For instance, there is evidence that people may attempt to align their attitudes to their behaviour, either through self-perception (Bem, 1972) or dissonance (Aronson, 1999) processes.

This notion is discussed in Self-Determination Theory (SDT; Deci & Ryan, 2008) which focuses on the quality of an individual's motivation to act based upon a continuum ranging from external to internal. The theory suggests that due to an innate psychological need for competence and autonomy, we gradually internalise behaviours and thus the motivation for performing them moves from external to internal on the continuum. Based upon this theory, it may be possible that if external motivations were sustained for long enough, individuals may start to align their attitudes with the behaviour they are performing to fulfil their need for motivational autonomy and to reduce cognitive dissonance. Furthermore, offering incentives to people to perform a behaviour they would not normally consider, provides an opportunity for people to debunk misconceptions they may have held about performing a particular behaviour. For

example, Fujii, Garling & Kitamura (2001) found car users had a better perception of public transport after they had engaged with it for an 8-day period.

However, possibly because of their expense, reward strategies tend not to last long enough to see whether a similar process would occur or whether motivation could in time move from externally to internally regulated. Therefore, debate continues surrounding the effectiveness of rewards and punishments (Eisenberger & Cameron, 1996; Frey & Oberholzer-Gee, 1997) and their value in terms of both financial cost and for facilitating behaviour change (Garling & Schuitema, 2007).

7.1.2.3. Minimising barriers. Minimising barriers can be both a structural change, (e.g. making recycling facilities more readily available), or an informational change (e.g. changing someone's perceptions of the barriers relating to a behaviour). Some of the earliest experiments to consider this involved changing the location or amount of facilities to create a behaviour change. For instance, Humphrey, Bord, Hammond, and Mann (1977) found individual, rather than communal recycling bins, increased uptake in recycling by 9% in an office environment. Others found that increasing the amount of recycling bins in a park increased rates by as much as 47% (Luyben & Bailey, 1979).

While this strategy seems an effective and reasoned approach, it can be challenging to implement as different people are likely to be prevented from performing an action by different barriers (Gardner & Stern, 2002). This withstanding, generally any attempts to make a behaviour easier and more convenient are thought to have a positive impact, while any increase in perceived difficulty is thought to negatively influence behaviour (Cheung et al, 1999; Werner et al, 1995).

One of the most common ways to minimise barriers to PEB appears to be to increase how convenient performing the behaviour is. This has been shown to influence

recycling of newspapers (Boldero, 1995); textiles (Domina & Koch, 2002), and more general curb-side collection waste (Oskamp, Zelezny, Schultz, Hurin & Burkhardt, 1996). Within the waste management domain, Robertson and Walkington (2009) found that the presence of recycling boxes was an important determinant of recycling behaviour amongst 1,664 Oxford University students. Similarly, another study, again in an institutional environment, found that memos that explained to employees what could be recycled, alongside structural changes, such as providing a desktop recycling container, increased recycling rates (Brothers, Krantz & McClannahan, 1994).

Along these lines, in recent years, 'nudge' strategies have built upon the foundations of minimising barriers through modifying 'choice architecture' (Thaler & Sunstein, 2008). The aim of nudge strategies is to ensure the desirable option (e.g. the environmental behaviour) is the easiest and most attractive option for the individual to choose. The changes that are made are sometimes not explicit, and so the individual is often not aware of the modification. This approach, termed 'liberal paternalism' (Thaler & Sunstein, 2008), respects the need to change behaviour, while allowing individuals a choice, hence people can be 'nudged' but not forced. In recent years, this approach has been adopted by policy makers from the UK and US governments (Dolan, Hallsworth, Halpern, King, & Vlaev, 2010).

While a number of studies have demonstrated minimising barriers to be an effective method of creating a behaviour change (Jacobs, Bailey & Crews, 1984; Judge & Becker, 1993), much like the behaviour change strategies discussed previously, there is some concern that these dramatic changes in behaviour cannot be sustained. Even some of the earliest studies such as Humphrey et al. (1977) and Luyben and Bailey (1979) warned of a stark drop towards baseline rates some weeks and months after the initial

intervention. Also, while minimising physical barriers may be somewhat effective, without financial support and legislative powers to make changes to environments, this strategy may be somewhat limited.

7.1.2.4. Commitment. Commitment strategies are a popular method of securing a promise or pledge from a person to perform a certain behaviour (Lokhorst, Werner, Staats, van Dijk, & Gale, 2013). Studies considering commitment as a method of changing behaviour have shown it to be successful when considering transport choice (e.g. Matthies, Klöckner & Preißner, 2006) or recycling (e.g. Werner et al., 1995).

A meta-analysis of 19 studies by Lokhorst, Werner, Staats, van Dijk and Gale (2013) found that commitment alone, or in combination with another behaviour change strategy (e.g. feedback), produced a positive behaviour change significantly more than in control groups. As certain projects may not have been published due to non-significant findings, they also calculated how many papers would have to be found that demonstrated no effect for their findings to be reversed. They calculated that 124 'null' articles would be needed to counter the evidence they had for the effectiveness of commitment strategies. Moreover, when only considering articles that ran follow-up tests after the commitment period has stopped, an effect, albeit more modest, was still found compared to the control groups. However, the findings were a little less clear when comparing commitment to other strategies, as opposed to just a control group. In this case, only commitment strategies used alongside another strategy were more effective than other strategies alone. But this finding was based on a very small sample of only five studies that met the criteria.

In summary, while effective compared to control groups, there is some uncertainty as to how commitment compares to other strategies to promote PEB,

especially if commitment approaches are conducted as an intervention in isolation.

Moreover, commitment strategies may have to run for a relatively long time to ensure participants maintain a behaviour long enough for it to result in their attitudes and habits changing, and these strategies may be resource-intensive, because convincing individuals to commit to a behaviour may require building trust (Werner et al., 1995).

7.1.2.5. Goal setting. Self-set goals have been shown to increase task performance and can act as a motivational factor to induce behaviour change (Stadtlander & Coyne, 1990). Such goal-setting strategies have been tested experimentally, in the form of simple cognitive memory tests (West, Dark-Freudeman, & Bagwell, 2009) and also in real-life applied settings (Locke & Latham, 2002). Within the environmental psychology domain, both McCaul and Kopp (1982) and Hamad, Cooper and Semb (1977) concluded that goal setting increased recycling rates. However, this was only tested at the end of the intervention period and did not include follow-up checks to assess the longevity of these increases. Furthermore, both the above studies concentrated on special populations (i.e. college and schools) and so the generalisability of the findings is somewhat unknown.

In terms of what goals to set, challenging goals are thought to elicit better performance than easily acquired goals (West, Thorn, & Bagwell, 2003), although surpassing an individual's skill level by setting too ambitious goals may have negative consequences on task performance (West & Thorn, 2001; West, Welch & Thorn, 2001). Thus, framing environmental goals can be troublesome as sometimes, due to the global scale of the problem, individuals may have low self-efficacy relating to PEB, and thus feel the goal set is beyond their control or powers.

Klockner (2013) highlights the importance of creating a feeling of self-efficacy, especially when using goal driven interventions. McCalley and Midden (2002) found that

using a combination of an ambitious goal alongside feedback was effective in reducing people's energy use relating to using washing machines, but neither strategy in isolation was successful. The researchers also noted that those individuals who were more self-oriented, responded better to a self-set goal as opposed to an externally set goal. For individuals who were more pro-socially oriented, the opposite result was found.

7.1.2.6. Social norms. Social norms have been used to promote environmental behaviour in many settings. For example, research has documented how after being told their neighbours had reduced their energy use, other households went on to use less energy themselves (Schultz, Nolan, Cialdini, Goldstein & Griskevicius, 2007; Nolan, Schultz, Cialdini, Griskevicius & Goldstein, 2008). Similarly, in a hotel setting, emphasising descriptive norms by replacing signs that said "please help us save the environment and reuse your towels" with signs that said "the majority of guests reuse their towels", increased the reuse rate by 10% (Goldstein et al., 2008).

However, social norms may become less persuasive when people hold strong personal norms regarding a behaviour. For example, a person who already feels passionately that they have a moral duty to recycle, is less likely to be influenced by information about how other people act (Gockeritz, Schultz, Rendon, Cialdini, Goldstein, & Griskevicius, 2010). This may be because, according to the norm-activation-model, social norms have to be internalised as personal norms before they are acted upon. Thus, if personal norms and social norms are not congruent, it is unlikely the individual will internalise the social norm.

Consequently, when considering social norms as a behaviour change strategy it is first important to understand how the individual relates to the 'group' you are promoting as the 'norm'. For example, Nigbur, Lyons and Uzzell (2010) found that social norms only

influenced personal norms when the individual identified strongly with the group. In other words, individuals may only internalise a norm if they believe people 'like them' are also performing the behaviour. A difficulty with this approach is if people believe others performing the environmental behaviour are very different to them (e.g. they do not share the same values), they are less likely to accept this norm.

Consequently, considering variables such as personal values may be a more effective strategy when considering behaviour change. This is because, despite a high risk of failure because the path from values to behaviour is indirect, they are relatively stable compared to other variables and so have the potential to last a long time (Klockner, 2013). This notion will be discussed later in this chapter, when the behaviour change intervention is described.

Using social norms as the basis of an intervention may therefore be challenging on two counts: First, if people do not identify with the group performing the norm, they may not wish to align their behaviour with them, and second, other norms may influence other behaviours (e.g. cross-norm effects; Keizer, Lindenberg & Steg, 2008). The implication of this is that it would not be enough for a social norm regarding recycling to exist, if other environmental norms are broken (e.g. taps are left running, lights are left on).

Furthermore, campaigns that use social norms have got to guard against adverse effects by drawing attention to a behaviour. For instance, if individuals are given the average performance for a group regarding a behaviour and realise they are performing better than other group members, they may start to behave less environmentally friendly as they believe others are not putting in enough effort (Cialdini, Demaine, Sagarin,

Barrett, Rhoads, & Winter, 2006). Consequently, caution must be exercised when using social norms in environmental settings.

7.1.2.7. Prompts. These interventions can take the form of either written or verbal communication given to individuals or to groups to encourage a behaviour. The communication could be factual, persuasive, serve as a reminder, or be a mix of the three approaches. For example, Geller, Farris and Post (1973) prompted the purchase of returnable soft drink containers by distributing leaflets to customers. The prompts were significantly better than the no-prompt condition in ensuring returns of the containers, with 25% extra returnable purchases made. However, this figure dropped back to baseline after prompting was withdrawn.

Austin, Hatfield, Grindle and Bailey (1993) further highlighted the precarious nature of prompts, as they found the position of prompts impacts significantly on their effectiveness. In their study of paper recycling, they found a prompt above the bin elicited a 50% increase in recycling, but in a different condition where the sign was 4 metres away from the bin, only a 17% increase was noted. Klockner (2015) suggests that prompts may be an effective intervention strategy in cases where people already have positive attitudes towards the behaviour. Yet, the strategy may be less effective if individuals have indifferent or negative attitudes towards the behaviour as prompts are unlikely to activate new cognitions in a decisional situation, but rather just support existing beliefs.

Knowledge-based prompt interventions often include information provision: an approach rooted in the knowledge-deficit model (Schultz, 2002). However, research suggests information alone may not be very effective (Schultz, 1998). For example, Staats, Wit and Midden (1996) found participants demonstrated an increase in knowledge about global warming, but no behaviour changes occurred. A more effective method of creating

a behaviour change, which will be discussed in the current study, may be through *tailored messages* (Abrahamse, Steg, Vlek & Rothengatter, 2007). This information is designed to reach certain individuals, or clusters of individuals, who share certain characteristics (Kreuter, Farrell, Olevitch & Brennan, 1999).

7.1.3. Summary of Behaviour Change Strategies

While many different strategies exist, each carry strengths and weaknesses and many require logistical and financial support to enact meaningful change (Brown, Werner, & Kim, 2003; Werner, 2003). However, the need to carefully consider the individuals being targeted appears to be a crucial factor in designing an intervention, particularly as individual differences have been suggested as a possible cause for the failure of interventions (Klockner, 2013). A possible solution may be to identify and treat diverse sub-groups differently (Schultz et al., 1995); as such the segmentation approach outlined in previous chapters seems to be a suitable tool on which to base an intervention.

As the literature suggests that external motivations such as feedback, incentives, prompts and punishments may only work for a limited time, internal motivation stemming from an individual's values appear to be more appropriate for creating a sustainable behaviour change. Moreover, the limited success of interventions built upon the notion of providing general information could be because they do not recognise individual differences when promoting a behaviour (Corner & Randall, 2011; Darnton, 2008; McKenzie-Mohr, 2000). To this end, providing information about a behaviour but tailoring the information to be congruent with the values an individual endorses seems a suitable strategy on which to implement a behaviour change campaign. The following sections discusses literature relating to this aim.

7.1.4. Value-Congruent Tailoring

Considering how best to ensure messages are acted upon by individuals has been the basis for research in many fields including marketing, business and psychology amongst others (Cheng, Woon & Lynes, 2011). Research into value-congruence has focused on message framing (Bolderdijk et al., 2013; Gromet et al., 2013; Johnson & Eagly, 1989; Jost et al., 2009; Kidwell et al., 2013; Schwartz, 1994). For example, messages that appear to be congruent with an individual's values may be implicitly preferred to those that are not (e.g. van den Broek, Bolderdijk & Steg, 2017). This may be because tailored messages possess greater self-relevance to recipients (Dijkstra, 2008). Consequently, tailored messages may cause the individual to elaborate on the message for longer, and ultimately increase persuasion (Nelson & Garst, 2005; Updegraff, Sherman, Luyster, & Mann, 2007).

Tailoring appears to be particularly relevant within the environmental domain as research has suggested that individuals may engage in pro-environmental behaviour for a variety of reasons (e.g. Goal framing theory, Lindenberg & Steg, 2006). For example, scholars surmise many non-environmental motives such as frugality and luxury may result in environmentally friendly behaviour (De Young, 2000; Unsworth et al., 2013). Consequently, framing communication may be vital in ensuring individuals act upon the message. One way to ensure an environmental campaign is effective may be to discover the goals that are held by an individual and to ensure any messages sent to the individual relate to those goals. As values can be conceptualised as high-order goals, this approach may be particularly fruitful when value-congruent messages are employed.

Value-congruence may also be important as if an individual is already inclined to frame a behaviour in terms of a particular goal, relating the behaviour to another goal that is not relevant to them is unlikely to encourage them to engage in the behaviour

(Unsworth et al., 2013). Thus, highlighting how a behaviour may help an individual achieve their goals (e.g. in the case of this study, their values) may help engage people with environmental behaviours who otherwise would fail to be swayed by traditional normative-based campaigns. For instance, if gain goals are more likely to be focal for an individual because they strongly endorse egoistic values, attempting to frame communication relating to environmental behaviour in terms of normative goals may be ineffective. This may mean multiple interventions are required for different groups of people.

Highlighting how a behaviour is consistent with an individual's values can increase the behaviour's self-concordance. Self-concordance is the "motivational propensity that derives from the degree to which a particular behaviour is connected to the rest of the person's goal hierarchy" (Unsworth & McNeill, 2017, p6.). Self-concordance may further help promote the behaviour as it will highlight how performing the behaviour will help the individual achieve their personal value goals. This may help to internally motivate an individual to complete the behaviour, thus also limiting the chances of an individual perceiving the change to be enforced.

Self-determination theory posits this is important as even a slight perception of external control can have negative repercussions on behaviour (Deci & Ryan, 2008). In severe cases, it may result in an individual rebelling against the suggestions and performing worse than before. Moreover, internal motivation such as performing a behaviour because it is consistent with your values may lead to greater likelihood of an individual maintaining the behaviour over time (Pelletier & Sharp, 2007), and going on to try and perform more difficult behaviours (Green-Demers, Pelletier, & Ménard, 1997; Séguin, Pelletier, & Hunsley, 1998).

7.1.5. Segmentation as a Tool to Shape Behaviour

This study will attempt to apply the segmentation approach that has been used throughout this body of research, to *increase* recycling behaviour. Social marketing and more specifically segmentation approaches have been previously employed in studies considering how best to ensure a message is persuasive enough to result in a behaviour change (Edwards & Cable, 2009). Segmentation at a group level may be preferable to mass-media approaches attempting behaviour change (Klockner, 2015). This is because campaigns designed to appeal to the ‘statistical everyman’ are not likely to be viewed favourably by certain sub-groups of the population (Darnton, 2008).

Segmentation approaches may also be preferable to campaigns that focus upon behaviour change at the individual level, as while these may be successful (e.g. [Australian] Department for Transport, Energy and Infrastructure, 2009), they can involve high resource costs due to the personalised nature of the tailoring. Thus, using segmentation as the basis of a behaviour change ensures that attention is paid to the ‘people’ aspect of the campaigns at a group level (Tabanico & Schultz, 2007), but the costs are likely to be more feasible than attempting personalised communication. Therefore, this study will tailor messages at the group level based upon the segmentation group each individual is assigned to. In order to send the messages to participants, the current study utilises modern communication methods in the form a mobile application (an app) created by the author.

7.1.6. Mobile Apps and Behaviour Change

Incorporating more modern methods of communication into behaviour change research may be particularly useful to ensure engagement, especially because participants in this study are students. Although the use of mobile smartphone apps to encourage behaviour change is still relatively new, a glut of mobile applications doing exactly this have recently been released. This is perhaps unsurprising given how many people own a smartphone (estimated at 2.32 billion; Statistica, 2017),

Health behaviours appear to be popular subject of interest, with recent publications reviewing apps designed to change behaviour relating to smoking cessation (Abroms, Westmaas, Bontemps-Jones, Ramani, & Mellerson, 2013), nutrition and diet (Direito, Dale, Shields, Dobson, Whittaker, & Maddison, 2014) and increasing physical activity (Conroy, Yang, & Maher, 2014). Far fewer smartphone applications concentrate on environmental outcomes, however those that do demonstrate the wide range of behaviours that are being targeted. For example, O'Rourke and Ringer (2016) consider the impact of using the mobile app 'goodguide' when shopping. Goodguide informs the user of the 'green' credentials of a product if they scan its barcode, allowing users to seek out the most sustainable products. Other apps relating to the environment include 'greenMeter' which displays to the user how fuel-efficient their driving is and 'lightbulbfinder' which allows users to compare saving to be made from switching to energy efficient lightbulbs.

In terms of recycling, which is particularly relevant to this study, 'irecycle' provides users information about recycling facilities nearby. Other recycling charities and companies also have apps but their use is of a more practical nature. For example, the main features of the 'KeepBritainTidy' app allow you to report graffiti or fly-tipping. Consequently, while some apps such as 'goodguide' allow you to filter their suggestions

by what is most important to the user, to the author's knowledge, no environmental smartphone app provides tailored messages to the user based upon their values. The current study aims to enhance this literature by attempting tailored communications based upon the values associated with the segmentation groups.

7.1.7. The Current Study

Over a three-week period, a modest sample of 58 students will be used to test whether receiving value-congruent information will result in a greater increase in recycling behaviour than receiving non-tailored information. Participants in the study will be split into two groups: one group will receive messages tailored to be congruent with the values of the cluster group they have been assigned to (e.g. the Self-enhancers will receive information relating to egoistic and hedonic concerns), while in the other condition, participants will receive messages that have not been tailored to the cluster group they belong to. For example, in this condition, if an individual is classified as a self-enhancer, they may receive communication that relates to biospheric and altruistic concerns, rather than value-congruent egoistic concerns

The intervention itself was provided in the form of messages sent through a mobile application. One informative message was sent five days a week for three weeks. The information for the intervention was sourced from Guides Network (2017). The messages were factual in their nature, but for each of the groups, the fact was framed in a manner to emphasise how it could impact on concerns relating to the values they endorsed. In the tailored condition, the Non-engagers were sent only the basic message as they had not shown any affinity to any of the values in question; the Selfless contributors were sent messages highlighting biospheric and altruistic motivations; the Self-enhancers were sent messages relating to egoistic and hedonic motivations, and the

Value opportunists were sent double-framed messages (e.g. ones that relate to egoistic-hedonic concerns and biospheric-altruistic concerns). The other half of the participants, in the non-tailored condition, were assigned to one of the *other* three groups that did not represent the group they were matched with. This was assigned randomly as receiving a random intervention mimics mass media environmental campaigns that provide information and motives without having awareness of any of the specific characteristics of the individual.

Individuals were assigned to one of the four cluster groups using a discriminant analysis. Discriminant analysis was used because the sample of 58 people may be too small to be classified by a cluster analysis. Discriminant analysis can categorise people into groups based upon patterns in the data, however the researcher must specify how many groups there are, meaning this approach requires some prior knowledge of how many groups 'exist'. As the previous research in this thesis has consistently identified four groups, the discriminant analysis was instructed to categorise the participants into one of the four groups.

To test how accurate the discriminant analysis was, the data for this study was added to a dataset previously collected (Chapter three UK sample). The output from the discriminant analysis indicates how accurately the participants have been matched to the cluster group they were previously assigned. Thus, if the participants from chapter three are classified correctly by the discriminant analysis, this indicates with confidence that the participants for the current study will have been classified in the appropriate group (Follows & Jobber, 2000). As four groups are being classified, a chance accuracy rate would be 25%. However, previous discriminant analyses have found rates between 72%

(Poortinga & Darnton, 2016) and 78.2% (Laroche, Bergeron & Barbaro-Forleo, 2001) to be satisfactory.

Once classified, participants will download the app, which was created and designed by the author. It was named 'THINKGREEN' and was published in modes compatible with IOS and Android phones. The app itself was deliberately simplistic and easy to navigate, only having three screens: A home page that displayed the name and logo of the app; an 'about' page which explained that the app would be updated with a new message every week day and provided contact details of the researcher, and finally, the 'messages' page. This is where the messages were displayed.

The following paragraphs outline how the messages were constructed. First a fact was taken from Guides Network (2017). Each day, one of these was sent to the all individuals within a group. For example, the Non-engagers were sent: 'Did you know... Plastic can take up to 500 years to decompose? Recycling plastic will reduce the amount going to landfill.' The Selfless contributors were sent the same fact, but their message also emphasised how this impacts upon biospheric-altruistic concerns, for example: 'Helping to reduce the amount of waste going to landfill may potentially limit some health risks for people living close to landfill. So, by recycling, you are indirectly benefitting another community and potentially helping someone have a better quality of life'. Similarly, the Self-enhancers received the same message sent to the Non-engagers but also received information relating to how this impacts upon egoistic-hedonic concerns: 'Recycling plastics can reduce the need for new raw materials to be extracted from the earth. This can reduce the cost of making some products. So, by recycling you may be saving yourself money on future purchases'. Finally, the Value opportunists received all three of these components together.

To clarify with another example, the Non-engagers received a basic fact: 'Up to 60% of the rubbish that ends up in the general waste bin could be recycled. Try to increase your recycling by separating out the items that could be put in your recycling bin'. The Selfless contributors received this *and* how this relates to *biospheric-altruistic* concerns: 'Recycling can reduce the amount of raw materials needed to produce many products. Therefore, recycling can slow processes such as deforestation which can lead to habitat destruction and global warming. By recycling you are ultimately benefitting nature, animals and the planet'. The Self-enhancers received the basic fact *and* a how this related to *egoistic-hedonic* concerns: 'Increasing recycling and consequently reducing waste can save local authorities money in disposal costs. This money is ultimately passed on to you the savings can be spent by the local authority on increasing amenities, facilities and resources for you to use in your area'. Finally, the Value opportunists received all three components (e.g. the fact *and* biospheric-altruistic motivations *and* egoistic-hedonic motivations; further examples can be found in Appendix U).

The app had different 'channels' (not visible to the participants), and participants were allocated to the 'channel' appropriate to the condition they were assigned to. This allowed the author to send the appropriate message to the various groups. As the participants' values were pre-determined and could not be manipulated, the author had no control over how many individuals would be assigned to each of the four segmentation groups. Due to the disproportionate way in which the participants were allocated to the segmentation groups, it was not possible to analyse the effect of the interaction between cluster group membership (e.g. being a non-engager) and receiving tailored information. This fine-grain analysis would require far more participants in each of the groups.

For example, only 14% of the sample from a previous study in this thesis were Non-engagers. If this percentage is representative of the population, then to obtain 30 Non-engagers in each of the tailored and non-tailored conditions, a total sample of 429 participants would be required. Achieving this sample would be far beyond the means and scope of this research project, especially considering the level of commitment required from participants (and the researcher) to complete this study. Consequently, only a main effect of value-congruent tailoring will be considered. This will be assessed by comparing the before-and-after scores of a self-reported measure of recycling behaviour, and comparing the tailored versus non-tailored groups on how useful participants found the app.

To ensure any differences between the groups were not due to lack of engagement in one condition, two forms of engagement checks were carried out. First, during the three-week period on four days (the 3rd, 7th, 11th and 14th days of the intervention) participants were asked to answer a non-related question (e.g. is it sunny where you are today?). This was not part of the study apart from to test how many individuals were checking the app. A second measure was more explicit: an item at the end of the intervention asked participants about their use of the app during the intervention period.

7.1.8. Summary and Hypotheses

This study provides a novel perspective into the transition from theory to practice of using a values-based segmentation approach to shape behaviour using a mobile communication. This is an important step in showing how the research conducted previously could be applied, and what the implications of doing so may be for environmental campaigners and policy makers. So far, this chapter has assessed

behaviour change strategies, outlined the advantages of using segmentation approaches in applying value-congruent tailoring, and discussed existing mobile applications that consider environmental behaviours. Overall, it is expected that this study can contribute to literature on how value-congruent tailoring may be an effective behaviour change strategy, and the findings may inform environmental campaigners in how they may encourage recycling. The review of previous literature leads to the following hypotheses:

H₁: Individuals who receive value-congruent information will increase their recycling behaviour more than those who receive non-tailored communication.

H₂: Individuals who receive value-congruent information will find the mobile application more useful than those who receive the non-tailored communication.

7.2. Method

7.2.1. Participants

Participants for this study were all psychology students who received course credit for taking part in the experiment. In total, 58 students participated. The mean age was 19.84 years ($SD=3.93$). A large majority of the participants were female ($n=49$; 84.5%).

7.2.2. Design

An experimental design was employed with two between-subject conditions. In one condition participants received information congruent with the values they endorsed, while in the second condition participants were randomly allocated to receive information that was not purposely designed to be congruent with the values they endorsed. The dependant variables used to assess the effectiveness of the intervention were 'change in recycling behaviour' which was calculated from the self-reported recycling scores taken before and after receiving the intervention and 'usefulness of the app' which was reported by all participants at the end of the intervention.

7.2.3. Materials

Although the questionnaire was completed online, for reference a hard copy can be found in Appendix V.

7.2.3.1. Values. Values were assessed by same the scale as outlined in chapter three.

7.2.3.2. Recycling. Recycling was assessed by the same scale as outlined in chapter three before and after the intervention.

7.2.3.3. Usefulness of the app. This was assessed by one-item presented at the end of the intervention which asked participants to rate ‘how useful did you find the app?’ on a scale from 1 (not useful at all) to 5 (extremely useful).

7.2.3.4. Engagement checks. An item at the end of the intervention period asked participants to rate ‘how often did you use the app?’ this ran from 1 (not at all) to 5 (very frequently).

7.2.4. Participants

After signing up for the study, participants received a link to complete the values scale through the online system ‘Smartsurvey’ and asked about their recycling behaviour. After completing this questionnaire, participants were sent instructions as to how to download the app. The intervention period started after all participants had downloaded the app. For some this meant the intervention period did not start until approximately three weeks after they downloaded the app. The intervention ran from February 8th until February 26th 2016. This did not coincide with any exams or major holidays for the students who had taken part. The messages were sent between 9am and 4pm Monday to

Friday, but no regular time was set to minimise the likelihood of a participant always being pre-occupied when the message was sent (e.g. always in a lecture at 11am, or always in the shower at 9am).

Furthermore, the author believed not having a set time may stop participants second guessing when a message was from the THINKGREEN app. Participants were encouraged to allow 'push notifications' from the app but the author had no way of guaranteeing whether all participants allowed this. A push notification is where a message that is sent displays on the phones screen when the phone is locked. This is thought to increase interaction with the messages as the message is accessible in one click as opposed to having to enter through the application.

Participants were instructed that the app would sent them messages every day and that they should read and where necessary (for the engagement checks) engage with the messages. After three weeks, a second survey was sent through the app which required participants to complete the scales relating to their recycling behaviour, how useful they found the app and how frequency they used the app. The participants were not made aware that different versions of the app were available. The study was approved by Keele University Ethics Committee (Appendix W) and standard BPS requirements were followed including providing an information sheet, consent form and debrief (Appendix X).

7.3. Results

7.3.1. Data Preparation

The participants' ratings of the values scales were used to categorise the participants as either a Non-engager, Self-enhancer, Selfless contributor or a Value-opportunist. This process was completed by adding the participant's data to an existing

data set, and running a discriminant analysis. Cases from the existing dataset were classified with 94.6% accuracy, suggesting the discriminant analysis was highly accurate in predicting cluster group membership. For the current dataset, participants were placed in to groups with a high degree of certainty (above 90%).

The engagement check measures were assessed to better understand if any participants needed to be removed from the analysis due to lack of engagement. All participants responded to a minimum of three of the four checks, with 64% ($n=37$) responding to all four and no significant differences were found between the two conditions regarding self-reported use of the app: $t(1,56) = .08, p > .05$.

7.3.2. Data Analysis

Descriptive statistics were considered to better understand how the tailored and non-tailored conditions performed regarding recycling and how they rated the app.

Figure 7.1 shows how the tailored and non-tailored groups' recycling scores altered from pre- to post- intervention. It appears the tailored condition increased their recycling more than the non-tailored condition, but the variance for this condition was also greater.

Figure 7.2 shows how useful the tailored and non-tailored conditions found the app. It seems to suggest that the group that received the value-congruent messages also found the app more useful.

To formally assess these measures, two t-tests were employed. The first found a significant effect of tailoring $t(1,56) = 2.28, p < .05$. This indicated that those who received the tailored information ($M=.78, SD=1.07$) increased their recycling significantly more than those who did not receive a tailored intervention ($M=.25, SD=.61$). The second t-test found a significant difference in terms of how the groups viewed the usefulness of the app $t(1,56) = 2.71, p < .01$. It was found those who received the tailored intervention

($M=3.57$, $SD=.97$) perceived the app as more useful than those who did not receive the tailored intervention ($M=2.89$, $SD=.92$). Together these findings offer support for both hypotheses one and two.

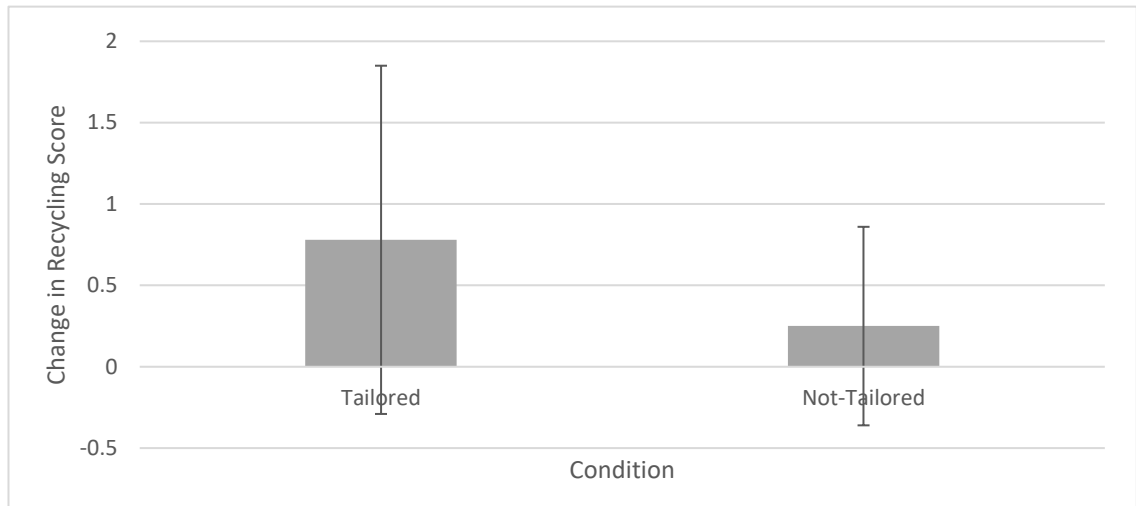


Figure 7.1. *The change in recycling behaviour reported by participants in the tailored and non-tailored conditions.*

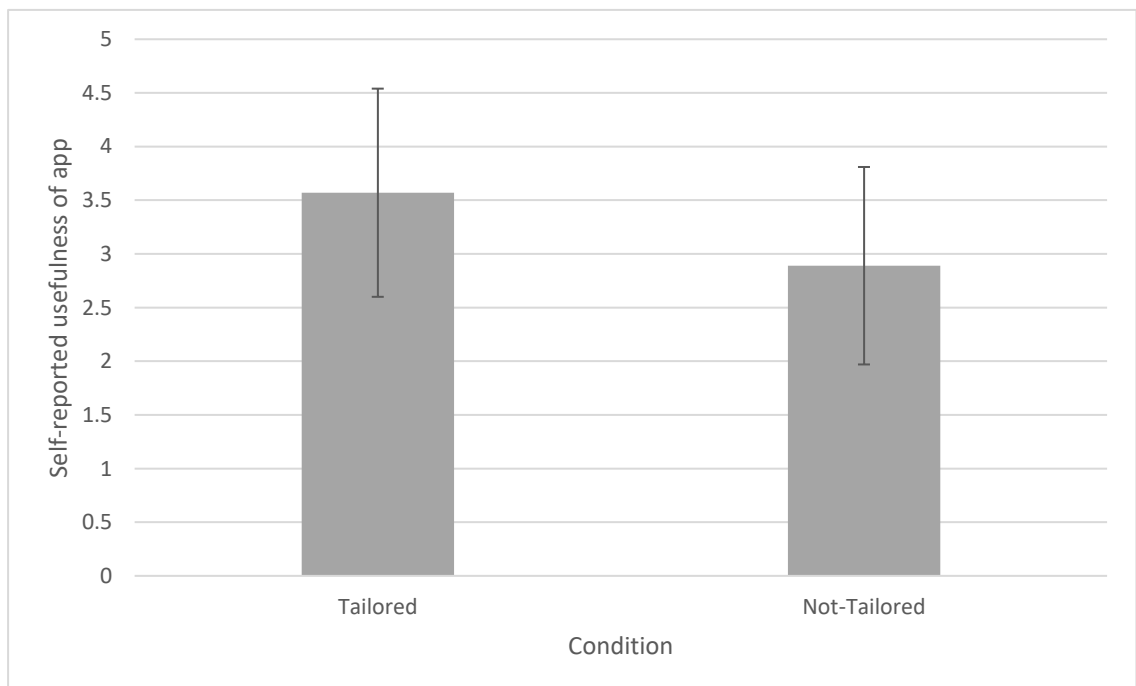


Figure 7.2. *Self-reported usefulness of the app from participants in the tailored and not-tailored conditions.*

7.4. Discussion

7.4.1. Summary of Findings

The findings suggest that receiving value-congruent information can increase recycling behaviour more than when receiving non-targeted information. Moreover, those who received the tailored communication perceived the app as more useful than those who did not receive the tailored information. These findings support both the hypotheses. However, it does appear that the variation of the effectiveness of a tailored intervention is greater than a non-tailored intervention. Considering the interaction between the effectiveness of the tailoring and cluster group membership, which was not possible in this study, may provide further insight into why the variation may be larger in this condition.

7.4.2. Is Value-Congruent Tailoring through a Mobile Application Effective?

These findings are consistent with previous literature which has found value-congruent information to be preferable to value-incongruent information (van den Broek, Bolderdijk, & Steg, 2017; Gromet et al., 2013; Johnson & Eagly, 1989; Jost et al., 2009; Kidwell et al., 2013; Schwartz, 1994). However, this study provides a nuanced difference as the comparison was not between value-congruent and value-incongruent but value-congruent and randomised. This meant that participants in the control group did not necessarily receive a value-incongruent message. This is more representative of real-life environmental campaigns, in which the campaigners simply would not know about the characteristics of the individuals who were receiving the message.

This design meant that in the non-tailored condition, an individual categorised as a self-enhancer (i.e. someone who highly regards egoistic and hedonic values), may not

necessarily have received the intervention that was *incongruent* with their values (i.e. an intervention that focussed on biospheric and altruistic values). Instead they may have received a message that was not tailored to relate to any of the values (value-neutral), or interestingly, a message that was tailored to relate to all four values (value-combined).

If they had received the latter type of message (value-combined), half of the content would have still been congruent with their values (messages relating to egoistic-hedonic concerns), but half of the message would have been incongruent (relating to biospheric-altruistic concerns). Consequently, to see a significant difference between the two conditions is arguably more meaningful than seeing a difference between only congruent versus incongruent information as shown in previous work (e.g. van den Broek et al, 2017).

The findings also fit more broadly with literature that has suggested tailoring to be an effective form of shaping behaviour (Abrahamse et al., 2005; Daamen et al., 2001; Kidwell, Farmer & Hardesty, 2013). More specifically, the study seems consistent with literature that has suggested that promoting a behaviour to be congruent with an individual's goals (in this case their values) may increase the self-concordance of the behaviour and thus increase an individual's engagement with that behaviour (e.g. Unsworth & McNeill, 2017). However, it should be noted that increasing self-concordance was not explicitly measured, so it is only the author's interpretation that this may be the mechanism by which the behaviour change occurred. Future research may want to more formally assess this.

Finally, the findings also contribute to a growing base of literature that has considered mobile applications for use in behaviour shaping campaigns (e.g. Direito et al., 2014; O'Rourke & Ringer, 2016). The use of a mobile app may aid engagement with a

younger audience more than traditional forms of communication. However, as experienced by the author of this study, setting up an app can take considerable planning and time, and may be too resource intensive, especially for lower-budget resource projects. One possible solution that the author feels may be more appropriate in future research would be to attempt to integrate messages into an already existing app. The added advantage of this is that the app may serve an additional purpose than 'just' being an environmental app, which may increase its initial popularity with users.

Overall, it appears that value-congruent tailoring through a mobile application is an effective method of shaping behaviour, and more than this, using a values-based segmentation approach as the basis on which to apply the tailoring appears to lead to an increase in environmental behaviour. This suggests that the values-based segmentation may be useful for not only understanding behaviour but also as a basis to shape behaviour.

7.4.3. Limitations and Future Research Suggestions

Given the demand of this study on the participants (multiple questionnaires, downloading the app, engaging with the app daily for five-days-a-week for three-weeks, responding to engagement checks), the author notes the engagement was impressive, with all participants completing at least three of the four engagement checks. For context, for their participation, students could only receive a maximum of one-hour of course credit, which the author estimates to be significantly less time than completing all these activities entailed.

This engagement rate is particularly impressive if one considers that, given the applied nature of the study, the intervention may have had to cut through an unknown number of events that participants may have encountered during the three-week period

(e.g. family emergency, job interviews, relationship issues). The author argues that this lack of control provides a truer evaluation of the intervention, and is more in keeping with how most environmental campaigns would have to run. However, of course this may have added greater variance to the data.

Given the requirements the study placed on the participants, attracting enough participants to be able to compare the interaction between the cluster-groups and the intervention-type (estimated to be 429) would take significant ingenuity. Potentially, payment may attract more participants, but crucially, a method of recruitment would be required that does not make the external rewards of participating the primary focus of the research. There would perhaps need to be a check to ensure that the engagement and behaviour change occurred as a result of the value-congruent information, and not from the offer of a reward for completing the study.

However, achieving a sample size large enough to consider whether value-congruent messages have a larger effect on certain groups of people would be of real interest. Especially given that the analysis of the posters in chapter 5 found significant differences between the groups in how appealing and how motivating they found other forms of communication. Another consequence of sample size of this study was that it is not possible to pass further comment on whether double-framing (e.g. interventions that contain messages relating to both biospheric/altruistic concerns and egoistic/hedonic concerns) can be detrimental to pro-environmental behaviour as put forward by Deci and Ryan (2008) and Evans, Maio, Corner, Hodgetts, Ahmed and Hahn (2013).

Future research may want to consider providing even more tailored information. For example, chapter six found certain determinants of behaviour seem to influence some groups more than others, so in conjunction with providing value-congruent

information, messages relating to these determinants could also be utilised. For example, the Self-enhancers could receive value-congruent information that also promoted reasons for engaging in the behaviour relating to conformity, whereas moral obligations to perform the behaviour could be highlighted for the Selfless contributors.

Further tailoring could also consider how the groups performed on the socio-demographic variables measured in chapter three. For example, Selfless contributors appear to hold more left-wing beliefs than the other groups and this group comprised a disproportionately high number of females. Utilising this information, alongside the values they endorse, could allow campaigners to further tailor the campaigns to the groups (e.g. through gender-oriented messages). Finally, as the groups seem to be at different stages in their behaviour, tailoring to the stages of change may also be useful (Prochaska & DiClemente, 1986). For example, while the Selfless contributors may need messages encouraging them to *maintain* their behaviour (e.g. recycling), Self-enhancers may need encouragement to *begin* the behaviour, while Non-engagers may need messages that encourage them to *start contemplating* the behaviour. Future research exploring tailoring may wish to use the values-based segmentation model as a basis on which to explore these suggestions.

7.4.4. Conclusion

As the last empirical chapter of this thesis, this study provides evidence of how the values-based segmentation approach outlined in the previous chapters can be used in an applied setting; offering a first attempt at transitioning from theory to practice. While some limitations with the study exist, the work offers a template for how future research could utilise the segmentation approach to shape behaviour. The significant effect of value-congruency on both behaviour and on how useful participants found the mobile

application suggests that this avenue may be fruitful for future research to explore. In summary, this study offers encouragement that the segmentation approach may be used as basis to change behaviour alongside its use to understand current behaviour. In this way, the study provides a clear demonstration of how psychological theory can be translated into practice.

Chapter 8. General Discussion

8.1. Summary of Findings

Through rising sea temperatures, an increasing frequency of extreme weather events, and unprecedented levels of climate migration, the lasting damage humans are causing the planet is being realised. The negative consequences of abusing nature and reducing the Earth's environmental quality are impacting upon people, plants and animals on a personal, social and environmental level the world over. These events can be slowed, and some even stopped, but this requires people to engage in pro-environmental behaviour. While on first inspection engaging in pro-environmental behaviour would seem a logical choice for our species, too many people are too often not acting in the environment's best interest. This thesis set out to understand why this might be the case by attempting to better understand what drives environmental behaviour. It attempted to achieve this by testing the usefulness of values-based segmentation for explaining environmental behaviour.

The values-based segmentation was tested on over 7400 individuals spanning eight countries, and in total considered how the groups performed on 22 environmental outcomes. Overall, the values-based segmentation was replicable within and between countries, and found meaningful groups that differed on a wide range of environmental norms, intentions and behaviour. Four distinct groups of people were consistently found based upon people's regard for biospheric, altruistic, egoistic and hedonic values: those who do not highly endorse any of these values (the Non-engagers), those who highly endorse all values (the Value opportunists), those who highly endorse only biospheric and altruistic values (the Selfless contributors) and those who highly endorse only egoistic and hedonic values (the Self-enhancers).

Generally, the importance each of these groups attributed to each of the values measured remained relatively stable when tested on multiple samples within and between cultures. While exceptions existed, a general pattern emerged that the Selfless contributors and Value opportunists tended to perform more environmentally friendly on a range of outcomes than the Non-engagers and Self-enhancers. This suggests that endorsing conflicting values (i.e. being a value-opportunist) did not appear to be detrimental to environmental behaviour, and in some cases appeared to enhance environmental outcomes.

The body of work found, in line with Goal Framing Theory, environmental behaviour to be multi-dimensional. As both environmentally-focussed (e.g. biospheric) and non-environmentally focussed values (e.g. egoistic values) motivated different behaviours. Moreover, consistent with VBN theory, the relationship between values and behaviour was shown to be mediated by moral norms.

The values-based segmentation approach seems to be an appropriate tool for *shaping* as well as *understanding* behaviour. In line with previous research (e.g. Unsworth, 2017) it was found that increasing the self-concordance of behaviours through highlighting the congruency between performing the action and certain values that the individual highly endorsed, increased environmental behaviour. In order to fully answer *how useful* the approach was, the following sub-sections discuss the findings of this thesis in relation to each of the thesis aims outlined in *section 1.5.2* of chapter one.

8.2. Which Values Should be Included in a Values-based Segmentation?

Values associated with the self-transcendence versus self-enhancement dimension outlined in Schwartz's Theory of Basic Values (1992; 1994) were selected as these are thought to exert the greatest influence on environmental outcomes (Nordlund

& Garvill, 2002; Stern, 2000; Thøgersen & Ölander, 2002). Biospheric, altruistic and egoistic values were assessed in chapter two, before hedonic values were also included from chapter three onwards, in line with research that suggested that they too influenced environmental outcomes (e.g. Steg, Perlaviciute, van der Werff & Lurvink, 2014). Table 8.1 shows how each of the four values performed when predicting a range of psychological variables, intentions and behaviour from studies across this thesis. The following sections consider each of the values presented in the table.

8.2.1. Biospheric values. Biospheric values predicted every environmental outcome expect for environmental conformity (in which case it was approaching significance). Consequently, of all the values studied, they seem most appropriate to be used as a basis on which to understand behaviour. This is not surprising given these are the only values that have explicit links to the environment (Stern, 2000). In all cases, biospheric values promote the outcome that would be best for the environment, and so are positively related to environmental norms, intentions and behaviour.

8.2.2. Egoistic values. Egoistic values seem somewhat appropriate to be used in a values-based segmentation as they were found to be a negative predictor of moral norms; particularly in student samples. They also predicted many behaviours, but unlike biospheric values that had a consistent (positive) influence on environmental outcomes, egoistic values promoted some behaviours but inhibited others. For example, endorsing egoistic values appears to increase behaviours such as using re-usable vessels and buying imperfect produce, but in some studies, negatively predicts recycling.

Table 8.1

Beta co-efficients from multiple regressions of biospheric, altruistic, egoistic and hedonic values predicting environmental outcomes

Outcome Type	Outcome Variable	Empirical Chapter	Values			
			Bio	Alt	Ego	Hed
Psychological Variables	Moral Norms	Chapter 2 (UK, Students, $n=284$)	.36***	.10 [#]	-.14***	N/A
		Chapter 3 (UK, Students, $n=371$)	.41***	.09 [#]	-.11*	-.08 [#]
		Chapter 3 (Brazil, Students, $n=239$)	.32***	.15*	-.13*	-.03
		Chapter 5 (UK, Non-Students, $n=331$)	.52***	.12 [#]	-.06	-.03
	Situational Barriers		.37***	.05	-.12 [#]	N/A
			-.23**	.06	.08	N/A
		Chapter 6 (UK, Students, $n=222$)	.21***	.06	.06	N/A
			.41***	.12 [#]	-.12 [#]	N/A
			.28***	-.07	-.05	N/A
			-.15 [#]	-.15*	.20**	N/A
Intentions	Increase Sustainable Energy	Chapter 4 (Europe, general sample, $n=6045$)	.08***	.02	.07**	.05*
	Reduce Car Use		.22***	.07*	.02	-.03*
Behaviour	Recycling	Chapter 3 (UK, Students, $n=371$)	.31***	.08	-.13*	-.11*
		Chapter 3 (Brazil, Students, $n=239$)	.21***	-.02	-.07	-.07
		Chapter 5 (UK, Non-Students, $n=331$)	.45***	-.01	-.10 [#]	-.03
	Green Product Purchase	Chapter 3 (UK, Students, $n=371$)	.40***	-.07	.05	-.23***
		Chapter 3 (Brazil, Students, $n=239$)	.18*	-.05	-.24***	.02
	Carrier Bag Usage		.60***	-.16**	.11*	-.14**
			.35***	.04	-.01	-.13 [#]
	Re-using Materials	Chapter 5 (UK, Non-Students, $n=331$)	.31***	.07	-.03	-.07
	Using Re-Usable Cups		.30***	-.02	.27***	-.12 [#]
	Buying Imperfect Produce		.39***	-.02	.18**	-.03

*** $p < 0.001$, ** $p < .01$, * $p < .05$, # = $p < .1$

For other behaviours, the influence of egoistic values is less clear. Regarding purchasing green products, egoistic values are a positive predictor when considering a general sample, a negative predictor when considering a sample of students from Brazil, and are not a significant predictor when considering a sample of students from the UK. Finally, in terms of antecedents of environmental behaviour, egoistic values are positively related with environmental conformity and intentions to increase sustainable energy.

Literature tends to suggest egoistic values are negatively related to environmental behaviour, as most environmental behaviours require some form of self-sacrifice (e.g. Stern, 2000; De Groot & Steg 2008). However, the findings here present a far more complex picture. The notion that egoistic values may have a positive impact on some environmental behaviours is not new; however, it certainly is less common. Some empirical work has found that egoistic values positively predict attitudes and intentions towards using a park-and-ride system (De Groot & Steg, 2007b) while other research by Ojea and Loureiro (2007) suggests egoistic values positively predict willingness to pay for preserving wildlife.

The behaviours positively predicted by egoistic values in this thesis (sustainable energy use, buying imperfect produce, and re-using vessels), may carry economic benefits. For example, some sustainable energy plans can be cheaper than 'regular' fuel, (Carrington, 2017), imperfect produce schemes such as 'wonky veg' boxes can cost 30% less than standard products (Smithers, 2016) and high-street coffee shop chains often give financial discounts or other rewards for bringing your own cup (Moorhouse, 2017). Consequently, it does appear that certain environmental behaviours can be supported by egoistic values. Future research may not be able to assume that the literature that suggests egoistic values are negatively related to environmental outcomes applies to all

behaviours; each behaviour may need specific investigation, particularly if financial benefits can arise from performing it.

8.2.3. Altruistic values. Altruistic values only sporadically predicted behaviour; being a negative predictor of green product purchase in one of the three studies that used this measure. Altruistic values appear more useful when considering antecedents of behaviour: positively predicting intention to reduce car use, negatively predicting environmental conformity, and positively predicting moral norms. Although it should be noted that while altruistic values predicted moral norms in a sample of Brazilian students, it was only approaching significance in three other samples: two using UK students and one using a non-student sample.

These findings are perhaps not too surprising as biospheric values are thought to hold more influence on environmental behaviour than altruistic values (De Groot & Steg, 2008). However, whether these values are included in future values-based segmentations may depend on what behaviour is being investigated. Those that have a strong moral basis may wish to include altruistic values as they were predictive (or at least approaching significance) when considering moral norms relating to environmental behaviour. This finding is consistent with norm based theories (e.g. VBN, Stern, 2000; and particularly the NAM, Schwartz, 1977) which conceptualise environmental behaviour as a moral action.

Altruistic values also predicted intention to reduce car use. The author speculates this may be because it is reasonable to assume that doing so may benefit the local community by reducing pollution and limiting congestion. However, previous research considering this has found no relationship between altruistic values and intention to

reduce car-use, albeit on a smaller sample of 490 individuals (De Groot, Steg & Dicke, 2007).

Another complex finding regarding altruistic values is that they negatively predicted 'green' product purchase. However, as previously alluded to in chapter four, this may be because there were competing products that better served their altruistic motives (e.g. fair trade). Altruistic values have been shown to conflict with biospheric values previously, when considering donating to either an environmental or a humanitarian charity (De Groot & Steg, 2008). Consequently, altruistic values may be particularly useful to include to understand environmental behaviours when there is an alternative behaviour that could instead benefit other humans, but overall do not seem an integral part of a values-based segmentation.

8.2.4. Hedonic values. Hedonic values were included from chapter three onwards in this thesis, but were not included in chapter six that considered psychological variables from other theoretical frameworks. Consequently, hedonic values were only considered in relation to 15 environmental outcomes. Hedonic values failed to predict any of the psychological variables including moral norms, but did predict four of the eight measures used for behaviours and behavioural intentions. Hedonic values were also approaching significance for another two. Of all the behavioural outcomes they predicted, hedonic values seem to have the largest influence (negative) on 'green' product purchase behaviour.

Wang, Chen, Chan and Zheng (2000) offer support for this finding as they find hedonic values are negatively associated with utilitarian goods, and positively associated with luxury and novelty goods. As 'green' goods tend to be made fit for purpose, this could explain why this relationship exists. Anecdotally, the author also speculates that the

time required to research and locate brands that offer 'green' products may be a time-consuming and unexciting process and so may also conflict with hedonic motives.

In a review of 53 studies considering 'green' purchase behaviour, Joshi and Rahman (2015) cite two studies (Cerjak, Mesić, Kapić, Kovačić, & Markovina, 2010; Padel & Foster, 2005) which find hedonism to be *positively* related to green product purchase. This is contrary to the findings of this work. However, upon further inspection both the studies cited involve 'green' food choices rather than conventional products. While 'being green' and 'being hedonistic' may be possible in terms of food choice as many 'green' foods may also be tasty foods (Baudry et al., 2017), the positive relationship may not extend to purchasing other green products.

In summary, biospheric values seem to be an essential component for inclusion in a segmentation approach to understand environmental behaviour, whereas the other three values studied may aid approaches when investigating some, but not all behaviours. Egoistic values seem to be useful when considering environmental behaviours that may also carry some economic consequences, while hedonic values appear to be useful when considering environmental intentions and time-consuming behaviours. In this thesis, altruistic values appear to be the least useful predictor, however when investigating environmental behaviours that have obvious consequences for other humans, or behaviours that highlight competition between benefits for other environment *or* humans (e.g. buying organic *or* fair trade products) altruistic values may be useful to include.

As a values-based segmentation model is likely to provide a broad understanding for a range of environmental behaviours, there are always likely to be some behaviours that certain values do not predict. Researchers may need to make a trade-off between employing a segmentation approach that can predict many environmental outcomes but

that may contain redundant variables when considering certain behaviours, or reduce the segmentation to only include the most relevant values (e.g. biospheric and egoistic values) but potentially limit the model when assessing other behaviours that may be motivated by omitted values. The research may take either approach depending on the aims of the research (e.g. understand many behaviours or to produce a more precise model a specific behaviours). In this thesis, as many different outcomes were being considered across the body of work, all values were retained for most studies²⁹.

8.3. Is a Values-Based Segmentation Approach Replicable Within and Between Cultures?

The segmentation model was employed six times within the thesis on a total of 7482 individuals from eight countries across Europe and South America. Across every sample, a four-group solution could be found. Moreover, the profile of these groups regarding how they scored on egoistic, altruistic, biospheric and hedonic values remained consistent. These groups were named Non-engagers, Selfless contributors, Value opportunists and Self-enhancers. The Non-engagers scored low on all values, whereas the Value opportunists scored high on all values. The Selfless contributors scored high on biospheric-altruistic values but low on egoistic-hedonic values, while the Self-enhancers scored high on egoistic-hedonic values and low on biospheric-altruistic values³⁰.

While the general pattern of findings (i.e. whether a group scored high or low) did not alter across all six samples, variation existed regarding exactly how high was 'high' and how low was 'low' when comparing different samples. *Table 8.2* shows the standardised scores for each of the cluster groups regarding biospheric, altruistic, egoistic

²⁹ The exception being in Brazil where hedonic values were excluded from the segmentation analysis after it was found that they did not predict any of the outcomes.

³⁰ By 'high' and 'low', the author is referring to above and below the sample average for that variable.

and hedonic variables. It also shows the cluster group size (as a percentage of the sample). Each variable has three figures: the weighted average, a conservative estimate and an extreme estimate. The conservative and extreme estimates essentially report the range found across all studies. For example, when considering the table, the Non-engagers' weighted average score for biospheric values was .82 of a standard deviation below the sample average across all studies. In the most conservative case they only scored .7 of a standard deviation below the average, whereas in the most extreme case they scored 1.75 standard deviations below the sample average.

The weighted averages show that in general there appears to be a greater number of Value opportunists in the population (31%), followed by Selfless contributors (29%), Self-enhancers (22%) and then Non-engagers (18%). This is a somewhat positive outcome as the most popular groups tend to be the two groups that engage in the most environmental behaviour. Interestingly, DEFRA (2008) find that their worst performing group, the honestly disengaged, also accounts for 18% of their sample. Consequently, the figure that just under 1/5 of people may not be motivated to engage in environmental actions appears to be supported in both research projects.

Overall, it is the Value opportunists who score highest on biospheric and altruistic values, however this group also scored highest on egoistic and hedonic values. These competing motivations may limit their environmental behaviours to a smaller subset that can be supported by (or at least not have a negative impact upon) all values (Kopetz, Faber, Fishbach & Kruglanski, 2011). As Schwartz (1992; 1994) suggests values are ordered by relative importance, the *absolute score* for each value may be less important than the *relative score* when comparing the importance attributed to multiple values for each cluster group.

Table 8.2.

Cluster group size and scores (standardised) on biospheric, altruistic, egoistic and hedonic values

Measures	Scores	Cluster Groups			
		Non-engagers	Self-enhancers	Value opportunists	Selfless contributors
Cluster Size (% of sample)	Conservative	13	15	25	25
	Average	18	22	31	29
	Extreme	23	23	44	36
Biospheric Values	Conservative	-0.70	-0.16	0.57	0.25
	Average	-0.82	-0.64	0.89	0.30
	Extreme	-1.75	-1.23	1.12	0.85
Altruistic Values	Conservative	-0.48	-0.67	0.48	0.26
	Average	-0.91	-0.68	0.85	0.42
	Extreme	-2.61	-0.77	0.91	0.64
Egoistic Values	Conservative	-0.51	0.19	0.48	-0.45
	Average	-1.18	0.51	0.77	-0.53
	Extreme	-1.26	0.74	1.50	-1.20
Hedonic Values	Conservative	-0.69	0.11	0.53	-0.49
	Average	-1.22	0.55	0.75	-0.56
	Extreme	-1.72	0.58	1.03	-0.85

For example, while the Value opportunists score the highest on biospheric values in absolute terms (.89), their *relative* score between the importance they attribute to biospheric values compared to egoistic values is only .12 (calculated by subtracting the egoistic average from the biospheric average for the group). Whereas the Selfless contributors score much lower on biospheric values than the Value opportunists in *absolute terms* (.30), but their *relative score* when comparing the importance they attribute to biospheric compared with egoistic values is over six times larger at .83 than the Value opportunists relative difference between these values. This suggests that when competing priorities arise, the Selfless contributors are much more likely to select the

option that is consistent with their biospheric values than the Value opportunists, as the relative importance of these values for the Selfless contributors is much higher.

The scores in the table may also provide some insight for policy makers and campaign managers about which strategies to pursue with the different groups. Steg et al. (2014a) and Unsworth, Yeo and Beck (2014) both outline that goal alignment may be one strategy to shape behaviour. For example, policy makers could attempt to frame behaviours in a manner that highlights how they are compatible with the values a group endorses. For example, highlighting both economic and environmental benefits may appeal to the Value opportunists as they are already predisposed to endorse biospheric and egoistic values, and the 'gap' between the relative importance they place on each of the values is relatively small (e.g. the difference between the importance they attribute to biospheric compared with egoistic values). However, this strategy may be less effective for the Self-enhancers. This group have a much larger 'gap' between the importance they attribute to egoistic and biospheric values (e.g. .87 in favour of egoistic values) and so goal alignment is likely to be much more difficult. Other strategies such as incentives, regulation, or promoting egoistic aspects of behaviour (e.g. status) may be more appropriate for this group.

Some groups are relatively stable in their scores on a value across the studies, for example, the Self-enhancers' regard for altruistic values only differs by .1 of a standard deviation across all six studies. However, some groups' endorsement for some values are far less stable. For example, the Non-engagers endorsement of altruistic values changes by over two standard deviations when comparing the most conservative and extreme figures across all six studies. In short, while the general 'pattern' of the values endorsed by the groups is replicable across studies, the precise scores may differ considerably. This

could have influence on why groups perform inconsistently across different studies, and so researchers using this approach may have to consider this when interpreting their findings.

In summary, the cluster groups are broadly replicable within and between clusters. The same four groups were found in samples containing participants from the UK, Brazil, France, Switzerland, Hungary, Norway, The Netherlands and Greece. While the groups' pattern of scores was consistent between these studies (e.g. Value opportunists always scored high on biospheric values), the groups' exact scores on values, relative to the sample mean, differed considerably in some cases. Overall, this offers support for the replicability of a values-based segmentation approach and offers optimism for its ability to be used on diverse samples around the world.

8.4. Do the Segmentation Groups Differ on a Range of Environmental Outcomes?

As previously outlined in *Table 8.1*, a total 22 environmental outcomes were considered across the thesis. Some of these were considered multiple times with different samples (e.g. recycling) while some were only tested once (e.g. carrier bag use). The following passage is split into four sections each dealing with a different type of environmental outcome: psychological antecedents of environmental behaviours, intentions, behaviours, and preferences for environmental communication.

8.4.1 Psychological antecedents of environmental behaviour. The groups identified from the segmentation analyses were found to differ on five of the seven antecedents of behaviour that were measured³¹. These were moral norms (which were

³¹ Although the groups were found to differ regarding their belief around social norms relating to recycling, after employing a Bonferroni comparison for multiple post-hoc tests, the differences between the groups were not significant.

measured multiple times throughout the thesis), awareness of consequences, community concern, perceived behavioural control, and environmental conformity.

Moral norms have been shown to mediate the relationship between values and behaviour, and can be activated by our values (VBN theory, Stern 1999; 2000). Therefore, it is not surprising that the groups derived from a values-based segmentation analysis differ on this variable. Consistent with previous literature which has found biospheric and altruistic values to be positively related with moral norms (Kaiser, Hubner & Bogner, 2005; Steg, Dreijerink, & Abrahamse, 2005; Stern, 2000; Van Riper & Kyle. 2014), the groups who highly endorsed biospheric and altruistic values scored highest on moral norms, Indeed, for this variable, and for community concern which also has clear altruistic motivations, both the Value opportunists and Selfless contributors scored higher than the Self-enhancers and the Non-engagers.

The groups also differed on three other antecedents of environmental behaviour: awareness of consequences, perceived behavioural control and environmental conformity. For the first two of these, the Value opportunists scored significantly higher than the Non-engagers. A reason why this might be the case is that the items that contributed to the 'awareness of consequences' scale included consequences relating to finances *and* the environment, therefore it is possible that the Value opportunists (who value both of these) possess a greater awareness on consequences relating to them.

In contrast, because the Selfless contributors are likely to focus upon the *environmental* consequences stemming from environmental behaviour, they may have less awareness about the financial outcomes of doing so. Based on this reasoning, it not surprising that the Non-engagers have the lowest awareness of consequences as they are

not likely to focus on either the environmental or economic outcomes as much as the other groups as they do not highly endorse values relating to these concerns.

The Value opportunists also scored highest on perceived behavioural control; thus, they had the highest belief in themselves to be able to perform recycling. In contrast, once again the Non-engagers scored lowest on this. As PBC is thought to moderate the intention-behaviour gap, interventions could look to attempt to increase the PBC of the Non-engagers group to encourage them to recycle. While this approach may help the Non-engagers, a different approach may be more suitable for the Self-enhancers: This group scored the highest on the measure of environmental conformity: (e.g. recycling just to 'fit in'). Consequently, it appears social influence may be an effective tool to consider for this group, thus campaigns may wish to utilise psychological research that considers promoting social norms when targeting this group (e.g. Goldstein, Cialdini & Griskevicius, 2008)

8.4.2. Intentions. The groups differed on both the behavioural intentions relating to car use and energy use that were considered in this thesis. Both the Selfless contributors and Value opportunists stated a greater intention to reduce their car use than the other groups. This appears to be a fairly consistent pattern emerging across the work where the two groups that highly endorse biospheric and altruistic values (i.e. the Value opportunists and Selfless contributors) act more environmentally than the other two groups. As this measure was of *intention* to reduce car use, it is not clear whether these groups will go on to do this, especially as there is thought to be an intention-behaviour gap (Armitage & Conner, 2001; Bamberg, Ajzen, & Schmidt, 2003).

Intention to increase *sustainable* energy use also differed across the groups. The Value opportunists out-performed all other groups, while the Self-enhancers and Selfless

contributors had higher intentions than the Non-engagers. For this outcome, biospheric, egoistic and hedonic values all had a positive effect on intention. Consequently, it appears this outcome is cumulative, in the sense that, as all values are positively linked to it, the higher your endorsement for all values, the greater your intention. This appears to be a good example of a behaviour where endorsing values from 'conflicting' domains enhances the chances of an individual performing environmental behaviour. Consequently, this suggests that in specific situations, values that are traditionally thought of as conflicting, may actually be complementary.

However, as sustainable energy intentions were measured instead of behaviour, a reason the Selfless contributors may have had lower intentions than the Value opportunists is because they are already performing this behaviour. Without data on current behaviour it is not possible to assess which way to interpret this finding. This may be an interesting avenue for future research.

Researchers have suggested that individuals may not be aware of their true environmental impact, and so scientists must take some responsibility for deciding which behaviours should be the focus for studies and campaigns (Gatersleben, Steg, & Vlek, 2002; Stern et al. 1997). This research contributes to this debate by suggesting that, for those individuals who highly regard values from conflicting domains, concentrating on behaviours that are supported by *all* these values may be most effective. While this group may not engage in behaviours they perceive to be detrimental to one of the values (e.g. they may not be willing to pay more to get organic produce), they may be willing to adopt behaviours that satisfy their economic and environmental concerns (e.g. increase sustainable energy use, over unsustainable energy consumption). Therefore, by

campaigns could increase their chances of being effective by targeting these types of environmental behaviour when considering this segment of the population.

8.4.3. Environmental behaviour. The groups identified from the values-based segmentation differed on all environmental behaviours measured, and for most of them did so in a similar way across the studies. For recycling, buying imperfect produce, re-using carrier bags, and re-using materials, the Value opportunists and Selfless contributors outperformed the other two groups. In terms of 'green' product purchase, the findings were mixed: in one study the Value opportunists performed as well as the Selfless contributors, while in another they performed significantly worse. So, further investigation into the Value opportunists group may be needed specifically for this behaviour.

The only time the groups did not differ across any of the behaviours was in chapter three, where differences regarding recycling behaviour in Brazil were investigated. In this study, only biospheric values predicted recycling behaviour, so it is possible that the inclusion of egoistic and altruistic values to the segmentation model only added 'noise' to the data, and thus made it difficult to detect any differences between the groups. However, aside from when considering recycling in Brazil, a general pattern appeared to emerge from the data: the Non-engagers and Self-enhancers perform less environmentally friendly behaviour than the other two groups.

While some issues may exist with using a self-report measure of environmental behaviour (discussed later in this section), it appears a values-based segmentation is a useful tool in distinguishing between the groups on their environmental behaviour. The segmentation approach appears to show that highly endorsing conflicting values does not have a detrimental effect on environmental behaviour, and in some circumstances (e.g.

using re-usable vessels) can aid environmental behaviour. These types of behaviours may be ones for policy makers to concentrate on when targeting Value opportunists.

8.4.4. Environmental communication. The effect of group membership on the appeal and motivation attributed to value-congruent (and value-incongruent) posters relating to water conservation was investigated in chapter five. Overall, compared to the Non-engagers, the Value opportunists rated all environmental communication as more appealing. This is perhaps not surprising as the Non-engagers do not highly regard any of the values and so are unlikely to rate any communication that is tailored to these values as having considerable appeal. Moreover, based upon findings relating to environmental intentions and behaviour, it appears the Non-engagers are not motivated to engage with environmental issues anyway.

In terms of the appeal of the communication, three of the four groups (all apart from the Non-engagers) rated the poster that was best matched with their values as, at least, joint most appealing. However, only one of these groups, the Selfless contributors, rated the poster that was value-congruent (biospheric/altruistic) as outright most appealing. Interestingly, the Value opportunists preferred a poster that was tailored to the values they highly endorsed as much as a poster only tailored to half of the values they highly endorsed (i.e. biospheric and altruistic values). This suggests the Value opportunists may not require communication that attempts to target *all* the values they highly endorse to find it appealing and motivating, instead communication may only be required to contain *some* value-congruent content.

Similar findings were derived when considering the motivation provided by the posters. The Non-engagers showed a preference for posters that gave a reason why people should save water (e.g. for the environment, for economic reasons, or for both),

but had no preference between these posters. One possible option to explore when attempting to motivate this group is to consider whether they highly endorse any other values (e.g. Schwartz's other value-types: Openness to Change, Conservatism) that have not been explored in this thesis.

The resulting message from this exploration into tailoring messages to the groups may be less about what campaigners should do, and more about what they should not do. Many of the groups had no clear favourite poster, but the Selfless contributors had one clear *least* favourite. All other groups rated a value-neutral poster as least appealing and least motivating apart from the Selfless contributors. This group rated the poster that gave egoistic and hedonic motives as lower on both measures than the value-neutral poster. For this group, it appears that providing no reason at all to perform a behaviour may still be better than providing an economic or hedonic reason. Policy makers and campaign designers may wish to bear this in mind as while including egoistic concerns may make the campaign more accessible and appealing to certain segments of the population, caution must be taken against alienating the Selfless contributors group, especially because currently these are the group who are engaging in the most pro-environmental behaviour. This recommendation is in line with previous work that has suggested individuals may disregard or act adversely to behaviour that is not congruent with their goals (e.g. Strickland, Taber, & Lodge, 2011).

The finding that the groups respond differently to tailoring, suggests that tailoring communication to be value-congruent may be of use to policy makers. This is consistent with previous findings that suggest tailoring may be effective at shaping behaviour (Gromet, Kunreuther & Larrick, 2013; Kidwell, Farmer & Hardesty, 2013; Schwartz, 1994)

and at encouraging individuals to consider the message for longer (Nelson & Garst, 2005; Updegraff, Sherman, Luyster, & Mann, 2007).

To summarise this section, it appears the groups identified from the values-based segmentation differ on a wide-range of environmental outcomes including determinants of behaviour, behaviour, and environmental communication. To illustrate how policy makers and campaign designers may utilise this research, *Table 8.3* presents the author's interpretation of how effective targeting different variables may be in attempting to shape and understand the groups' behaviour. The table also provides a description of the groups' current performance on the behaviours investigated in this thesis.

To aid interpretation of the table an example is provided for how it may be used. A policy maker wishes to devise an intervention to increase how often a self-enhancer reuses carrier bags. First, from the table it appears the Self-enhancers carrier bag use is currently low (relative to other groups). To increase this behaviour, the policy maker wishes to select an intervention that will have maximum effect. From considering antecedents of behaviour, it appears that for the Self-enhancers environmental conformity (e.g. performing a behaviour to fit in) may have a high impact. Thus, the policy maker can use this table to help design an intervention. As a second example, if a policy maker wishes to further increase the Selfless contributors recycling rates, they may wish to try and manipulate moral norms and community concern to increase the behaviour. As this group are already performing relatively 'high' on recycling, the policy maker may wish to be ambitious with their campaign and try and get this group to perform advanced

behaviours as they are already likely to be performing basic behaviours relating to recycling³².

Table 8.3.

An interpretation of the groups' performances regarding values, psychological determinants of behaviours, intentions and self-reported behaviour

Environmental Outcomes		Non-engagers	Self-enhancers	Selfless contributors	Value opportunists
Antecedents of Behaviour	Moral Norms	LOW	LOW	HIGH	HIGH
	Awareness of Consequences	LOW	MEDIUM	MEDIUM	HIGH
	Community Concern	LOW	MEDIUM	HIGH	HIGH
	Perceived Behavioural Control	LOW	MEDIUM	MEDIUM	HIGH
	Environmental Conformity	MEDIUM	HIGH	LOW	MEDIUM
Intentions	Car use	LOW	LOW	HIGH	HIGH
	Sustainable energy	LOW	MEDIUM	MEDIUM	HIGH
Behaviour	Recycling	LOW	LOW	HIGH	HIGH
	Reusing Carrier Bags	LOW	LOW	HIGH	HIGH
	Reusing Materials	LOW	LOW	HIGH	HIGH
	Purchasing Imperfect Produce	LOW	LOW	HIGH	HIGH
	Purchasing Green Products	LOW	LOW	HIGH	MEDIUM*
	Using a Reusable Vessel	LOW	LOW	MEDIUM	HIGH

*Conflicting results across different studies within the thesis.

³² Low, medium and high represent the groups' scores in comparison to other groups. For example, for moral norms, both the non-engagers and self-enhancers scored significantly lower than the other two groups. In contrast, for intention to increase use of sustainable energy over unsustainable energy, the value-opportunists (high) performed better than the selfless contributors (medium), and both of these groups performed better than the non-engagers and self-enhancers (low).

While it appears that the Selfless contributors and Value opportunists are more environmentally friendly than the Non-engagers and Self-enhancers, there appears to be small windows of opportunity by which policy makers could target the Non-engagers and the Self-enhancers. Thus, alongside contributing to academic literature, this work can have helpful implications for policy makers and campaign designers.

8.5. Do Moral Norms Mediate the Relationship Between the Cluster Groups and Environmental Behaviour?

VBN theory postulates that our values influence behaviour via mediating variables including moral norms. While the NAM and VBN both include other mediators such as general beliefs and ‘awareness of consequences’ between values and moral norms, values have been shown to directly influence both moral norms and environmental behaviour (e.g. Steg, Dreijerink, & Abrahamse, 2005). Indeed, in chapters two, three and five of this thesis, this was shown to be the case: moral norms mediated the relationship between cluster group membership and environmental behaviours including recycling, reuse of carrier bags and green product purchase.

The findings from chapter five suggested that endorsing different combinations of values (represented in the form of cluster group membership) could influence behaviour directly, indirectly or in a combination of both ways. Moreover, this seemed to depend on which groups were being assessed and on what behaviour. This suggests the value-behaviour relationship to be extremely complex, and may explain why some scholars have noted the inconsistency between studies in whether they find a direct or indirect effect of values on behaviour (e.g. Keizer, 2014)

In chapter five it was also noted that sometimes a MANOVA which considered the effect of cluster group membership on environmental behaviour found no differences

between two groups. However, the mediation analysis often did report differences between the same groups as it could compensate for the mediating effect of moral norms (e.g. between the Non-engagers' and Self-enhancers' recycling). Findings such as this advocate the use of mediation analyses in future work as the approach offers further insight into the mechanisms that are causing the differences between the groups. In interesting avenue for future work may be that, as the groups differed on other determinants of behaviour that weren't assessed as mediators in this thesis (e.g. those found in chapter six: awareness of consequences, perceived behavioural control), testing additional mediators between cluster group membership and environmental behaviour may increase the predictive power of the model

8.6. Can the Values-Based Segmentation Approach be used as a Basis to Shape Environmental Behaviour?

While the main aim of this thesis was to investigate whether a values-based segmentation approach could be used to *understand* behaviour, the final empirical chapter considered whether it could also be used to *shape* behaviour. To test this, an experiment was devised in which 58 participants downloaded a mobile phone app and received a message on the app every work-day for three weeks. One group received messages that highlighted how the behaviour was related to the values they highly endorsed. For example, the Selfless contributors would be reminded of the environmental/altruistic consequences of recycling, while the Self-enhancers would receive information relating to the egoistic/hedonic consequences of recycling. While participants in a second condition would receive messages that were not tailored to the values they endorsed.

Previous research suggested value-congruent information may be favoured (van den Broek, Bolderdijk, & Steg, 2017) as it may possess greater self-relevance to recipients (Dijkstra, 2008). Increasing the self-relevance or self-concordance of a behaviour has been shown previously to increase intentions to increase sustainable energy use (Unsworth & McNeill, 2017). Consistent with these findings, this study found participants who received the tailored mobile application went on to increase their recycling more than the group which did not receive a tailored message.

This work offers some promise that a values-based segmentation approach could be used to shape behaviour. However, having tested this on a very modest sample as only one part of a much larger body of research, the author feels that this topic would benefit from further consideration. Encouraging participation in order to achieve a large enough sample to analyse other interactions (e.g. between cluster group membership and intervention type) could not be achieved with the resources available for this research project and so this presents a serious consideration for researchers considering this line of work. Moreover, while every attempt was made by the author to design and publish a mobile application, there is no doubt that a multi-disciplinary team of researchers (with a computing specialist) may be able to create a more interactive and aesthetically pleasing application. Rather than attempt to create their own app, embedding environmental content into another existing application may be a fruitful avenue for future researchers to consider,

8.7. Methodological Issues and Limitations

8.7.1. Power and effect size. While it appears that overall the findings reflect positively on the usefulness of a values-based segmentation approach for understanding environmental behaviour, there are some issues and limitations with the work. So far,

the findings have been discussed in terms of whether they are significant at the $\alpha=.05$ level. Considering the effect size and power of each of the analyses may reveal whether the test was sufficiently powered to find an effect and if so, what the size of the effect was. *Table 8.4* shows the effect sizes, category of the effect (ranging from '1' denoting very small to '6' denoting very large), and observed power from the studies completed in this thesis.

It appears overall there is sufficient power to find an effect, should there be one present, in most cases, although a few studies are under-powered (below .8; Cohen 1992). The experimental study considering tailoring does not have sufficient power (but still finds an effect), and when considering recycling in Brazil, the study is also under-powered (this time no effect is found). Finally, some of the analyses considering how values influence psychological determinants of behaviour (such as situational factors, awareness of consequences and perceived behavioural control) are slightly under-powered (but an effect was still found to be present).

From the table, it appears there are a large range of effect sizes. In general, values appear to have a larger effect size than cluster group membership when predicting the same behavioural outcomes. This is to be expected as information is lost when condensing four continuous variables (e.g. values) into one categorical variable (e.g. cluster group membership). However, despite losing some information, some of the effect sizes relating to the (M)ANOVAs performed with cluster group membership as the independent variable are large. For reference, effect sizes over .14 (category 5 or above) are rated as 'large', and those over .06 (category 3 and 4) are rated as 'medium' (Miles & Shevlin, 2001).

Table 8.4.

Effect Size and Observed Power of the Analyses Completed in this Thesis

Chapter	Analysis	Independent or Predictor Variable	Dependent or Outcome Variable	Effect Size*	Category of Effect Size (1-6)**	Observed Power
2	Regression	Values	Moral Norms	.18	4	.99
	MANOVA	Cluster Groups	Moral Norms	.15	5	1.00
			Recycling	.05	3	.85
3	Regression	Values (UK)	Moral Norms	.21	5	1.00
			Recycling	.14	3	.99
			Product Purchase	.15	4	.99
		Values (Brazil)	Moral Norms	.18	4	.99
			Recycling	.06	2	.82
			Product Purchase	.10	3	.99
	MANOVA	Cluster Groups (UK)	Moral Norms	.12	4	1.00
			Recycling	.08	3	.99
			Product Purchase	.09	4	.99
		Cluster Groups (Brazil)	Moral Norms	.11	4	.97
			Recycling	.03	2	.42
			Product Purchase	.08	3	.95
4***	Regression	Values	Sustainable Energy	.02	1	1.00
			Car Use	.06	2	1.00
	MANOVA	Cluster Groups	Sustainable Energy	.02	1	1.00
			Car Use	.04	2	1.00
	Regression	Values	Moral Norms	.34	6	1.00
			Recycling	.19	5	1.00
			Product Purchase	.29	6	1.00
			Carrier bags	.14	3	1.00
			Re-using material	.12	3	.99
			Reusable vessels	.14	3	1.00
			Imperfect produce	.18	4	1.00
			Moral Norms	.21	6	1.00
			Recycling	.14	5	1.00
			Product Purchase	.14	5	1.00
			Carrier bags	.11	4	.99
			Re-using material	.12	4	1.00
			Reusable vessels	.08	3	.97
			Imperfect produce	.16	5	1.00
			Moral Norms	.10	4	1.00
			Community Concern	.13	4	.99
			PBC	.04	2	.70
6	MANOVA	Cluster Groups	Situational Factors	.01	1	.62
			Awareness of Consequences	.06	2	.61
			Environmental Conformity	.06	2	.85
7	ANOVA	Tailoring (Experimental Manipulation)	Recycling	.09	3	.61

* R^2_{ADJ} is reported for all regressions, where as partial-eta-squared is reported for all (M)ANOVA

**Categories of effect size, based upon Miles and Shevlin (2001), run from 1 (very small) to 6 (very large) with the type of analysis performed considered.

***Behavioural intentions, rather than behaviour, are considered in this chapter.

It appears the values-based segmentation has the largest effect when explaining environmental behaviours and moral norms using a non-student sample from the UK. VBN theory outlines a causal chain for how values influence behaviour (Stern, 2000), and empirical research has also shown values to directly influence behaviour (Kaiser et al., 2005). Therefore, it is not surprising that the values-based segmentation was most appropriate at understanding environmental behaviours and moral considerations (e.g. moral norms and community concern).

The smallest effect size occurs when the cluster groups are used to explain environmental intentions (e.g. intention to increase sustainable energy use) from a multi-nation sample. De Groot and Steg (2007b) found values were not predictive of intentions regarding the use of a park-and-ride facility. A possible suggestion to why values (or values-based segmentation) may struggle to predict intentions is that, intentions are included in rational choice models such as TPB but tend not to be included in the causal chain outlined by VBN theory. Instead, in VBN theory, it is suggested that a personal moral obligation to act influences behaviour. This work supports this stance, but does suggest that some variables associated with rational choice models (e.g. perceived behavioural control) could be incorporated into the model as additional predictors of behaviour. Future work may wish to consider testing a more comprehensive model (e.g. including behavioural outcomes and additional predictors) to test whether a values-based segmentation model could be used in conjunction with variables from other theoretical frameworks.

8.7.2. Measuring values. Another recurring issue within this thesis it that the egoistic values sub-scale often failed to load as expected. The five items that make up the egoistic scale, as used in De Groot and Steg (2008), stem from the 'power' domain (e.g.

power, wealth and authority) and the 'achievement' domain (e.g. influence and ambition) set out by Schwartz (1992). However, in empirical chapters two and three, the item 'ambition' and on occasion 'influence', correlated with the altruistic values sub-scale more than the egoistic scale.

First, this means that when the offending items were removed from the egoistic subscale, it was heavily skewed in favour of 'power' rather than 'achievement' values. While this does not appear to have had a detrimental effect on the study, it may be worth noting for future work. Although both 'achievement' and 'power' values are likely to contribute to over-arching self-enhancement goals such as increasing self-esteem, achievement values are more likely to be demonstrated through competence in the completion of a specific task/interaction, whereas power values relate to the preservation or attainment of social dominance/status in a more general sense. Therefore, the measure of egoistic values used in this study may not proportionately represent these two constructs.

Secondly, as ambition and influence loaded more strongly on the altruistic scale, particularly when using student samples, in future work, it may be worth attempting to understand how this group conceptualise these values. It could be that although the items were originally intended to be related to the 'self', being ambitious and having influence could be viewed as altruistic, if that 'power' is put to good use.

8.7.3. Measuring environmental behaviour. When discussing behaviour, this thesis relies on self-report. Literature suggests this may be not as accurate as objective measures, because people may inflate their behaviour (Félonneau & Becker, 2008). Indeed, a positive relationship was found between self-reported recycling and providing socially desirable answers in chapter three.

One interpretation of this is that those individuals who claimed to have recycled the most, may have inflated their behaviour somewhat. However, as the relationship was explored by correlations, it is not possible to determine this. Consequently, this work can only advise that necessary caution be taken when considering findings, such as those presented in this thesis, that rely on self-report.

The thesis also piloted a measure of recycling behaviour in chapter two where individuals estimated how many items they had recycled in the past 24 hours rather than by using a Likert scale. The rationale for this was to ensure participants thought about their specific behaviour, and to add an element of precision to the measurement. However, the author acknowledges that the 24-hour period may not reflect their general behaviour. Moreover, judging recycling behaviour by the number of items an individual recycles may not be fair. A high number of items could be reached as a function of having many items to recycle (e.g. when living in a shared house) rather than through a commitment to recycling. For example, if an individual only had six items to recycle but did so, they are a more committed recycler than an individual who recycled seven items but put another eight items in the general waste. This measure did not capture this and so the author recommends future work should, despite some flaws, employ traditional methods of capturing self-report such as Likert scales³³. Thus overall, despite some limitations, the author cannot suggest a better measure than using a self-report Likert scale to measure environmental behaviour, if collecting objective behaviour is not possible.

³³ Moreover, in terms of methodological issues, allowing participants to write down any number of items increased the error variance leading to more outliers.

A further issue is that single-item measures of behaviour were often employed. The advantage to this approach is that it adds clarity for the researcher and reduces the length of questionnaire for participants, however multiple items behavioural measures can be more reliable as participants scores can be averaged out, thus limiting the effect of mistakes/severe under or over estimation when answering. However, the author notes that there appeared to be no notable effect when considering how values predicted these behaviours, in comparison to how values predicted behaviours with multi-item scales (e.g. recycling or green product purchase).

Finally, consistent with Goal Framing Theory (Lindenberg 2001, 2006, 2008; Lindenberg & Steg 2007), the findings presented here suggest behaviour to be multi-dimensional as different groups performed differently on a range of behaviours. Also in line with the theory, it appears that even when performing the same behaviour, individuals from different groups may be doing so for different reasons. Future research may want to try to empirically test if this is the case; for example, considering the main motivations of members of the different groups when they are performing the same task.

8.7.4. Designing materials. While every effort was made to ensure materials for the more applied aspects of this thesis (i.e. content for the poster study in chapter five and the app study in chapter seven) reflected the 'tailored' values they were meant to (e.g. an egoistic message represented an egoistic message), this could not be guaranteed. While colleagues informally reviewed these materials and a small group of undergraduates informally rated them for appropriateness, no formal manipulation checks were performed. While egoistic-hedonic motives and biospheric-altruistic motives are quite distinct, the author cannot rule out the possibility that participants did not feel that the message represented their interpretation of these values. While this is unlikely,

to remove any doubt, future research may wish to employ a more explicit manipulation check when conducting work of this nature.

8.7.5. Response tendencies. The segmentation groups were identified based upon the importance people attributed to a range of values. While two of the groups scored relatively high on some values and low on others (i.e. Self-enhancers and Selfless contributors), two groups scored either high on all values (i.e. the Value opportunists) or low on all values (i.e. the Non-engagers). This raises the possibility of whether these were genuine differences in their values or differences in response styles such that regardless of the content a 'value-opportunist' tends to be generous in their ratings, while a 'Non-engagers' tend to be conservative in theirs.

While this is a possibility, the author does not believe this to be the case for several reasons. First, previous research has suggested that individuals may hold multiple goals that can stem from opposing domains (e.g. Unsworth et al., 2014) and DEFRA (2008) suggest that there is a significant group of the population (around 18%) who are 'honestly disengaged'. Consequently, previous research offers support that these two distinct groups 'exist' and are more than the product of response tendencies. Further support for the existence of these two 'types' of people are found in previous literature regarding segmentation. For example, Poortinga and Darnton (2016) found 'aspirers' to score 'high' on conflicting values relating to self-enhancement and self-transcendence values and Blimey and Braithwaite (1997) found a group who scored below the sample average on all values. These findings again support the validity of these groups.

Moreover, meaningful results were obtained from the analyses performed in this thesis such that the group that scored 'high' on values did not also score 'high' on all other variables. For example, the Value opportunists (who scored high on all values)

scored lower than the Selfless contributors regarding purchasing green products and lower than the Self-enhancers on environmental conformity. This suggests that this group do not just rate all scales generously, and that the existence of groups who highly endorse all values are the product of genuine beliefs regarding the importance of these values and not response tendencies. To satisfy this further, future work may want to employ creative outcome measures that do not use scales to eliminate any possibility of response tendencies influencing the segmentation model. Alternatively, future work may want to consider whether the same groups are found when using a different measure to classify values. For example, Schwartz (2001) proposed the Portraits Value Questionnaire as an alternative method that uses vignettes rather than listing the values.

8.8. Suggestions for Future Research

Alongside the suggestions outlined in the previous section to rectify some of the methodological issues and limitations noted, the author recommends several avenues for future study. First, given the UK's recent commitment to stop selling petrol and diesel cars, and the growth of 'smart' technologies, the values-based segmentation approach could be used to understand how the different groups are likely to differ regarding: acceptance of these changes (e.g. policy acceptability relating to smart roads), cope with these changes (e.g. willingness to adapt to new technologies, and how they trust the companies implementing these changes. Investigating the usefulness of a values-based intervention to help the different groups make these transitions would also be of great value. Investigating how different segments of the population accept and cope with these substantial changes may be of national interest regarding how the transition towards sustainable solutions occurs.

Another topic of this thesis that requires further exploration is the 'Non-engagers'. On average, 18% of the participants that contributed to work in this thesis were classified as Non-engagers: the exact same percentage as who DEFRA (2008) classify as honestly disengaged. DEFRA recommend that this group may only respond to regulation and are unlikely to engage with soft measures to shape their behaviour (e.g. encouragement, increased knowledge). While the author is inclined to agree that this may be the most effective approach, a possible avenue may be to explore non-traditional motives. Most research focussing on values and environmental behaviour considers the self-enhancement and self-transcendence dimension (e.g. Kalof, Dietz, Stern, & Guagnano, 1999; Nordlund & Garvill, 2002, 2003; Schultz et al., 2005; Stern, Dietz, & Guagnano, 1998; Stern, Dietz, Kalof, & Guagnano, 1995; Thøgersen & Ölander, 2002). However, Schwartz's other dimensions, 'Openness to change' versus 'conservatism', may be worth exploring to see whether any of these values are highly endorsed by this group. Again, understanding what motivates this group is of great importance as, if generalisable, this group accounts for around 1/5th of the UK's populations (i.e. 11.8 million people).

Finding one value that they highly endorse would be of real use as behaviour change campaigns could consider how to align environmental behaviours with this value, increasing the self-concordance of the behaviour for this group. This technique has been shown to be successful in increasing behavioural intentions in previous research (e.g. Unsworth & McNeill, 2017). Equally, future work encouraging behaviour change may wish to consider an even greater level of tailoring to each of the groups. For example, environmental conformity (e.g. recycling to 'fit in') may encourage the Self-enhancers to increase their behaviour and so should be considered for inclusion in campaigns targeting this group alongside providing value-congruent motivations.

Another avenue for future research to explore is how a values-based segmentation approach could be used more widely. Collecting people's values can be quite difficult and may not be able to be scaled up, however, values could be predicted based upon a range of other variables that councils and local authorities have access to. For instance, the ACORN segmentation provides a wide range of information about most UK postcodes and classifies inhabitants into 18 groups (or 62 types). Cross-referencing these groups with which values-based segmentation group they are likely to be in, may help environmental campaigners better tailor their messages to residents. However, suitably matching ACORN groups with the Values-based groups may prove challenging.

Future research may want to further explore the stability of the values-based segmentation groups. As mentioned previously in this discussion section, while the pattern of what values the groups scored high or low on remained consistent within and between cultures, the exact scores of the groups differed, particularly for the Non-engagers' scores on altruism. Understanding whether these differences are caused by a particularly altruistic sample, or whether there are more systematic cultural differences may be of interest to policy makers. Considering systematic cultural differences in the importance attributed to the values by the groups, may allow governments and multi-country commissions (e.g. the European Union) to consider whether a policy is likely to be accepted and adopted in many countries, or whether certain countries may need special exceptions/laws. Finally, future work may also wish to consider further changes to the values-based segmentation model. Increasing the scope to include other values (e.g. openness to change, tradition) may be of interest, as may further exploring whether altruistic, hedonic and egoistic values are always appropriate for inclusion in the model.

8.9. Implications for Outside of Academia

This research carries implications for policy makers and environmental campaigners. First, understanding people's values appears to be a suitable way to further our understanding of their environmental behaviour. A values segmentation approach may be particularly useful for policy makers as values can transcend specific situations and so can be applied to a broad range of behavioural outcomes (Poortinga & Darnton, 2016). Also, there are a relatively small number of values and so they may be an efficient tool for use in practice (Rokeach, 1973).

It appears tailoring messages to be congruent with the values endorsed by these groups may be somewhat useful in shaping their behaviour. Different techniques may be more successful for different groups: regulation for Non-engagers, promoting environmental conformity for Self-enhancers, morality and environmental concern for the Selfless contributors, and a mixture of both economic and environmental reasons for the Value opportunists appear to be good starting points for policy makers and future research to consider.

The research also suggests policy makers may want to promote different behaviours to different groups to make the campaigns most efficient. For example, behaviours that are supported by both egoistic-hedonic and biospheric-altruistic values may be more appropriate for the Value opportunists. This may mean they perform a smaller subset of behaviours but do so with greater internal motivation (i.e. they will perform fewer environmental behaviours but one they do will have high self-concordance). Targeting these behaviours may limit 'wasting' resources on promoting behaviours they are unlikely to engage with.

This research also suggests that the groups may be at different stages regarding their willingness to engage in environmental behaviour. While the Selfless contributors are already performing a range of behaviours well, the Non-engagers do not seem to be engaged with most of these. Consequently, campaigners may wish to further tailor their materials, as while the Selfless contributors group may just need help maintaining their behaviour, and maybe encouraged to perform even more 'advanced' (e.g. more costly or complicated) behaviours, the Non-engagers and Self-enhancers may need encouragement to start performing some of the more basic behaviours more efficiently. To this end, tailoring to 'stages of change' (Prochaska & Velicer, 1997) alongside providing value-congruent information may be a fruitful approach for policy makers to take.

This research joins a growing body of work which suggests tailoring to be an effective method of shaping behaviour (e.g. Bain, Hornsey, Bongiorno, & Jeffries, 2012; Johnson & Eagly, 1989; Kidwell et al., 2013; Schwartz, 1994; Unsworth & McNeill, 2017). In this thesis, it appears receiving value-congruent information may increase environmental behaviour more than receiving non-tailored information, but importantly for policy makers, it appears that overall, receiving incongruent information is not detrimental to behaviour in most cases. For example, in chapter seven, those who received a non-tailored message still increased their recycling but not by as much as the group who received the value-congruent messages.

This may mean that local authorities could take a few more risks in trying to tailor their content to reach individuals who may otherwise 'switch off' from traditional environmental campaigns that promote environmental reasons for engaging in the behaviour. However, two caveats should be highlighted when doing so. First, some researchers have found that long term environmental behaviour may decline if only

economic motives are highlighted (Deci & Ryan, 2008; Evans, Maio, Corner, Hodgetts, Ahmed & Hahn, 2013). Secondly, the findings reported in chapter five of this thesis suggest Selfless contributors may react adversely to value-incongruent messages.

8.10. Contribution to Environmental Psychology and Related Fields

First, this work expands theoretical literature, particularly offering support for VBN theory (Stern, 2000), and work that suggests behaviour to be multi-dimensional and stem from both environmental and non-environmental goals (e.g. Goal Framing Theory, Lindenberg 2001, 2006, 2008; Lindenberg & Steg 2007). The research also extends work considering self-concordance, particularly the finding that linking an environmental behaviour with the values an individual highly endorses can increase environmental behaviour.

The work offers a novel contribution by being the first segmentation model, to the author's knowledge, to explicitly test how endorsing multiple, and sometimes divergent values influences environmental behaviour. Other segmentation models have considered environmental behaviour without values (e.g. Anable, 2005), values without environmental behaviour (e.g. Madrigal & Kahle, 1999) or both variables but with a range of other variables (e.g. Blamey & Braithwaite, 1997; Poortinga & Darnton, 2016).

Even these latter studies that do focus upon values and environmental behaviour, do not measure biospheric, altruistic egoistic and hedonic values as this study has done. Moreover, they were not tested on multiple samples from different countries like in this work. Another strength of this work is its attempt to link theory to practice by outlining and testing one possible method of using a values-based segmentation model to shape behaviour. Finally, the work also contributes to methodological literature by exploring the relationship between self-report and social desirability.

8.11. Conclusion

This thesis set out with the aim of evaluating whether a values-based segmentation approach is a useful way of understanding behaviour. The empirical findings suggest that: values appear to predict a range of environmental behaviours, groups found from the segmentation are replicable within and between cultures, and the groups identified are meaningful in the sense that they differ on a range of environmental outcomes. Thus, the findings offer optimism for how a values-based segmentation could be used to understand, and to shape, environmental behaviour. It appears the approach could be utilised by policy makers and environmental campaigners to make behaviour change campaigns more effective, and by the academic community to investigate how endorsing multiple, and sometimes conflicting values influences environmental outcomes. It is hoped that this contribution may make a significant and meaningful difference to help better understand and shape environmental behaviour, and thus help tackle some of the environmental problems planet Earth currently faces.

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APPENDIX A

Chapter Two Questionnaire

Thank you for agreeing to take part in this study. First, please provide the following information:

Age: _____ Gender: _____

Section A: Values

Below, sixteen values are described. Please indicate how important each value is for you AS A GUIDING PRINCIPLE IN **YOUR** LIFE.

Use the rating scale below:

-1 is for rating any values **opposed** to the principles that guide you.

0 means the value is not at all important, it is not relevant as a guiding principle for you.

3 means the value is important

6 means the value is very important.

7 is for rating a value of supreme importance as a guiding principle in your life.

Ordinarily there are no more than two such values.

The higher the number (0, 1, 2, 3, 4, 5, 6), the more important the value is as a guiding principle in **YOUR** life. Try to distinguish as much as possible between the values by using **different numbers**.

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very impo rtant</i>	<i>of supreme importanc e</i>
1. EQUALITY (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
2. SOCIAL POWER (control over others, dominance)	-1	0	1	2	3	4	5	6	7
3. UNITY WITH NATURE (fitting into nature)	-1	0	1	2	3	4	5	6	7

4. A WORLD AT PEACE (free of war and conflict)	-1	0	1	2	3	4	5	6	7
5. WEALTH (material possessions, money)	-1	0	1	2	3	4	5	6	7
6. AUTHORITY (the right to lead or command)	-1	0	1	2	3	4	5	6	7
7. SOCIAL JUSTICE (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
8. PROTECTING THE ENVIRONMENT (preserving nature)	-1	0	1	2	3	4	5	6	7
9. INFLUENTIAL (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
10. HELPFUL (working for the welfare of others)	-1	0	1	2	3	4	5	6	7
11. RESPECTING THE EARTH (harmony with other species)	-1	0	1	2	3	4	5	6	7
12. PREVENTING POLLUTION (protecting natural resources)	-1	0	1	2	3	4	5	6	7
13. AMBITIOUS (hard-working, aspiring).	-1	0	1	2	3	4	5	6	7

Section B: Attitudes

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **7** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement. Circling **4** indicates you are **neither agree or disagree** with the statement.

1. I feel I should not waste anything if it can be used again

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

2. It would be wrong of me not to recycle my waste

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

3. I would feel guilty if I did not recycle my waste

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

4. Not recycling goes against my principles

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

Section C: Recycling

Finally, please indicate to the best of your knowledge, how many items you estimate you have recycled in the past 24 hours?

APPENDIX B

Chapter Two Ethics



RESEARCH AND ENTERPRISE SERVICES

9th December 2014

Grant Bosworth
Room 1.23
Dorothy Hodgkin Building

Dear Grant,

Re: Recycling values, attitudes and behaviours

Thank you for submitting your application for review. I am pleased to inform you that your application has been approved by the Ethics Review Panel. The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Summary of Proposal	3	06/12/14
Information Sheets	3	06/12/14
Consent Forms	3	06/12/14
Questionnaire	3	06/12/14

If the fieldwork goes beyond the date stated in your application, you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP1 in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP1 in the subject line of the e-mail. This form is available via <http://www.keele.ac.uk/researchsupport/researchethics/>

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP1 in the subject line of the e-mail.

Yours sincerely

PP

Dr Jackie Waterfield
Chair – Ethical Review Panel

APPENDIX C
Chapter Two Information Sheet, Consent form and Debrief



Information Sheet

Invitation

You are being invited to consider taking part in a research study relating to your values and environmental behaviour. This project is being undertaken by Grant Bosworth (PhD Candidate, School of Psychology).

Before you decide whether you wish to take part, it is important for you to understand why this research is being completed and what it will involve for you. Please ask if there is anything that is unclear or if you would like more information.

Aims of the Research

This study aims to explore the relationship between people's values, attitudes and their environmental behaviour.

Do I have to take part?

You are free to decide whether you take part. If you do decide to take part you will be asked to sign a consent form and then complete a questionnaire relating to values, attitudes and environmental behaviour. You are free to withdraw from the study at any time until you place your completed questionnaire with other anonymous questionnaires – as it will not be possible to identify your questionnaire at this stage.

What will happen if I take part?

You will be asked to complete a questionnaire asking about your environmental values, attitudes and your environmental behaviour. This should take around ten minutes to complete. Once you have done so you may place your questionnaire in the box pointed out by the researcher.

How will information about me be used?

After the completion of the study your data will be pooled with all the other completed questionnaires. The data may be retained for reference in future studies and may be published in journals. You are not required to reveal any identifying information aside from your age and gender in this study.

Who will have access to information about me?

The data will be secured securely on a password protected computer which only the lead researcher has access to. After a five-year period (maximum) all original data will be securely disposed of. Furthermore, all personal data will be kept confidential and only the researcher and his supervisors will have access to the data.

Who is funding and organising the research?

The research will form part of a PhD Thesis that is being funded by Keele University Research Institute for the Social Sciences.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should speak to the researcher in the room or e-mail *Grant Bosworth* at g.j.bosworth@keele.ac.uk. Alternatively, if you do not wish to contact the researcher you may contact Chris Stiff on c.stiff@keele.ac.uk

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:

Nicola Leighton
Research Governance Officer
Research & Enterprise Services
Dorothy Hodgkin Building
Keele University
ST5 5BG
E-mail: n.leighton@uso.keele.ac.uk
Tel: 01782 733306



CONSENT FORM

Name and Contact details of Principal Investigator: *Grant Bosworth, Room 1.23 Dorothy Hodgkin Building, Keele University. E-mail: g.j.bosworth@keele.ac.uk*

Please tick box if you agree with the statement

- | | | |
|---|--|--------------------------|
| 1 | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2 | I understand that my participation is voluntary and that I am free to withdraw at any time up until my questionnaire has been posted with all other questionnaires | <input type="checkbox"/> |
| 3 | I agree to take part in this study. | <input type="checkbox"/> |
| 4 | I understand that data collected about me during this study will be pooled with other data and may be submitted for publication. | <input type="checkbox"/> |
| 5 | I agree to allow the dataset collected to be used for future research projects | <input type="checkbox"/> |

Name of Participant:

Signature:

Date:



Debrief

Thank you for completing this study.

This study aims to investigate the relationship between values, attitudes and environmental behaviour.

It is thought certain values are positively related to environmental attitudes and behaviour, while other values are negatively related to environmental behaviour.

This study will consider whether the importance you attributed to the values is related to your self-reported environmental behaviour.

If you would like to know more about this study please contact the researcher at:
g.j.bosworth@keele.ac.uk

Or alternatively, if you would like to read more about this topic please see the following references:

De Groot, J. I., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330-354.

Nordlund, A. M., & Garvill, J. (2002). Value structures behind pro-environmental behavior. *Environment and Behavior*, 34(6), 740-756.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.

APPENDIX D

Assumption checks for regressions

Regression 1: Values Predicting Recycling

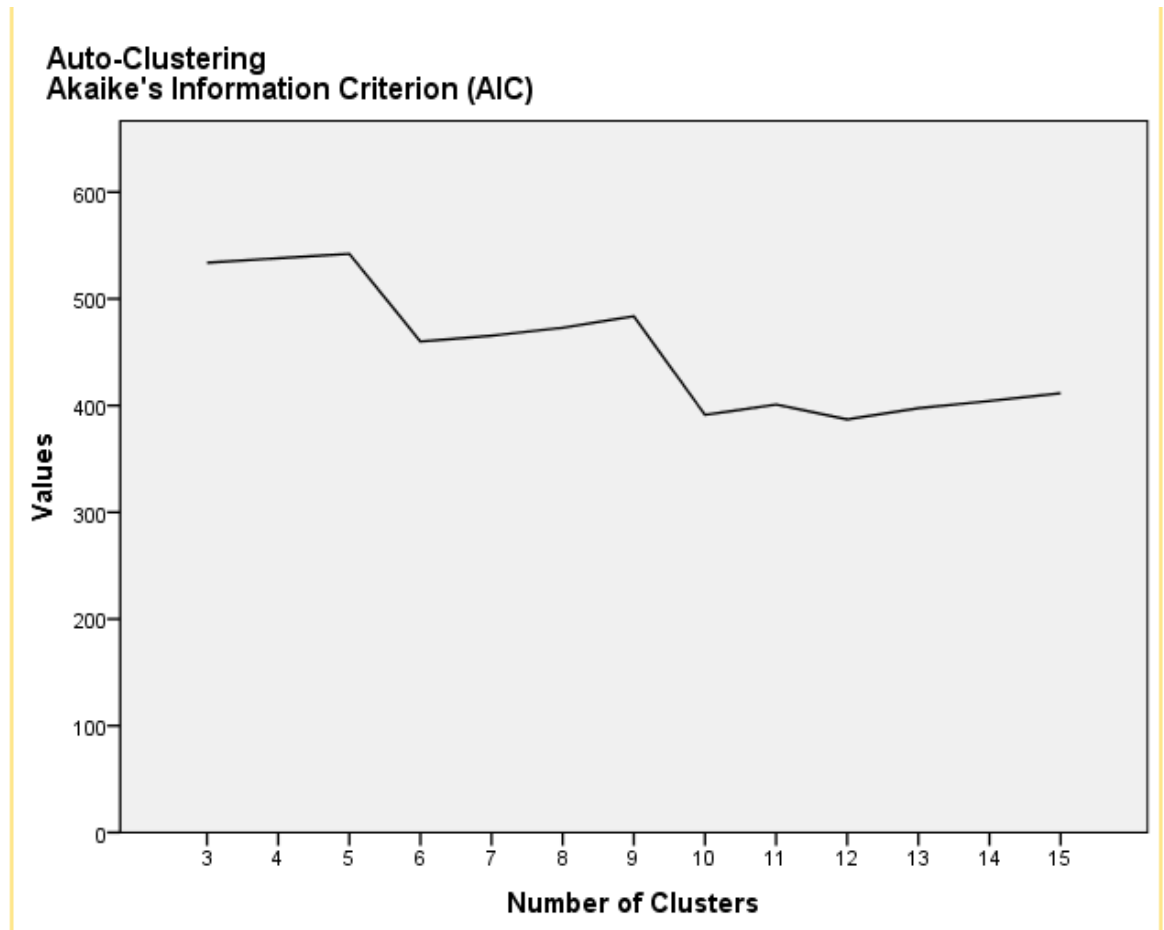
First, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. Twelve outliers were detected and were removed to meet this assumption (Std. Residual Min = -1.69, Max = 3.02). Tests were also employed to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern as the Tolerance of all predictor variables was greater than 0.1 and the VIF was less than 10 (Biospheric value-orientation: Tolerance = .738, VIF = 1.355; Altruistic value-orientation: Tolerance = .750, VIF = 1.334; Egoistic value-orientation: Tolerance = .972, VIF = 1.029). Third, both the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Finally, the assumption of non-zero variances was checked and was met.

Regression 2: Values on Moral Norms

Once again, an analysis of standard residuals was carried out to screen for outliers. As all values were between -3.29 and 3.29 it was concluded that no outliers were present (Std. Residual Min = -2.79, Max = 2.17). Tests were performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 2.06). As found in the previous regression, both the histogram of standardised residuals and the normal P-P plot also indicated the data contained approximately normally distributed errors. Finally, as before, the data also met the assumption of non-zero variances.

APPENDIX E

AIC showing a marked drop in model fit after the 3, 4 and 5 group solutions.



APPENDIX F

Assumptions Checks for Chapter 2 MANOVA

To satisfy the assumption checks for the MANOVA, boxplots were produced for both dependent variables to check for outliers, resulting in twenty-one outliers being removed mainly due to outliers on the self-report measure of recycling behaviour. The MANOVA was considered appropriate as both dependent variables were thought to be related, which was confirmed by performing a correlation analysis between them: $r(279) = .16, p < .01$.

Q-Q plots were also produced and suggested the data was normally distributed. Finally, Levene's test of equality of variance was performed. This suggested that for self-reported recycling behaviour there was the possibility of unequal variance across conditions: $F(1, 280) = 3.38, p = .02$. However, this is not too surprising given the data-driven approach taken to identify the cluster groups. Upon further inspection, and taking the approach into consideration, as the ratio between the groups' variance was less than three-to-one, no further action was taken (Dean & Voss, 1999). Moreover, no such violation was detected for the other dependent variable: $F(1, 280) = 1.85, p = .14$.

APPENDIX G:
Chapter 3 Questionnaire

Thank you for agreeing to take part in this study. First, please provide the following information:

Age: _____ Gender: _____

Section A: Values

Below, sixteen values are described. Please indicate how important each value is for you
AS A GUIDING PRINCIPLE IN **YOUR** LIFE.

Use the rating scale below:

-1 is for rating any values **opposed** to the principles that guide you.

0 means the value is not at all important, it is not relevant as a guiding principle for you.

3 means the value is important

6 means the value is very important.

7 is for rating a value of supreme importance as a guiding principle in your life.

Ordinarily there are no more than two such values.

The higher the number (0, 1, 2, 3, 4, 5, 6), the more important the value is as a guiding principle in **YOUR** life. Try to distinguish as much as possible between the values by using

different numbers.

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
14. EQUALITY (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
15. PLEASURE (gratification of desires)	-1	0	1	2	3	4	5	6	7
16. SOCIAL POWER (control over others, dominance)	-1	0	1	2	3	4	5	6	7

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
17. UNITY WITH NATURE (fitting into nature)	-1	0	1	2	3	4	5	6	7
18. A WORLD AT PEACE (free of war and conflict)	-1	0	1	2	3	4	5	6	7
19. WEALTH (material possessions, money)	-1	0	1	2	3	4	5	6	7
20. ENJOYING LIFE (enjoying food, sex, leisure, etc.)	-1	0	1	2	3	4	5	6	7
21. AUTHORITY (the right to lead or command)	-1	0	1	2	3	4	5	6	7
22. SOCIAL JUSTICE (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
23. PROTECTING THE ENVIRONMENT (preserving nature)	-1	0	1	2	3	4	5	6	7
24. INFLUENTIAL (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
25. HELPFUL (working for the welfare of others)	-1	0	1	2	3	4	5	6	7
26. SELF-INDULGENT (doing pleasant things)	-1	0	1	2	3	4	5	6	7

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
27. RESPECTING THE EARTH (harmony with other species)	-1	0	1	2	3	4	5	6	7
28. PREVENTING POLLUTION (protecting natural resources)	-1	0	1	2	3	4	5	6	7
29. AMBITIOUS (hard-working, aspiring).	-1	0	1	2	3	4	5	6	7

Section B: Attitudes

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **7** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement. Circling **4** indicates you are **neither agree or disagree** with the statement.

1. I feel I should not waste anything if it can be used again

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

2. It would be wrong of me not to recycle my waste

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

3. I would feel guilty if I did not recycle my waste

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

4. Not recycling goes against my principles

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

Section C: Environmental Behavior

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **6** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement.

1. I recycle my waste wherever possible

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

2. Separating items for recycling is something I always do

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

3. Providing the facilities are available, I try to recycle

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

4. When available, I select products that can be recycled ahead of equivalent products that cannot be recycled'

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

5. When available, I select products made from recycled materials ahead of equivalent products made from non-recycled materials

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

Section D

Please select true or false in relation to the statements below

It is sometimes hard for me to go on with my work if I am not encouraged.	True	False
I sometimes feel resentful when I don't get my way.	True	False
On a few occasions, I have given up doing something because I thought too little of my ability.	True	False
There have been times when I felt like rebelling against people in authority even though I knew they were right.	True	False
No matter who I'm talking to, I'm always a good listener.	True	False
There have been occasions when I took advantage of someone.	True	False
I'm always willing to admit it when I make a mistake.	True	False
I sometimes try to get even rather than forgive and forget.	True	False
I am always courteous, even to people who are disagreeable.	True	False
I have never been irked when people expressed ideas very different from my own.	True	False
There have times when I was quite jealous of the good fortune of others.	True	False
I am sometimes irritated by people who ask favours of me.	True	False
I have never deliberately said something that hurt someone's feelings.	True	False

Questionário Ambiental (Brasil)

Por favor, forneça sua idade e gênero:

Idade: _____

Gênero: _____

Seção A

Abaixo dezesseis valores são apresentados. Após cada valor, a explicação é dada entre parênteses. Por favor, indique qual a importância de cada valor para você como **um princípio orientador de sua vida**. Para isso, use a escala de classificação a seguir:

- 1** significa que o valor é contrário aos seus.
- 0** significa que o valor não é importante de forma alguma.
- 3** significa que o valor é importante.
- 6** significa que o valor é muito importante.
- 7** significa que o valor de suprema importância como um princípio orientador em sua vida.

Quanto maior o número, mais importante é o valor como um princípio orientador em sua vida.

	<i>Contrário aos meus valores</i>	<i>Não é importante</i>	<i>Importante</i>					<i>muito importante</i>	<i>de suprema importância</i>
1. IGUALDADE (oportunidades iguais para todos)	-1	0	1	2	3	4	5	6	7
2. PRAZER (satisfação de desejos)	-1	0	1	2	3	4	5	6	7
3. PODER (controle sobre os outros, dominação)	-1	0	1	2	3	4	5	6	7
4. UNIDADE COM A NATUREZA (integração da natureza)	-1	0	1	2	3	4	5	6	7

	<i>Contrário aos meus valores</i>	<i>Não é importante</i>	<i>Importante</i>					<i>muito importante</i>	<i>de suprema importância</i>
5. MUNDO EM PAZ (livre de guerra e de conflitos)	-1	0	1	2	3	4	5	6	7
6. RIQUEZA (bens materiais, dinheiro)	-1	0	1	2	3	4	5	6	7
7. APRECIAR A VIDA (gostar de comida, sexo, lazer, etc.)	-1	0	1	2	3	4	5	6	7
8. AUTORIDADE (o direito de liderar ou comando)	-1	0	1	2	3	4	5	6	7
9. JUSTIÇA SOCIAL (correção de injustiça, cuidado pelos fracos)	-1	0	1	2	3	4	5	6	7
10. PROTEÇÃO DO MEIO AMBIENTE (preservação da natureza)	-1	0	1	2	3	4	5	6	7
11. INFLUENTE (impacto sobre as pessoas e acontecimentos)	-1	0	1	2	3	4	5	6	7
12. PRESTATIVO (trabalhar pelo bem-estar dos outros)	-1	0	1	2	3	4	5	6	7
13. AUTO-SATISFAÇÃO (fazer coisas agradáveis para si)	-1	0	1	2	3	4	5	6	7
14. RESPEITANDO A TERRA (harmonia com outras espécies)	-1	0	1	2	3	4	5	6	7
15. PREVENÇÃO DA POLUIÇÃO (proteção dos recursos naturais)	-1	0	1	2	3	4	5	6	7
16. AMBIÇÃO (trabalho árduo, aspirações)	-1	0	1	2	3	4	5	6	7

Seção B

Por favor, marque a opção com a resposta que melhor descreve você ...

1. Acredito que não deveria jogar no lixo qualquer coisa que possa ser reutilizada

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Concordo Totalmente)

2. Seria errado da minha parte não reciclar o meu lixo.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Concordo Totalmente)

3. Eu me sentiria culpado se não reciclasse o meu lixo.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Concordo Totalmente)

4. Não reciclar é contra os meus princípios.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Concordo Totalmente)

Seção C

Por favor, marque a opção com a resposta que melhor descreve você ...

1. Eu tento reciclar tudo que posso.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 (Concordo Totalmente)

2. Eu sempre separo itens para reciclagem.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 (Concordo Totalmente)

3. Havendo estrutura adequada, eu reciclo sempre

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 (Concordo Totalmente)

4. O fato de um produto ser reciclável influencia na minha decisão de comprá-lo.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 (Concordo Totalmente)

5. Prefiro um produto feito de material reciclado do que um de material não-reciclado.

(Discordo Totalmente) 1 — 2 — 3 — 4 — 5 — 6 (Concordo Totalmente)

Seção D

Por favor selecione verdadeiro ou falso em relação às declarações abaixo

Às vezes, é difícil para mim continuar o meu trabalho se eu não sou encorajado.	Verdadeiro	Falso
Às vezes, me sinto chateado quando eu não consigo fazer as coisas da minha maneira.	Verdadeiro	Falso
Em alguns momentos, eu desisto de fazer alguma coisa porque eu subestimo a minha capacidade.	Verdadeiro	Falso
Houve momentos em que eu me revolttei contra as pessoas em posição de autoridade, mesmo sabendo que elas estavam certas.	Verdadeiro	Falso
Eu sempre sou um bom ouvinte, independente de com quem eu estou falando.	Verdadeiro	Falso
Houve momentos em que eu me aproveitei de alguém.	Verdadeiro	Falso
Sempre estou disposto a admitir quando eu cometo um erro.	Verdadeiro	Falso
Às vezes, eu tento revidar em vez de perdoar e esquecer.	Verdadeiro	Falso
Sou sempre cordial, mesmo com as pessoas que são desagradáveis.	Verdadeiro	Falso
Eu nunca me incomodei quando as pessoas expressaram ideias muito diferentes da minha.	Verdadeiro	Falso
Houve momentos em que eu senti um pouco de inveja do sucesso dos outros.	Verdadeiro	Falso
Às vezes, eu fico irritado com pessoas que me pedem favores.	Verdadeiro	Falso
Eu nunca disse intencionalmente algo que ferisse os sentimentos de alguém.	Verdadeiro	Falso

APPENDIX H
Chapter 3 Questionnaire



Information Sheet

Invitation

You are being invited to consider taking part in a research study relating to your values and environmental behaviour. This project is being undertaken by Grant Bosworth (PhD Candidate, School of Psychology).

Before you decide whether you wish to take part, it is important for you to understand why this research is being completed and what it will involve for you. Please ask if there is anything that is unclear or if you would like more information.

Aims of the Research

This study aims to explore the relationship between people's values, attitudes and their environmental behaviour. Also, this research will consider common personality traits such as whether you are a good listener or not.

Do I have to take part?

You are free to decide whether you take part. If you do decide to take part you will be asked to sign a consent form and then complete a questionnaire relating to values, attitudes and environmental behaviour. You are free to withdraw from the study at any time up until you place your questionnaire in a pile with other anonymised questionnaires.

What will happen if I take part?

You will be asked to complete a questionnaire asking about your values, attitudes, environmental behaviour and common personality traits. This should take around fifteen minutes to complete. Once you have done so you may place your questionnaire in the box pointed out by the researcher.

How will information about me be used?

After the completion of the study your data will be pooled with all the other completed questionnaires. The data may be retained for reference in future studies and may be published in journals. You are not required to reveal any identifying information aside from your age and gender in this study.

Who will have access to information about me?

The data will be secured securely on a password protected computer which only the lead researcher has access to. After a five-year period (maximum) all original data will be securely

disposed of. Furthermore, all personal data will be kept confidential and only the researcher and his supervisors will have access to the data.

Who is funding and organising the research?

The research will form part of a PhD Thesis that is being funded by Keele University Research Institute for the Social Sciences.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should speak to the researcher in the room or e-mail *Grant Bosworth* at g.j.bosworth@keele.ac.uk. Alternatively, if you do not wish to contact the researcher you may contact Chris Stiff on c.stiff@keele.ac.uk

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:

Nicola Leighton
Research Governance Officer
Research & Enterprise Services
Dorothy Hodgkin Building
Keele University
ST5 5BG
E-mail: n.leighton@uso.keele.ac.uk
Tel: 01782 733306



CONSENT FORM

Name and Contact details of Principal Investigator: *Grant Bosworth, Room 1.23 Dorothy Hodgkin Building, Keele University. E-mail: g.j.bosworth@keele.ac.uk*

Please tick box if you agree with the statement

- | | | |
|---|--|--------------------------|
| 1 | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2 | I understand that my participation is voluntary and that I am free to withdraw at any time up until my questionnaire has been posted with all other questionnaires | <input type="checkbox"/> |
| 3 | I agree to take part in this study. | <input type="checkbox"/> |
| 4 | I understand that data collected about me during this study will be pooled with other data and may be submitted for publication. | <input type="checkbox"/> |
| 5 | I agree to allow the dataset collected to be used for future research projects | <input type="checkbox"/> |

Name of Participant:

Signature:

Date:



Debrief

Thank you for completing this study.

This study aims to investigate the relationship between values, attitudes and environmental behaviour.

It is thought certain values are positively related to environmental attitudes and behaviour, while other values are negatively related to environmental behaviour.

This study will consider whether the importance you attributed to the values is related to your self-reported environmental behaviour.

This study will also consider whether differences exist between participants who completed this questionnaire in the UK and Brazil.

The final part of the questionnaire asked about 'common personality traits', actually these questions were measuring 'social desirability'. In other words, the questionnaire was attempting to assess whether participants may answer in way that seems the most acceptable but may not be entirely accurate. The study will consider the answers to this portion of the questionnaire in conjunction with the self-reported environmental behaviour, to see if there is a link between the two.

If you would like to know more about this study please contact the researcher at:
g.j.bosworth@keele.ac.uk

Or alternatively, if you would like to read more about this topic please see the following references:

De Groot, J. I., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330-354.

Nordlund, A. M., & Garvill, J. (2002). Value structures behind pro-environmental behavior. *Environment and Behavior*, 34(6), 740-756.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.

APPENDIX I

Ethics for Chapter 3



Ref: ERP354

8th October 2015

Grant Bosworth
School of Psychology
Room 1.23
Dorothy Hodgkin Building
Keele University

Dear Grant

Re: 1 - The Value-Goal-Behaviour Relationship: An Exploratory Study

Thank you for submitting your revised application for review.

I am pleased to inform you that your application has been approved by the Ethics Review Panel.
The following documents have been reviewed and approved by the panel as follows:

Document(s)	Version Number	Date
Summary Document	2	29/09/2015
Information Sheet	2	29/09/2015
Consent Form	2	29/09/2015
Questionnaire	2	29/09/2015

If the fieldwork goes beyond the date stated in your application (28th September 2016), you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP3 in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP3 in the subject line of the e-mail. This form is available via <http://www.keele.ac.uk/researchsupport/researchethics/>.

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP3 in the subject line of the e-mail.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'C H Bosworth' with 'pp' written below it.

Dr Helena Priest
Chair – Ethical Review Panel

APPENDIX J

Assumption Checks for Chapter 3

Factor Analysis Assumptions (UK)

First, the Kaiser-Meyer-Olkin measure of sampling adequacy was .71, above the recommended value of .6, and second, Bartlett's test of sphericity was significant: $\chi^2(10) = 666.89, p < .05$. Finally, the communalities were all above .3 confirming that each item shared some common variance with other items. Given these overall indicators, the factor analysis was conducted with a maximum-likelihood method with varimax rotation. This method was employed ahead of principal-axis factoring as the author has no reason or wish to identify one factor to account for significantly more variance than another (e.g. a principal factor).

Factor Analysis Assumptions (Brazil)

First, the Kaiser-Meyer-Olkin measure of sampling adequacy was .62, above the recommended value of .6, and Bartlett's test of sphericity was significant: $\chi^2(10) = 192.19, p < .05$. Finally, the communalities were all above .3 confirming that each item shared some common variance with other items. Given these overall indicators, the FA was conducted with a maximum-likelihood method with varimax rotation was employed.

APPENDIX K

Assumptions Checks for Regressions in Chapter 3

Before running the regression, several assumptions checks were performed. First, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. The assumption was met as no outliers were found (Std. Residual Min = -2.76, Max = 2.66). Tests were also employed to see if the data met the assumption of collinearity. The output indicated that multicollinearity was not a concern as the tolerance of all predictor variables was greater than 0.1 and the VIF was less than 10 (Biospheric value-orientation: Tolerance = .689, VIF = 1.45; Altruistic value-orientation: Tolerance = .692, VIF = 1.45; Egoistic value-orientation: Tolerance = .788, VIF = 1.27; Hedonic value-orientation: Tolerance = .777, VIF = 1.29). Third, the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Tests were also performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 1.95). The data also met the assumption of non-zero variances. The second regression investigated whether the values predicted recycling behaviour was also performed. First, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. The assumption was met as no outliers were found (Std. Residual Min = -3.06, Max = 2.40). Second, both the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Tests were also performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 1.81). Finally, the data also met the assumption of non-zero variances. The third regression investigated whether the values predicted green product purchase. Again, before doing so, the assumption checks were met yet one outlier was found and removed, which left no other outliers (Std. Residual Min = -2.09, Max = 3.03).

APPENDIX L

Assumption checks for Chapter 3 MANOVA UK sample

To satisfy the assumption checks for this test, boxplots were produced for all dependent variables to check for outliers. This resulted in five outliers being removed due to their scores on moral norms, three outliers being removed due to their scores on self-reported recycling and one outlier being removed due to their score on the green product purchase measure. In total, this screening process reduced the sample by nine people, to 362 participants. Q-Q plots and histograms were also produced and suggested the data was normally distributed. Finally, Levene's test of equality of variance was performed. This suggested that there was equal error variance across groups for all three dependent variables: Moral norms $F(3,358) = 2.47, p > 0.05$; Recycling $F(3,358) = 2.53, p > 0.05$, and 'green' product purchase $F(3,358) = 2.54, p > 0.05$.

Assumptions checks for Chapter 3 MANOVA Brazil sample

For the Brazilian sample, Boxplots for all dependent variables revealed three outliers which were removed due to their scores on moral norms, one outlier removed due to their score on self-reported recycling and two outliers removed due to their scores on the 'green' product purchase measure. In total, this screening process reduced the sample by six people, to 233 participants. Q-Q plots and histograms suggested the data was normally distributed. Levene's test of equality of variance suggested that there was equal error variance across the groups for two of the three dependent variables: Recycling $F(3,229) = 1.05, p > 0.05$, and 'green' product purchase $F(3,229) = 1.66, p > 0.05$. However, it was found that there was not equal error variance across the groups for the moral norms measure $F(3,229) = 5.16, p < 0.05$. Upon further inspection of the variances, as no one group had variance three-times that of any other group, the data was left untreated given the robustness of the tests conducted, and the data-driven nature of arriving at the four cluster groups.

APPENDIX M

Assumption checks for chapter 4.

First, for the regression of values on sustainable energy use, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. The assumption was met as no outliers were found (Std. Residual Min = -2.02, Max = 2.49). Second, tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern as the Tolerance of all predictor variables was greater than 0.1 and the VIF was less than 10 (Biospheric values: Tolerance =.543, VIF = 1.84; Altruistic values: Tolerance =.537, VIF = 1.86; Egoistic values: Tolerance =.728, VIF =1.37; Hedonic values: Tolerance =.716, VIF = 1.40). Third, both the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Tests were also performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 1.93).

Second, for the regression of values on intention to reduce car use, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. The assumption was met as no outliers were found (Std. Residual Min = -1.66, Max = 2.47). Second, the data met the assumption of collinearity as indicated by the findings reported in the previous regression. Third, both the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Tests were also performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 1.93).

.....

APPENDIX N

Chapter 5 Questionnaire

Thank you for agreeing to take part in this study. First, please provide the following information:

Age: _____ Gender: _____

Section A: Values

Below, sixteen values are described. Please indicate how important each value is for you AS A GUIDING PRINCIPLE IN **YOUR** LIFE.

Use the rating scale below:

-1 is for rating any values **opposed** to the principles that guide you.

0 means the value is not at all important, it is not relevant as a guiding principle for you.

3 means the value is important

6 means the value is very important.

7 is for rating a value of supreme importance as a guiding principle in your life.

Ordinarily there are no more than two such values.

The higher the number (0, 1, 2, 3, 4, 5, 6), the more important the value is as a guiding principle in **YOUR** life. Try to distinguish as much as possible between the values by using **different numbers**.

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
1. EQUALITY (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
2. PLEASURE (gratification of desires)	-1	0	1	2	3	4	5	6	7
3. SOCIAL POWER (control over others, dominance)	-1	0	1	2	3	4	5	6	7

		<i>opposed to my values</i>	<i>not important</i>		<i>important</i>			<i>very important</i>	<i>of supreme importance</i>	
4.	UNITY WITH NATURE (fitting into nature)	-1	0	1	2	3	4	5	6	7
5.	A WORLD AT PEACE (free of war and conflict)	-1	0	1	2	3	4	5	6	7
6.	WEALTH (material possessions, money)	-1	0	1	2	3	4	5	6	7
7.	ENJOYING LIFE (enjoying food, sex, leisure, etc.)	-1	0	1	2	3	4	5	6	7
8.	AUTHORITY (the right to lead or command)	-1	0	1	2	3	4	5	6	7
9.	SOCIAL JUSTICE (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
10.	PROTECTING THE ENVIRONMENT (preserving nature)	-1	0	1	2	3	4	5	6	7
11.	INFLUENTIAL (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
12.	HELPFUL (working for the welfare of others)	-1	0	1	2	3	4	5	6	7
13.	SELF-INDULGENT (doing pleasant things)	-1	0	1	2	3	4	5	6	7

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
14. RESPECTING THE EARTH (harmony with other species)	-1	0	1	2	3	4	5	6	7
15. PREVENTING POLLUTION (protecting natural resources)	-1	0	1	2	3	4	5	6	7
16. AMBITIOUS (hard-working, aspiring).	-1	0	1	2	3	4	5	6	7

Section B: Attitudes

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **7** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement. Circling **4** indicates you are **neither agree or disagree** with the statement.

1. If I performed pro-environmental behaviours on a regular basis I think that I would be a responsible person.

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

2. If I performed pro-environmental behaviours on a regular basis I would show respect for humans and the earth

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

3. If I performed pro-environmental behaviours on a regular basis I would feel like I'm doing something morally right

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

4. If I performed pro-environmental behaviours on a regular basis I would have a good conscience

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

5. I have a moral obligation to adopt pro-environmental behaviours on a regular basis

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

6. My personal values prompt me to perform pro-environmental behaviours on a regular basis

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 — 7 (Strongly Agree)

Section C: Environmental Behavior

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **6** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement.

1. I recycle my waste wherever possible

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

2. Separating items for recycling is something I always do

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

3. Providing the facilities are available, I try to recycle

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

4. When available, I select products that can be recycled ahead of equivalent products that cannot be recycled'

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

5. When available, I select products made from recycled materials ahead of equivalent products made from non-recycled materials.

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

6. I try to re-use 'everyday' items such as paper, cardboard, jars and pots.

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

7. I take a re-usable vessel (e.g. cup/mug/glass) with me rather than accept a disposable vessel (e.g. from a coffee shop).

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

8. I re-use carrier bags when I go shopping.

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

9. I buy imperfect vegetable produce such as those from a 'wonky' veg box.

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

APPENDIX O

Chapter 5 Posters

Value-Neutral:



Value-Bio/Alt:



Value-Ego/Hed:

Save Water



A  from your tap...




can increase your water costs





Saving water has positive consequences for your finances, allowing you to spend your money on more enjoyable things.
Save water by turning off your taps.

Value-Combined:




Save Water



A unused  from your tap...



leads to unnecessary energy use
and can increase your water costs



Saving water has positive consequences for your finances, allowing you to spend your money on more enjoyable things, whilst also benefiting plants, animals and communities around the world.
Save water by turning off your taps

APPENDIX P

Ethics for Chapter 5



Ref: ERP355

8th October 2015

Grant Bosworth
School of Psychology
Room 1.23
Dorothy Hodgkin Building
Keele University

Thank you for submitting your revised application for review.

I am pleased to inform you that your application has been approved by the Ethics Review Panel.
The following documents have been reviewed and approved by the panel as follows:

Document(s)	Version Number	Date
Summary Document	2	29/09/2015
Information Sheet	2	29/09/2015
Consent Form	2	29/09/2015
Questionnaire	2	29/09/2015

If the fieldwork goes beyond the date stated in your application (28th September 2016), you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP3 in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP3 in the subject line of the e-mail. This form is available via <http://www.keele.ac.uk/researchsupport/researchethics/>.

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP3 in the subject line of the e-mail.

Yours sincerely

Dr Helena Priest
Chair – Ethical Review Panel

CC RI Manager
Supervisor

APPENDIX Q

Chapter Five Information Sheet, Consent form and Debrief



Information Sheet

Invitation

You are being invited to consider taking part in a research study relating to your values and environmental behaviour. Before you decide whether you wish to take part, it is important for you to understand why this research is being completed and what it will involve for you. Please ask if there is anything that is unclear or if you would like more information.

Aims of the Research

This study aims to explore the relationship between people's values, attitudes, environmental behaviour and their preferences regarding different types of communication relating to the environment.

Do I have to take part?

You are free to decide whether you take part. You are free to withdraw from the study at any time until you submit the questionnaire.

What will happen if I take part?

If you do decide to take part you will be asked to sign a consent form (or tick the appropriate box if completing this online) and then complete a questionnaire relating to values, attitudes and environmental behaviour. The final part of the questionnaire will ask you about your preferences for four posters relating to water conservation. This should take around fifteen minutes to complete.

How will information about me be used?

After the completion of the study your data will be pooled with all the other completed questionnaires. The data may be retained for reference in future studies and may be published in journals. You are not required to reveal any identifying information aside from your age and gender in this study.

Who will have access to information about me?

The data will be secured securely on a password protected computer which only the lead researcher has access to. After a five-year period (maximum) all original data will be securely disposed of. Furthermore, all personal data will be kept confidential and only the researcher and his supervisors will have access to the data.

Who is funding and organising the research?

The research will form part of a PhD Thesis that is being funded by Keele University Research Institute for the Social Sciences.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should e-mail *Grant Bosworth* at g.j.bosworth@keele.ac.uk. Alternatively, if you do not wish to contact the researcher you may contact Chris Stiff on c.stiff@keele.ac.uk

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:

Nicola Leighton
Research Governance Officer
Research & Enterprise Services
Dorothy Hodgkin Building
Keele University
ST5 5BG
E-mail: n.leighton@uso.keele.ac.uk
Tel: 01782 733306



CONSENT FORM

Name and Contact details of Principal Investigator: *Grant Bosworth, Room 1.23 Dorothy Hodgkin Building, Keele University. E-mail: g.j.bosworth@keele.ac.uk*

Please tick box if you agree with the statement

- | | | |
|---|--|--------------------------|
| 1 | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2 | I understand that my participation is voluntary and that I am free to withdraw at any time up until my questionnaire has been posted with all other questionnaires | <input type="checkbox"/> |
| 3 | I agree to take part in this study. | <input type="checkbox"/> |
| 4 | I understand that data collected about me during this study will be pooled with other data and may be submitted for publication. | <input type="checkbox"/> |
| 5 | I agree to allow the dataset collected to be used for future research projects | <input type="checkbox"/> |

Name of Participant:

Signature: (Tick box for online version)

Date:



Debrief

Thank you for completing this study.

This study aims to investigate the relationship between values, attitudes and environmental behaviour.

It is thought certain values are positively related to environmental attitudes and behaviour, while other values are negatively related to environmental behaviour. This study will consider whether the importance you attributed to the values is related to your self-reported environmental behaviour.

The study also is investigating whether people who hold certain values prefer communication that emphasises different reasons to engage in pro-environmental behaviour. For example, some people may be more motivated by financial savings, while others may be more motivated by the consequences acting pro-environmentally has for the planet.

If you would like to know more about this study please contact the researcher at:
g.j.bosworth@keele.ac.uk

Or alternatively, if you would like to read more about the relationship between values and environmental behaviour please see the following sources:

De Groot, J. I., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330-354.

Nordlund, A. M., & Garvill, J. (2002). Value structures behind pro-environmental behavior. *Environment and Behavior*, 34(6), 740-756.

APPENDIX R

Chapter 5 Assumptions

Factor analysis

First, the Kaiser-Meyer-Olkin measure of sampling adequacy was .75, above the recommended value of .6, and second, Bartlett's test of sphericity was significant ($\chi^2(10) = 785.38, p < .001$). Finally, the communalities were all above .3 confirming that each item shared some common variance with other items. Given these overall indicators, the FA was conducted with a maximum-likelihood method with varimax rotation was employed. This method was employed ahead of principal-axis factoring as the author has no reason or wish for one factor to account for significantly more variance than another (e.g. a principal factor).

Regression

First, an analysis of standard residuals was carried out to screen for outliers. For this assumption to be met all values needed to lie between -3.29 and 3.29. The assumption was met as no outliers were found (Std. Residual Min = -2.84, Max = 2.91). Second, tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern as the Tolerance of all predictor variables was greater than 0.1 and the VIF was less than 10 (Biospheric value-orientation: Tolerance = .63, VIF = 1.60; Altruistic value-orientation: Tolerance = .68, VIF = 1.47; Egoistic value-orientation: Tolerance = .75, VIF = 1.33; Hedonic value-orientation: Tolerance = .74, VIF = 1.36). Third, both the histogram of standardised residuals and the normal P-P plot indicated the data contained approximately normally distributed errors. Tests were also performed to ensure the data also met the assumption of independent errors. This was again satisfactory as the Durbin-Watson value was between 1 and 3 (Durbin-Watson value = 1.94).

MANOVA

First, boxplots were produced for all dependent variables to check for outliers, this resulted in eighteen outliers being removed due to their scores on the dependent variables. Q-Q plots and histograms were also produced and suggested the data was normally distributed. Finally, Levene's test of equality of variance was performed. This suggested that for some groups there were unequal error variances; however, upon further inspection no one group has a variance larger than three times that of any other. Consequently, given the robustness of the test and the data driven nature of how the groups were reached, the analysis was performed as planned.

APPENDIX S

Ethics for Chapter 6



Ref: ERP1216

27th October 2015

Grant Bosworth
RISS – Psychology
Room 1.23 Dorothy Hodgkin Building
Keele University

Dear Grant,

Re: Recycling Values, Attitudes and Behaviours?

Thank you for submitting your application to amend study. I am pleased to inform you that your application has been approved by the Ethical Review Panel.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Environment and Recycling Questionnaire	4	16/10/2015

If the fieldwork goes beyond the **31st July 2016** you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating **ERP1** in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating **ERP1** in the subject line of the e-mail. This form is available via <http://www.keele.ac.uk/researchsupport/researchethics/>

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating **ERP1** in the subject line of the e-mail.

Yours sincerely

Dr Jackie Waterfield
Chair – Ethical Review Panel

CC RI Manager
Supervisor

APPENDIX T
Chapter Six Information Sheet, Consent form and Debrief



Information Sheet

Invitation

You are being invited to consider taking part in a research study relating to your values and environmental attitudes. This project is being undertaken by Grant Bosworth (PhD Candidate, School of Psychology).

Before you decide whether you wish to take part, it is important for you to understand why this research is being completed and what it will involve for you. Please ask if there is anything that is unclear or if you would like more information.

Aims of the Research

This study aims to explore the relationship between people's values and their environmental attitudes.

Do I have to take part?

You are free to decide whether you take part. If you do decide to take part you will be asked to sign a consent form and then complete a questionnaire relating to values and environmental attitudes. You are free to withdraw from the study at any time until you have submitted your questionnaire.

What will happen if I take part?

You will be asked to complete a questionnaire asking about your values and environmental attitudes. This should take around ten minutes to complete.

How will information about me be used?

After the completion of the study your data will be pooled with all the other completed questionnaires. The data may be retained for reference in future studies and may be published in journals. You are not required to reveal any identifying information aside from your age and gender in this study.

Who will have access to information about me?

The data will be secured securely on a password protected computer which only the lead researcher has access to. After a five-year period (maximum) all original data will be securely disposed of. Furthermore, all personal data will be kept confidential and only the researcher and his supervisors will have access to the data.

Who is funding and organising the research?

The research will form part of a PhD Thesis that is being funded by Keele University Research Institute for the Social Sciences.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should speak to the researcher in the room or e-mail *Grant Bosworth* at g.j.bosworth@keele.ac.uk. Alternatively, if you do not wish to contact the researcher you may contact Chris Stiff on c.stiff@keele.ac.uk

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:

Nicola Leighton
Research Governance Officer
Research & Enterprise Services
Dorothy Hodgkin Building
Keele University
ST5 5BG
E-mail: n.leighton@uso.keele.ac.uk
Tel: 01782 733306



CONSENT FORM

Name and Contact details of Principal Investigator: *Grant Bosworth, Room 1.23 Dorothy Hodgkin Building, Keele University. E-mail: g.j.bosworth@keele.ac.uk*

Please tick box if you agree with the statement

- | | | |
|---|--|--------------------------|
| 1 | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2 | I understand that my participation is voluntary and that I am free to withdraw at any time up until my questionnaire has been posted with all other questionnaires | <input type="checkbox"/> |
| 3 | I agree to take part in this study. | <input type="checkbox"/> |
| 4 | I understand that data collected about me during this study will be pooled with other data and may be submitted for publication. | <input type="checkbox"/> |
| 5 | I agree to allow the dataset collected to be used for future research projects | <input type="checkbox"/> |

Name of Participant:

Signature: (replaced with a tick box if completing online)

Date:



Debrief

Thank you for completing this study.

This study aims to investigate the relationship between values and environmental attitudes, particularly those relating to recycling.

It is thought certain values are positively related to environmental attitudes, while other values are negatively related to environmental attitudes.

This study will consider whether the importance you attributed to the values is related to your environmental attitudes (these are thought to determine to what extent you recycle).

If you would like to know more about this study please contact the researcher at:
g.j.bosworth@keele.ac.uk

Or alternatively, if you would like to read more about this topic please see the following references:

De Groot, J. I., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330-354.

Nordlund, A. M., & Garvill, J. (2002). Value structures behind pro-environmental behavior. *Environment and Behavior*, 34(6), 740-756.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.

APPENDIX U

Example messages from the App

Example One

Non-engagers: “Did you know.... 70% less energy is required to recycle paper compared with making it from raw materials, try to make sure you always recycle paper”

Selfless contributors: “Did you know.... 70% less energy is required to recycle paper compared with making it from raw materials. Recycling paper can reduce our demand for wood, which can reduce deforestation, this can help preserve wildlife habitat and biodiversity. Try to make sure you always recycle paper”

Self-enhancers: “Did you know.... 70% less energy is required to recycle paper compared with making it from raw materials. If firms use less energy in making paper they will be able to offer more cost-effective and inexpensive recycled paper in shops, which could have financial benefits for you. Try to make sure you always recycle paper”

Value opportunists: “Did you know.... 70% less energy is required to recycle paper compared with making it from raw materials. If firms use less energy in making paper they will be able to offer more cost-effective and inexpensive recycled paper in shops, which could have financial benefits for you. Recycling paper can also reduce our demand for wood, which can reduce deforestation, this can help preserve wildlife habitat and biodiversity. Try to make sure you always recycle paper”

Example Two:

Non-engagers: “Did you know...If non-recyclable materials are put in the recycling it is known as contamination. Sometimes even just one non-recyclable item placed in the recycling will see the whole bag rejected. This means lots of recyclable products end up in landfill. Try to ensure you know exactly what can be recycled before you put things in a bin.

Selfless contributors: Did you know...If non-recyclable materials are put in the recycling it is known as contamination. Sometimes even just one non-recyclable item placed in the recycling will see the whole bag rejected. This means lots of recyclable products end up in landfill. Try to ensure you know exactly what can be recycled before you throw things in the bin. Recycling more effectively means less waste ends in landfill. This can benefit the environment as landfill sites often cause pollution to the local environment by contaminating the groundwater and soil. Try to ensure you know exactly what can be recycled before you put things in a bin.

Self-enhancers: Did you know...If non-recyclable materials are put in the recycling it is known as contamination. Sometimes even just one non-recyclable item placed in the recycling will see the whole bag rejected. This means lots of recyclable products end up in landfill. Try to ensure you know exactly what can be recycled before you throw things in the bin. It has been estimated that some councils spend up to £50'000 a month dealing with contaminated recycling. By recycling more effectively, you could reduce this figure, which would ultimately have financial benefits for you as this money could be spent on other resources that may benefit you more. Try to ensure you know exactly what can be recycled before you put things in a bin.

Value opportunists: Did you know...If non-recyclable materials are put in the recycling it is known as contamination. Sometimes even just one non-recyclable item placed in the recycling will see the whole bag rejected. This means lots of recyclable products end up in landfill. Try to ensure you know exactly what can be recycled before you throw things in the bin. Recycling more effectively means less waste ends in landfill. This can benefit the environment as landfill sites often cause pollution to the local environment by contaminating the groundwater and soil. Also, it has been estimated that some councils spend up to £50'000 a month dealing with contaminated recycling. By recycling more effectively, you could reduce this figure, which would ultimately have financial benefits for you as this money could be spent on other resources that may benefit you more. Try to ensure you know exactly what can be recycled before you put things in a bin.

APPENDIX V
Chapter 7 Questionnaires

Thank you for agreeing to take part in this study. First, please provide the following information:

Age: _____ Gender: _____

Section A: Values

Below, sixteen values are described. Please indicate how important each value is for you AS A GUIDING PRINCIPLE IN **YOUR** LIFE.

Use the rating scale below:

-1 is for rating any values **opposed** to the principles that guide you.

0 means the value is not at all important, it is not relevant as a guiding principle for you.

3 means the value is important

6 means the value is very important.

7 is for rating a value of supreme importance as a guiding principle in your life.

Ordinarily there are no more than two such values.

The higher the number (0, 1, 2, 3, 4, 5, 6), the more important the value is as a guiding principle in **YOUR** life. Try to distinguish as much as possible between the values by using **different numbers**.

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
1. EQUALITY (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
2. PLEASURE (gratification of desires)	-1	0	1	2	3	4	5	6	7
3. SOCIAL POWER (control over others, dominance)	-1	0	1	2	3	4	5	6	7

		<i>opposed to my values</i>	<i>not important</i>		<i>important</i>			<i>very important</i>	<i>of supreme importance</i>	
4.	UNITY WITH NATURE (fitting into nature)	-1	0	1	2	3	4	5	6	7
5.	A WORLD AT PEACE (free of war and conflict)	-1	0	1	2	3	4	5	6	7
6.	WEALTH (material possessions, money)	-1	0	1	2	3	4	5	6	7
7.	ENJOYING LIFE (enjoying food, sex, leisure, etc.)	-1	0	1	2	3	4	5	6	7
8.	AUTHORITY (the right to lead or command)	-1	0	1	2	3	4	5	6	7
9.	SOCIAL JUSTICE (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
10.	PROTECTING THE ENVIRONMENT (preserving nature)	-1	0	1	2	3	4	5	6	7
11.	INFLUENTIAL (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
12.	HELPFUL (working for the welfare of others)	-1	0	1	2	3	4	5	6	7
13.	SELF-INDULGENT (doing pleasant things)	-1	0	1	2	3	4	5	6	7

	<i>opposed to my values</i>	<i>not important</i>			<i>important</i>			<i>very important</i>	<i>of supreme importance</i>
14. RESPECTING THE EARTH (harmony with other species)	-1	0	1	2	3	4	5	6	7
15. PREVENTING POLLUTION (protecting natural resources)	-1	0	1	2	3	4	5	6	7
16. AMBITIOUS (hard-working, aspiring).	-1	0	1	2	3	4	5	6	7

Section B: Recycling

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

Circling the number **1** indicates you **strongly disagree** with the statement, while **6** indicates you **strongly agree** with the statement. You can also circle any number in between to indicate mild disagreement/agreement.

1. I recycle my waste wherever possible

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

2. Separating items for recycling is something I always do

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

3. Providing the facilities are available, I try to recycle

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

Questionnaire two (post intervention)

Please circle the **number** that best represents your agreement with the following four statements. If you make an error, please put a line through the mistake and circle the correct number clearly. Please only circle one number for each statement.

1. I recycle my waste wherever possible

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

2. Separating items for recycling is something I always do

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

3. Providing the facilities are available, I try to recycle

(Strongly Disagree) 1 — 2 — 3 — 4 — 5 — 6 (Strongly Agree)

4. How useful did you find the app?

(Not useful at all) 1 — 2 — 3 — 4 — 5 (Extremely Useful)

5. How often did you use the app?

(Not at all) 1 — 2 — 3 — 4 — 5 (Very Frequently)

APPENDIX W

Chapter 7 Ethics



Ref: ERP1298

8th September 2016

Grant Bosworth
Psychology
Dorothy Hodgkin Building
Keele University

Dear Grant,

Re: Tailoring Environmental Communication in a Mobile Application

Thank you for submitting your application for review. The Panel reviewed the above application and would like to commend you on the quality of your submission. It was agreed that the application is approved with the following recommendation:

Recommendation – *the comment below is a recommendation only and is not a requirement for ethical approval*

Consent Form

- The Panel recommend that the applicant reconsiders the way in which the statements have been formatted to the centre of the document.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Information Sheet	1	09-08-2016
Consent Form	1	09-08-2016
Questionnaires 1, 2 and 3	1	09-08-2016

If the fieldwork goes beyond the date stated in your application, **1st July 2017**, or there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator at research.erps@keele.ac.uk stating **ERP1** in the subject line of the e-mail. This form is available via <http://www.keele.ac.uk/researchsupport/researchethics/>

If you have any queries, please do not hesitate to contact me via the ERP administrator on research.erps@keele.ac.uk stating **ERP1** in the subject line of the e-mail.

Yours sincerely,

Dr Jackie Waterfield
Chair – Ethical Review Panel

CC Supervisor
RI Manager

APPENDIX X

Chapter Seven Information Sheet, Consent form and Debrief



Information Sheet

Invitation

You are being invited to consider taking part in a research study relating to the evaluation of a mobile application. This project is being undertaken by Grant Bosworth (PhD Candidate, School of Psychology).

Before you decide whether you wish to take part, it is important for you to understand why this research is being completed and what it will involve for you. Please ask if there is anything that is unclear or if you would like more information.

Aims of the Research

This study aims to evaluate a mobile application that provides its users with messages relating to recycling.

Do I have to take part?

You are free to decide whether you take part. You are free to withdraw from the study at any time until you have submitted the final questionnaire (after you have evaluated the mobile application).

What will happen if I take part?

If you do decide to take part you will be asked to sign a consent form and then you will receive a link to complete a questionnaire. After completing the questionnaire, you will receive more instructions as to how to download and access the mobile app. You will then receive another link (through the app) informing you the app is now active (this may be up to one month after you downloaded the app). When the app is active it will send you one message every working day for three weeks. Sometimes there will be links within the messages – please engage with these as appropriate. After the three-week trial period, you will receive another questionnaire that will ask you to evaluate the app. Finally, at the end of this questionnaire you will receive a debrief telling you more about the study.

How will information about me be used?

After the completion of the study your data will be pooled with that collected from other people. The data may be retained for reference in future studies and may be published in journals. You are not required to reveal any identifying information aside from your age and gender in this study.

Who will have access to information about me?

The data will be secured securely on a password protected computer which only the lead researcher has access to. After a five-year period (maximum) all original data will be securely disposed of. Furthermore, all personal data will be kept confidential and only the researcher and his supervisors will have access to the data.

Who is funding and organising the research?

The research will form part of a PhD Thesis that is being funded by Keele University Research Institute for the Social Sciences.

What if there is a problem?

If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should speak to the researcher in the room or e-mail *Grant Bosworth* at g.j.bosworth@keele.ac.uk. Alternatively, if you do not wish to contact the researcher you may contact Chris Stiff on c.stiff@keele.ac.uk

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:

Nicola Leighton
Research Governance Officer
Research & Enterprise Services
Dorothy Hodgkin Building
Keele University
ST5 5BG
E-mail: n.leighton@uso.keele.ac.uk
Tel: 01782 733306

CONSENT FORM

Name and Contact details of Principal Investigator: *Grant Bosworth, Room 1.23 Dorothy Hodgkin Building, Keele University. E-mail: g.j.bosworth@keele.ac.uk*

**Please tick box if you
agree with the statement**

- | | | |
|---|--|--------------------------|
| 1 | I confirm that I have read and understand the information sheet for the above study | <input type="checkbox"/> |
| 2 | I understand that my participation is voluntary and that I am free to withdraw at any time up until I submit the final questionnaire | <input type="checkbox"/> |
| 3 | I agree to take part in this study. | <input type="checkbox"/> |
| 4 | I understand that data collected about me during this study will be pooled with other data and may be submitted for publication. | <input type="checkbox"/> |
| 5 | I agree to allow the dataset collected to be used for future research projects | <input type="checkbox"/> |

Name of Participant:

Signature: (replaced with a tick box if completing online)

Date:



Debrief

Thank you for completing this study.

This study aimed to see whether over a three-week period engaging with a mobile application could increase your recycling.

The app was tailored in two ways: For half the participants, the information you received was thought to be congruent with the values you endorse (based upon your answers to the first questionnaire you completed). For example, if you valued 'helping others' the app provided you with information about how by recycling you can help other people. For the other half of the participants in this study, the information was not tailored. For example, if you valued 'helping others' you may have received information about the monetary benefits of recycling.

This study will consider whether receiving tailored messages increased recycling, and the usefulness of the app, more than receiving a non-tailored message.

If you would like to know more about this study please contact the researcher at:
g.j.bosworth@keele.ac.uk

Or alternatively, if you would like to read more about the topic, please see:

De Groot, J. I., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330-354.

Pelletier, L. G., & Sharp, E. (2008). Persuasive communication and pro-environmental behaviours: How message tailoring and message framing can improve the integration of behaviours through self-determined motivation. *Canadian Psychology/Psychologie Canadienne*, 49(3), 210.