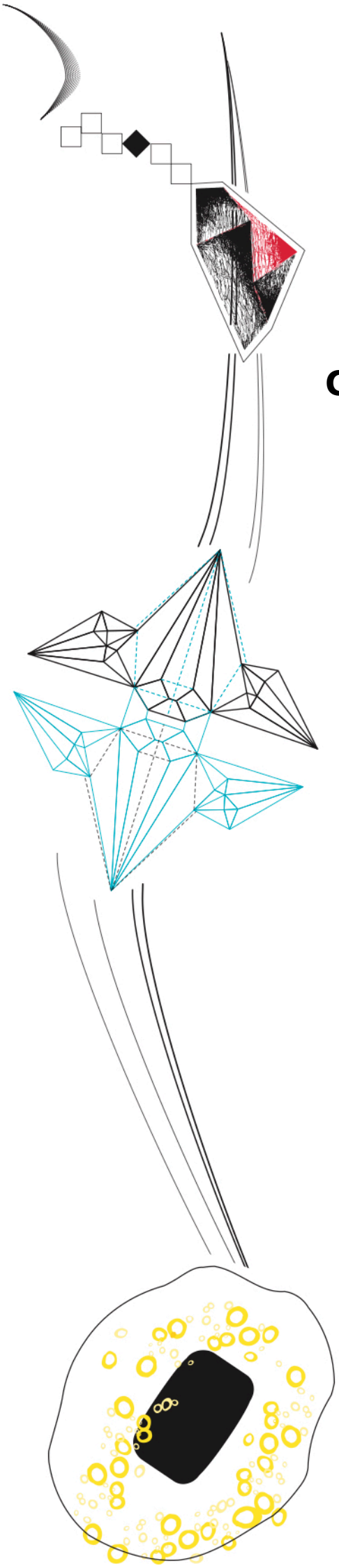

Nudging Sustainability

Can Visualized Nudges Evoke Specific Behavioural Intentions and Behaviours?

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Abstract

It is inevitable to mitigate the human factor of today's environmental problems. For this reason, the current research set out to determine whether the well-known *Nudge Strategy* could potentially evoke an improvement in the matter of increasing a person's self-reported environmental self-identity while decreasing his self-reported level of consumerism at the same time. It was hypothesized that Nudges that visualize either an environmental solution or a problem could subconsciously increase a person's self-reported environmental self-identity and correspondingly reduce his self-reported consumerism, because responses would be adjusted towards the implemented Nudge values. Therefore, observational field experiments among a randomized sample of 180 students were conducted in which participants were confronted with either pictorial environmental solutions or problems before being asked to fill out exactly the same survey. Thereby, the *Solution Nudge* and the *Problem Nudge* created the two experimental groups while a third group served as a control group. Ultimately, the findings suggest that it is easier to strengthen a person's self-evaluated environmental self-identity than reducing the level of consumerism through the implemented Nudges. This assumption can be supported through the assumption that behavioural intentions are more susceptible to influence than the behaviour itself. Consumerism is thus, stronger anchored in a person than his corresponding environmental self-identity.

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1. Introduction

1.1 The Global Impact of Humanity on the Environment

Global warming, pollution, water shortages, loss of biodiversity, the Great Pacific Garbage Patch – naming just a few of today's environmental problems which pose a threat to the environment while there is enough evidence for further continuing this list. Nonetheless, there is no doubt that many of those problems are rooted in human behaviour, as we are all living far beyond the ecological limits of our planet (Steg & Vlek, 2009). For instance, if all humans wanted to eat as much meat as we do in Europe, then we would need the yearly resources of three planets to feed them all (Thurn & Kreuzberger, 2014). Generally speaking, environmentally significant behaviour can be defined by its real environmental impact which changes the availability of environmental resources or alters the structure and dynamics of ecosystems or the biosphere itself (Steg & Vlek, 2009). Consequently, pro-environmental behaviour refers to behaviours that change the environment as little as possible or even benefits the environment. Nevertheless, this does not necessarily mean that all significant environmental behaviours have a direct environmental impact, for example the disposing of waste, they can also have an indirect environmental effect by shaping the context in which choices are made that directly cause environmental change which can be of higher impact than direct ones, such as policies and markets.

Moreover, the impact of human behaviours on the environment has mostly been an everlasting by-product of human desires and demands, for instance for comfort, mobility, power, status, enjoyment, as well of the organizations, markets and technologies humanity has created to meet those desires (Stern, 2000). For that reason, “think about the environment as the outcome of a global choice architecture system in which decisions are made by all kind of actors, from consumers to large companies to governments” (Thaler & Sunstein, 2009, p. 195). Despite this omnipresent known problem, markets still provide strong incentives for firms to cater to the demands of individual consumers, and firms will continuously compete to meet those demands, whether or not those demands represent the wisest environmental choices (Thaler & Sunstein, 2009). This form of competition does not only drive down prices, making the current choice options even cheaper and harder to resist for each consumer, but it also leads to the current level of overexploitation and other negative externalities. To clarify, the current proportion of today's food industry on climate change is about 40% (Thurn & Kreuzberger, 2014). Those 40% mainly consist out of modern industrial agriculture, transportation as well as the processing and

changing land use. Besides, all resources of external mineral fertilizer, which are extensively used in today's food productions, will be already used up within this century.

Given the above, this can be ascribed to the paradox of today's social traps, also known as the tragedy of the commons. According to Hardin (1968) “the individual benefits as an individual from his ability to deny the truth even though society as a whole, of which he is part, suffers” (p.1244). Those operations for short-term profit over-exploit our resources while aggravating the climate change and other environmental problems which leads to a long-term overall loss to our environment and hence to our society too (Thaler & Sunstein, 2009). Thus, markets and their consumers extensively contribute to today’s environmental problems.

However, considering just one individual's behaviour, the impact on the environment is nearly unremarkable, but it is of highly significant impact when many people individually do the same things (Stern, 2000; Anantharaman, 2018). This view is in line with Jackson (2005), who states that the current level of consumerism “is key to the impact that society has on the environment” (p. v). Consequently, one of the most severe threats of humanity on environmental sustainability is the current level of consumerism as a part of human behaviour. Thereby, making it indisputable that the current level of consumerism needs to be changed so as to reduce its environmental impact and to promote environmental sustainability (Steg & Vlek, 2009; Gattersleben, Murtagh & Abrahamse, 2014). For this reason, consumerism is determined as the prevailing target behaviour in the context of this research. It follows that, consumerism refers to the actions that individuals take and choices they make to consume certain products or services or live in specific ways rather than others which can have direct as well as indirect impacts on the environment (Jackson, 2005). Therefore, sustainable consumerism can be associated with actions and choices, reducing the environmental impact, such as purchasing organic food, fair-trade products, and reusing material goods.

1.2 Behavioural Intentions

Another prospect of environmentally significant behaviour is defined via the subjective, personal intention underlying the particular behaviour pattern (Stern, 2000). These intentions usually possess a desire to reduce the environmental impacts of such identified target behaviours and shift to a more sustainable path. Thereby, the intent-oriented paradigm focuses on people’s beliefs, motives, mindsets, capabilities and further psychological aspects in order to understand the target behaviours. Accordingly, coherent researches tend to refer to pro-environmental behaviours as behaviours that people adopt with the explicit intention to achieve an outcome that is beneficial for the environment (Steg & Vlek, 2009; van der Werff, Steg &

Keizer, 2013b). Numerous previous studies have discovered that the manner how someone identifies himself is closely related to his behavioural intentions and thus, his behaviours (see Whitmarsh & O'Neill, 2010; van der Werff et al., 2013b; Dermody, Koenig-Lewis & Hanmer-Lloyd, 2018). In the context of promoting sustainable behaviours, a person's environmental self-identity has been defined "as the extent to which one sees oneself as a type of person whose actions are environmentally-friendly" (van der Werff, Steg & Keizer, 2013a, p.1258). Moreover, through previous researches it has been proven that this type of self-identity has the potential to drive respective pro-environmental behaviours as those actions can construct and preserve the self-concept and builds a relationship with the significant others which even further enhances the desire to act accordingly (van der Werff et al., 2013a, Dermody et al., 2018). Therefore, environmental self-identity has a stronger influence on pro-environmental behaviours than attitudes or values, because a person's self-identity strives for consistency between his self-perceptions and his behaviours (Sparks & Shephard, 1992; Whitmarsh & O'Neill, 2010). Consequently, environmental self-identity is vital to explain the underlying paradigm of behavioural intentions. For this reason, environmental self-identity is determined as the underlying target intention of this research. Strengthening people's environmental self-identity is deemed necessary in order to be able to reduce the current level of consumerism.

1.3 Generational Decline of Environmental Concern

Moreover, although the urgency to bring about change has raised, there is even mounting contrary evidence that environmental concern and the commitment to engage in a more pro-environmental behaviour is higher in older generations than in younger ones (Fielding & Head, 2012; Gronhoj & Thogersen, 2017). That might be because we are facing obesity rather than famine, which distorts our way we think about the current level of consumerism (Thurn & Kreuzberger, 2014). However, this is simultaneously putting another threat to sustainability as we cannot push the responsibility for creating a sustainable future to the next generation since we are the first generation which directly perceives the effects of those problems (Gronhoj & Thogersen, 2017). Nevertheless, today's young generation, existing of tomorrow's leaders and decision-makers, needs to adopt sustainability; otherwise, environmental problems will become even worse. That is why the individuals of the current young generation, more precisely, individuals between the age of 18 and 27 were further examined in the context of this research as they are considered to have moved out from home. Thus, making their own consumption choices in their everyday life. Due to the feasibility, the research sample of this population arose

from undergraduate university students of a Dutch university in Enschede and a German university in Muenster.

1.4 State of Research

Referring to previous researches of environmental significant behaviours, most of them have applied the intent-oriented paradigm when examining the underlying complexity of the behavioural systems (see Thompson & Barton, 1994; van der Werff et al.,2013a, b; Whitmarsh & O'Neill, 2010). Therefore, not only internal but also external antecedents of such behaviours have been taken into account. However, the underlying paradigm of those studies transferred contextual, external factors as "subjectively perceived environment" (Kaaronen, 2017). Thus, the system of cognition and behaviour, that is ecological had been reduced to the inner sphere in those studies. Accordingly, the impact and interplay of decisive internal antecedents, such as attitudes, norms, values and self-identity on pro-environmental behaviours, have been extensively investigated and there is a high consciousness about which intentions, such as values, attitudes or norms, promote pro-environmental behaviour and which prevent them (see Steg & Vlek, 2009; Whitmarsh & O'Neill, 2010; Gattersleben et al., 2014). As a result, there is enough evidence that people are more inclined to engage in a specific behaviour when they are driven by self-motivation, primarily through self-identity (van der Werff et al., 2013a).

Additionally, positive attitudes towards the value of nature have been indicated as playing a crucial role in the context of sustainability (Thompson & Barton, 1994). Ultimately, those researches have been essential to get insight and to understand the complexities of such patterns. Thus, those approaches envisage that changes in behaviour patterns will arise from internal changes in individual beliefs, attitudes and norms (Jackson, 2005).

However, this is contrary to the sufficient evidence that all those internal antecedents, no matter how strong they are, are not conditionally resulting in particular behaviours (Kaaronen, 2017; Chekima, Chekima & Chekima, 2019). Therefore, even when people know about those connections and have correspondent values and attitudes, it is probably not salient enough for their behaviour. Hence, there is a gap between intentions and actual behaviour, so-called "attitude-behaviour gap" (Kaaronen, 2017). This gap indicates that there must be factors which anticipate behavioural change. Nevertheless, this gap needs to be bridged, because otherwise environmental problems, which already pose a threat to the whole planet, will get even worse.

Moreover, when the effects of external factors on pro-environmental behaviour have been studied, internal factors have been often left out as well, indicating, for instance, that consumers

are locked into consumption choices by a variety of external conditions, such as accessibility and financial constraints (Jackson, 2005).

However, even integrative approaches which intended to account simultaneously for internal and external antecedents failed at discovering universal change potentials since behaviour is a complex and individual interplay of diverse antecedents and thus, there are no standard or universal attributes which are strong enough to cover all of the underlying aspects of environmental psychology. It follows that there is no straightforward relationship between motives and actual behaviour. That is probably one reason why, previous attempts to provoke change towards sustainability in the form of implementing policies and other innovations have not been sufficient to reduce the impact of human behaviours on the environment (Whitmarsh & O'Neill, 2010). Accordingly, governments are also reluctant to strict interventions since they fear loss of political support and public repercussions. Consequently, the exigence of behavioural public administration, in this domain closely connect to environmental psychology, has considerably risen.

1.5 Consumption Choices and Actions

Concerning the moment when individuals make a consumption decision, individuals face two problems, which even contribute to environmental problems (Thaler & Sunstein, 2009). First, if they engage in environmentally harmful choices and actions, through their consumerism, they will probably pay nothing for the environmental costs that they inflict (Gifford, 2014). Second, consumerism does not provide useful feedback about the prevailing consequences and lacks opportunities for learning and improving as the relationship between choice and effect on the environment is ambiguous (Thaler & Sunstein, 2009). Thus, they probably do not even know that their current consumption pattern is causing severe harms to the environment in which this uncertainty leads to the continuation of environmental harmful choices and actions. However, people only make good choices in contexts in which they have the right information, experiences and prompt feedback. If this is not the case, they do significantly less well. That is the case in the current context of consumerism since the current consumption choices cannot reasonably be claimed to be the best means of promoting their well-being because they cause severe environmental problems.

Additionally, when ordinary consumers are making choices, they are pervasively influenced by endlessly selected elements by choice architects to move their decisions in an intended direction, trying to sell them things without actually knowing that (Thaler & Sunstein, 2009). Accordingly, a choice architect can be anyone who organizes the context in which people make

decisions attempting to lead them in directions. As previously described competitive markets find ways to overcome our last shred of resistance to bad environmental choices and to increase their profit.

1.6 Potentials to Provoke Change

For that reason, as long as ordinary consumers are not choosing well, some changes or incentives within the choice architecture might provoke an improvement.

However, people are more inclined to engage into more sustainable consumerism if they are driven by inner self-motivation, thus when they have the feeling that their choices and actions, they make are autonomous rather than requested or forced by third parties (Gronhoj & Thogersen, 2017). Requesting or forcing specific behaviours lead to the perception that individuals lack in choice and control, which is an unstable behaviour basis. Especially when it comes to consumption choices, people desire to choose for themselves in order to satisfy their desires and demands. That is one of the reasons why external incentives have been insufficient in the long-run as they were not assimilated to the self. Governmental policies or other innovations tend to comprise consumer sovereignty, and lean-to emerge the feeling that the individually perceived quality of life might be flattened through such an implementation (Whithmarsh & O'Neill, 2010). Consequently, individuals are tending to accept those reluctantly leading to the pervasive limited success of such implementations.

These assumptions are in line with the *Nudge Strategy* invented by R.H. Thaler and C.R. Sunstein (2009). In this perspective, an incentive in the form of a Nudge alters people's behaviour without forbidding any options or significantly changing their economic incentives while the freedom of choice can still be preserved which might lead the individuals in directions that will improve their choices and thus their lives. To illustrate, one of the most familiar Nudge is the pictorial health warning on cigarette packages (Hammond, 2011).

Concerning the current level of consumerism, today's consumption choices and actions cannot be claimed to be the best means of promoting ordinary consumers' well-being. For that reason, such a treatment in the form of a Nudge might provoke an improvement as it is assumed that current consumption choices would not have been made if individuals have had complete access to all the necessary abilities and information.

1.7 Research Intention and Research Question

Given the above, previous researches have mainly focused on identifying and explaining attributes of different causal relationships of environmentally significant behaviours which has

been deemed necessary to build a fundamental understanding and for the first time, to discover change potentials. Admittedly, none of the attempts to bring about an improvement have been successful. When it comes to behavioural changes people are more inclined to engage in such a change if they are driven by self-motivation while they have the feeling that they still preserve the autonomy about their choices and actions (see Stern, 2000; van der Weff et al., 2013a). Governmental policies or other innovations tend to comprise such autonomies, explaining why individuals have been tending to accept those reluctantly, which has leaded to the pervasive limited success.

As a result, the research aim of this study can be seen as an attempt to provoke behavioural improvement through the renowned *Nudge Strategy* by R.H. Thaler and C.R. Sunstein. On these grounds, the research interest is located beyond just looking at relationships between antecedents and actually executed behaviours as this has been satisfactorily done by previous researches through which the decisive factors have already been discovered. More precisely, given that it is intended to create change prospects in a systematic, scientific way, the research interest is located in causal relationships. Thus, how the Nudge affects the outcome of interest. More precisely, how the Nudge potentially enhances environmental self-identity while decreasing the level of consumerism towards a more sustainable pattern. However, due to the scope of this thesis it was necessary to delineate the research interest in accordance to self-reported environmental self-identity and likewise to self-reported consumerism using the survey method after experimentally being confronted with the treatment in the form of a Nudge. Consequently, the explanatory research question arose:

> **To what extent can the *Nudge Strategy* evoke more self-reported environmental self-identity and reduce self-reported consumerism among individuals between the age of 18 and 27?**

Accordingly, imperative sub questions arose as well:

What kind of Nudge is best suited for the research purpose?

How much can small changes in the choice architecture make a difference?

Does Nudging equally affect self-reported environmental self-identity and self-reported consumerism?

What are the barriers for individuals of this age group?

Does the context differ between the two locations of observation?

Expediently, understanding causalities and mechanisms underlying environmental self-identity as well as consumption patterns can be seen as the leading direction of this research. Consequently, the impact of the *Nudge Strategy* on sustainable consumerism and its internal factors as well as external factors that are all interconnected was further tested, creating an integrative experimental approach. More precisely, observational field experiments were conducted which seek the confirmatory explanation of the Nudge effects on individually reported environmental self-identity and consumerism among a random sample of 180 undergraduate university students of a Dutch university located in Enschede and a German university located in Muenster. Change is crucial to saving the environment and thus our society. Hence, this research is in line with the increasing need for a transition to a sustainable future and to prevent further environmental problems, and thus, it is of highly scientific and societal relevance.

2. Theoretical Framework[1]

In order to address the research question, the following section aims at building the theoretical foundation of investigating change prospects congruent with the *Nudge Strategy* by R.H. Thaler and C.R. Sunstein (2009). In order to promote the intended changes through *Nudging*, it is essential to have a clear comprehension of the underlying subset of specific characteristics and attributes. Correspondingly, understanding and maintaining sustainable consumerism rest, either explicitly or implicitly, on what its antecedents are and how they either influence or constrain change. In the context of consumerism, it is important to distinguish such antecedents between internal and external factors. Environmental self-identity accounts thereby for an internal antecedent. Nevertheless, environmental attitudes have been additionally assessed during the data collection, but the results did not feature statistical differences and thus, due to the feasibility of this research could not further be given attention to. Consequently, external antecedents can be ascribed to accessibilities of sustainable consumption alternatives and financial constraints.

[1] Please note that gender-neutral pronouns are considered to reduce the comprehensibility of theoretical frameworks in the context of behavioural sciences, which is why the use of pronouns themselves are tried to be avoided. However, whenever this was not possible, it is decided to stick to the pronoun “he” while accentuating that this is not proposed to discriminate any other genders.

Accordingly, essential parts of Nudging are at first discussed and conceptualised followed by its correspondent appliance on the target behaviour of this research: consumerism. Second, environmental self-identity and constraining external antecedents are discussed while additional incorporating pertinent elements of the *Nudge Strategy* on environmental self-identity.

2.1 Decision-Making under Uncertainty

The understanding of heuristic thinking under uncertainty and its pervasive paradigm about decision-making has been highlighted as central to changing people (Tversky & Kahnemann, 1974). More precisely, Thaler and Sunstein (2009) stated that the "understanding of human behaviour can be improved by appreciating how people systematically go wrong" (p. 21). Thereby, central to behaviour is the underlying decision-making process from choices available, emphasising that the design of choices significantly influences the decisions people make. According to judgements and decision-making in situations of uncertainty, a person relies on a limited number of heuristic principles which "reduce the complex tasks of assessing probabilities and predicting values to simpler judgemental operations" (Tversky & Kahnemann, 1974, p. 1124). In general. three heuristics are predominantly employed in those situations: adjustment and anchoring, availability, and representativeness.

Considering Tversky and Kahnemann (1974), people make estimates by starting from an initial value that is adjusted towards the direction one thinks is appropriate to yield the final answer. The initial value or starting-point serves with this as the anchor and may be suggested by the formulation of the problem or may be the result of partial computations. Anchoring occurs even if the anchor values are uninformative for the critical estimate. Subconsciously comparing the judgemental target to the anchor's value changes the accessibility of knowledge about the target itself. Thereby, different starting points yield different estimates, which are biased towards the initial values, the so-called *anchoring effect*. For instance, in one experiment participants have been asked about their frequency of dating before being asked about their level of happiness, the correlation between dating and happiness was significantly higher than when this has been asked the other way around (Thaler & Sunstein, 2009). Thus, an anchor can even influence how someone thinks his life is going.

Correspondingly the availability heuristic assesses the probability of an outcome by asking how readily examples come to mind while the representativeness heuristic assesses the probability of similarities and connections of the judgemental target with one's images and stereotypes (Thaler & Sunstein, 2009).

Furthermore, people do not make logical and rational decisions as much of their everyday behaviours are carried out with little conscious deliberation at all and thus it is rather instinctive and irrational (Furnham & Chu Boo, 2011). This assumption is congruent with the underlying approach of Nudging that distinguishes human thinking in two kinds, one that is intuitive and automatic, more precisely it is unconscious and another that is reflective, rational and rather effortful (Thaler & Sunstein, 2009). The automatic system is fast whereas the reflective system is slow. Therefore, the automatic system can be referred to as one's gut reaction while the reflective system constitutes the conscious thought. Imagine a person being in an aircraft facing altitude differences. The automatic system would think that one is about to die while the reflective system would rely on his knowledge that aircrafts account for the safest means of transportation and thus will be safe. As described, both kinds of thinking rely on heuristics in this situation. However, the automatic system relies on the anchoring heuristic while the reflective system relies instead on the availability heuristic in that case. This contrast does not only exemplify that heuristics can lead to biases but also that one's automatic system can be incorrect. Therefore, relying on the automatic system can lead people in wrong directions in which they systematically go wrong. Ultimately, through clarifying how people think, make decisions and behave, it has been possible to create change prospects helping people to improve their thinking and decisions in many domains (Furnham & Chu Boo, 2011).

2.2 The Nudge – *Anchor*

As already discussed, people only make good choices in contexts in which they are experienced, have sufficient information and prompt feedback, whereas, under uncertainty, this is not the case. Considering the gist of Nudging, as long as people are not choosing correctly, some changes in the choice architecture can make their lives go better (Thaler & Sunstein, 2009). A sound system of choice architecture helps people to improve their ability to map and hence to select options that will make them better off.

According to Thaler and Sunstein "A Nudge [...] is any aspect of the choice architecture that predictably alters people's behaviour without forbidding any options or significantly changing their economic incentives." (2009, p.6). An incentive in the form of a Nudge is thus based on indirect encouragement and enablement while avoiding enforcement. Moreover, a Nudge preserves the freedom of choice while it is easy and cheap to avoid. Given the heuristics above, an anchor can serve equally as a Nudge through ever-so-subtle suggesting an uninformative, but pervasive starting-point for a person's thought process, such as a decision-making process in the context of consumption choices as this potentially reduces the choice ambiguity (Thaler

& Sunstein, 2009). Thereby, the anchor offers valuable guidance in addressing personal choices. In terms of the anchor and adjustment heuristic, such an anchor can increase the ease with which certain information come to mind and is thus, equally to priming. Therefore, it is not a rocket-science that if particular objects are made visible and salient, people's behaviour can be affected. Ultimately, this form of a Nudge potentially serves as an unconscious incentive and can be applied to virtually any type of human relationships where the alteration of people's thinking and decision-making may be beneficial for those people and to broader society.

In the context of decreasing the environmental impact of humanity, anchors are most suitable when representing information or disclosures pictorially (Thaler & Sunstein, 2009). Those types of visualized anchors achieve greater degrees of attentions as textual ones. Thereby, it can be considered that they are more effective, because it is easier for the individual to assimilate them. It can be concluded that those types of Nudges increase a person's awareness of environmental affects and thus, could provoke corresponding improvement (Thaler & Sunstein, 2009). However, pictorial disclosures and information follow two different paradigms for evoking an improvement. The purpose of disclosure is to activate safeguards in the form of anchors that are framed through the visualization of a potential loss, such as environmental virtues through a current environmental challenge. Since people are loss aversive, this form of disclosure serves as a warning (Tversky & Kahnemann, 1974). Those environmental effects usually represent the outcome of what is collectively done to the environment. However, this form of disclosure tends to be somewhat distant to the individual, because much of today's environmental problems are not individually tangible. Therefore, people might act the innocent. Alternatively, the purpose of visualized information is to inform or remind people how they could quickly improve their individual choices and actions in order to reduce their environmental impact (Thaler & Sunstein, 2009). Thus, this can serve as a motivator helping them to understand what they individually could do for the collective good. Thereby helping people to implement beneficial actions and outcomes through encouraging them to consider, explore and assess steps towards sustainability without purporting the one “right” way. Furthermore, people tend to be more prone to informative *Anchor-Nudges* when they feel that the underlying starting-point is more closely relevant to their own lives rather than seeming to be distant and unfounded to their lives.

Therefore, implementing anchors which individually stimulate methods of resolution can be assumed to be a stronger Nudge than ones that disclosure a collectively induced environmental problem. In the following, the Nudge that manifests methods of resolution is called *Solution Nudge* while the Nudge disclosing a common environmental problem is called *Problem Nudge*.

2.3 The Issues of Consumerism

Environmental issues raise new kinds of uncertainty issues for consumers as those environmental issues are usually rather slow, distant and unrelated to the present choices that have been made or to our direct social environment and are thus hidden (Gifford, 2011). Hence, the environmental costs, inflicted through the present consumption choices, do not cause any immediate personal difficulties and are thus outside immediate attention leading to environmental numbness. More precisely, the relation between choice and effect is ambiguous. Thereby, this uncertainty leads to the perpetuation of established patterns (Thaler & Sunstein, 2009).

Furthermore, ordinary, everyday behaviours are carried out with little conscious deliberation at all since they are a matter of routine and thereby lack attention because the automatic system is very comfortable that way (Thaler & Sunstein, 2009). Moreover, much of everyday consumption is almost invisible, even to the person carrying out the behaviour. Especially eating has turned out to be one of the most mindlessness activities people do. To illustrate, regarding to Thurn and Kreuzberger (2014), 75% of the population in Germany does not even care about where their food in the supermarkets come from. Consumerism can be ascribed to habitual behaviours that is thus, automatized which even further diminishes deliberations when choices are to be made (Jackson, 2005; Gifford, 2011). Hence, many people do not scrutinize what they are actually eating especially in the matter of environmental issues. However, even if one's reflective system wants to be charitable, their automatic system does not get around it, because the focus is on other things when the action takes place (Thaler & Sunstein, 2009). Hence, self-control issues intensify when choice and consequences are separated.

Moreover, due to the diversity and complexity of production facilities, the best practice in one place might not be the best in another (Stern, 2000). This issue is even fortified through the increased number of ingredients of today’s commercial products. To illustrate, New Zealand-raised lamp eaten in the United Kingdom has a smaller carbon footprint than United Kingdom-raised lamp eaten in the United Kingdom (Grunert & Juhl, 1995).

Consequently, people who act environmentally friendly have to be concerned and conscious of the environmental consequences of their choices and actions (Grunert & Juhl, 1995). Accordingly, this imposes simultaneously more effort and less pleasure than ordinary, everyday consumerism. It can be concluded that those people know that the production, distribution, use and disposal of products lead to external, hidden costs, evaluate such costs, and minimize them by their own choices and actions. Referring to Grunert and Juhl “environmental concerns has been found to be a major determinant of buying organic food" (1995, p. 45) because it means

that environmental effects are known to the person. In this respect, sustainable consumerism, such as buying organic or local food products, reflects an interest in natural cultivation methods that preserve resources and minimize environmental problems to some extent.
Nonetheless, decisions and actions presupposing high involvement are more susceptible to value influence than those presupposing less involvement (Grunert & Juhl, 1995). To clarify, even low involvement choices and actions, such as buying shampoo, can become a target of influence when deliberately bought from organic companies, like Lush.

2.3.1 Application 1: Nudging Self-Reported Consumerism

Given that most people are not experts and it is obscure which beneficial actions to take and how as there is no universal or obvious path, as well as that effects, are delayed a Nudge is most suitable. Sustainable consumerism has been classified as a high involvement behaviour that is, therefore, more susceptible to value influence. For this reason, a Nudge could potentially strengthen the continuity of sustainable choices and actions. Hence, in the general context of consumerism, a Nudge selectively increases the accessibility of an anchor-consistent-subset of respective consumerism knowledge when choices and actions are to be made. Requesting or forcing specific behaviours lead to the perception that individuals lack in choice and control, which is an unstable behaviour basis. Especially when it comes to consumer choices, people desire to choose for themselves in order to satisfy their demands.
Concerning the incorporation of a Nudge, the individuals' perception of autonomy and behavioural control is not violated and thus, is associated with high hopes in increasing sustainable consumption choices.
It can be concluded that sustainable choices and actions are expected to be easier to access through a *Solution Nudge* likewise a *Problem Nudge*. Nevertheless, suggesting a starting point for what could individually be done to reduce a person's environmental impact of his level of consumerism can be assumed to be even more accessible and motivating than confronting one with a collectively infused problem. The *Problem Nudge* could either be too distant to the individual so that he might act the innocent or it could arise the feeling of guilt. Feeling guilty distorts the processes of thinking as this feeling shifts the attention away from the object to only themselves, and not even to their own interests (Hardin, 1968).

Consequently, the following hypotheses have been derived:

Hypothesis 1a. The group confronted with a *Solution Nudge* will report a lower level of consumerism than the control group without a Nudge.

Hypothesis 1b. The group confronted with a *Problem Nudge* will report a lower level of consumerism than the control group without a Nudge.

Hypothesis 1c. The group confronted with a *Solution Nudge* will report a lower level of consumerism than the group with a *Problem Nudge*.

2.4 Environmental Self-identity as Behavioural Intention

Previous researches in the environmental domain have proven that one's self-identity is an essential predictor of several environmentally friendly intentions which are likely to result in particular behaviour patterns (e.g. Whitmarsh & O'Neill, 2010 van der Werff et al., 2013a,b; Gattersleben et al., 2014). Thereby, people are more inclined to engage in a specific behaviour if they are driven by motivations which are assimilated to their self.

For this reason, self-identity has been defined as the label used to portray oneself, which relates to a particular behaviour (Whitmarsh & O'Neill, 2010). Accordingly, a particular self-identity may be valued and maintained by performing the behaviours that are part of the accepted criteria for the valid self-ascription of such an identity and thus, can be considered justifiable to be at least a behavioural intention while increasing the potential of executing the corresponding behaviour (Sparks & Shepherd, 1992). Thus, environmental self-identity is the extent to which someone sees himself as a type of person who acts environmentally-friendly (van der Werff et al., 2013a,b). Consequently, a person with a healthy environmental self-identity is more likely to act environmentally friendly than those with a weak environmental self-identity. When one acts congruous with his self-identity, he satisfies parts of his social needs by communicating not only to the outside world but also to himself who he is and whom he wants to be (Jackson, 2005). This role of social communication while performing the desired action is of greater relevance to the individual so that potentially this person does not even perceive the present action as one of more effort and less pleasure. Additionally, once a pro-environmental behaviour becomes identity-syntonic, this behaviour becomes automatized (Dermody et al., 2018). Consequently, such a person is expected to be more likely to make choices towards sustainability.

2.4.1 Application 2: Nudging Self-Reported Environmental Self-Identity

Corresponding to the two implemented Nudges when people have to evaluate their environmental self-identity, both Nudges are assumed to strengthen one's environmental self-identity. More precisely, when a person starts to think about whether he identifies himself as a type of person who acts environmentally friendly while being confronted with an environmental Nudge - no matter if Solution or Problem Nudge, this person is assumed to adjust his self-perception towards the presented environmental virtues since aspiring a more ecological identity should satisfy the feelings which the *Anchor-Nudges* may cause. Nevertheless, it can be assumed that a person identifies himself faster with behaviours that are accessible in his mind like the visualized methods of resolution. Thus, the *Solution Nudge* potentially evokes a higher environmental self-identity since this type of identification is easier to access.
For that reason, the following hypotheses have been derived:

Hypothesis 2a: The group confronted with a *Solution Nudge* will report a higher level of environmental self-identity than the control group without a Nudge.

Hypothesis 2b: The group confronted with a *Problem Nudge* will report a higher level of environmental self-identity than the control group without a Nudge.

Hypothesis 2c: The group confronted with a *Solution Nudge* will report a lower level of consumerism than the group with a *Problem Nudge*.

2.5 Consumerism and Environmental Self-Identity

Choices are influenced by a multitude of considerations, and that is why material goods and services account for far more than satisfier of functional roles (Sparks & Shepherd, 1992). Consumer goods are particularly crucial to the individual for what they signify about the individual and his life, for instance his loves, desires, relationships, achievements and failings, not only for himself but also to others (Jackson, 2005). In other words, consumerism also accomplishes symbolic meanings through which each identifies himself with ideals and social groups and thus socially communicates to some extent. Through consumption, communication does not only take place between each other but also with one’s past, with ideals, fears, to differentiate from others, to position oneself within a social group and with our aspirations, thus in pursuit of meaning. Thereby, it can be additionally referred to as a socialisation process of

consumerism within a social group/society as a person tries to figure out the social and societal acceptability of his conduct while maintaining his place within this. Hence, one's identity accounts for a significant influence on consumerism (van der Werff et al., 2013a).

Thereby, the lack of enjoyment of sustainable consumerism could be filled through eliciting feelings by contributing to the good cause and thus by accomplishing one's environmental self-identity in that course. Additionally, once a pro-environmental choice becomes identity-syntonic, this behaviour becomes automatized (Dermody et al., 2018). Consequently, such a person is expected to be more likely to make choices towards sustainability.

Given the above, it can also be assumed that people with stronger environmental self-identity are more likely to reflect their identities through the consistency of congruent behaviours. Since lavish consumerism contradicts environmental self-identity, it is assumed that the linkage of environmental self-identity should reduce a person's level of consumerism.

Furthermore, someone's environmental self-identity maintains not only through choices and actions at the present time, but also through past choices and actions since the conception of self-identity is a continuous process.

As a result, the following hypothesis has been derived:

Hypothesis 3: The level of environmental self-identity is negatively associated with consumerism.

2.6 Contextual Barriers

Considering the "attitude-behaviour-gap", having inner pro-environmental intentions, such as the previously discussed environmental self-identity as well as environmental concerns, values and attitudes, is not alone sufficient to induce behavioural change (Kaaronen, 2017). Hence, in order to induce more sustainable consumerism among individuals, it is of high relevance to understand how their everyday environment potentially constraints the actualization of their pro-environmental intentions.

Significant hindrances define the extent of effort needed to perform a specific action in the context of sustainable consumerism. The most decisive structural barriers are the accessibility to such sustainable options as well as financial restrictions (Gifford, 2011). Sustainable consumption alternatives, such as organic food products or fair-trade products are always more expensive and harder to access, especially in comparison to discounter products and thus, are associated with more effort and less pleasure (Van der Werff et al., 2013a). Consequently, even

low involvement actions can turn into high involvement actions if shifted to the sustainable path. Not only is the accessibility outside someone's control, indicating that even when someone wants to be charitable, but those alternatives are not reachable, also does this absence block behavioural intentions no matter how strong they are (Gifford, 2014). Likewise, does the individual's financial situation potentially put a barrier on such choices.

Therefore, it has been assumed that the attitude-behaviour link is most reliable when contextual factors are weak or non-existent (Stern, 2000). This assumption is in line with Thaler and Sunstein, who asserted that "participation rates jump up when enrolment is easy" (Thaler & Sunstein, 2009, p.125). As a result, it has been deemed necessary to control for structural barriers during this research as structural barriers must be removed whenever possible. Nevertheless, removing only structural barriers is insufficient as psychological barriers are of more considerable influence (Gifford, 2014).

3. Methods

This chapter describes and discusses the research methods that were used in the current research process. Therefore, the following subsections are expediently subdivided in research design, case selection and sampling, operationalisation and measurement of all variables of this research and data analysis.

3.1 Research Design

In pursuance of improving the understanding of the problem of intention-behaviour discrepancies of today's environmental significant level of consumerism with the intent of contributing to the solution towards increasing environmental self-identity while reducing the level of consumerism, an applied research method has been inevitable. Moreover, the context, and the purpose, as well as the type of research question, define the methodological foundations of a study (Trochim, Donnelly & Arora, 2016). Therefore, studying causal relationships is the driving interest, since the principal aim of this study was to look at the effects of the two different Nudges on self-reported environmental self-identity and consumerism of individuals between the age of 18 and 27.

For this reason, an experimental research approach was designed beneficial to develop and test causal hypotheses that were derived from the previous application and assessment of relevant theories and propositions. These hypotheses were then tested through observational field experiments which sought a confirmatory explanation of changes in one's environmental self-

identity and (sustainable) consumption patterns through the well-known *Nudge Strategy*. As a result, it was possible to reach a better correspondence between scientific knowledge and the objective reality by putting the theoretical hypothesis to an empirical, experimental test while improving the understanding of the research objective (Field, 2017).

However, behaviours consist of such a complex system of many underlying aspects, and since only a limited variety of those aspects could have been investigated due to the scope of this research, it could not be phased out that there might be even stronger other factors which adhere potential to promoting sustainable consumerism and environmental self-identity. However, when considering and evaluating all underlying aspects and regulations of this research in respect of time, resources and scope as well as the potentials and restrictions of such a research design, it is assumed worth noticing that this can be considered as the best approach in pursuance of the research interest.

3.2 Case Selection and Sampling

The population of individual students between the age of 18 and 27 were theoretically assumed as being of relevance for further investigation in the current context of this research which is why individuals have been the units of analysis. These units of analysis were expected to have some contextual characteristics in common in the first place, which created a comparable basis of the research interest. The simple random sampling technique was applied to select the subset of the investigated units of analysis among undergraduate university students of a Dutch and a German university. The sample size consisted out of 180 individuals, 90 individuals from each university, which was deemed necessary in pursuance of reducing the probability of sampling bias. Hence, this has created the units of observation.

Concerning the fact that there had been no prior information about the target population, this form of probability sampling ensured that every individual of the population had gotten an equal chance to be part of the selected sample via randomisation (Babbie, 2013). This sampling technique ensured the reliability of the findings among the units as most other sources of systemic variation could be eliminated, besides the intended ones through the treatment in the form of a Nudge (Field, 2017). Accordingly, this was another aspect decreasing the probability of sampling bias among this research. Supplementary to the exercised sampling technique to select the sample, the selected sample was further randomly distributed into each of the three experimental groups. Therefore, this selective sampling approach has configured the best way to test the hypotheses within this experimental research, including the overall aim to provoke change.

3.3 Operationalisation and Data Collection - *Procedure*

First, quantitative data was collected through a combined research strategy out of methods from the experimental, survey as well as field research approaches. Thereby, observational field experiments were executed in which data was collected via the survey method.

Thereby, three comparable groups of individuals were created from each university, using random assignments in which the incentive in the form of a Nudge, as the starting-point of the experiment, was manipulated differently across groups. Afterwards, the participants were asked to fill in completely the same self-reported survey[2]. Through this survey they were directly asked to evaluate their extent of agreement of several statements and their frequencies of specific consumer behaviours, to answer open questions and were additionally confronted with vignettes in terms of descriptions of constructed situations in which consumption choices between an unsustainable and sustainable option were built in experimentally. This survey was built upon standardised questions and items using already existing measures from previous studies in the context of environmental significant intentions, behaviours and consumerism itself as well as a few demographic questions concerning age, gender and income (see Walton & Jones, 2018; Bouman, Steg & Kiers, 2018). Hence, by keeping all other variables, contextual attributes etc. constant, a comparable basis among each experimental group could be secured. As a result, six experimental groups of equal size of 30 participants emerged from the overall number of 180 participants. Accordingly, a *Problem Nudge Group*, a *Solution Nudge Group* and a control group were shaped individually for each university.

However, other variables were assessed as well, but due to the scope of this study, they could not further be incorporated afterwards.

The following subsections aim at specifying precisely how each conceptualised variable was assessed.

3.3.1 The Treatments in the form of *Nudging*

The creation of the three experimental groups of comparable individuals served as the foundation of practicable observations among the different outcomes of the implemented Nudges (Field, 2017). This creation was conducted for both universities separately, forming an overall comparable basis between them. Before answering the self-reported survey, an incentive in the form of a Nudge, in terms of an anchor-heuristic, was presented to the participants of the two experimental groups.

[2] Please find the survey sheet in the Appendix.

Concerning to that, one group was confronted with an environmental problem, following called the *Problem Nudge,* more precisely with a picture of a glacier from 1906 and a picture of precisely the same glacier in 2002.

Figure 1. *Problem Nudge*[3].

[3] Glacier retreat - Svalbard. Photograph courtesy of Christian Åslund (recent photograph) and the Norwegian Polar Institute (archived image).

Correspondingly, the second group has been confronted with an environmental solution, following called the *Solution Nudge*, a picture representing: reduce, reuse and recycle.
Given the above, the *Problem Nudge* reflects a collective consequence of today's climate change, thus, what today's society has collectively done to the environment, while the *Solution Nudge* reflects what individually could be done to improve their environmental impact.

Figure 2. *Solution Nudge*[4].

Therefore, the third group has not been *nudged* in any way serving as the control group. The control group attempts to clarify further the effect of nudging on the respondent variables. Therefore, the *Nudge Strategy* generated a nominal level of measurement in which the variable has three attributes which are not ordered since their abilities are put on an empirical test.

3.3.2 Consumerism

One of the central dependent variables of this research, namely consumerism, has been delineated in observational terms via the frequency of specific environmental significant consumer behaviours: (1) eating organic, locally grown or seasonal food; (2) eating meat; (3) buying environmentally friendly products; and (4) using a car as a means of transport. Respondents could indicate the first four frequencies on a six-point Likert Scale ranging from:

[4] Copy-right free image

6-7 days a week; 3-5 days a week; 1-2 days a week; once or twice a month; less often until never. Hence, an ordinal level of measurement was created.

These measured items originated from numerous previous studies and thus, can be seen as reviewed standardised measures (alpha = .61) in the context of (sustainable) consumerism (see Whitmarsh & O'Neill, 2010; Gattersleben et al., 2014). Accordingly, an increased frequency of eating and purchasing organic food in compliance with decreased frequencies of eating meat and car usage is referred to as reduced consumerism and thus is considered as being sustainable. In addition, it was resolved to assess consumerism at the very first. This was intended to assure the most unbiased responses of the respondents' ordinary levels of consumerism, except the intended reductions by respondents from the two experimental groups.

Considering the validity of the measurement technique it can be said that all aspects of the concept have been covered through the four items and that they are correctly related to conceptually related indicators as well as to other theoretically relevant variables. Thus, the content, the criterion and the construct of the measurement can be considered as being valid since they reflect the real meaning of the concept under consideration.

3.3.3 Behaviour

However, since sustainable consumerism is evaluated as a socially desirable necessity of today's society, vignettes have been built in experimentally creating the variable *Behaviour.* Thereby, participants were asked to choose one out of two options of a product, in which one option was sustainable whereas the other was not. Thus, a dichotomous level of measurement appeared.Moreover, these vignettes were built upon the previous investigated method from two studies which have been conducted by van der Werff, Steg and Keizer (2013a & 2013b). Their used vignettes represented one option of the product as a sustainable option, which was 10% more expensive than the unsustainable option. As a result, three vignettes were built upon this strategy. For instance, participants chose between a Litre of milk of 65 cents, which was produced in an industrial livestock farming and a Litre of milk of 72 cents, which was produced sustainably. Additionally, two vignettes were created in order to assess recyclable and transportation preferences in the context of sustainability. Thereby, not only product preferences could be assessed through this strategy, but also the willingness to pay more could be assessed[5].

[5]. Please find the Appendix for the choice task within the survey.

Accordingly, the use of vignettes allows for more accurate measurement of the respondent's attributes towards the given scenarios and thus towards the variable *behaviour* of this research. The hidden items measuring the respective variable in vignettes create a more objective matter because evaluating the choice options in socially desirable ways has become more complicated for the respondents (van der Werff et al. 2013a, 2013b). However, the chance that respondents might answer in a socially desirable way could only be reduced through vignettes but not completely prohibited in the context of this research. Additionally, it is also vital to notice that the Nudge might provoke more positive answers among the respondents as the implementation of a Nudge has the potential to serve as a subconscious incentive which is congruent with the pervasive research interest of this study. That is why the control group served as an attempt to clarify further and estimate the moderating effect of Nudging.

3.3.4 Environmental Self-Identity

Environmental self-identity was assessed through three well established general items: (1) Acting environmentally friendly is an important part of who I am; (2) I am the type of person who acts environmentally friendly; (3) I see myself as an environmentally friendly person. These items have been most commonly used in every environmental research where the concept of environmental self-identity took a stake in (see, e.g. van der Werff et al., 2013a, b; Whitmarsh & O'Neill, 2010; Walton and Jones, 2018). Furthermore, one additional item was measured, focusing on the behaviour that is relevant for this study: sustainable consumerism – namely, (4) I am aware/conscious about consuming sustainable goods. This item was deduced from previous studies which have been focusing on either pro-environmental behaviour or sustainable consumerism (see Gattersleben et al., 2014; Gattersleben et al., 2019; Dermody et al., 2018). General measured items have been considered to be more reliable than specific ones as they are seen as less susceptible, which is why the three general items and only one specific item were used to assess environmental self-identity (Kaiser, 1998).

Accordingly, participants have been asked to rate each item on a seven-point Likert Scale, ranging from strongly disagree to strongly agree. Likewise, an ordinal level of measurement emerged. Following the assumption that general items form a more reliable scale, reliability was checked through Cronbach's alpha. When scaled those four items formed a reliable measure of environmental self-identity (alpha = .81). However, when only the three general measured items were scaled reliability scored even higher (alpha =.90). For this reason, only the three general measured items were further used for data analyses. Furthermore, when assessing the validity of the measurement technique it can be said that all aspects of the concept

have been covered through the three general items and that they are correctly related to conceptually related indicators as well as to other theoretically relevant variables. Thus, the content, the criterion and the construct of the measurement can be considered as being valid since they reflect the real meaning of the concept under consideration.

3.3.5 Controlling for Contextual Barriers

The accessibility of sustainable consumption options was delineated in operational terms as 'the distance to organic/regional food options in the shops or supermarkets around the participants' home'. Participants could choose between three options: (1) 5-10 mins walking distance; (2) 5-10 mins cycling distance and (3) too far too walk or cycle. Thus, an ordinal level of measurement was generated.

As already discussed in the theory section, longer distances can be pondered as posing a threat to sustainable consumerism in the form of a contextual barrier which is out of the individual's control. That is why the exact distance has been considered extraneous to sustainable consumerism, only the distances which can still be associated with relatively low involvement are of significant interest as they should not hinder sustainable consumerism.

Concerning the assumption that the individual's financial situation has the potential to generate another crucial hindrance on sustainable consumerism. Therefore, financial means were assessed through income. For this reason, participants were asked to state their average monthly income. Thus, a real number was measured on a ratio level.

3.3.6 General Characteristics

In order to be able to assess the additional impact of broader characteristics. Participants have been further asked to indicate their gender, age, university and study subject.

In order to considerate the participant's discomfort when specifying their gender, it has been possible to choose between male, women and diverse. Thus, creating a nominal level of measurement. However, only two participants reported their gender as diverse, which is why the variable *gender* was recoded after data collection, creating the final Variable *Male.* Thereby, gender was measured on a dichotomous level distinguishing between *Male* and *No Male*.

3.3.7 Objective Anchor Measurement – *Possession of a Reusable Bottle*

In order to be able to evaluate the impact of social desirability bias in this study, all respondents were asked, after they had completed the survey, which drinking bottle they were using on that day of observation. This post-test was intended to prove the congruence between the

respondents' answers and their actual consumerism in their everyday life. As a consequence, self-reported pro-environmental behaviour, more precisely environmental self-identity and sustainable consumerism, was thereby controlled by an actual, objectively observable pro-environmental behaviour. Consequently, people who embody *real* pro-environmental behaviours should relate their intentions and behaviours. More precisely, this served as a control whether responses are incorporated by the observed bottle rather than social desirability. Thus, it can be assumed that those people use a reusable drinking bottle rather than disposable ones. Furthermore, this did not only serve as a control for social-desirability bias, but it also served as an attempt to ascertain whether the Nudges can potentially trigger less consumerism even in people who already exhibit pro-environmental behaviours or not. Ultimately, the respondents are in possession of a (reusable) drinking bottle even if the Nudge are absent and thus, the Nudge could not impact on the Bottle and vice versa.

After data had been collected, the notations revealed that the respondents possessed five different sorts of drinking bottles: single use plastic, returnable[6], reusable plastic, reusable glass and reusable metal. In order to reduce the collected data and to enhance clarity, those bottles were later grouped in disposable, reusable plastic, and reusable metal / glass bottles.

3.4 Data Analysis

The following section first discusses general aspects of causality that were crucial for the sake of analysing the data and interpreting the corresponding results. Afterwards, the statistical procedure is further elucidated of which factor analyses, descriptive statistics and inferential statistics were part from. Stata13 was used for the sake of explicit data analyses.

3.4.1 Aspects of Causality

Through the randomised assignments to the three groups, the subjects have been initially comparable enough to satisfy the statistics used to evaluate the results (Babbie, 2013). Thus, the absence of a traditional pre-test in experimental researches can be justified through this assumption. Moreover, because of the focus on the difference in the outcomes after the Nudge was implemented among the randomly assigned groups as well as the similarities of the compared groups the correct time order could be secured, correlations can be identified, and non-spuriousness can be secured (Field, 2017). Thus, all three aspects of causality among the

[6] Returnable = plastic “Pfandflasche” (deposit bottle)

implemented Nudges could have been secured, which reduces the potential of threats to this research.

3.4.2 Factor Analysis

Before data could be analysed, factor analysis was deemed necessary for the latent variables of this research – consumerism, behaviour and environmental self-identity – as they could not be assessed directly. Since these variables were manifested through underlying facets of which each was reflected in an observable and measurable item, each of them resulted in their own variable. As a result, the multiplicity of measured data increased immensely. For the sake of apparent data analysis, a principal component analysis (PCA) was conducted to reduce the facets towards the underlying factor. Factor Analysis serves data reduction to a more manageable size on behalf of retaining as much of the original information as possible (Field, 2017). Thus, factor analysis accounts herewith for a valid and reliable statistical technique.
However, when it was attempted to analyse behaviour, it was not possible to construct a consistent scale, and thus, this variable could not be taken into account for the following data analyses.

3.4.3 Statistics

First of all, missing values were expediently transformed to ".99" as well as item reversals were taken into account to secure the data accuracy. After that, detailed descriptive statistics of all measured items, as well as their corresponding variables, were calculated. Those summaries do not only enable comparisons across the experimental groups or other units, but they also construct the *sine qua non* for inferential statistics (Trochim, Donnelly & Arora, 2016). Inferential statistics do not only allow for judgements to the probability that an observed difference between groups is a dependable one, but they also allow for generalisations from the units of observation to the units of analysis and thus reach for conclusions that go beyond the immediate data at hand. For this reason, respective descriptive statistics had been computed at first, covering major features of distributions, central tendencies and dispersions of each variable of this study, followed by inferential statistics in the form of stepwise OLS regression analysis.

4. Results

This section presents the results of all the data that was analysed for the sake of the research interest. First, the essential features of the sample and the data is described, including the factor

analyses for the sake of data reduction, and followed by intensive analyses of all the hypotheses of this research.

4.1 Description of the Data

Table 1 portrays the descriptive statistics of the basic features of the sample and each variable and its measured items separately through summarising the relatively large set of observations. Those summaries include the mean score, the standard deviation as well as the range among the number of observations.

4.1.1 Sample Characteristics

In total, 180 individuals participated in this study, of which 72 were male and of which only two participants indicated their gender as diverse (*SD* = .49). The average age was 21.51 (*SD* = 2.15). The participant's average income was 674.31€ (*SD* = 328.46) though 6 participants did not rate their income.

However, the respondents specified 17 different study subjects through which a proportionally large set of attributes of the respective variable with relatively few participants having each one emerged. For the sake of countering the enlarging subset of the variable “subject”, the subjects were later assorted to the three major underlying scientific domains of the given subjects. Additionally, 21 respondents did not indicate their subject at all. Accordingly, all study subjects out of social, political, health and law sciences were transferred to as “alpha-gamma”. Subsequently, all study subjects out of natural, technological and engineering sciences were assigned to “beta”. Third, subjects out of the business domain created the third attribute “business”). Consequently, the new complete and mutually exclusive set of attributes resulted in the new variable “study_type”. As a result, 50% of the respondents’ studied a subject out of the beta domain (*SD* = .5) while 18% studied a subject out of the business domain (*SD* = .39).

On the day of observation, about 44% of the participants had a reusable plastic bottle with them (*SD* = .5), and about 26% of them had a reusable glass or metal bottle (*SD* = .44) and whereas the rest just had a disposable one.

Furthermore, 47% of the respondents indicated their access to organic or regional food options to be within cycling distance (*SD* = .5) and another 42% at walking distance (*SD* = .5) whereas 2 out of the total 180 individuals did not report their accessibility. Admittedly, only essential characteristics of the sample have been reported in the body of the thesis itself.

Table 1.
Descriptive Statistics for All Variables in the Analyses.

Variable	Obs	Mean	SD	Min	Max
Consumerism factor	180	0	.77	-1.88	1.89
Environmental self-identity factor	180	0	.93	-2.91	1.75
Treatment (reference = control)					
Solution	180	.33	.47	0	1
Problem	180	.33	.47	0	1
Reusable bottle (ref = disposable)					
Plastic bottle	180	.44	.5	0	1
Glass / metal bottle	180	.26	.44	0	1
Accessibility (ref = too far)					
Cycling distance	178	.47	.5	0	1
Walking distance	178	.42	.5	0	1
Gender = male	180	.4	.49	0	1
Location = Muenster	180	.5	.5	0	1
Age	180	21.51	2.15	18	27
Income	164	674.31	328.46	0	2100
Study type (ref = alpha-gamma)					
Business	159	.18	.39	0	1
Beta	159	.5	.5	0	1

4.1.2 Factor Analyses of Latent Variables

4.1.2.1 Factor Analysis of Self-Reported Consumerism

Following the established research, consumerism was theoretically emphasised as an environmentally significant behaviour. Apparently, its environmental impact developed from multiple elements. For this reason, consumerism could not directly be accessed in the context of this research and thus accounts for a latent variable. For this reason, factor analysis on the four items of consumerism yielded a one-factor solution (Eigenvalue = 1.13) explaining 28 % of the variance. Thereby, Table 2 portrays the results of the PCA. The factor scores of the subjects were saved using the "regression" method into a variable with the name **cons_factor**.

Table 2.
Factor Analysis of Consumerism (One-Factor Solution; Eigenvalue = 1.13).

Item	Factor loading	Uniqueness
Consumerism 1 “Eat organic, locally grown or seasonal food”	.58	.65
Consumerism 2 “Eat meat”	-.61	.61
Consumerism 3 “Buy environmentally friendly products/ products with less packaging”	.58	.63
Consumerism 4 “Use a car/ van to travel, either as a driver or as a passenger”	-.29	.81
Cronbach’s alpha = .61		

4.1.2.2 Factor Analysis of Self-Reported Environmental Self-identity

Self-identity accounts for a latent variable in the same way as consumerism does. On these grounds, factor analysis on the three general measured items was also deemed necessary.

A factor analysis of the three items of environmental identity yielded a one-factor solution (Eigenvalue = 2.18) explaining 73% of the variance. Hence, Table 3 presents the individual results. The factor scores of the subjects were saved using the "regression" method into a variable with the name **environmental_identity_factor.**

Table 3.
Factor Analysis of Environmental Self-Identity (One-Factor Solution; Eigenvalue = 2.18).

Item	Factor loading	Uniqueness
Identity 1 “Acting environmentally friendly is an important part of who I am”	.80	.37
Identity 2 “I am the type of person who acts environmentally friendly”	.90	.20
Identity 3 “I see myself as an environmentally friendly person”	.86	.25
Cronbach’s alpha =.90		

4.1.3 Simple Correlations

Table 4 provides additional summaries of the correlations between the two explanatory variables, consumerism and environmental self-identity, as well as the control variables, age and income. The results show that there is only a highly significant negative correlation between the level of consumerism and environmental self-identity, $r = -.65$, $p = .000$. This suggests that identifying oneself as an environmentally friendly person could already reduce one's reported level of consumerism, which would be in line with the assumptions about the dependencies of behavioural intentions and actual executed behaviour. The only other, comparatively weaker, a correlation exists between age and income, $r = .19$, $p = .02$.

Table 4.
Simple Correlations of Continuous Variables.

Variable	(1)	(2)	(3)	(4)
1. Consumerism factor	1.00			
2. Environmental self-identity factor	-.65***	1.00		
3. Age	-.14	0.13	1.00	
4. Income	-.06	.06	.19*	1.00

Note: N (1,2,3) = 180; N (4) = 164; p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

4.2 Results of Hypotheses Testing

First of all, the results of analyses of all the hypotheses of this research, in which all control variables are added, show that the two control variables *study type* and *income* neither significantly explain differences of the *consumerism factor* nor the *environmental self-identity factor,* but simultaneously account for most of the missing values. For this reason, Nested Models are not applied and therefore, did not restrict the number of observations to the most restrictive model with full controls. Ultimately, this research seeks to retain as much explanatory power and degrees of freedom as possible. The presented statistical analyses are based on ANOVA, but the underlying regressions were more striking for the sake of the present research interest and therefore stepwise ordinary least square (OLS) regression analyses were conducted to test the hypotheses and the explanatory power among the Models.

The subsequent sections test the hypotheses in chronological order in which they have been derived from previous applications of relevant theories.

4.2.1 Results of Hypotheses Testing 1: Nudging Self-Reported Consumerism

Figure 3 illustrates the effects of Nudging on self-reported consumerism among the three experimental groups. Therefore, the two Nudge groups report lower levels of consumerism, although their interquartile ranges are higher.

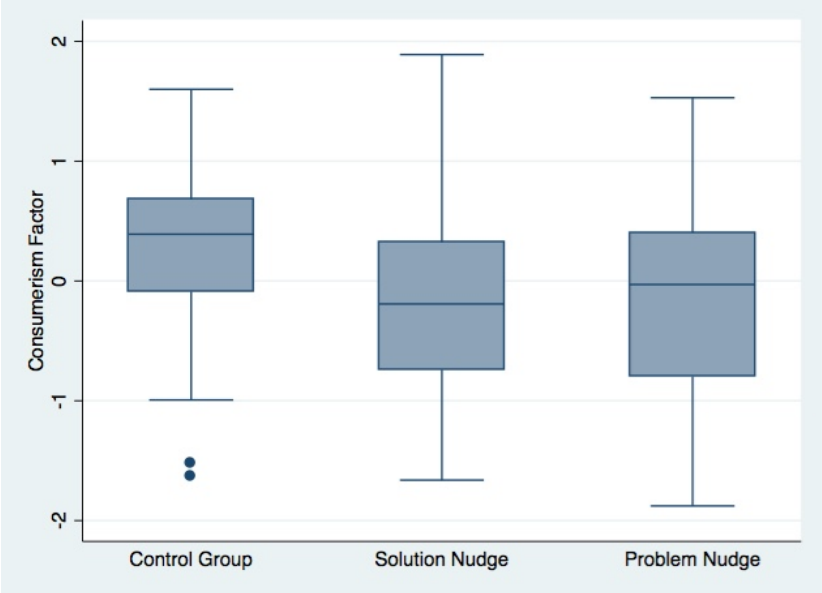

Figure 3. Boxplot. *Nudging Consumerism.*

4.2.1.1 Nudge Effects on Self-Reported Consumerism

Table 5 presents the results of a stepwise OLS regression analysis testing whether the implemented Nudges negatively affect self-reported consumerism, so as to reduce it.

Model 1 explains the level of self-reported consumerism by only taking the two treatments into account for analysis. A linear regression established that the treatment effect explained 5% of the variance in the level of reported consumerism (F (2,177) = 5.90, p = .003).

The control group displays a significantly higher level of consumerism, while both Nudge groups score significantly lower on consumerism. However, the treatment groups themselves do not differ much in scoring. Nevertheless, the Nudge effects themselves are further analysed in Table 6 of the subsequent section.

Expediently, the following Models examine the impact of all other variables on the relation between the two Nudges and the level of reported consumerism.

In Model 2, this effect is controlled for the possession of a reusable bottle and the accessibility of sustainable options, explaining 19% of the variance in the level of self-reported consumerism (F (6,171) = 7.79, p = .000). Those who do not have a reusable bottle of plastic or glass /metal, report a significantly higher level of consumerism. Likewise, those who do not have access to sustainable options, within cycling or walking distance, display a significantly higher level of reported consumerism than those who do. Strikingly, the most substantial effect has the possession of a glass/metal bottle on the level of reported consumerism. Consequently, this supports that the responses of consumerism are incorporated by the observed bottle rather than social-desirability.

In Model 3, all control variables are added, explaining 35% of the variance in the level of self-reported consumerism (F (12,131) = 7.41, p = .000). Males scored significantly higher on the consumerism scale. However, location, age, income and study type are not associated with reported consumerism among the groups. Consequently, other control variables do neither provide an alternative explanation for the treatment effects as the treatment effects remain significantly high even when all controls are incorporated in the analysis.

Model 4 is the final model with only significant controls, explaining 27% of the variance in the level of self-reported consumerism (F (7,170) = 7.41, p = .000).

All four models reveal significantly high treatment effects on self-reported consumerism, while none of the other variables provides an alternative explanation for those effects as the coefficients of both treatment effects remain similar. It can be concluded that the original relationship between the Nudges and self-reported consumerism is genuine, because the outcome persists even when controlled for all other variables.

On these grounds of evidence, Hypothesis 1a and 1b can be supported. Both experimental groups, confronted with either the *Problem Nudge* or the *Solution Nudge,* report a significantly lower level of consumerism than the control group without a Nudge throughout all four models.

Table 5.
Stepwise Regression Analysis of Self-Reported Consumerism.

	Model 1	Model 2	Model 3	Model 4
Treatment (reference = control)				
Solution	-.40 (.14)**	-.37 (.13)**	-.33 (.14)*	-.36 (.12)**
Problem	-.42 (.14)**	-.40 (.13)**	-.39 (.13)**	-.42 (.12)***
Reusable bottle (ref = disposable)				
Plastic bottle		-.26 (.13)*	-.21 (.13)	-.18 (.12)*
Glass/ metal bottle		-.66 (.14)***	-.61 (.15)***	-.63 (.13)***
Accessibility (ref = too far)				
Cycling distance		-.56 (.18)**	-.42 (.18)*	-.49 (.17)**
Walking distance		-.46 (.18)*	-.31 (19)	-.42 (.17)*
Gender = male			.43 (.12)***	.48 (.10)***
Location = Muenster			.25 (.13)	
Age			-.04 (.03)	
Income			.00	
Study type (ref = alpha-gamma)			.27 (.17)	
Business			.19 (.14)	
Beta				
Constant	.27 (.10)	1.00 (.19)***	1.32 (.68)	.71 (.19)***
N	180	178	144	178
Adjusted R^2	.05	.19	.35	.27

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

4.2.1.2 Differences Between the two Nudge Effects on Self-Reported Consumerism

Table 6 presents the analyses of the strength differences of the two Nudges on self-reported consumerism. Model 1 shows that the *Solution Nudge* does not significantly reduce reported consumerism compared to either the *Problem Nudge* or *No Nudge* (F (5, 172) = 7.08, p = .000). Model 2 shows that the *Problem Nudge* does not significantly reduce reported consumerism compared to either the *Solution Nudge* or *No Nudge* (F (5, 172) = 7.39, p = .000). Additionally, Model 3 shows that the *Problem Nudge* does not significantly reduce reported consumerism stronger than does the *Solution Nudge* (F (5, 113) = 4.9, p = .000).

To summarize, both *Nudge groups* score significantly lower on self-reported consumerism than does the *Control group,* although both *Nudge* effects do not differ much. Moreover, other variables of this research do not provide an alternative explanation for the treatment effects. Hence, it does not matter whether one is confronted with a *Solution Nudge* or a *Problem Nudge*. For this reason, Hypotheses 1c is not supported.

Table 6.
Analysis of Differences Between Treatment Effects on Consumerism.

	Model 1	Model 2	Model 3
Treatment (reference = control)			if treatment>0
Solution	-.17 (.11)		
Problem		-.21 (.11)	-.04 (.13)
Reusable bottle (ref = disposable)			
Plastic bottle	-.26 (.13)*	-.28 (.13)*	-.44 (.16)*
Glass/ metal bottle	-.69 (.14)***	-.68 (.14)***	-.68 (.18)***
Accessibility (ref = too far)			
Cycling distance	-.51 (.18)*	-.56 (.18)**	-.54 (.22)*
Walking distance	-.42 (.18)	-.45 (.18)*	-.52 (.22)*
Constant	.76 (.18)***	.82 (.19)***	.73 (.23)**
N	178	178	119
Adjusted R^2	.15	.15	.14

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
$p < .05$ = ()*; $p < .005$ = ()**; $p < .001$ = ()***

4.2.2 Results of Hypotheses Testing 2:
Nudging Self-Reported Environmental Self-Identity

Figure 4 illustrates the effect of Nudging on self-reported environmental self-identity among the three experimental groups. Therefore, the two Nudge groups report higher levels of environmental self-identity and their interquartile ranges are smaller in comparison to the control group.

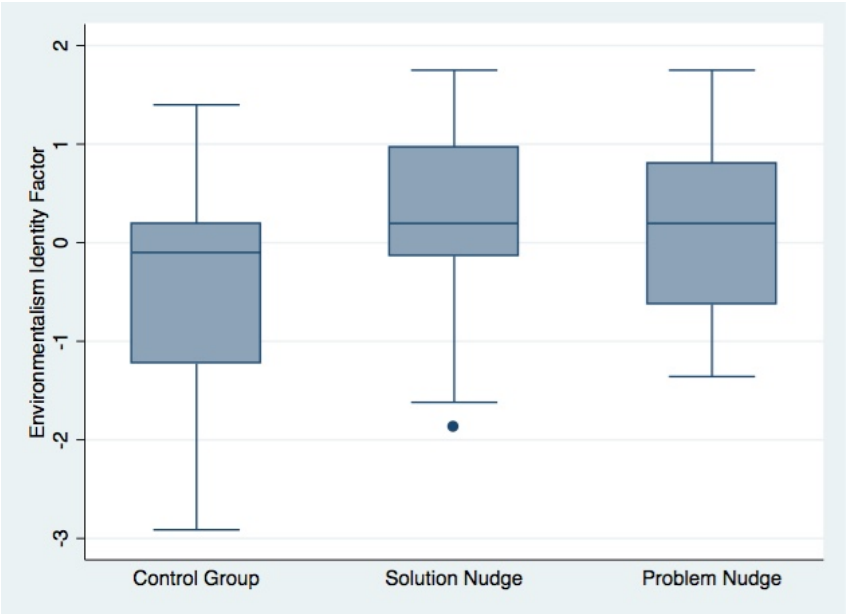

Figure 4. Boxplot. *Nudging Environmental Self-Identity.*

4.2.2.1 Nudge Effects on Self-Reported Environmental Self-Identity

Table 7 presents the results of a stepwise OLS regression analysis testing whether the implemented Nudges positively affect self-reported environmental self-identity, to increase it. Model 1 explains the level of self-reported environmental self-identity by only taking the two treatments into account for analysis. A linear regression established that the treatment effects explain 11% of the variance in the level of reported environmental self-identity (F (6, 171) = 11.99, p = .000). The control group displays a significantly lower level of environmental self-identity, while both *Nudge groups* score significantly higher on environmental self-identity. Strikingly, the group confronted with a *Solution Nudge* displays an even higher level of consumerism than the other treatment group confronted with a *Problem Nudge.* Please Note that these differences are further analysed in Table 8 of the subsequent section.

Expediently, the following Models examine the impact of all other variables on the relation between the two Nudges and the level of reported consumerism.

In Model 2, this effect is controlled for the possession of a reusable bottle and the accessibility of sustainable options, explaining 16% of the variance in the level of self-reported environmental self-identity (F (6, 171) = 6.67, p = .000). Those who do not have a reusable bottle of plastic or glass /metal report a significantly lower level of environmental self-identity. However, the effects of accessibility are not significant.

In Model 3, all control variables are added, explaining 16% of the variance in the level of self-reported environmental self-identity (F (12, 131) = 3.26, p = .000). However, male, location, age, income and study type are not associated with reported environmental self-identity among the groups. Consequently, other control variables do neither provide an alternative explanation for the treatment effects as the treatment effects remain significantly high even when all controls are incorporated in the analysis. Interestingly, the Model with full controls does not significantly better explain the variance in self-reported environmental self-identity. For this reason, Model 2 is the better one, because it retains more degrees of freedom than does Model 3. Additional analyses excluded an interaction effect between treatment and bottle.

All three models show significantly high treatment effects, while none of the other variables provides an alternative explanation for those effects. That is why, the original relationship between the two Nudges and self-reported environmental self-identity is genuine.

On these grounds of evidence, Hypothesis 2a and 2b can be supported. Both experimental groups, confronted with either the *Problem Nudge* or the *Solution Nudge,* report a significantly higher level of environmental self-identity than the control group without a Nudge throughout all three models.

Table 7.
Stepwise Regression Analysis of Self-Reported Environmental Self-Identity.

	Model 1	Model 2	Model 3
Treatment (reference = control)			
Solution	.77 (.16)***	.72 (.16)***	.61 (.19)**
Problem	.53 (.16)***	.53 (.16)***	.46 (.18)*
Reusable bottle (ref = disposable)			
Plastic bottle		.30 (.15)*	.36 (.18)*
Glass/ metal bottle		.56 (.17)***	.64 (.21)**
Accessibility (ref = too far)			
Cycling distance		.40 (.22)	.50 (.25)*
Walking distance		.42 (.22)	.44 (.25)
Gender = male			-.16 (.17)
Location = Muenster			.09 (.18)
Age			.02 (.04)
Income			0
Study type (ref = alpha-gamma)			
Business			-.18 (.23)
Beta			-.24 (.19)
Constant	-.43 (.11)***	-1.07 (.23)***	-1.65 (.94)
N	180	178	144
Adjusted R^2	.11	.16	.16

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

4.2.2.2 Differences Between the two Nudge Effects on Self-Reported Environmental Self-Identity

Table 8 presents the analyses of the strength differences of the two Nudges on self-reported environmental self-identity. Model 1 shows that the *Solution Nudge* scores significantly higher on reported environmental self-identity compared to either the *Problem Nudge* or *No Nudge.* Thereby, the presence of the *Solution Nudge* accounts for a unit increase of .46 of self-reported environmental self-identity holding all other variables constant (F (5, 172) = 5.46, p = .000).
Model 2 shows that the *Problem Nudge* does not score significantly higher on self-reported environmental self-identity compared to either the *Solution Nudge* or *No Nudge* (F (5,172) = 3.45, p = .005).
However, Model 3 shows that the *Solution Nudge* does not score significantly higher on self-reported environmental self-identity when only compared to the *Problem Nudge* (F (5,113) = 3.08, p = .012).

To summarize, both *Nudge groups* score significantly higher on self-reported environmental self-identity than does the *Control group.* Moreover, the *Solution Group* scores significantly higher compared to both other groups. However, this is not the case anymore when compared to only the *Problem group*. Moreover, other variables of this research do not provide an alternative explanation for the treatment effects.

Table 8.
Analysis of Differences Between Treatment Effects on Environmental Self-Identity.

	Model 1	**Model 2**	**Model 3**
Treatment (reference = control)			if treatment>0
Solution	.46 (.14)***		
Problem		.17 (.14)	-.19 (.15)
Reusable bottle (ref = disposable)			
Plastic bottle	.31 (.16)*	.35 (.16)*	.29 (.18)
Glass/ metal bottle	.61 (.18)***	.61 (.18)***	.52 (.19)*
Accessibility (ref = too far)			
Cycling distance	.32 (.22)	.40 (.23)	.41 (.24)
Walking distance	.37 (.23)	.40 (.23)	.52 (.24)*
Constant	-.76 (.22)***	-.74 (.23)**	-.38 (.25)
N	178	178	119
Adjusted R^2	.11	.06	.08

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
$p < .05$ = ()*; $p < .005$ = ()**; $p < .001$ = ()***

4.2.3 Results of Hypothesis Testing 3:

Negative Associations Between Environmental Self-Identity and Consumerism

Corresponding to the assumption that someone's self-identity potentially affects one's behaviour as well as one's behaviour affects how one identifies himself, this section presents the results of the Nudge effects on reported consumerism when self-reported environmental self-identity was added in the analysis and vice versa.

4.2.3.1 Nudge Effects on Consumerism Additionally Explained with Environmental Self-Identity

Table 9 presents the results of a stepwise OLS regression analysis testing the additional impact of self-reported environmental self-identity on self-reported consumerism.

Model 1 explains the level of self-reported consumerism by only taking self-reported environmental self-identity into account for analysis. A linear regression established that self-reported environmental self-identity explained 42% of the variance in the level of reported consumerism (F (1, 178) = 130.93, p = .000).

In Model 2, the treatment effects are added. Strikingly, the two Nudges do neither have an additional impact on self-reported consumerism nor does the Model explain additional variance in the level of self-reported consumerism (F (3,176) = 44.36), p = .000).

Expediently, the following Models examine the impact of all other variables on the relation between the two Nudges and the level of reported consumerism additionally explained by self-reported environmental self-identity.

Model 3 controls for the possession of a reusable bottle and the accessibility of sustainable options, explaining 48 of the variances in the level of self-reported consumerism (F (7, 170) = 24.64, p = .000). Those who do not possess a reusable glass /metal bottle score significantly higher on consumerism. However, only the effects of accessibility within cycling distance are significant but comparatively weaker than the possession of a reusable glass/ metal bottle.

In Model 4, all control variables are added, explaining 64% of the variances in the level of self-reported consumerism (F (13,130) = 20.27, p = .000). To that effect, males scored significantly higher on the consumerism scale, so do the Muenster students as well. However, age, income and study type are not associated with reported consumerism among the groups.

Model 5 portrays the regression analyses when only significant variables are added in the equation, explaining 58% of the variance of self-reported consumerism (F (5,174) = 50.91, p = .000). Nevertheless, the differences of the treatment effects were further analysed to ensure the results which portray the absence of the Nudge effects on self-reported consumerism when environmental self-identity is added. These results are presented in Table 10, reassuring the previous results of Table 9.

Consequently, the Nudges neither explain variances in consumerism when self-reported environmental self-identity is added in the equation nor provide the control variables an alternative explanation as the impact of environmental self-identity remains the same. Instead, environmental self-identity and the possession of a reusable glass /metal bottle as well as being a male and living in Muenster hold the strongest explanations for variation in reported consumerism.

Table 9.
Stepwise Regression Analysis of Self-Reported Consumerism Additionally Explained with Environmental Self-Identity.

	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental self-identity factor	-.54 (.05)***	-.54 (.05)***	-.50 (.05)***	-.48 (.05)***	-.46 (.04)***
Treatment (reference = control)					
Solution		.01 (.11)	-.01 (.11)	-.04 (.11)	
Problem		-.13 (.11)	-.14 (.11)	-.17 (.10)	
Reusable bottl (ref = disposable)					
Plastic bottle			-.11 (.10)	-.03 (.10)	-.10 (.09)
Glass/metal bottle			-.37 (.12)***	-.30 (.12)*	-.35 (.10)***
Accessibility (ref = too far)					
Cycling distance			-.36 (.14)*	-.18 (.14)	
Walking distance			-.25 (.15)	-.09 (.14)	
Gender = male				.35 (.09)***	.45 (.08)***
Location = Muenster				.30 (.10)**	.36 (.08)***
Age				-.03 (.02)	
Income				0	
Study type (ref = alpha-gamma)					
Business				.19 (.13)	
Beta				.07 (.10)	
Constant	.00 (.04)	.04 (.08)	.46 (.16)**	.52 (.52)	-.23 (.09)*
N	180	180	178	144	180
Adjusted R^2	.42	.42	.48	.64	.58

Note: OLS Regression of consumerism (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

Table 10.
Analysis of Differences Between Treatment Effects on Consumerism Additionally Explained with Environmental Self-Identity.

	Model 1	Model 2	Model 3
Environmental self-identity factor	-.51 (.05)***	-.50 (.05)***	-.54 (.07)***
Treatment (reference = control)			if treatment>0
Solution	.06 (.09)		
Problem		-.13 (.09)	-.15 /.11)
Reusable bottle (ref = disposable)			
Plastic bottle	-.10 (.10)	-.11 (.10)	-.29 (.13)*
Glass/ metal bottle	-.38 (.12)**	-.37 (.12)***	-.40 (.15)*
Accessibility (ref = too far)			
Cycling distance	-.34 (.14)*	-.36 (.14)*	-.32 (.18)
Walking distance	-.23 (.15)	-.25 (.15)	-.24 (.18)
Constant	.37 (.15)*	.45 (.15)**	.53 (.19)*
N	178	178	119
Adjusted R^2	.48	.49	.44

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

4.2.3.2 Nudge Effects on Environmental Self-Identity additionally explained with Consumerism

Table 11 presents the results of a stepwise OLS regression analysis testing the additional impact of self-reported consumerism on environmental self-identity.

Model 1 explains the level of self-reported environmental self-identity by only taking self-reported consumerism into account for analysis. A linear regression established that consumerism explained 42% of the variance of reported environmental self-identity (F (1, 178) = 130.93, p = .000).

In Model 2 the treatment effects are added, explaining 46% of the variance of reported environmental self-identity (F (3,176) = 51.01, p = .000). Strikingly, only the *Solution Nudge* has a significant additional impact on self-reported environmental self-identity.

Expediently, the following Models examine the impact of all other variables on the relation between the two Nudges and the level of reported environmental self-identity additionally explained by consumerism. Model 3 controls for the possession of a reusable bottle and the accessibility of sustainable options, explaining 47% of the variances of self-reported consumerism (F (7, 170) = 23.13, p = .000). However, both controls are not significant and thereby do not provide an alternative explanation. Nevertheless, this result supports the assumption that reported consumerism and the possession of a reusable bottle, which was classified as a real, observable pro-environmental behaviour in the methods section, are so strong related that consumerism suppresses the bottle effect. Thereby, this finding fortifies that consumerism is well related to real behaviours and not to social desirability in the context of this research.

In Model 4, all control variables are added, explaining 53% of the variances in the level of self-reported environmental self-identity (F (13,130) = 13.41, p = .000). Accordingly, the Muenster students score significantly higher on reported environmental self-identity. However, gender, age, income and study type are not associated with reported environmental self-identity among the groups.

Model 5 portrays the regression analyses when only significant variables were taken into account in the equation, explaining 46% of the variance of self-reported environmental self-identity (F (4,175) = 38.76, p = .000). However, the location is not significant anymore.

Throughout all five Models, self-reported consumerism has a highly significant, negative impact on environmental self-identity while the *Solution Nudge* has a significant positive impact.

Ultimately, even when controlled for respondents' level of consumerism, the *Solution Nudge* triggers significantly higher environmental self-identity, although consumerism significantly reduces environmental self-identity. Consequently, it is still possible to trigger additional senses of environmental self-identity by using the Nudge.

Table 11.
Stepwise Regression Analysis of Environmental Self-Identity Additionally Explained with Consumerism.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Consumerism factor	-.79 (.07)***	-.73 (.07)***	-.74 (.07)***	-.92 (.09)***	-.76 (.07)***
Treatment (reference = control)					
Solution		.47 (.13)***	.44 (.13)***	.30 (.15)*	.46 (.13)***
Problem		.23 (.13)	.23 (.13)	.10 (.14)	.22 (.13)
Reusable bottle (ref = disposable)					
Plastic bottle			.11 (.13)	.17 (.14)	
Glass/metal bottle			.08 (.15)	.08 (.16)	
Accessibility (ref = too far)					
Cycling distance			-.02 (.18)	.11 (19)	
Walking distance			.08 (.18)	.16 (.19)	
Gender = male				.23 (.13)	
Location = Muenster				.33 (.14)*	.13 (.11)
Age				-.01 (.03)	
Income				0	
Study type (ref = alpha-gamma)					
Business				.07 (.18)	
Beta				-.07 (.14)	
Constant	.0 (.05)	-.23 (.09)*	-.33 (.20)	-.44 (.71)	-.29 (.10)**
N	180	180	178	144	180
Adjusted R^2	.42	.46	.47	.53	.46

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

4.2.3.2.1 Differences Between Nudge Effects

Table 12 presents the analyses of the strength differences of the two Nudges on self-reported environmental self-identity when consumerism is taken into account. Model 1 shows that the *Solution Nudge* scores significantly higher on reported environmental self-identity compared to either the *Problem Nudge* or *No Nudge* (F (6,171) = 26.13, p = .000). Model 2 shows that

the *Problem Nudge* does not score significantly higher on self-reported environmental self-identity compared to either the *Solution Nudge* or *No Nudge* (F (6,171) = 23.51, p = .000). However, Model 3 shows that the *Solution Nudge* does not score significantly higher on self-reported environmental self-identity than does the *Problem Nudge* (F (6,112) = 14.27, p = .012). To summarize, the *Solution Group* scores significantly higher compared to both other groups. However, this is not the case anymore when compared to only the *Problem group*. Moreover, other variables of this research do not provide an alternative explanation for the treatment effects.

Table 12.
Analysis of Differences Between Treatment Effects on Environmental Self-Identity Additionally Explained with Consumerism

	Model 1	**Model 2**	**Model 3**
Consumerism factor	-.77 (.07)***	-.79 (.07)***	-.65 (.08)***
Treatment (reference = control)			if treatment>0
Solution	.32 (.11)**		
Problem		-.03 (.11)	-.22 (.12)
Reusable bottle (ref = disposable)			
Plastic bottle	.10 (.12)	.12 (.13)	-.00 (.15)
Glass/ metal bottle	.08 (.15)	.07 (.15)	.08 (.17)
Accessibility (ref = too far)			
Cycling distance	-.07 (.18)	-.05 (.18)	.06 (.20)
Walking distance	.05 (.18)	.05 (.18)	.18 (.20)
Constant	-.18 (.18)	-.08 (.19)	.10 (.21)
N	178	178	119
Adjusted R^2	.46	.43	.40

Note: OLS Regression (unstandardized coefficient; standard errors between parentheses);
p < .05 = ()*; p < .005 = ()**; p < .001 = ()***

5. Conclusion

It is pervasive that the current environmental impact of individual consumerism and their corresponding markets need to be changed since those aggregate the current environmental problems. However, external interventions, such as policies or subsidiaries, have been ineffective, especially in the long-run. Previous researches have extensively established that this is predominantly because external incentives are not assimilated to the self and thus, lack in realisation consistency on the merits. Consequently, it has been discovered that it is deemed necessary to preserve the individual's autonomy of choices and actions in order to realise

practical conversions towards sustainable consumerism. As a consequence, the exigence of behavioural public administration, in that domain closely connected to environmental psychology, has radically risen. The researches which came with the territory have been essential for building the understanding of environmental significant behaviours and intentions as some form of intervention is inevitable to finally bring about change. Those researches revealed that environmental self-identity is an essential predictor of pro-environmental behaviours, including sustainable consumerism (e.g. Whitmarsh & O'Neill, 2010; Gattersleben, 2014; van der Werff et al., 2013a,b; Dermody et al., 2018). However, it has been detected that someone's self-identity is more closely interconnected with behavioural intentions rather than actual behaviours (e.g. Sparks & Shepherd, 1992; Stern, 2000). This finding provided thereby an explanation of the so-called "attitude-behaviour-gap" indicating that there must be underlying external factors that hinder intentions to result in congruent choices and actions. Accordingly, contextual factors have been identified as severe hindrances, overweighing internal motivations, for instance, the lack of accessibility or financial constraints (e.g. Stern, 2000; Gifford, 2014; Kaaronen, 2017; Chekima et al., 2019). For this reason, contextual barriers must be reduced to the bare minimum, while stressing that psychological considerations are more crucial in order to bring about change as they are more effective in the long-run (Gifford, 2014).

That is why this research set out to determine whether the *Nudge Strategy* could potentially evoke an improvement in the matter of increasing environmental self-identity while simultaneously decreasing consumerism. However, this interest had been delineated in observational terms to self-reported survey questions and statements after being presented with a Nudge. Accordingly, the investigation of the potentials of Nudges was split in a *Solution Nudge* and a *Problem Nudge,* creating the two experimental groups while the third group served as a control group. Remarkably, this research did not only control for the previous indicated contextual barriers and other general characteristics but also self-reported social-desirability bias through the "bottle adjusted" external measure of actual behaviours. Thereby, the possession of a reusable bottle additionally assured whether the Nudges could potentially evoke an improvement even in people who already exhibit pro-environmental intentions and behaviours. Therefore, in already exhibited pro-environmental behaviours, it is the residuals intentions that remain when controlled for the respondents' pro-environmental behaviours.

It was hypothesised that both *Nudge groups* would report a lower level of consumerism than the control group and that the group confronted with a *Solution Nudge* would report an even lower level of consumerism than the group confronted with a *Problem Nudge*. Likewise, it has

been hypothesised that both *Nudge groups* would report a higher level of environmental self-identity than the control group and that the group confronted with a *Solution Nudge* would report an even higher level of environmental self-identity than the group confronted with a *Problem Nudge*. Furthermore, it was additionally hypothesised that environmental self-identity is negatively associated with consumerism.

Based on the analyses, it is possible to draw several conclusions. In the first place, the findings support the hypothesised effects of the two Nudges on both consumerism and environmental self-identity. Accordingly, respondents of both *Nudge groups* displayed a significantly lower level of self-reported consumerism and a significantly higher level of environmental self-identity than respondents of the control group. However, the findings of self-reported consumerism revealed that the two Nudge effects do not differ in strength when the effects were compared. For this reason, it can be concluded that it does not matter whether one is *nudged* by an environmental solution or a problem before being asked to assess their ordinary level of consumerism.

Furthermore, controlling for the bottle allowed for appraising the deviance of self-reported consumerism that could not be explained by the presence of a specific pro-environmental behaviour. In fact, it is the residual's variance that remains when controlled for the observed possession of a (reusable) bottle. Thus, controlling for the reusable bottle established a valid and reliable objective external measure of a specific pro-environmental behaviour in the context of self-reported consumerism. Besides that, neither the contextual barriers nor any other control variables provided an alternative explanation for the findings of self-reported consumerism.

On the contrary, when the effect of the *Solution Nudge* on self-reported environmental self-identity is further analysed, the results support that indeed a Nudge which visualises methods of resolution is the stronger Nudge in comparison to the *Problem Nudge* and *No Nudge*. Nevertheless, these findings obliterate when compared to only the *Problem Nudge* and the control group.

Comparing these two results, it can be seen that the two Nudges account for a reliable predictor of consumerism as well as environmental self-identity when analysed separately. However, it is worth noticing that the Nudge does not strengthen the relationship; it only provokes an improvement in terms of self-evaluation when reporting consumerism and environmental self-identity.

Nevertheless, it is necessary to compare the results of the two separate analyses with the ones from the combined ones[7]. Accordingly, the findings, presented in Table 5, account for a third of the variance of self-reported consumerism. However, Table 9 represents the findings that revealed that environmental self-identity itself already explains more variance of self-reported consumerism than the ones of Table 5 do when all variables are part of the equation (except environmental self-identity). Thereby, these findings disperse the initially discovered treatment effects. Alternatively, being a male and living in Münster accounts herewith for increased respondents' level of consumerism. It can be concluded that self-reported environmental self-identity is a stronger predictor of reduced levels of consumerism in comparison to the two Nudges. Nevertheless, for people who do not report a robust environmental self-identity, the Nudges still affect their self-evaluated consumerism at stake to some extent.

Despite these considerations, the findings show that the Nudges, especially the *Solution Nudge*, triggers significantly higher senses of self-reported environmental self-identity, even when reported consumerism is added in the equation[8]. Although self-reported consumerism decreases senses of environmental self-identity, the Nudges still trigger additional senses of self-reported environmental self-identity. Therefore, the hypothesised effect of Nudging self-reported environmental self-identity can be further supported. Additionally, the hypothesised negative associations between self-reported consumerism and self-reported environmental self-identity are further supported as well.

Given the above, one can argue that the Nudge is a significantly stronger predictor of reported environmental self-identity while environmental self-identity itself revealed as a substantial predictor of reduced levels of reported consumerism. Hence, this evidence additionally supports the hypothesis that self-reported environmental self-identity is negatively associated with self-reported consumerism. For the sake of securing that reporting environmental self-identity could not additionally increase social-desirability answers of consumerism, consumerism was assessed first in the survey, followed by environmental self-identity and all other factors. However, it cannot be ruled out that the responses patterns of environmental self-identity on consumerism may be driven, at least partly, by the responses of consumerism. For instance, recall the example of the study in which one-half of the participants were asked to judge their life-satisfaction after being asked about the number of dates they had within the last month. The findings revealed the highest correlations of both questions when assessed in this order, while the reversed assessment did not correlate. This appeared because the emotion aroused by the

[7] Tables 5, 7, 9 and 11.
[8] Comparing the results of Table 7 and 11.

dating question was still on the participants' mind when the question about their general happiness came up. Accordingly, those findings could potentially also serve as an explanation of the findings of this research. Both behavioural intentions that are reflected in environmental self-identity, as well as sustainable consumerism, are susceptible to influence on the merits. Behavioural intentions and behaviours seek for mental congruence and consistency in both directions. Apparently, the direction of causality is vague, and in the context of this study, it cannot be fully determined whether it is consumerism explained by environmental self-identity or environmental self-identity explained by consumerism.

Nevertheless, the concepts of consumerism, as well as environmental self-identity, were separately constructed, especially since the specific measure of identity was taken out of the factor analysis, and clearly specified in observational terms and it is, at least not the construct validity which can account for the vague direction of causality in this research. For this reason, future research in this field would be of great help in amending the vague direction of causality of environmental self-identity and consumerism. For instance, changing the order of measurement might yield an improvement.

Although the current research is based on the simple random sampling technique, generalisability of the findings is subject to certain limitations. For instance, since only students have built the units of observation, the generalisability should thereby, be considered as presumably being limited to students between the age of 18 and 27 rather than individuals of this age group as a whole. More extensive and broader research could thus, verify the generalisability of the findings beyond just students. Considering that the students in Muenster scored higher on consumerism, as Males did, additional research is needed to check whether these findings might be context-sensitive before generalization can be further assured.

Given that measuring specific consumer behaviour through the use of vignettes did not produce a scale, further in-depth analysis of expressed behaviours could yield more explanations.

With attention to the fact that rating participants' self-reported environmental attitudes were also a constituent part of the operated survey, this ought to deliberate whether this might have unintendedly affected the findings of the current research. Although the measured environmental attitudes themselves have not produced statistical differences for other measured variables at all[9], it might be that evaluating personal environmental attitudes before environmental self-identity affected the respondent's conduct when they had to evaluate their environmental self-identity. Considering the happiness-dating example, evaluating

[9] That is why they were taken out of the present research.

environmental attitudes could potentially have made people think about the environment as well as themselves differently. On these grounds, it could be recommended that the current research should be repeated without measuring environmental attitudes to exclude all possibility of doubt.

To summarise, the Nudges trigger not only additional senses of self-reported environmental self-identity, but also the negative impact of reported consumerism on environmental self-identity is weaker through the implementation of a Nudge. However, self-reported environmental self-identity has a weaker impact on consumerism than vice versa. This finding is in line with the assumption that behavioural intentions, to which environmental self-identity belongs, can potentially serve as a predictor of specific behaviours but are not necessarily resulting in those.

Ultimately, the findings of the current research suggest that it is easier to strengthen a person's self-evaluated environmental self-identity than reducing his level of consumerism through the use of Nudges. This assumption can be supported through the assumption that behavioural intentions are more susceptible to influence than the behaviour itself. Consumerism is thus, stronger anchored in a person than his corresponding environmental self-identity.

Nevertheless, considering today's aggregating environmental challenges, that are predominantly inflicted through the impact humanity has on the natural environment, there are several important changes which need to be made. That is why the current research primarily adds insight to what extent Nudging evokes personal connections with nature itself. These connections could result in behavioural intentions, likewise environmental self-identity, which potentially could affect a person's conduct when consumption choices and actions are to be made. Local, regional and sustainable production and consumerism that adapts seasonal transitions is needed to reduce the global impact of humanity on the environment and thus, to safeguard environmental sustainability.

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6.2 Image References

Glacier retreat Svalbard. *Problem Nudge*

The image was first found on:

Brown, R. (2017). Pictures Show Climate Change's Dramatic Arctic Impact. *National Geographic*

https://news.nationalgeographic.com/2017/03/my-climate-action-q-a-aslund-arctic-glacier-greenpeace/ (retrieved on 04/05/19).

Both glacier photographs are protected by copyright. Therefore, both originators have been asked for permission via mail. *Courtesy of:*

Christian Åslund/ Greenpeace - coloured photograph.

http://www.christian.se/global-warming-retreating-glaciers (retrieved on 15/05/19).

Norwegian Polar Institute - archive image. The image has been directly sent to the author of this thesis; the Norwegian Copyright Act needs to be met.

Reduce, Reuse, Recycle. *Solution Nudge*

License-free image. http://clipart-library.com/clipart/6iy5e9qAT.htm (retrieved on 13/05/19)

7. Appendices

7.1 Survey Sheet

SURVEY CONSUMERISM

I. How often do you take each action?

Please indicate through ticking the applicable box

	6-7 days a week	*3-5 days a week*	*1-2 days a week*	*Once/ twice a month*	*Less often*	*never*
Eat organic, locally grown or seasonal food						
Eat meat						
Buy environmentally friendly products/ products with less packaging						
Use a car/ van to travel, either as a driver or as a passenger						

II. How many return flights do you take per year? _____

III. What would you choose in your everyday life?

Please circle either option A or B for each situation

1. **A** buy a Litre of milk of 65 cents, which is produced in an industrial livestock farming
B buy a Litre of milk of 72 cents, which is produced sustainably

2. **A** buy a pair of jeans of 110 €, which is fair trade
B buy a pair of jeans of 100 €, which is produced unsustainably

3. **A** single-use-plastic coffee to go cup at a café
B pay additional 1€ for a recyclable option at the same café

4. **A** buy 250gr of tomatoes of 1.99 €, which is well shaped, wrapped in plastic and imported
B buy 250gr of tomatoes of 2.19 €, which is a bit deformed, locally grown and not wrapped in anything

5. **A** 30 mins drive to work/ uni by car
B 45 mins via public transport to work/ uni, both ticket (B) and petrol costs (A) are of equal price

IV. What do you think about each statement?

Please indicate through ticking the applicable box

	Strongly disagree	***Disagree***	***Neutral***	***Agree***	***Strongly agree***
Humans are as much part of the ecosystem as other animals					
The most important reason for conservation is human survival					
Nature is valuable for its own sake					
The thing that concerns me most about deforestation is that there will not be enough lumber for future generations					
I can enjoy spending time in natural settings just for the sake of being out in nature, as a stress reliver, comfortable in nature					
Sometimes it makes me sad to see forests cleared for agriculture					
It bothers me that humans are running out of their supply of oil					
We need to preserve resources to maintain a high quality of life					

V. Can you identify yourself with those statements?

Please indicate through ticking the applicable box

	Strongly disagree	***Disagree***	***Slightly disagree***	***neutral***	***Slightly agree***	***Agree***	***Strongly Agree***
Acting environmentally friendly is an important part of who I am							
I am the type of person who acts environmentally friendly							
I see myself as an environmentally friendly person							
I am aware/ conscious about consuming sustainable goods							

VI. Are you aware/ do you care about the environmental harms you inflict through your consumerism? ***Please circle: NO. YES. If yes, how?***

VII. Are you planning/ willing to change your consumerism regarding to its environmental impact? Please circle: NO. YES. ***If yes, what and how?***

VIII. What are your two most important reasons for being concerned about the environment? ***Such as preferences and intentions***

IX. Characteristics

1. What is your gender? **O** men **O** women **O** diverse
2. How old are you? _____
3. From which university and study department are you study and in which year/ semester are you?

   _____

4. How high is your average monthly income? _____
5. What is applicable for you? Please cross

O I have an additional job **O** I receive BaföG/ study loan **O** my parents pay for my living costs

6. How accessible are organic/ regional food options in the shops or supermarkets around your home?

   O 5-10mins walking distance **O** 5-10mins cycling distance **O** too far to walk or cycle

X. What should/ could be changed (all over the world) in order to solve environmental problems/ reduce climate change etc?

7.2 Data Codebook

end of do-file
CODEBOOK

---

cn **Casenumber**

---

type: numeric (int)

range: [1,180] units: 1
unique values: 180 missing .: 0/180

mean: 90.5
std. dev: 52.1057

percentiles: 10% 25% 50% 75% 90%
18.5 45.5 90.5 135.5 162.5

---

group **group**

---

type: numeric (byte)

range: [1,6] units: 1
unique values: 6 missing .: 0/180

tabulation: Freq. Value
30 1
30 2
30 3
30 4
30 5
30 6

---

date **date**

---

type: numeric (byte)

range: [1,4] units: 1
unique values: 4 missing .: 0/180

tabulation: Freq. Value
43 1
50 2
47 3
40 4

---

cons_1 **cons_1**

---

type: numeric (byte)

range: [1,6] units: 1
unique values: 6 missing .: 0/180

tabulation: Freq. Value
21 1

62 2
37 3
46 4
12 5
2 6

---

cons_2 **cons_2**

---

type: numeric (byte)

range: [1,6] **units: 1**
unique values: 6 **missing .: 0/180**

tabulation: Freq. Value
39 1
63 2
29 3
21 4
5 5
23 6

---

cons_3 **cons_3**

---

type: numeric (byte)

range: [1,6] units: 1
unique values: 6 missing .: 0/180

tabulation: Freq. Value
12 1
61 2
38 3
43 4
19 5
7 6

---

cons_4 **cons_4**

---

type: numeric (byte)

range: [1,6] units: 1
unique values: 6 missing .: 0/180

tabulation: Freq. Value
7 1
20 2
16 3
68 4
57 5
12 6

---

flights **flights**

---

type: numeric (byte)

range: [0,4] units: 1
unique values: 5 missing .: 3/180

tabulation: Freq. Value
21 0
61 1
58 2
22 3
15 4
3 .

---

behav_1 **behav_1**

---

type: numeric (byte)

range: [0,1] units: 1
unique values: 2 missing .: 0/180

tabulation: Freq. Value
44 0
136 1

---

behav_2 **behav_2**

---

type: numeric (byte)

range: [0,1] units: 1
unique values: 2 missing .: 0/180

tabulation: Freq. Value
55 0
125 1

---

behav_3 **behav_3**

---

type: numeric (byte)

range: [0,1] units: 1
unique values: 2 missing .: 3/180

tabulation: Freq. Value
80 0
97 1
3 .

---

behav_4 **behav_4**

---

type: numeric (byte)

range: [0,1] units: 1

unique values: 2 missing .: 0/180

tabulation: Freq. Value
65 0
115 1

---

behav_5 **behav_5**

---

type: numeric (byte)

range: [0,1] units: 1
unique values: 2 missing .: 1/180

tabulation: Freq. Value
63 0
116 1
1 .

---

eco_1 **eco_1**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 0/180

tabulation: Freq. Value
3 1
12 2
10 3
86 4
69 5

---

eco_2 **eco_2**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 0/180

tabulation: Freq. Value
11 1
24 2
27 3
57 4
61 5

---

eco_3 **eco_3**

---

type: numeric (byte)

range: [2,5] units: 1
unique values: 4 missing .: 0/180

tabulation: Freq. Value
7 2
11 3
77 4
85 5

---

eco_4 **eco_4**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 0/180

tabulation: Freq. Value
2 1
11 2
22 3
85 4
60 5

---

anthro_1 **anthro_1**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 1/180

tabulation: Freq. Value
10 1
59 2
57 3
47 4
6 5
1 .

---

anthro_2 **anthro_2**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 2/180

tabulation: Freq. Value
31 1
72 2
28 3
32 4
15 5
2 .

---

anthro_3 **anthro_3**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 1/180

tabulation: Freq. Value
18 1
51 2
63 3
32 4
15 5
1 .

---

anthro_4 **anthro_4**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 1/180

tabulation: Freq. Value
1 1
15 2
31 3
78 4
54 5
1 .

---

identity_1 **identity_1**

---

type: numeric (byte)

range: [1,7] units: 1
unique values: 7 missing .: 0/180

tabulation: Freq. Value
1 1
10 2
22 3
26 4
67 5
37 6
17 7

---

identity_2 **identity_2**

---

type: numeric (byte)

range: [1,7] units: 1
unique values: 7 missing .: 0/180

tabulation: Freq. Value
4 1
5 2

24 3
30 4
69 5
37 6
11 7

---

identity_3 **identity_3**

---

type: numeric (byte)

range: [1,7] units: 1
unique values: 7 missing .: 0/180

tabulation: Freq. Value
1 1
10 2
18 3
41 4
59 5
38 6
13 7

---

identity_4 **identity_4**

---

type: numeric (byte)

range: [1,7] units: 1
unique values: 7 missing .: 0/180

tabulation: Freq. Value
1 1
2 2
11 3
29 4
52 5
61 6
24 7

---

gender **gender**

---

type: numeric (byte)

range: [0,2] units: 1
unique values: 3 missing .: 0/180

tabulation: Freq. Value
72 0
106 1
2 2

---

age **age**

---

type: numeric (byte)

```
        range:  [18,27]                 units:  1
unique values:  10                      missing .:  0/180

         mean:   21.5111
      std. dev:   2.15201

   percentiles:        10%       25%       50%       75%       90%
                        19        20        21        23      24.5
```

---

income **income**

```
        type:  numeric (double)

        range:  [0,2100]                units:  .01
unique values:  33                      missing .:  16/180

         mean:   674.309
      std. dev:   328.457

   percentiles:        10%       25%       50%       75%       90%
                       300       500       700       850      1000
```

---

finances **finances**

```
        type:  numeric (byte)

        range:  [1,99]                  units:  1
unique values:  8                       missing .:  0/180

  tabulation:  Freq.  Value
                 32  1
                 25  2
                 15  3
                 48  4
                 40  5
                  6  6
                  9  7
                  5  99
```

---

accessibility **accessibility**

```
        type:  numeric (byte)
       label:  dist

        range:  [0,2]                   units:  1
unique values:  3                       missing .:  2/180

  tabulation:  Freq.   Numeric  Label
                 19         0  too far
                 84         1  cycling distance
                 75         2  walking dstance
                  2         .
```

---

uni **uni**

---

type: numeric (byte)

range: [1,4] units: 1
unique values: 4 missing .: 0/180

tabulation: Freq. Value
89 1
1 2
81 3
9 4

---

semester **semester**

---

type: numeric (byte)

range: [2,99] units: 1
unique values: 9 missing .: 0/180

tabulation: Freq. Value
52 2
1 3
48 4
5 5
32 6
8 8
1 9
2 11
31 99

---

grade **grade**

---

type: numeric (byte)

range: [1,99] units: 1
unique values: 6 missing .: 0/180

tabulation: Freq. Value
62 1
27 2
2 3
14 4
1 5
74 99

---

bottle **bottle**

---

type: numeric (byte)

range: [1,5] units: 1
unique values: 5 missing .: 0/180

tabulation: Freq. Value

```
                27  1
                79  2
                20  3
                14  4
                40  5
```

---

subject **subject**

```
        type:  numeric (byte)

       range:  [1,99]                units:  1
unique values:  17                   missing .:  0/180

        mean:   17.4167
    std. dev:   30.0623

 percentiles:       10%       25%       50%       75%       90%
                      1       2.5         7        13        99
```

---

treatment **Treatment Condition**

```
        type:  numeric (byte)
       label:  treat1

       range:  [0,2]                 units:  1
unique values:  3                    missing .:  0/180

  tabulation:  Freq.   Numeric  Label
                  60         0  Control Group
                  60         1  Solution Nudge
                  60         2  Problem Nudge
```

---

problem **(unlabeled)**

```
        type:  numeric (float)

       range:  [0,1]                 units:  1
unique values:  2                    missing .:  0/180

  tabulation:  Freq.  Value
                 120  0
                  60  1
```

---

solution **(unlabeled)**

```
        type:  numeric (float)

       range:  [0,1]                 units:  1
unique values:  2                    missing .:  0/180

  tabulation:  Freq.  Value
                 120  0
```

60 1

---

reuse_bottle **bottle**

---

type: numeric (byte)
label: reuse

range: [0,2] units: 1
unique values: 3 missing .: 0/180

tabulation: Freq. Numeric Label
54 0 disposable
79 1 plastic bottle
47 2 glass / metal bottle

---

munster **(unlabeled)**

---

type: numeric (float)

range: [0,1] units: 1
unique values: 2 missing .: 0/180

tabulation: Freq. Value
90 0
90 1

---

male **gender**

---

type: numeric (byte)

range: [0,1] units: 1
unique values: 2 missing .: 0/180

tabulation: Freq. Value
108 0
72 1

---

study **subject**

---

type: numeric (byte)

range: [1,16] units: 1
unique values: 16 missing .: 21/180

mean: 6.64151
std. dev: 4.7311

percentiles: 10% 25% 50% 75% 90%
1 2 5 11 13

---

study_type **subject**

```
            type:  numeric (byte)
           label:  study1

           range:  [0,2]                units:  1
      unique values:  3                 missing .:  21/180

        tabulation:  Freq.  Numeric  Label
                     50        0  alpha-gamma
                     29        1  business
                     80        2  beta
                     21        .
```

---

cons_factor **Consumerism Factor**

```
            type:  numeric (float)

           range:  [-1.877894,1.8899125]      units:  1.000e-10
      unique values:  132                     missing .:  0/180

            mean:  -1.6e-10
        std. dev:  .774061

      percentiles:       10%       25%       50%       75%       90%
                   -1.02541  -.602882   .070834   .572956   .926702
```

---

environmental_identity_factor **Environmental Identity Factor**

```
            type:  numeric (float)

           range:  [-2.9124134,1.7501237]      units:  1.000e-09
      unique values:  60                       missing .:  0/180

            mean:  2.3e-10
        std. dev:  .934877

      percentiles:       10%       25%       50%       75%       90%
                   -1.32397  -.581145   .150829   .666881   1.13782
-
```