… for they know not what they do

An exploratory review of the barriers to pro-environmental behaviour and policy approaches to address them.

Gesa Langer

LUCSUS

Lund University Centre for
Sustainability Studies

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Abstract

Given the extent and urgency of many sustainability challenges it is crucial that individuals change their behaviour to steer society towards a more sustainable future. Yet, a variety of barriers exist that hinder sufficient individual pro-environmental behaviour. As it is not only important to understand these barriers but also how to facilitate more pro-environmental behaviour, my research aim is to find out why people do not behave more environmentally friendly, to develop an analytical framework of the barriers to pro-environmental behaviour, and to explore potential ways to overcome these barriers.

I reviewed academic literature on the barriers to pro-environmental behaviour using a subsumption technique and categorised them into four categories based on how they influence pro-environmental behaviour (problem awareness, motivation for and realisation of individual action, and sufficient action). Barriers discussed in the literature and their interrelations are presented. They range from psychological barriers such as worldviews and perceived inequality, to structural barriers such as lack of infrastructure and information overload. Even though the categories can be displayed as steps of awareness and motivation for individual environmentally friendly actions, pro-environmental behaviour does not require climbing these steps sequentially. Instead, policy can create shortcuts from each category directly to pro-environmental behaviour using adequate interventions (e.g. framing, convenience, infrastructure projects and cognitive dissonance). In general, policymakers as external actors appear powerful in removing barriers to individual pro-environmental behaviour, but in particular governments' power in implementing individual behaviour change is constrained by the ideological foundation of liberal states, such as liberty and autonomy. Finally, taking both the problem-solving and critical approach of sustainability science, I conclude that the contextual nature of barriers allows little contribution from academic research to problem-solving and transdisciplinary approaches are needed to overcome barriers in real world settings. Furthermore, individual behaviour is constrained by existing structures which need to changes in order to achieve a sustainable future.

My thesis contributes to sustainability science synthesising interdisciplinary knowledge of barriers to pro-environmental behaviour from fields such as psychology, economics, and sociology. This gives practitioners as well as academics a comprehensive understanding of the complex and dynamic field of barriers to pro-environmental behaviour and aims to generate inspiration for further research and interventions. In exploring how to overcome these barriers, my thesis contributes to one of sustainability science's core questions aimed at improving human-nature interactions towards a more sustainable future.

Keywords: pro-environmental behaviour; behaviour change; cognition; climate change; environmental policy; sustainability science

Word count (thesis): 13 914

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Abbreviations

BMUB German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

EC   European Commission

EU   European Union

GHG   Greenhouse gas

IPCC   Intergovernmental Panel on Climate Change

NGO   Non-governmental Organisation

Tfl   Transport for London

UK   United Kingdom

U.S.   United States of America

ZIEK   Zusammen ist es Klimaschutz (Together it is climate protection [own translation])

1 Introduction

In our everyday life people are encouraged to behave in an environmentally friendly way by reducing waste through recycling or carbon emissions by choosing a provider of renewable energy. However, even one of my fellow sustainability science students gave up on recycling because she thought it was too complicated. Assuming that sustainability students are concerned about the environment, the barriers to change behaviour might be even higher for people with weaker environmental attitudes. So why do knowledge and awareness still not result in pro-environmental behaviour?

Our life consists of a myriad of decisions, such as whether to take a long shower in the morning, what to have for breakfast or how to get to work. All of these decisions and choices shape one's behaviour. They also impact the natural environment in one way or the other, for example through the emission of pollutants or the consumption of (non-)renewable resources. However, barriers hinder the adaptation of more environmentally friendly lifestyles and moreover increased population and economic growth stresses the carrying capacity of the earth (Meadows, Meadows, Randers, & Behrens III, 1972; Meadows, Randers, & Meadows, 2005). Already for four of the nine "planetary boundaries" (Steffen et al., 2015, p. 6) "challenges […] have advanced to levels where human welfare is directly and immediately threatened" (Jerneck et al., 2011, p. 71). Given the urgency and scope of the problem (IPCC, 2014; Steffen et al., 2015) and the inadequacy of technological improvements to solve it (Higham, Cohen, Peeters, & Gössling, 2013), it is crucial that individuals change their behaviour (Koger, Leslie, & Hayes, 2011; McKenzie-Mohr, 2000b; Schultz, 2014) to steer society towards a more sustainable future (IPCC, 2014).

Yet, "[a]ssessing the role of human nature in environmental policy remains both understudied and urgent" (D. Johnson & Levin, 2009, p. 1594). Therefore, this paper's contribution is to create a comprehensive overview of the barriers to achieving more environmentally friendly behaviours discussed in the academic literature. By categorising these barriers according to their influence on pro-environmental behaviour and visualising their interrelations, practitioners in policy-making as well as academics gain an overview of the complex and dynamic field of environmental behaviour as a source of inspiration for further research or interventions. As Moseley and Stoker (2013, p. 9) pointed out "we are still a long way from knowing how best to translate our understanding of people's decision processes from the social sciences into viable policy interventions".

I start this thesis by explaining my motivation, research aim and its relevance for sustainability science. In chapter 2, I summarise previous researches and define concepts relevant for my research questions. The methodology for my analysis is described in chapter 3. My results are presented in

chapters 4 and 5 and discussed in chapters 6 and 7. Finally, I open up opportunities for further research in chapter 8 and conclude in chapter 9.

1.1 Motivation

"If so many people are concerned about climate change, the environment, and sustainability, why are more of us not doing what is necessary to ameliorate the problems?" (Gifford, 2011, p. 290)

More environmentally friendly behaviour should be a self-evident consequence given the dimension and urgency of environmental issues (IPCC, 2014; Steffen et al., 2015). However, this is not happening and information seems to be particularly inefficient at changing people's behaviour (Blake, 1999; Koger et al., 2011). Even though environmental concern has been increasing, individual action is not living up to its potential (Gifford, 2011). My research is therefore driven by the desire to determine what hinders people from behaving pro-environmentally despite all the information available concerning the severity and danger of environmental problems, in particular climate change.

The lack of a comprehensive overview of barriers to pro-environmental behaviour is problematic as "the development of an effective [policy] program needs to begin with identifying barriers" (McKenzie-Mohr, 2000a, p. 533). Policymakers and organisations (also individuals themselves) need to know what barriers they are dealing with to tailor adequate solutions. Thus, it is important to understand which barriers affect which groups in society (Gifford, 2013). The psychologist P. Wesley Schultz (2014, p. 107) voiced, when asked for advice for a carbon emission reduction campaign, it is "important [...] to match the tool to the audience and the behavior." However, policymakers and practitioners lack a comprehensive and multidisciplinary overview of barriers to pro-environmental behaviour, their influence, and how they can be overcome (Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009; Young & Middlemiss, 2012).

1.2 Research aim and questions

My research aim is to find out why people do not behave in a more environmentally friendly way, to develop an analytical framework of the barriers to pro-environmental behaviour, and to explore potential ways to overcome these barriers.

In their submitted manuscript, Parolo et al. (2015) found that research papers over the last decades are published more frequently and also forgotten more quickly. Consequently, it is doubtful

"whether a scientist is actually fully aware of all relevant results available in scientific archives" (Parolo et al., 2015, p. 2). As neither researchers nor practitioners have the resources to work through these archives, "reviews are critical in synthesising scientific knowledge" (Card, 2010, p. 725). Confirming these tendencies, a meta-search[1] for `pro-environmental behaviour´ yielded almost half a million peer reviewed results. The aim of my thesis is therefore to synthesise the existing knowledge and to provide a comprehensive and systematic overview of barriers to pro-environmental behaviour. According to Eisenhart (1998, p. 395), writing an interpretive review opens up "possibilities for new thinking that arise from different ways of viewing or using [existing knowledge] and its parts". In line with this interpretation, the goal of my qualitative review is to give a new "perspective on human views and actions" (Eisenhart, 1998, p. 397) with regards to pro-environmental behaviour. The target audience for this overview is therefore not only researchers of various disciplines but also practitioners aiming to remove barriers to pro-environmental behaviour.

To address this issue this thesis answers the following research questions:

1. What are the barriers to pro-environmental behaviour?
2. How do these barriers influence pro-environmental behaviour?
3. How can these findings support policymakers in making individual behaviour more environmentally friendly?

The first two questions were combined for my analysis and are answered in chapter 4 using the methodology described in chapter 3. Building on the results of the first two questions, the third one is answered in chapter 5.

1.3 Relevance for sustainability science

Sustainability consists of social, economic and environmental components which are all linked in the field of environmental behaviour. Social interactions and economic processes form behaviours that affect the environment which in turn reacts upon society. Thus, looking into what hinders pro-environmental behaviour contributes to answering the question of how human-nature relations can be improved and particularly how society can reach a more sustainable trajectory (Kates et al., 2001; Ziegler & Ott, 2011). By integrating findings from multiple disciplines, my thesis is aimed at increasing and improving communication among different academic fields. Taking into account not only the problem-solving nature of sustainability science but also discussing my analysis from a critical

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[1] The search was conducted on LUBsearch on March 17, 2015.

perspective (Jerneck et al., 2011) the role of barriers to pro-environmental behaviour for sustainability science is explored.

Sustainability science is not solely about the "interaction between nature and society" but also "society's capacities to guide those interactions along more sustainable trajectories" (Kates et al., 2001, p. 641). Hence, in addition to identifying barriers hindering a sustainable interaction, I also discuss individual capacities and external interventions to overcome these barriers. By looking into the role of policy in the removal of barriers to pro-environmental behaviour this thesis contributes to one of sustainability science's core questions which asks for incentive structures that foster a sustainable relationship between nature and society (Kates et al., 2001).

2 Definitions and previous research

2.1 Behaviour and pro-environmental behaviour

According to a study by Levitis, Lidicker Jr, and Freund (2009), behaviour is a widely used concept but is not clearly defined. Based on a literature review and a survey among members of "behaviour-focused scientific societies" (p. 104), the authors define behaviour as "the internally coordinated responses (actions or inactions) of whole living organisms (individuals or groups) to internal and/ or external stimuli, excluding responses more easily understood as development changes" (p. 108). This includes one-time actions and repetitive behaviours (McKenzie-Mohr, 2000b). Actions and inactions as well as the underlying decisions and subconscious processes are regarded as the components of behaviour in this thesis. In particular, the concept of pro-environmental behaviour is used, defined as "behavior that consciously seeks to minimize the negative impact of one's actions on the natural and built world" (Kollmuss & Agyeman, 2002, p. 240). In research, this concept is used synonymously with other terms, for example environmentally friendly behaviour (Osbaldiston & Schott, 2012). Even though the public-sphere behaviour (Stern, 2000) is an important aspect of pro-environmental behaviour, it had to be excluded from the analysis to remain within the scope of this thesis. Private-sphere behaviours (Stern, 2000) comprise mainly of consumption decisions (Dietz, Stern, & Weber, 2013) and the way we communicate them (e.g. discussing the advantages of public transport with others).

Barriers identified in this thesis are applicable to all types of pro-environmental behaviour. Despite being just one out of many serious environmental and sustainability issues, most examples I use are related to climate change mitigation as it is most readily available in the literature. Additionally, climate change is highly interconnected with other environmental problems (e.g. recycling or organic agriculture; BMUB, 2014) and impacts of human behaviour can rarely be attributed to a single environment (Huutoniemi & Willano, 2014).

2.2 Barriers to pro-environmental behaviour

My definition of barriers follows McKenzie-Mohr and Schultz (2014, p. 37) who define them as "anything that reduces the probability of a person engaging in the target behavior". This broad term means that barriers can be low motivation, the absence of required structural and cognitive resources, or low perceived benefits of adapting the new behaviour. The idea that barriers hinder the adaption of a more environmentally friendly lifestyle has been brought forward by many researchers,

and cognitive or psychological barriers (Gifford, 2011; Kahneman, 2011; Tversky & Kahneman, 1974) have particularly received a lot of attention in recent years.

Attempts to provide comprehensive overviews of these barriers have been made by several authors in the past but do not account for the complexity and range of barriers that deter individuals from environmental action. For example, Gifford (2011) provided an extensive overview of cognitive and psychological biases. Although he mentioned probable causes for some barriers and potential interrelations, these comments remained vague. Similarly, the literature review by Newell, McDonald, Brewer, and Hayes (2014) focused solely on psychological barriers. Even though D. Johnson and Levin (2009) extended their analysis to organisational and political biases, it still stayed within the psychological realm which does not account for the lack of appropriate infrastructure, such as public transport, and the availability of products. Yet, these are relevant obstacles to overcome in order to adapt to an environmentally friendly lifestyle. Finally, all these authors used lists to represent barriers, which do not capture relations between the discussed barriers or to the individual.

Kollmuss and Agyeman (2002) as well as Lorenzoni, Nicholson-Cole, and Whitmarsh (2007) put the individual in the centre of their categorisation. In both papers barriers were classified to include regulatory and structural barriers, such as availability of appropriate infrastructure. Lorenzoni et al. (2007) distinguished two categories, which they coined *individual* and *social* barriers. Their study, being a meta-analysis of three studies undertaken in the United Kingdom, is limited to the barriers mentioned in those three studies and lacks the representation of interrelations.

Taking a slightly different approach, Kollmuss and Agyeman (2002) looked into factors that favour environmental action, differentiating *external* and *internal* factors. The graphical representation of their model of pro-environmental behaviour also includes potential barriers. Gifford and Nilsson (2014) took a similar stand by defining 18 factors that favour pro-environmental action and Stern (2000) provided four variables that shape pro-environmental behaviour. Factors that influence environmental behaviour are usually connected to the barriers identified in the literature. For example, proximity to problem sites favours direct sensory feedback of harmful actions and factors such as social class or years of education may increase cognitive capacity to access, search and process relevant information. However, the barriers are not central to any of these analyses and therefore are generally not clearly defined nor comprehensive.

More recently, Lorenzoni and Hulme (2009) as well as Leiserowitz, Maibach, Roser-Renouf, Feinberg, and Howe (2012) used segmentation to design profiles according to perceptions of climate change. In

2009, Lorenzoni and Hulme categorised participants of their focus groups based on previous survey data. Along two scales (importance of climate change and belief in human activities as a cause of climate change), four typologies were defined: engaging, doubting, uninterested, and denying. In contrast to the latter two groups, the *doubting* and the *engaged* regard climate change as important. The *engaged* further believed that human activities have an influence on the climate (as did the uninterested but they neglect the importance). Both papers provided a basis for the method applied in this thesis. However, they are less concerned with specific barriers to pro-environmental behaviour on the individual level but instead explain general attitudes towards climate change, robustness of beliefs and policy acceptance by the different population segments.

A first attempt to incorporate the influence of barriers to pro-environmental behaviour on the individual was undertaken by Blake (1999). He positioned individuality, responsibility and practicality between environmental concern and environmental action and stressed the need for policymakers to respond to these barriers in "differentiated ways" (Blake, 1999, p. 268). He stated that there is usually one limiting factor, e.g. even if someone has a pro-environmental attitude and feels responsible, practical barriers may hinder the transition from concern to action (Blake, 1999). On the other side, good practical conditions are of no help when the feeling of personal responsibility is absent. Even though Blake (1999) provided an interesting categorisation approach, his framework lacks details about the specific barriers and their interrelationships. Finally, despite acknowledging that different barriers apply for different people, his framework does not explicitly address this issue but nevertheless serves as a basis for this thesis.

2.3 Policymaking for pro-environmental behaviour

The deficits of the rational actor model and the causal relationship from knowledge to action have been known at least since Herbert Simon introduced the idea of *bounded rationality* in 1957. He used the analogy of a pair of scissors to describe that human behaviour is determined by the "the structure of the task environments and the computational capabilities of the actor" (Simon, 1990, p. 7). When making decisions humans do not optimise among all available choices and attributes; instead many factors influence human decision-making. Among the behaviour models that incorporate these insights, the *theory of planned behaviour* and the *value-belief-norm model* are most commonly used[2].

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[2] For an overview see Gifford (2011) and Kollmuss and Agyeman (2002).

The need for behaviour and barrier specific policies has been recognised by academics and practitioners in recent years (Schultz, 2014). Even though the individual motivation of people has become increasingly more important in policy making, few studies exist so far that explicitly match specific barriers with policy tools or achieve unambiguous results. For example, Pidgeon's policy recommendations are based on information provision which, as he argues himself, "will prove insufficient to change behaviour in the absence of other enabling measures" (Pidgeon, 2012, p. 97).

In their meta-analysis of experimental studies Osbaldiston and Schott (2012) looked at ten interventions to foster pro-environmental behaviour and their effectiveness. Although their data was not suited to provide quantitative estimates their study provided a first attempt to show varying effectiveness of interventions for different types of behaviour. They found that more complicated behaviour requires more engaging interventions. More recently, McKenzie-Mohr and Schultz (2014) as well as Schultz (2014) endorsed these findings. Using a community-based social marketing approach they provided a framework of effective behaviour change tools depending on the perceived intensity of barriers and benefits of the target behaviour. My thesis builds on their findings, enabling policymakers to better identify relevant barriers and how to approach them.

3   Methodology and Methods

3.1 Methodology

Following an exploratory research approach the objective of this thesis is to give insights into the barriers hindering pro-environmental behaviour on an individual level. By exploring interrelations and showing directions for further research, a better understanding of the variety of barriers is provided.

3.1.1   Ontology and epistemology

In my thesis I take a critical realist approach viewing "reality as […] distinct from our conception of it" (Alvesson & Sköldberg, 2009, p. 41). What is observable is only a reflection of underlying patterns which "operate prior to and independently of their discovery" (Bhaskar, 1998, p. xii). Despite its existence, it is difficult to get a grasp of reality as our social processes disturb our understanding of it (Alvesson & Sköldberg, 2009). Researchers need to develop theories to understand underlying mechanisms instead of limiting their search for causality to the observable part of reality. Thereby causality is complex, contextual and emergent (Alvesson & Sköldberg, 2009) corresponding with the contextual nature of behavioural barriers.

Taking a critical realist approach to knowledge, my analysis of barriers to pro-environmental behaviour is neither limited to observable data nor pure social constructs. For critical realists "[s]omething is real if it has a causal effect, that is, if it affects behaviour and makes a difference" (Alvesson & Sköldberg, 2009, p. 41). Consequently, this also includes theoretical concepts, i.e. social norms. As barriers to pro-environmental behaviour are diverse, using this inclusive idea of what is *real* is particularly suited to explore them.

3.1.2   Complexity and reflexivity

In the context of interactions with the environment, complexity science regards humans and nature as one interlinked socio-ecological system. The dominant idea of the Enlightenment, based on a duality of man and nature and natural exploitation, is replaced by a worldview of "mutual accommodation of man and nature" (Waldrop, 1992, p. 333). Thus, the idea of optimising or managing the environment becomes impossible since everything that is *done to* the environment will at some point have an effect on the *doer* himself, erasing barriers between the social and natural system (Waldrop, 1992). The same applies for all human actions as they are shaped by structural circumstances which in turn are influenced by human actions (Giddens, 1984). Therefore, the

researcher cannot be objective and unconnected but must place oneself into the research subject (Alvesson & Sköldberg, 2009). This implies that a pure analytical approach to complex problems is not possible (Huutoniemi, 2014).

According to Alvesson and Sköldberg (2009, p. 9), "it is difficult, if not by definition impossible, for the researchers to clarify the taken-for-granted assumptions and blind spots in their own social culture, research community and language". Consequently, this research is a reflection of my personal background and pre-understanding. This includes insights gained throughout the course of my Master programme as well as information obtained through my social interactions. Being a sustainability scientist, I automatically follow a normative concept (Ziegler & Ott, 2011) in pursuing the shift to a more sustainable pathway for society.

3.2 Method

The research in this thesis was carried out in two steps. First, behavioural barriers were identified and organised to answer the first two research questions. Based on this analytical framework, policy interventions to remove barriers were identified in order to answer the third research question. The following sections describe this process in more detail.

3.2.1 Data collection and analysis

The initial literature review was started with a search in Google scholar and a meta-search on LUBsearch[3] using the search terms `barriers´, `pro-environmental behaviour´, `environment´ AND `behaviour´, and `individual´. The meta-search was restricted to peer-reviewed articles to ensure academic quality. For each search, the first three pages of results were considered and all abstracts read. Papers dealing with barriers to pro-environmental behaviour as well as policies to remove them were considered.

As I was interested in just the occurrence of a barrier and not the extent to which it has been researched, I used a subsumption technique (for definition see Schreier, 2012). During the review process every new concept was added to a list subsuming all barriers and their characteristics. Inspired by grounded theory, thematic analysis and ethnographic content analysis I searched for themes and subthemes to structure my data and establish a first set of categories (Bryman, 2012) which emerged from the data (Miles & Huberman, 1994). As predetermined categories are likely to

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[3] For a complete list of databases please see http://lgdata.s3-website-us-east-1.amazonaws.com/docs/647/1284504/EDS_Data_Partners_nov_2014.pdf.

change throughout the review process (Bangert-Drowns, 2005), I revised constantly. To aim for completeness I extended the search to articles that were quoted in or cited the initial articles (Bryman, 2012). The search process (see also Figure 1) stopped when theoretical saturation in data collection (Bryman, 2012) for barriers to pro-environmental behaviour was reached. Additional information about the identified concepts was obtained by consulting policy documents and specialist literature from the respective fields.
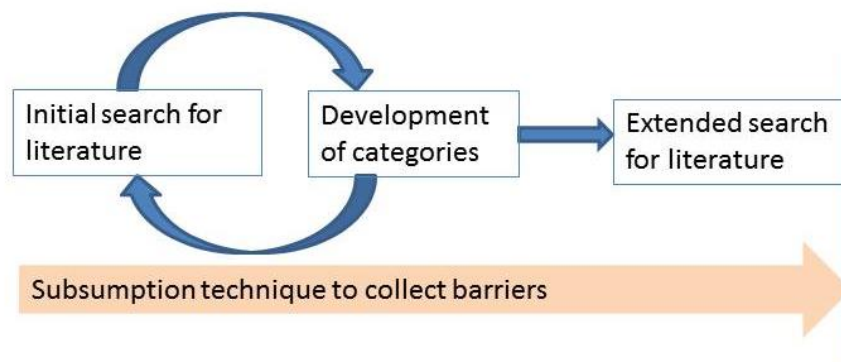
Figure 1. Process of data collection. The initial search for literature shaped the categories which were constantly revisited. An extended literature review took place until theoretical saturation was reached. Own illustration with methodology adapted from Bryman (2012) and Schreier (2012).

Given the limited timeframe for my analysis and the fact that most of the research papers analysing specific barriers to pro-environmental behaviour also discussed potential policy solutions, no additional systematic literature review was conducted for policymaking. All policymaking recommendations and interventions were collected using the subsumption technique and sorted according to the categories formed in the first step of my research. The scope for this paper only allowed for a brief theoretical analysis of how the barriers to pro-environmental behaviour can inform policymaking. Therefore, my focus was less on specific measures than on more general approaches to remove barriers to pro-environmental behaviour.

I chose to concentrate my research mainly on scientific articles for three reasons: First, scientific articles are more readily available. Second, I had to make sure to match the workload with the time assigned to this thesis. Third, the review of selected governmental and organisational reports that were the result of a Google search for `barriers´, `pro-environmental behaviour´ and `policy´ paired with `government´, `corporate´, `organisation´ and the name of some commonly known organisations did not result in any new barriers or policy interventions and thus confirmed my approach. In some cases these texts serve as examples or supporting evidence but are not central to my thesis.

3.2.2 Categorisation

I developed the categorisation following Lorenzoni et al. (2007, p. 449) in assuming that "different barriers are experienced by different groups of people". In other words, barriers act differently but ultimately all lead to insufficient pro-environmental actions. As the categories are also a result of my second research question, the explanation of my categories as well as the process leading to them is located in chapter 4.

3.2.3 Mind Map

After first gaining an overview of barriers in the literature, a more specific review of the single barriers was made to identify possible interrelations. The graphical representations of the results of the literature review provide an opportunity to detect connections and patterns hidden in a pure textual form (Wheeldon & Åhlberg, 2012). This clustering approach facilitates the understanding of the concepts at hand (Miles & Huberman, 1994), which "are often part of a network and can be combined with other concepts […] to show interrelationships and connections" (Wheeldon & Åhlberg, 2012, p. 26). To display the clusters under the different categories I created a mind map. As opposed to a concept map, the mind map allows for more flexibility because concepts are organised around a central key idea (Wheeldon & Åhlberg, 2012). This form of representation further allowed for an easy integration of new concepts and ideas with prior findings.

Despite using the symbol of steps for my categories (see Figure 3), sequence analysis did not prove to be adequate for my analysis as it is more suited to finding patterns of pro-environmental behaviour than to generally exploring barriers to pro-environmental behaviour. Also, neither the duration for the sequences nor whether they are passed (Blanchard, 2011) is relevant to my research.

4 Categorisation of barriers to pro-environmental behaviour

This chapter presents the results of my analysis. I start by introducing the categories which are my analytical basis and also results in the sense that barriers are sorted according to how they influence pro-environmental behaviour. Subsequently the barriers to pro-environmental behaviour are presented in sections 4.1 to 4.4 and summarised in section 4.5.

In their meta-analysis Bamberg and Möser (2007) found that problem awareness has the strongest effect on intention and actual behaviour. People who do not believe in climate change will not see the need for individual action at all and thus fall into the first category displayed on the top right in Figure 2. Additionally, belief in the efficacy of personal action is an important determinant in forming behavioural intent (Ajzen, 2002) and thus shapes the second category in the bottom right of Figure 2. This is in line with the categorisation used by Lorenzoni and Hulme (2009) and Stern (2000). Additionally, I established two categories distinguishing between two different types of engaged groups. This was necessary as barriers were identified that applied even if the required resources were available. Thus, the lack of resources seemed insufficient to explain the lack of appropriate individual action.
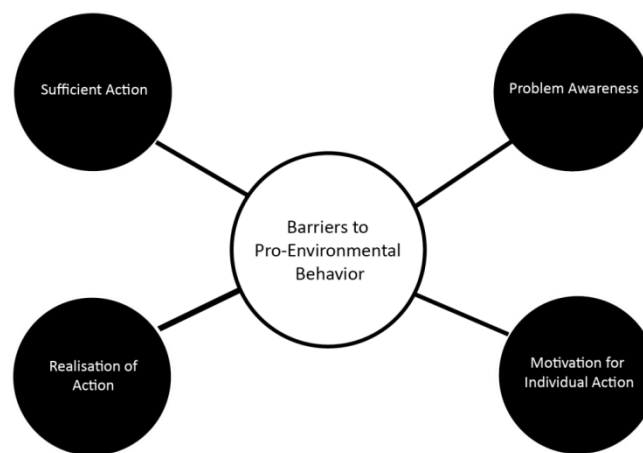
Figure 2. The four categories. These categories provided the basis for my analysis. Own illustration.

With hindsight one could also argue that the group in the top left in Figure 2 faces more cognitive barriers while those in the bottom left are blocked by structural or contextual barriers. Also, the category on the top right could have been divided to account for the differences in not recognising climate change as a general problem or not perceiving it as a personal threat. Those perceiving climate change as a threat to others might be motivated to act due to altruism and justice (Howell, 2013). However, this categorisation did not become apparent until after the first round of analysis.

Four main categories were identified to organise the different barriers. First, people might not act because (A) they are not aware of the problem or (B) do not see individual action as a possible solution. If people are aware of the need for individual action (C) lack of cognitive or structural resources to act accordingly might hinder pro-environmental actions. Finally, if people recognise the problem and the need for individual actions and possess the necessary resources there is still (D) insufficient action due to uncertainty about the right course of action or only limited action (Gifford, 2013) as people perceive their actions as being enough. Inspired by the causal order used in Stern's (2000) value-belief-norm theory I came to the conclusion that these categories can also be regarded as a series of steps one climbs (Figure 3). Recognition of the problem and the need for individual action as well as the availability of the required resources are prerequisites to the fourth category.
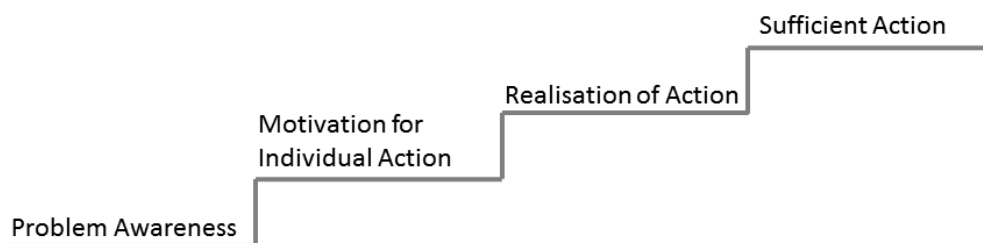
Figure 3. Steps to pro-environmental behaviour. The categories for barriers to pro-environmental behaviour could also be interpreted as a series of steps one climbs to reach pro-environmental behaviour. Own illustration.

Figure 4 displays the various barriers identified in the literature according to the four categories specified above. I do not claim this list to be complete nor unambiguously categorised as some barriers are highly interrelated and span different categories. The boundaries of this analysis are also quite narrow as it does not include the underlying motives of barriers, such as worldviews (which could be education or social norms) or lack of time or money (which can be due to prioritisation, social norm or conflicting goals, values and aspirations). Borrowing the words of Kollmuss and Agyeman (2002, p. 239), this representation is supposed to "help illuminate this complex field" of barriers to pro-environmental behaviour by creating a comprehensive overview.

In the following chapters I present my results sorted and displayed according to the previously described methods. I provide more detailed results for each of the four categories starting at the top right category in Figure 4 and continuing clockwise.
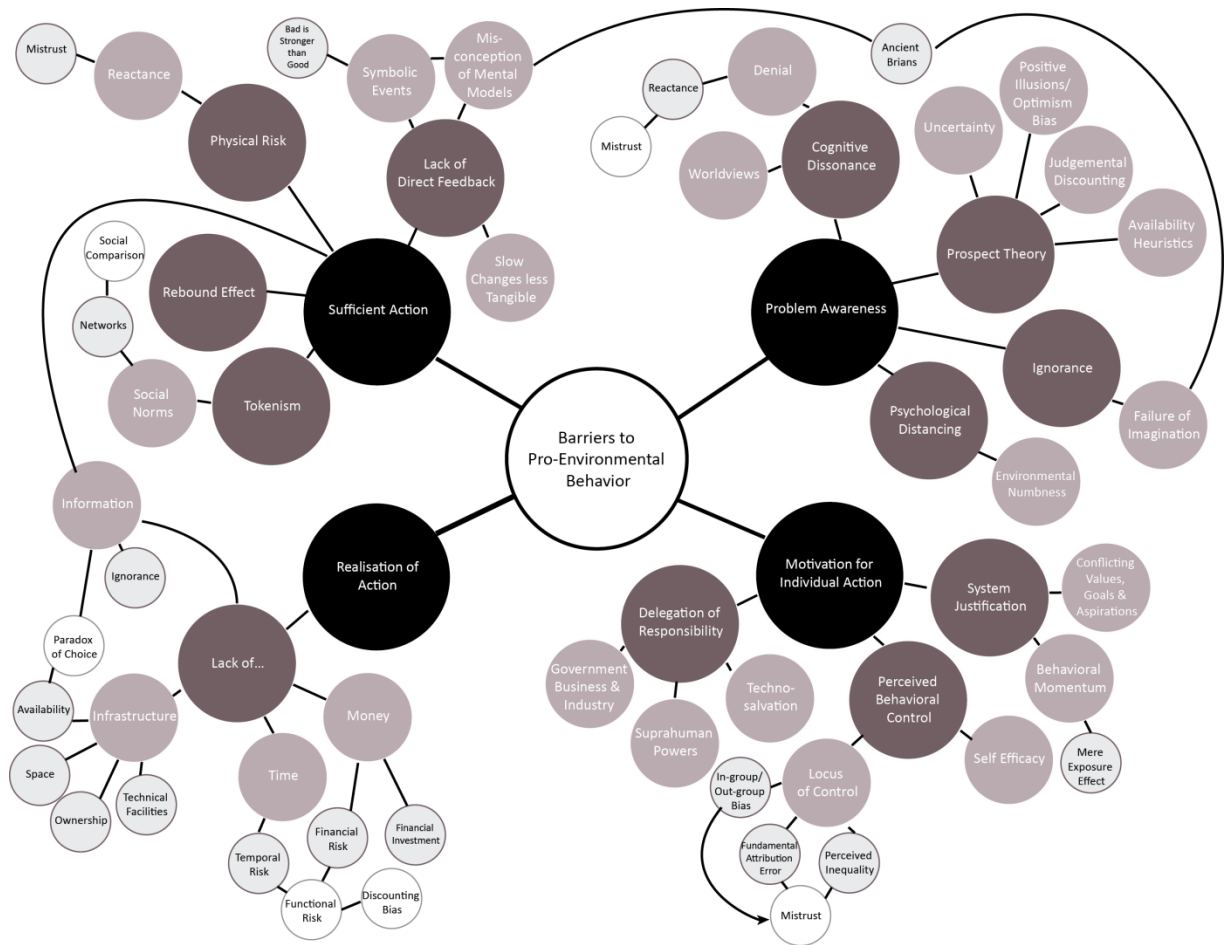
Figure 4. Schematic representation of barriers to pro-environmental behaviour. Categories are displayed in large black circles. Grey circles represent the different barriers. Barriers in smaller/lighter circles influence barriers in larger/darker circles. Own illustration.

4.1 Problem Awareness

The first category of barriers comprises those that block problem awareness. Even though there is broad consensus among the scientific community about anthropogenic climate change (Cook et al., 2013) evidence shows that not everyone regards it as a problem. According to a 2013 survey, 9% of European citizens do not consider climate change a very serious problem at this moment (EC, 2014a) and 20% do not feel like environmental problems have an impact on their daily lives (EC, 2014b). Barriers blocking the problem awareness are displayed in Figure 5. Each paragraph deals with one theme (dark grey circles in Figure 4) which is presented following Figure 5 counter clockwise starting from cognitive dissonance.
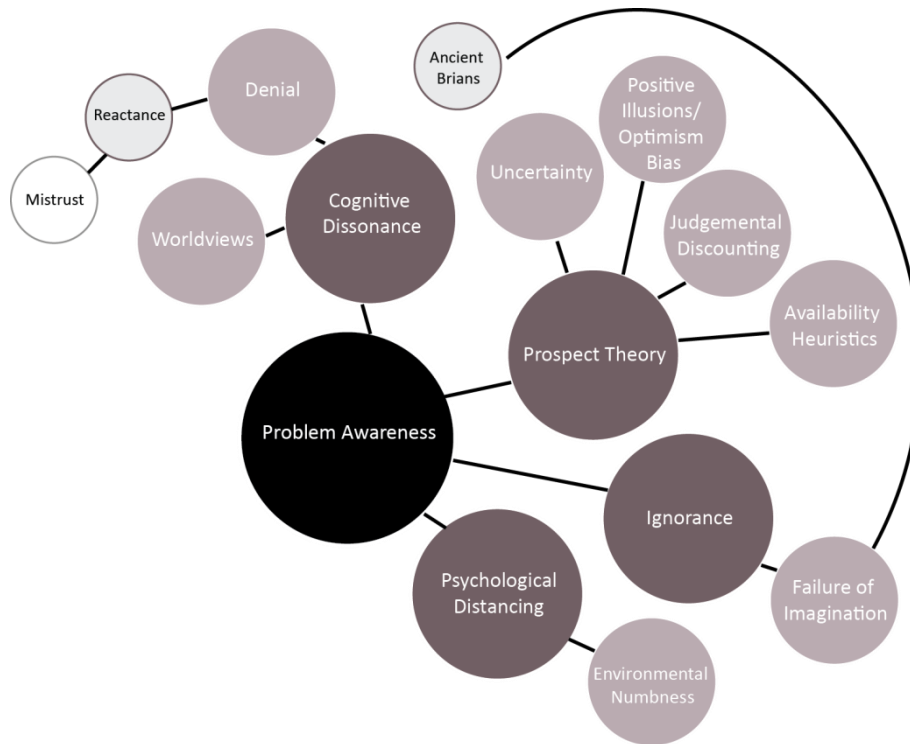
Figure 5. Barriers to problem awareness. Top right of Figure 4.

Cognitive dissonance. I identified *cognitive dissonance* as one of the main barriers to the acceptance of environmental problems. This means that instead of reviewing personal beliefs based on new evidence people tend to make these fit into pre-existing beliefs (D. Johnson & Levin, 2009; Moseley & Stoker, 2013) and explicitly search for information consistent with their beliefs (Fiske & Taylor, 2013). For example, the finiteness of many natural resources and the limited carrying capacity of the earth contradict the assumption of continuous growth underlying the current economic system (Jackson, 2009) and thus the message of finite resources will lead to cognitive dissonance for those entangled in this system (see also Feinberg and Willer (2011) for how belief in a just world undermines problem awareness of climate change). Thus, w*orldviews* (Gifford, 2011; Newell et al., 2014) play a crucial role in whether or not people accept the threat of climate change. If worldviews and messages do not correspond, people *mistrust* the source of environmental messages and, in extreme cases, *deny* the message in order to fit these into their pre-existing beliefs (Gifford, 2011). At the beginning of this year this became again apparent when Republican senators in the U.S. rejected measures that acknowledged the human influence on climate change (Goldenberg, 2015). In that context I also identified *uncertainty* as another barrier. In particular, competing messages in the media (Lorenzoni et al., 2007) create the false appearance that there is no consensus on climate change (Cook et al., 2013) and that the question of whether or not climate change happens is open for debate.

Rational distancing. While on the one hand media coverage is declared important to raise awareness about climate change and constantly challenge pre-existing beliefs, I also found it to have adverse effects. When being repeatedly exposed to the same message people tend to become fatigued by the issue and stop responding to it (Gifford, 2011; Pidgeon, 2012). In an extreme case this *environmental numbness* can result in a decoupling of emotions from the given problem, so called *psychological distancing* (Kollmuss & Agyeman, 2002; Leviston, Price, & Bishop, 2014).

Ignorance. During my analysis I had to distinguish between the denial of climate change as a general problem and the assumption that climate change will not affect one individually. People who generally trust in the scientific evidence were found to think that their personal lives will not be affected by climate change. The likely consequences of exceeding the planetary boundaries are highly complex and often unprecedented to the extent that the *ancient human brain fails to imagine* its effects (Gifford, 2011; D. Johnson & Levin, 2009). Thus, people often do not fully understand the causes and consequences of climate change and are not aware of the adverse effects on their personal lives imposed by climate change (Gifford, 2011; Lorenzoni et al., 2007).

Prospect theory. The last theme comprises barriers leading to a discounting of personal risk from climate change. In this context I found *prospect theory* to be the central concept which, according to Kahneman (2011) means that people are more risk prone with regards to potential losses than potential gains. In the context of climate change this means that instead of taking mitigation action people underestimate uncertainties and consequences and think they will be okay in the future. These misconceptions are influenced by other barriers, such as *judgemental discounting*, i.e. the belief that conditions are worse in distant places and in the future (Gifford et al., 2009; Newell et al., 2014). Also o*ptimism bias* or *positive illusions* which describes individuals' tendency to overestimate their own capabilities and control when dealing with negative events were found to reduce the perceived consequences from inaction. *Availability heuristics* complement this effect as people estimate probabilities based on how easily occurrences come to their mind (Kahneman, 2011). Since few circumstances can clearly be attributed to climate change the risk is underestimated by individuals. Also the inherent *uncertainty* in scientific climate predictions can be misinterpreted by people and politicians. Budescu, Por, Broomell, and Smithson (2014) found that people in 24 countries people misjudge the probabilities researchers intended to communicate. The phrase "very likely", intended to indicate a probability of at least 90% by IPCC, is interpreted as 72% on average while "very unlikely" (<10%) is perceived as an average probability around 43% (Budescu et al., 2014, p. 2). All of these barriers were found to amplify prospect theory preferences and thus a low perceived risk of being affected by climate change in the future.

4.2 Motivation for Individual Action

The Eurobarometer showed that 60% of those who regard climate change as a very serious problem at present have not taken action to fight it (EC, 2014a). Thus, recognising the problem is only the first step to behaviour change. Additionally, the need for individual action has to be acknowledged. Forming the intention to behave in a pro-environmental manner is the "immediate antecedent" to the actual behaviour (Ajzen, 2002, p. 665). This section presents barriers that hinder the motivation for individual action moving clockwise around Figure 6.
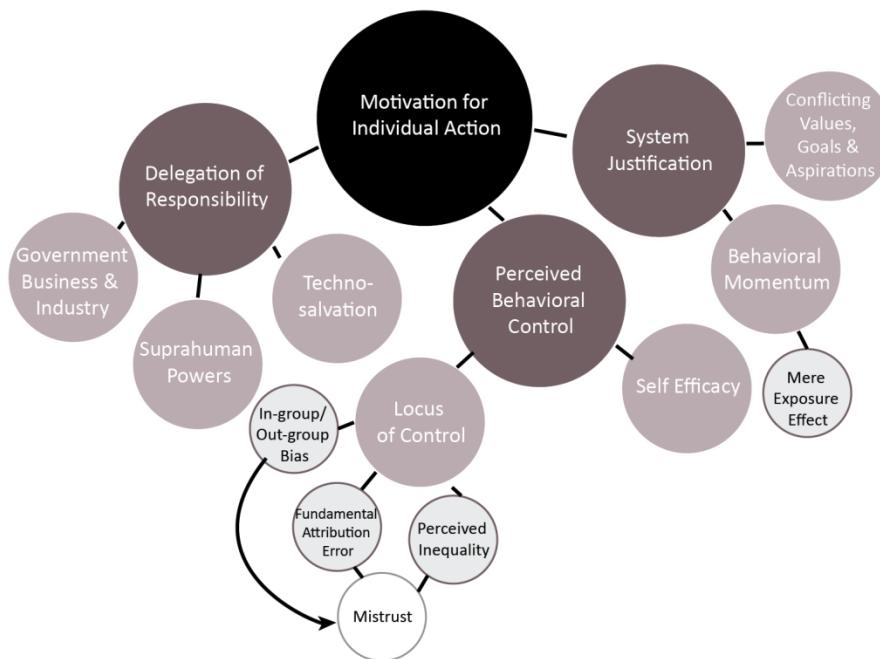
Figure 6. Barriers to motivation for individual action. Bottom right of Figure 4.

Delegation of responsibility. As a common coping mechanism to avoid individual action I identified the delegation of responsibility (see also Kollmuss & Agyeman, 2002). First, technological advancement is often regarded as a solution to climate change mitigation. In the EU people believe that technology will have a positive impact on the fight against climate change than "people's action and behaviour" (EC, 2014c, p. 24). Instead of changing their behaviour and lifestyle people *trust in technological innovations* ranging from increased fuel and carbon efficiency to geo-engineering (Lorenzoni et al., 2007). Positive emphasis of scientific progress reduces the likelihood of environmentally friendly behaviour (Meijers & Rutjens, 2014). Second, most people see the responsibility for tackling climate change with *national government* as well as *business and industry* rather than with themselves (EC, 2014a). Only 25% of Europeans think that they are personally responsible and 48% assign responsibility to the government (EC, 2014a). This is problematic as

Fielding and Head (2011) found young Australians to be less likely to pursue environmental friendly behaviour if they assign responsibility to the government instead of the community. Finally, particularly in developing countries, the faith in *suprahuman powers* (e.g. God or Mother Nature) appears to hinder pro-environmental behaviour change as people feel only God is capable of changing the climate (Wolf & Moser, 2011). For example, Mortreux and Barnett (2009) found that people in the Polynesian island nation Tuvalu to not to be concerned about climate change because God will prevent any harm from them. All of these barriers block individual action by shifting responsibility and power to other actors.

Perceived behavioural control. The second theme for this category is centred around the *perceived behaviour control* which consists of *self-efficacy* and *locus of control* (Ajzen, 2002; Gifford, 2011). The first refers to the perception one has over their capabilities to successfully perform a certain type of behaviour (Ajzen, 2002). People are discouraged by a task if they perceive their capacities to be insufficient to perform it, such as living without plastic or applying for financial support to install a PV module on their roof. Locus of control refers to the amount of control one has over the outcome of certain behaviours (Ajzen, 2002). In other words if someone thinks recycling at home will not make a difference because all waste is treated jointly at the municipal level one will feel low control over the outcome of individual recycling behaviour and refrain from pursuing it. Individuals with such an external locus of control were found to perceive their actions as insignificant as the outcome is not subject to their influence and thus tend to shift responsibility to other actors or the collective (Fielding & Head, 2011). Both act as strong barriers to pro-environmental behaviour.

During my research several other barriers were identified influencing the locus of control. In particular when the successful outcome of behaviour depends on the actions of others, individual actions suffer from the same problems as Hardin's (1968) common resource problem or social dilemma in general (Newell et al., 2014). Being a non-exclusive good, benefits of mitigation efforts cannot be limited to those who bear its costs and thus free-rider problems may occur (Lorenzoni et al., 2007). If people perceive their peers' actions to be insufficient they tend to be less motivated to act themselves (Göckeritz et al., 2010). The *fundamental attribution error*, where people attribute others' action to be intentional while their own behaviour is influenced by situational constraints (D. Johnson & Levin, 2009), contributes to this *perceived inequality*. This attribution error also applies to social groups when the own group (in-group) is evaluated more favourable than out-groups (D. Johnson & Levin, 2009). All of these barriers are favoured by *mistrust* between different individuals as well as among different groups and organisations and hinder the recognition of the need to perform pro-environmental behaviour at the individual level.

System justification. Pro-environmental behaviour often *conflicts with other goals, values and aspirations* (Gifford, 2011). On a personal level, long-distance travel, large houses or skiing holidays conflict with pro-environmental goals. Moreover, on a global level different issues appear more pressing than climate change, such as poverty, hunger and the lack of drinking water, and the economic situation (EC, 2014a). In general, people are willing to change as long as it does not compromise their current lifestyle (Lorenzoni et al., 2007). For example, Europeans strongly feel that environmentalism can enhance economic growth (EC, 2014b). The *mere exposure effect* contributes to the system justification as people tend to feel more comfortable with what they are used to (D. Johnson & Levin, 2009). In fact, habit is found to be one of the biggest barriers to behaviour change (Kollmuss & Agyeman, 2002; Walker, Thomas, & Verplanken, 2014). Gifford (2011) used the term *behavioural momentum* to describe the resistance of routine behaviours to permanent change. People might not even realise that they are pursuing unsustainable practices because they do not recognise their regular behaviours (Neal, Wood, Wu, & Kurlander, 2011). Thus, behavioural momentum can also be a barrier for those who theoretically acknowledge the need for individual action but lack the cognitive strength to practically implement these (see 4.3). Walker et al. (2014) found that even employees from a major environmental NGO have difficulties to change their mode of transportation to a more sustainable alternative. Hence, behaviour change is likely to be even more difficult for a citizen with average values and preferences with regards to the environment.

4.3 Realisation of Action

95% of Europeans state that it is important to them personally to protect the environment and 85% "believe they can play a role in protecting the environment" (EC, 2014b, p. 20). Thus, a majority of Europeans are aware of the problem and recognise the need for individual action. However, in the third category I identified practical barriers (Blake, 1999) which apply to those who have formed the intention for individual action but are then restrained by the lack of the appropriate resources. This time the themes are presented starting with lack of infrastructure (including lack of information) and then moving to the right in Figure 7.
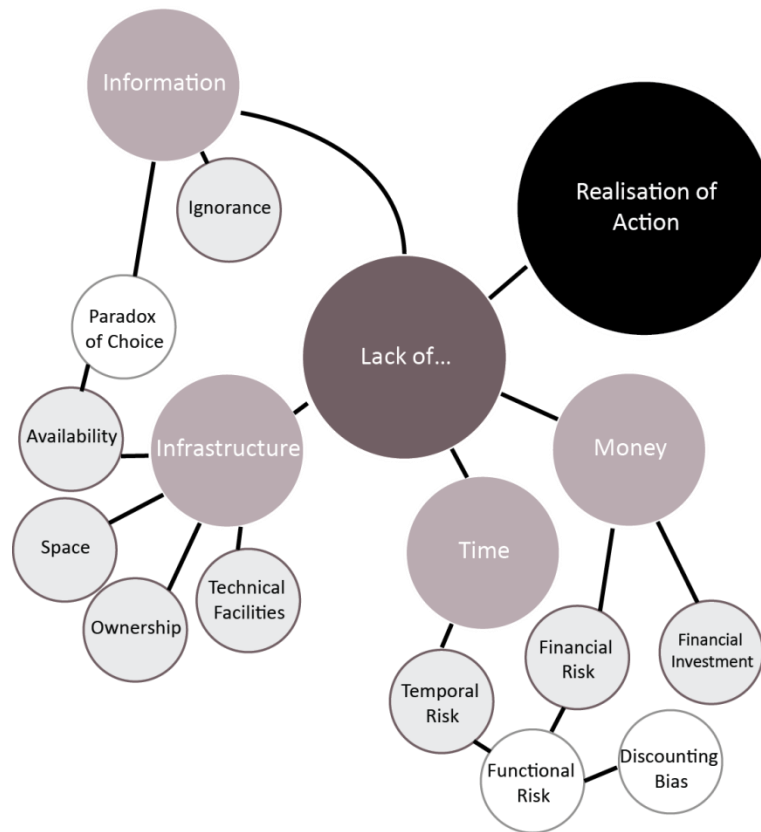
Figure 7. Barriers to the realisation of pro-environmental behaviour. Bottom left of Figure 4.

Lack of infrastructure. Pro-environmental behaviour often requires infrastructure. The pure motivation to use public transport is insufficient if these modes of transportation are not available (Lorenzoni et al., 2007). Similarly, recycling at home does not fulfil its purpose if recycling facilities at the community level do not exist and purchasing an electric car is redundant if there are no charging sites available. Blake (1999) further identified *lack of space* as a practical barrier to behaviour change. For example, recycling facilities or alternative heating systems (e.g. block heat and power plant) need room. Additionally, the issue of legal *ownership* (Gardner & Stern, 2008) is important for pro-environmental behaviour. The intention to purchase a solar rooftop panel is hampered if there is uncertainty about how long one can actually get benefits from the investment or – in an extreme case – averted if owners do not allow such installations in case the property does not belong to the occupant.

I found that the lack of infrastructure as a barrier to pro-environmental includes *availability* of environmentally friendly options. However, a broad supply of options and *information* can lead to cognitive overload and the *paradox of choice* as coined by Schwartz (2006). Indeed, Iyengar and Lepper (2000) found that people are less likely to make a purchase if the choice set is too big. Kinjo and Ebina (2014) confirmed this study concluding that a broad set of choice involves high choice

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costs for consumers which exceed the potential benefit of the purchase. People concerned with moral values of their purchases, e.g. the consideration of environmental impacts, expand their choice criteria leading to more complex decision processes (Harrison, Newholm, & Shaw, 2005; J. E. V. Johnson & Bruce, 1998). This is problematic for pro-environmental behaviour as people use heuristics when decisions become too complex (see also 4.4) and often these heuristics lead to the purchase of the cheapest or habitual product (Gigerenzer, 2008) instead of the most environmentally friendly (Hoek, Roling, & Holdsworth, 2013). Hence, not only the **lack of tailored information** but also too much information are barriers to pro-environmental behaviour.

The right amount of choice and information has been discussed in the literature for years and is a potential barrier that challenges the cognitive capacities of individuals thereby also requiring time for information research and processing. According to Peters, Klein, Kaufman, Meilleur, and Dixon (2013) choice overload leads to reluctance to choose and decreases satisfaction after the choice was made. A broad set of choice leads to the expectation of a perfect option and the fear of not having found the best one leads to dissatisfaction with the actual purchase. This potential regret lowers the benefits of the actual choice (Schwartz, 2006). The same applies when consumers pursue multiple goals simultaneously (Bettman, Luce, & Payne, 1998), e.g. locally produced, organic AND unwrapped. Non-availability of the ideal combination leads to frustration and regret (Schwartz, 2006). Choice and information block pro-environmental behaviour if they do not balance satisfaction and commitment on the one hand (Keller, Harlam, Loewenstein, & Volpp, 2011) and regret and responsibility on the other (Loewenstein, 1999; Schwartz, 2006).

Lack of time. Changing one's behaviour requires the investment of time to develop strategies as well as to access and process relevant information. Thus, *lack of time* was found to be an important barrier blocking pro-environmental behaviour. Additionally *temporal risk* was identified as an important barrier to changing behaviour even if people acknowledge the need for action. Gifford (2011) used the term to describe the potential regret when the desired result does not appear after an initial time investment. The temporal risk bias is strongly related to *habit* (see 4.2) as we tend to stay with what we know (mode of transport, cooking habits) in order to avoid spending time to plan a new course of action with uncertain personal benefits.

Lack of money. Even though 75% of Europeans state that they are willing to pay more for environmentally friendly products (EC, 2014b), a green lifestyle is still associated with costs not everybody might be able or willing to bear (Hergesell & Dickinger, 2013; Kaufman, 2014). Additionally, *financial risk* is inherent in behaviour that includes investment such as the purchases of more energy-efficient equipment. This and other behaviour change (e.g. public transport) are further

hindered by *sunk costs of financial investments* (Gifford, 2011). In economic theory, decisions should be independent of past investment which cannot be regained and be solely based on future costs and benefits. However, people feel like they are wasting money if they do not use the purchased car or if they abandon a still working fridge even though its energy efficiency is poor.

A barrier influencing the perceived lack of time and money is uncertainty about the potential outcomes. The term *functional risk* describes the possibility that green technologies will not satisfy standards and expectations (Gifford, 2011). The required time and money for the purchase, installation and adequate usage of a product can be perceived to be too high compared to the perceived functionality. For example, Lim, Mak, and Rong (2015) found that people refrain from purchasing electric vehicles because they fear their range will be insufficient for their needs. Thus, they may be more reluctant to invest the required amount of money into this new technology in particular when money is scarce. These investment decisions are further subject to the *discounting bias* which describes the tendency of people to value immediate rewards higher than future benefits (D. Johnson & Levin, 2009). This increases the reluctance to commit to long-term investments such as solar panels or insulation.

4.4 Sufficient Action

The fourth category applies to those that are aware of the problem, see the need for individual action and possess the relevant resources. It comprises barriers that lead to insufficient behaviour change as people engage in some pro-environmental behaviour but not necessarily the most effective ones or not at full extent. In this context Anders Wijkman (current vice president of the Club of Rome) said that "[p]eople do not know what the transition looks like even though they recognise the dilemma" (personal communication, March 5, 2015). This section presents the relevant barriers starting on the top right and moving clockwise around Figure 8.
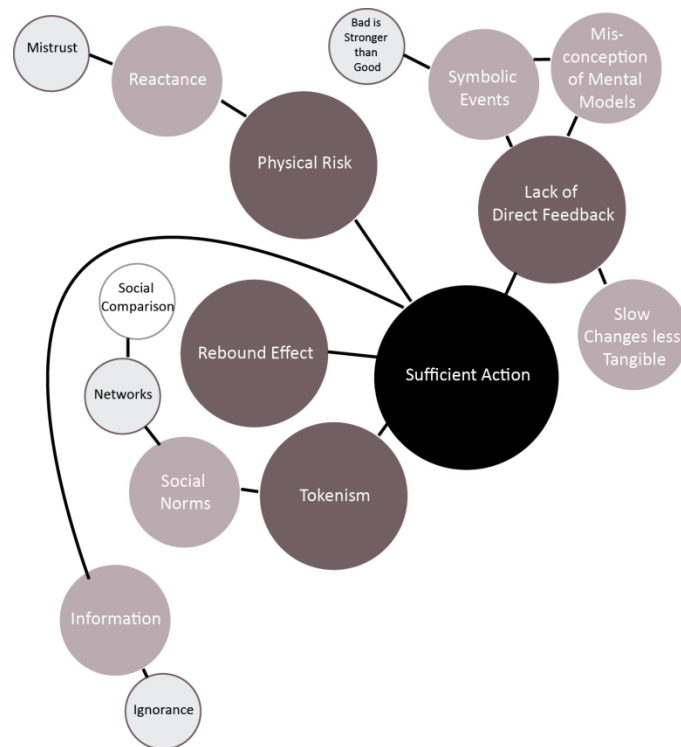
Figure 8. Barriers to sufficient action. Top left of Figure 4.

Lack of direct feedback. One of the most challenging barriers to pro-environmental behaviour is that people do not experience the immediate feedback of their behaviour or decisions (D. Johnson & Levin, 2009; Steg & Vlek, 2009). While touching an active hotplate immediately generates a negative feedback (i.e. pain), the information of increased greenhouse gas emissions from taking the car is not readily available in the selected environments people monitor. Hence, as opposed to touching the hotplate, our brains do not process the information to not repeat this behaviour or to engage in another behaviour (e.g. walking) more often. Even if there are immediate consequences of pro-environmental actions, their feedback is often *slow and thus not tangible* until it reaches a certain threshold when behaviour change might already be too late (Kollmuss & Agyeman, 2002). The time-lag of feedback occurs for example with the emission of greenhouse gases (GHGs): the temperature of the environment does not immediately increase but GHGs accumulate in the atmosphere leading to long-term changes. Consequently, the lack of direct feedback hinders automatic behaviour changes.

This barrier is not only based on the time-lag and geographic dimension of natural processes but also on cognitive misconceptions. *Mental models* often do not represent actual concepts and dynamics (Newell et al., 2014). Apart from the confusion of weather and climate and difficulties to distinguish stock and flow variables there is also a misconception about mitigations costs. Hatfield-Dodds and

Morrison (2010) believe that climate change mitigation decreases current income instead of future income growth. Thus, this barrier is also relevant for the barriers mentioned in section 4.2 as income losses are conflicting with other values and the existing lifestyle. Additionally, people tend to draw conclusions about patterns or concept based on *symbolic events* that sometimes are unrelated to the actual phenomenon (D. Johnson & Levin, 2009). Thereby negative events are more salient than positive ones (*bad is stronger than good*) and consequently more likely to initiate behavioural change (D. Johnson & Levin, 2009).

Tokenism. However, this feedback favours another barrier to successful pro-environmental behaviour named tokenism by Gifford (2011). Dietz et al. (2013) use the term *single-action bias* to describe that people often use one remedy to address a problem "to alleviate concern" (p. 85) even if more changes are necessary. Thereby people favour low-cost changes (Gifford, 2011) disregarding their impact. Despite being less effective than other measures, recycling is the most common action among Europeans to mitigate climate change (69%) followed by cutting down the consumption of disposable items (51%)[4] (EC, 2014a; see also Whitmarsh, 2009).

Longoni, Gollwitzer, and Oettingen (2014) extend this idea of *tokenism* to the validation of green behaviour, i.e. people use internal accounting taking pro-environmental choices in some areas as a justification for less green choices in other domains (McGregor, 2008). Thereby, tokenism is closely connected to barriers formed by *social norms* as validation occurs in a social setting (Longoni et al., 2014). What people think other people do or approve of is a strong predictor of one's own behaviour. For example, Schultz, Nolan, Cialdini, Goldstein, and Griskevicius (2007) provided households with information about their energy consumption compared to the average energy consumption in their neighbourhood (descriptive norm). They found that households with above-average energy consumption reduced their usage while those with below-average usage increased theirs. However, the increase did not happen when a sign of approval for low energy consumption (injunctive norm) was included (Schultz et al., 2007) (see also Cialdini, 2003; Moseley & Stoker, 2013; Newell et al., 2014). Placing one's own behaviour in relation to that of others is also relevant for the second category since assumptions about what other people do (descriptive norm) lead to barriers connected to *locus of control* (see 4.2).

Rebound effect. A concept related to *tokenism* is known as the Jevons paradox, which Gifford (2011) called rebound effect whereby efficiency gains are offset by increased usage thus undermining the

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[4] It has to be noted that actions such as purchasing a new house occur less frequently than other activities such as recycling or shopping but are combined in the survey question.

initial motivation to be more environmentally friendly. This is particularly true for energy efficiency (Freire-González & Puig-Ventosa, 2015). For example, the purchase of a more fuel efficient car leads to a reduced price for gas for a given range. As a consequence, people are tempted to drive more or transfer these savings to increase their footprint in other domains (e.g. long-distance travel instead of a camping trip). On a national level, Clement (2011) found an increase in overall carbon emissions in the U.S. between 1963 and 1997 despite improved emissions intensity of around 30%.

Lack of information. The lack of information identified in 4.3 extends its effects to people that are actively trying to change their behaviour and possess the financial and temporal resources. Gifford (2011, p. 291) used the term *ignorance* to describe that many people are unsure of the "relative benefits of different actions". Taking the example of spray cans, Stern (2000) pointed out that behavioural intent and impact may diverge if people are not well informed. Thus, activities lead to unintended outcomes when the search costs of information to prevent side effects are too high.

An increasing amount of product features become important when considering pro-environmental purchase decisions. Organic production is important for biodiversity to avoid eutrophication as well as to mitigate greenhouse gas emissions and to preserve valuable nitrogen and phosphorus resources. However, avoiding packaging (in particular plastic), is important to maintain healthy oceans (Eriksen et al., 2014). Transportation emits carbon dioxide while storage requires a lot of energy and thus greenhouse gas emissions as well. Taking all these factors into consideration in the purchase of a simple apple or tomato requires intensive research into complex life-cycle analysis which sometimes ends with puzzling results[5]. If the perceived difference in utility expected from different alternatives is little, the complexity of the decision at hand increases (J. E. V. Johnson & Bruce, 1997; Kim, Shin, & Han, 2014). Peters et al. (2013, p. 117) found that decisions are perceived to be "complex, when conflict exists among preferences for known options, when it is difficult to translate feelings into numerical scales such as money, and when strong feelings about options are lacking or in conflict". In these cases people do not know what they prefer and hence construct their preferences based on the context and situation they are in (Peters et al., 2013). Consequently, optimal solutions are no longer achievable with limited resources and uncertainty is inherent in most options.

Physical risk. Finally, connected to the problem of functional risk (see 4.3), there is physical risk inherent in new green technologies. For example hydrogen fuelled cars are perceived as insecure and

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[5] A study about meat production in the UK found that lambs shipped from New Zealand have a lower carbon footprint than locally raised lambs (Saunders & Barber, 2007).

thus people are uncertain whether or not their purchase is a good idea (Huijts, Molin, & Steg, 2012). Information and safety standards can be mistrusted and reactance (see 4.1) can lead to rejection of these messages and the decision for a more conventional purchase.

4.5 Summary of barriers to pro-environmental behaviour

This chapter has given a comprehensive overview of the barriers to pro-environmental behaviour found in academic papers. I have shown that these barriers can be grouped according to how they influence pro-environmental behaviour ranging from problem awareness over recognising the need for individual action and actually performing the behaviour as such to finally taking sufficient actions. While some barriers are more psychological or cognitive (systematic) biases in the way the human brain works, others are more contextual or structural and determined by the environment in which behaviours take place. In the end, all barriers lead to non-satisfactory outcomes with regards to the environmental impact. The question of whether these barriers are mere excuses is irrelevant in this context because as long as barriers are perceived by the individual they hinder pro-environmental behaviour and are therefore considered real (Alvesson & Sköldberg, 2009).

After having identified all the obstacles the question remains how to overcome them. The next chapter presents potential pathways for policymakers to make individual behaviour more environmentally friendly and how these measures differ with regards to the four categories identified previously.

5 Policymaking for pro-environmental behaviour

This chapter presents some insights into how the schematic representation of barriers in chapter 4 can support policymakers to promote pro-environmental behaviour. As the research question guiding this chapter is how my previous findings can support policymakers in making individual behaviour more environmentally friendly, I present my results in combination with further implications for policymaking. This is in line with my overall qualitative research approach as the strict separation of my research results and the outside world is impossible.

Policy, and thereby policymakers, are considered important actors in promoting sustainability (IPCC, 2014). Theoretically, policy can originate from any individual or organisation. In particular politicians, having legislative power, can directly remove some of the aforementioned barriers and further influence the visibility and perception of other, more psychological barriers. Pro-environmental behaviour is also on the agenda of many organisations acting on different geographical levels where they design campaigns to raise problem awareness, encourage individual action and try to give guidance on the right course of action.

An important finding from my analysis is that despite being organised in steps (Figure 3), each step does not have to be climbed in order to achieve pro-environmental behaviour. Figure 9 illustrates how policy can use shortcuts to create a direct path from each step to the pro-environmental behaviour. This insight is considered in the analysis of policymakers' opportunities to support pro-environmental behaviour. Due to the scope of this paper, this analysis is brief and exploratory but nevertheless gives a general overview of how the previous findings can inform policymakers in making individual behaviour more environmentally friendly. I follow the clockwise order used in chapter 4.
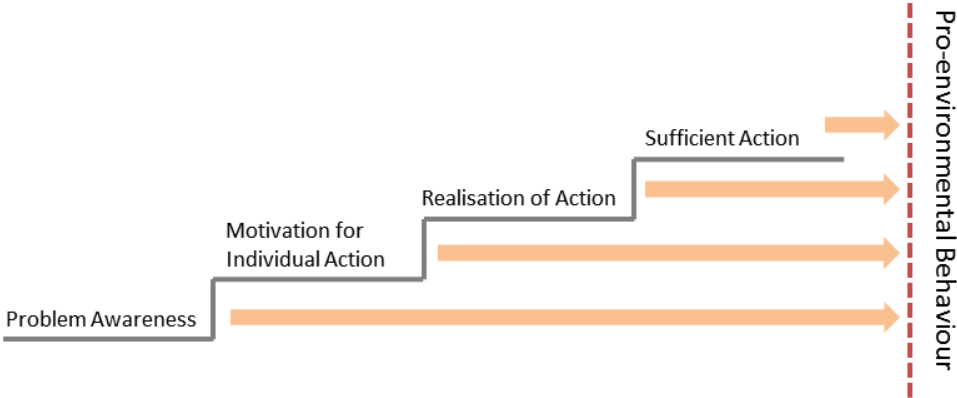
Figure 9. Shortcuts to pro-environmental behaviour. The arrows represent policies that direct people immediately to pro-environmental behaviour without climbing each step. Own illustration.

5.1 Problem Awareness

Recognising the problem and the personal consequences is the first step towards pro-environmental behaviour (Figure 9). People who regard climate change as a serious problem are more likely to take personal action on that issue (EC, 2014a). Barriers in this group, neglecting the problem and any personal vulnerability, are mainly psychological and cognitive. To challenge pre-existing beliefs and correct perceived probabilities of personal risk, policies targeted at this group need to *create salient experiences on a local level* (D. Johnson & Levin, 2009; Koger et al., 2011; Newell et al., 2014). However, concrete means on how to do this are scarce (Koger et al., 2011; Newell et al., 2014) and the removal of psychological barriers appears difficult without further insights from psychological research.

Nevertheless, environmental concern is often secondary for the adaptation of a low carbon lifestyle: not all behaviours that benefit the environment are triggered by environmental values and motivations (Howell, 2013; Whitmarsh, 2009). Instead of aiming at convincing people of the severity of environmental degradation policies can foster specific behaviours by *underlining other benefits* (see also Newell et al., 2014). Organic food can be framed as healthy, but also framed as benefitting the local economy (see Howell, 2013; Jerneck & Olsson, 2011; Whitmarsh, 2009). Thus, policymakers for this group should consider that it is not strictly necessary to change people's attitudes in order to change their behaviour.

Additionally, better understanding between science and the community has been proven to effectively overcome the barriers in this category. This can be achieved by increasing *scientific literacy* of decision-makers with educational campaigns. But also policies that address the source of the information (i.e. the scientific community) can be effective. For example, Budescu et al. (2014) found that complementing verbal terms with numerical ranges improves public understanding of probability statements.

5.2 Motivation for Individual Action

In the second category of barriers (second step in Figure 9) two themes are opposing each other. On the one hand underlying efforts of other actors potentially decrease barriers acting upon the locus of control. On the other, however, overconfidence in other actors' actions can develop which can increase the barriers associated with delegation of responsibility. Even though campaigns

emphasising the need and efficacy of all individual actions are generally useful they have to take these two sides into account[6].

Another approach to remove barriers is to use *convenience* as there is not necessarily a lack of resources but a reluctance to use them. For example, if a bus runs every five minutes from a person's house to their office at low costs and high convenience it is irrelevant whether or not that person thinks that other people do the same. Making pro-environmental behaviour convenient avoids all barriers associated with perceived behavioural control as well as delegation of responsibility. It builds in the assumption that it does not necessarily matter if other people perform behaviours when they are easy. In line with that, Tobler, Visschers, and Siegrist (2012) found perceived costs (together with perceived climate benefits) as the most important determinants of pro-environmental behaviour among Swiss households. McKenzie-Mohr and Schultz (2014) provide examples of how these costs can be reduced ranging from master switches in hotels automatically turning off lights to default settings for washing machines. These measures alter the choice architecture instead of the options as such and thus fall under the term *nudge* coined by Thaler and Sunstein (2009). This policy approach has become more and more popular in recent years to achieve behavioural change in health or finance (Thaler & Sunstein, 2009). In particular changing default option has been proven an effective tool. Momsen and Stoerk (2014) showed that when setting a renewable energy provider[7] as the default the share of people choosing this option can be increased by around 45%.

A problem with new and more convenient ways of behaving is that they are often ignored due to strongly ingrained habits (Verplanken & Wood, 2006). In particular upstream interventions, changing the context in which behaviours occur (Verplanken & Wood, 2006; Walker et al., 2014), have been used by policymakers to overcome the behavioural momentum. One example is the *meat-free day* initiative where municipalities change the decision design by serving only vegetarian food in cafeterias to make people rethink the impacts of their meat eating habits.

Finally, it is important to note for policymakers addressing barriers in the second category that despite being unwilling to change on the individual level, people generally acknowledge the problem. Hence, they are likely to support national and global agreements that enforce common execution of the behaviour. Consistent with that, 90% of Europeans think it is important that national governments set targets for renewable energy use and energy efficiency (EC, 2014a). Thus, even

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[6] The *ZIEK* campaign of the BMUB serves as a good example stressing the importance of joint efforts to achieve national CO_2 reduction targets. It gives instructions for individual activities while promoting government achievements (http://www.zusammen-ist-es-klimaschutz.de/index.html#).

[7] Their participants chose between conventional energy and a mix containing 50% renewable energy.

though individual pro-environmental behaviour is not seen as a goal in this category policymakers should acknowledge the willingness to find solutions on a broader scope.

5.3 Realisation of Action

As barriers in this category (third step in Figure 9) are shaped by a lack of infrastructure, time, money and information, the straightforward response is to provide whatever is lacking. However, giving someone time and money is not an easy endeavour and too much information can be as much of a barrier as too little. Therefore, policymakers usually focus on removing the barriers related to the lack of infrastructure. In particular governmental bodies are important actors here as they can issue incentives, regulations and own *infrastructure projects*. An example for the latter is the development of public transport and the installation of bike paths to encourage cycling as a pro-environmental behaviour. The London transportation authority is even constructing cycle superhighways with the goal to increase bike usage (TfL, 2015).

Financial *incentives* and *disincentives* are often provided by the state legislature. This includes increased costs for non-desirable behaviours (e.g. congestion charge or carbon taxes) or reduced costs for pro-environmental behaviour reducing financial barriers to pro-environmental behaviour. The widely used feed-in-tariffs to foster renewable energy is an example for the latter (Stefes, 2010). However, many researchers see incentives as critical because effects have been shown to wear off when the incentive is removed (Schultz, 2014) and pro-environmental behaviour is usually limited (McKenzie-Mohr & Schultz, 2014). *Regulations* have been a popular tool to combat environmentally unfriendly behaviour. However, these measures usually do not remove barriers on the individual level but address the problems on a broader scale. Through banning harmful substances (e.g. the Montreal Protocol) or setting limits (e.g. emission standards), the final behaviour is environmentally friendly without requiring active change from the individual.

The ambiguous barrier of information is more critical as some perceive there to be a lack of information while others are overwhelmed by it. Osbaldiston and Schott (2012) suggested using *instructions*, for example recommending washing at low temperature on clothes labels (Young & Middlemiss, 2012) to make it easier for people to perform pro-environmental behaviours. Combined with *tailored information* this increases problem-focused coping (Koger et al., 2011) and thus relieves the feeling of being overwhelmed by the extent of the problem(s). Instead of generally educating about consequences and causes of climate change, specific measures for greenhouse reduction and their effectiveness can be the basis for these campaigns (Dietz et al., 2013). Tailored information and instructions would also reduce barriers connected to a lack of time and money as well as the paradox

of choice. Also, the opportunity to test equipment reduces the functional risk barrier when people are unsure whether more environmentally friendly choices fulfil their needs.

5.4 Sufficient Action

Barriers on the fourth step (Figure 9) do not hinder pro-environmental behaviour as such but only limit the amount of action. Policymakers can build on existing efforts to further engage individuals. As people use environmentally friendly practices in parts of their lives (Steg & Vlek, 2009) further behaviour change can be achieved using *cognitive dissonance* (McKenzie-Mohr & Schultz, 2014). Thereby, the discrepancy between actions and attitudes (potentially manifested by pro-environmental behaviour in some areas) is pointed out. If policymakers target a group they already know to engage in some pro-environmental behaviour (e.g. users of public transport) they can use this as an entry point for further encouragement[8]. Performing the behaviour then erases the inconsistency between beliefs (i.e. being reliable and caring for the environment) and actions. *Commitments*, where people (publicly) state that they will engage in the target behaviour (see for example McKenzie-Mohr, 2000b), can complement this approach. When intervention and action are delayed commitment is more effective than dissonance (Rubens, Gosling, Bonaiuto, Brisbois, & Moch, 2015). As this approach builds on a general pro-environmental attitude (Schultz, 2014, p. 113) it is well suited for supporting pro-environmental behaviour in this category.

Another policy intervention to engage people in more pro-environmental behaviour is to use *tailored information*. One aspect is the communication of personal impacts on the environment. Messages related to climate change are often threatening which has been shown to disengage people as they feel unable to address the issue[9] (O'Neill & Nicholson-Cole, 2009). Instead, policymakers can design positive messages that recipients can relate to (Bertolotti & Catellani, 2014; O'Neill & Nicholson-Cole, 2009) to empower and encourage individuals. Information can also be used to create salient and local feedbacks (Lorenzoni et al., 2007), for example for energy usage (Allcott, 2011; Schultz et al., 2007). Combining feedback with goals and references (e.g. costs) improves its effectiveness (McKenzie-Mohr & Schultz, 2014) and approval of already good behaviour avoids convergence to the mean (Schultz et al., 2007).

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[8] This approach does not work if the motivation to perform the initial behaviour is not environmental (see 5.1).
[9] However, the same study found that threatening images make climate change seem more important.

5.5 Summary of policymaking for pro-environmental behaviour

This chapter has described how policymaking can foster individual pro-environmental behaviour for the different categories. These shortcuts (Figure 10) consist of changing the context of the situation (e.g. framing) or making the target behaviour convenient to bypass awareness and motivation. Infrastructure projects facilitate pro-environmental behaviour for the third category and cognitive dissonance can be used to bypass barriers to sufficient behaviour (Figure 10).
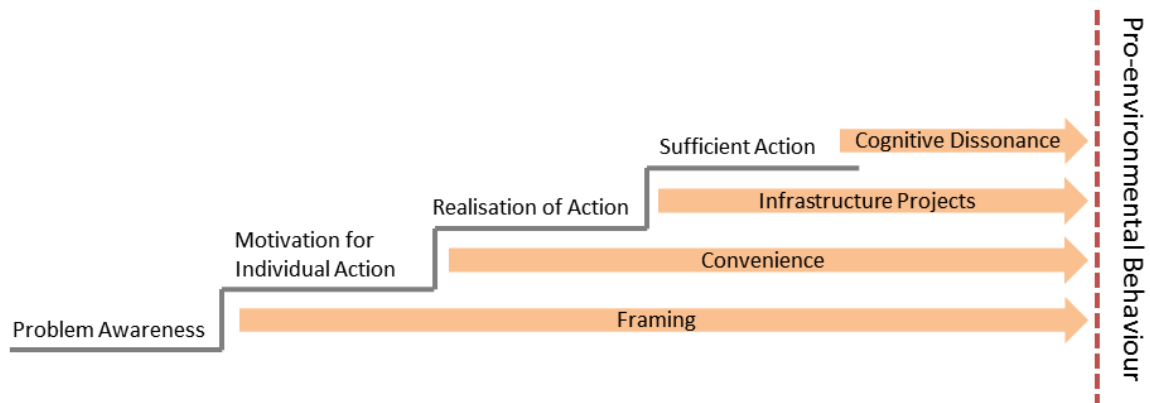
Figure 10. Shortcuts with policy examples. The policy interventions in the arrows are examples for policy interventions to direct people immediately to pro-environmental behaviour. Own illustration based on Figure 9.

Tailored information to provide instructions and feedback are effective tools to overcome barriers. However, the commonly used general informational campaigns only increase knowledge but do not facilitate behaviour change (Kollmuss & Agyeman, 2002). Also financial measures, such as incentives, are ambiguous as they are effective for selected behaviours but rarely spill over to other pro-environmental behaviours (Schultz, 2014; Thomas & Sharp, 2013). The subsequent chapter further discusses prerequisites and capacities to overcome pro-environmental behaviour, broadening the perspective to include individuals and external actors' capacities in general to overcome barriers to pro-environmental behaviour.

6 Internal vs. external removal of barriers

The previous chapters have shown the results of my analysis regarding barriers to pro-environmental behaviour, their influence and how this can inform policymakers. Despite being important to consider the role of policy, in this chapter I take a broader perspective on how to generally overcome barriers to pro-environmental behaviour. The individual capacity to remove barriers as well as the role of external actors in pro-environmental behaviour are explored leading to a short discussion of whether or not the removal of barriers requires an active participation of individuals.

In general the distinction between barriers removed internally by the individuals' capacities or by an external actor is hard to make. Looking at habit, it becomes clear that habits evolve within the individual in repeated situations in a given context, such as the mode of transportation used to go to work every day (Walker et al., 2014). Thus, overcoming the barriers of habit should lie within the individual's capacities, for example by making these processes conscious (Petty, Briñol, Tormala, & Wegener, 2007; Verplanken & Wood, 2006) and developing strategies to escape routines. However, breaking the habit is a tricky endeavour (otherwise it would not be such a significant barrier to pro-environmental behaviour) which might require external disruption in order to be changed (Verplanken & Wood, 2006; Walker et al., 2014). Hence, whether or not the removal of a barrier occurs internally or externally is sometimes ambiguous. This boundary is also blurred in this thesis as it does not analyse public-sphere behaviour (Stern, 2000) despite the fact that individual behaviour in the public-sphere can remove barriers affecting private-sphere behaviour.

6.1 Individual capacities to overcome cognitive barriers

Many barriers to pro-environmental behaviour are cognitive barriers (Gifford, Kormos, & McIntyre, 2011). Their removal thus lies within the individual's cognitive capacities, namely in ignoring values or social norms (Ockwell, Whitmarsh, & O'Neill, 2009). Yet, their subconscious occurrence (Fitzsimons et al., 2002) is the very reason cognitive barriers are so strong. However, by making thinking processes *explicit* and transferring them to the conscious sphere, the negative impacts of cognitive biases can be reduced[10] (Fiske & Taylor, 2013). This *metacognition* was found to affect subsequent judgements and behaviour (Petty et al., 2007, p. 270). Thus, information about the way people think is necessary to overcome cognitive barrier and consequently metacognition can also be triggered by external actors.

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[10] See also cognitive-behaviour therapy.

Information is also a component of many other barriers to pro-environmental behaviour, specifically information about the effect of one's behaviour on the environment and about what others are doing to prevent it (social comparison). The availability of and the intention to access and process the relevant information are important prerequisites. Even though these capacities lie within the individual, the relevant information is still usually produced by an external actor. Hence, the extent to which someone is capable of changing one's behaviour appears limited.

6.2 External actors' capacities to remove barriers

Some of the barriers to pro-environmental behaviour need additional actors, such as policymakers, in order to be removed. As I pointed out above, this classification is not unambiguous and might be interpreted differently depending on the researcher's perspective (see also reflexivity in 3.1.2).

The external removal of barriers is critical when a clear identification of and intention to remove barriers is not given or when people are unsure what to do. This applies in particular to barriers blocking the actual action once someone is aware of the problem and is motivated to act. Despite some cases where individual investment can also solve structural problems, such as the installation of energy plants at the household level (e.g. roof top mounted PV modules), the availability of infrastructure usually depends on *institutional decisions* outside the private sphere (e.g. recycling facilities or public transport). Also, time and money can be regarded as requiring external support for change, such as a general minimum income or appropriate subsidies that should allow people to purchase organic food and an energy-saving appliance. On the other hand, lack of time or money can also be a problem of prioritisation. Finding financial and temporal resources then lies within the individuals' capabilities but is hampered by social norms and competing values since time and money are allocated to activities perceived to be more important or societally approved.

Given that external actors play such a crucial role in removing barriers to pro-environmental behaviour, be it directly or indirectly as information providers, one can wonder whether it is not possible to remove all barriers solely by external actors. As governments are usually the legislative institution, their interventions are particularly powerful. The clear advantages of using government regulation are that most barriers are avoided (e.g. motivation for individual action) or become irrelevant (e.g. problem awareness). Additionally, government regulation can trigger social innovation and make sure actions occur within the limited timeframe of urgent environmental problems (Ockwell et al., 2009). Considering the amount of environmental problems the earth faces (Steffen et al., 2015) it is unlikely that governments will come up with a full set of regulations addressing all relevant behaviours (Stengel, 2011).

Another strong argument against government interventions is the right of individual freedom, autonomy and self-fulfilment anchored in the constitution of *liberal states* (e.g. U.S., Germany). Governments only intervene if individual actions endanger other citizens (*harm principle*). Environmental policy is often perceived as curtailing of personal freedom and therefore unpopular for policymakers wanting to be re-elected (Ockwell et al., 2009). Yet, some externalities have been recognised and addressed (e.g. carbon tax) but current efforts are not enough to shift society towards a more sustainable future (IPCC, 2014). Also, research has shown that externally steered pro-environmental behaviour crowds out or decreases intrinsic motivations to perform this behaviour (Cotterill, Stoker, & Wales, 2008; Keller et al., 2011). Thus, policymaking for pro-environmental behaviour is limited (Stengel, 2011) and the question of whether individual pro-environmental behaviour can be achieved exclusively through external actors remains unanswered at this point.[11] Instead, the general contribution of research into barriers to pro-environmental behaviour from a sustainability science perspective is discussed in the next chapter.

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[11] For further reading see for example Eckersley (2004), Jackson (2009) or Shearman and Smith (2007).

7 Problematisation of pro-environmental behaviour

In this final chapter I discuss the concept of barriers to pro-environmental behaviour with regards to sustainability science considering both the problem-solving and the critical approach of sustainability science (see Jerneck et al., 2011 for explanation). First, I discuss the extent to which the concept of pro-environmental behaviour and its barriers can be used to solve real-world problems. Afterwards, I take the critical approach in discussing the contribution of these concepts to a sustainable society.

7.1 Problem-solving approach

Even though it is useful to academically explore barriers to pro-environmental behaviour, a "purely scientific attitude can become a source of risk" (Ziegler & Ott, 2011, p. 35). Consequently, Kates et al. (2001, p. 641) argued that "scientific exploration and practical application must occur simultaneously" in sustainability science. However, they provide little guidance on how to do this. This section briefly looks into the problem-solving capacity of the concept of barriers.

Drivers and barriers of behaviour are highly contextual limiting the practicality of their general representation (see also McKenzie-Mohr, 2000b). Therefore, I agree with Lindenberg and Steg (2007, p. 132) who claimed that the general study of pro-environmental behaviour "is not very informative for practitioners as well as scientists". The intrinsic value of knowledge is contested as only a certain amount and very specific kinds of knowledge are relevant for and requested by practitioners (Frodeman, 2014). Considering the transdisciplinary claim of sustainability science, the co-production of knowledge to guide problem-solving has to become the focus of research (Frodeman, 2014). Thus, the usefulness of extensive research on the concept of barriers might be less informative for practitioners once the general set of what could potentially hinder pro-environmental behaviour is explored. Instead, best practice examples and general guidance on how to approach target behaviours are needed. Science can contribute in identifying the most effective policy tools (e.g. Schultz, 2014) and target behaviours (Dietz et al., 2013).

Even though there are success stories on the small scale in removing barriers to pro-environmental behaviour (McKenzie-Mohr & Schultz, 2014) the benefits for national campaigns are limited due to the contextual nature of the concept. Each policy needs to be designed for a specific set of conditions, barriers and preferences which impedes the deduction of general policy recommendations. To be effective, these interventions need to be based on transdisciplinary methods to make sure policy design and barriers of the target behaviour for the respective group align (McKenzie-Mohr & Schultz, 2014).

7.2 Critical approach

So far this thesis has followed a problem-solving approach and barriers to pro-environmental behaviour were analysed taking the current world order as given. However, sustainability science also comprises a critical approach where this order is questioned (Jerneck et al., 2011). The analytical scope in this section is thus widened to include the conditions that shape pro-environmental behaviour and assess the overall contribution of individual pro-environmental behaviour to a sustainable future.

Authors such as Huddart Kennedy, Krogman, and Krahn (2015) challenge the idea that pro-environmental behaviour actually reduces negative impacts on the environment. In their 2011 survey, the authors found no correlation between self-reported pro-environmental behaviour and household carbon footprints. As my analysis has shown, many barriers to sufficient pro-environmental behaviour are in place even though some actions are performed (4.4). Other authors (e.g. Dietz et al., 2009) concluded that significant carbon saving can be achieved through behaviour changes. Yet, these savings are small compared to national and international reduction targets (BMUB, 2014; IPCC, 2014).

All pro-environmental behaviour at the individual level is constrained by existing institutions and infrastructures (Jackson, 2009; Ockwell et al., 2009), such as increasing social and economic inequalities (Hobson, 2002; Jackson, 2009) but also car-based urban planning (McIntosh, Trubka, Kenworthy, & Newman, 2014). Yet, research and policy neither question these constraints nor the central position of consumption in society (Hobson, 2002; Jackson, 2009). Pro-environmental behaviour is only an end-of-pipe solution[12] (Higham et al., 2013) and the real barriers to pro-environmental behaviour often lay beyond the realm of influence of individuals. To ensure that society remains within its ecological boundaries researchers have repeatedly argued for a decoupling of social and personal welfare from consumption and economic growth (Jackson, 2009; Manno, 2002; Meadows et al., 1972; Meadows et al., 2005; Stengel, 2011). This cannot be achieved by individual private-sphere behaviour but requires political and social movements (Klein, 2014; Manno, 2002), such as the de-growth movement (Murphy, 2013) or the transition initiative (Hopkins, 2010). As "structures […] shape and constrain how people behave" (Jackson, 2009, p. 151) the impact range of pro-environmental behaviour is limited and significant changes for organisations, industries and institutions are also needed.

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[12] For arguments why production of fossil fuels should be the target of governance see Monbiot (2015).

8 Limitations and further research

Being a reflective researcher a lot of the analysis is based on my own experience which is located in Western societies. Even though my representation is based on literature from various global regions, its applicability to other cultures is ambiguous. Reviewing literature from various disciplines I had to familiarise myself with specialised knowledge outside of my subject area. Therefore, the analysis of the different barriers, their influence and their removal might seem imprecise in places to an expert. Considering the aim and target group of my thesis, which is to give a comprehensive overview for researchers from various disciplines and practitioners, I do not regard this to be a strong limitation.

In particular, the matching of policies and explicit policy tools with the different stages (described in chapter 5) remains underexplored. Not only the barriers but also the perceived benefits – as they influence the magnitude of the barriers – need to be considered. An exploration of the relationship between goal frame theory, i.e. the contextual dominance of normative, gain and hedonic goals, (see Lindenberg & Steg, 2007) and the categories of my analytical framework would lead to further insights into possible pathways to pro-environmental behaviour. Also different theories, for example nudging (i.e. changing the choice architecture instead of the options), could be explored with regards to their contribution in addressing barriers to behavioural change for the environment (see for example Momsen & Stoerk, 2014; Moseley & Stoker, 2013).

Further research should consider the role of complexity in individual decision-making, in particular preference construction and other heuristics. For example, the idea that people make better decisions with limited knowledge ("beneficial degree of ignorance" (Gigerenzer, 2008, p. 8)) and its implication for pro-environmental decision-making should be explored further. Bettman et al. (1998) argue that preferences are often constructed in the specific context of a decision situation. Thus, research in decisions and behaviour needs to combine experimental settings with real-world experience to assess cognitive processes. Interviews are of lower benefits since individual reporting about barriers is difficult because people are lacking insight into their own cognitive processes (Fischhoff, 2000).

One of the first questions when removing barriers is whether or not all barriers have to be addressed simultaneously. On the one hand one could agree with Blake (1999) that barriers are independent and each can act as limiting factors. In this case the removal of some barriers is ineffectual and interventions are more successful when they tackle different barriers simultaneously (Stern, 2000). On the other hand, the combination and interplay of barriers is also important. If pro-environmental behaviour is convenient and cheap it will unlikely be hindered by perceived inequality. Hence, it is

not only a question of what barriers are present but also how strong they act in the given context. Policymakers need to take an actor-centred approach to determine the right combination of interventions shaped by existing barriers. Despite being a relevant and interesting question the scope of this thesis allows no further insight into this topic.

Finally, this thesis contributed to the field of sustainability science by looking into barriers for the adaptation of pro-environmental behaviour on the individual level and potential policy solutions. However it does not discuss the ethical implications of such policies and state forms more detailed. The philosophical inquiry into possible measures to overcome barriers to pro-environmental behaviour is thus another topic for further research.

9 Conclusion

A variety of barriers have been discussed in the academic literature. This thesis has shown how these barriers influence behaviour differently. While some hinder problem awareness (4.1), others lower the motivation for individual action or impede the realisation of this action (4.2 and 4.3). Finally, even when these barriers are removed there is insufficient action due to barriers hindering sufficient engagement in pro-environmental behaviour (4.4). These barriers can be cognitive, psychological and structural and are usually interrelated. Therefore, policymakers need to be aware of the barriers in place when designing policy interventions and create shortcuts for each category to achieve pro-environmental behaviour (chapter 5). For example, making pro-environmental behaviour convenient and providing tailored information are measures that bypass many barriers to pro-environmental behaviour (e.g. perceived inequality, lack of time). Individuals' capacities to remove cognitive barriers are limited as it usually requires information provided by external actors.

The problem-solving contribution of research into barriers to pro-environmental behaviour is limited as barriers are contextual and policy programmes can rarely be transferred to other cases (7.1). Taking the critical approach of sustainability science it becomes clear that pro-environmental behaviour is constrained by existing framework conditions and broader changes, such as decoupling growth from welfare, are needed (7.2). Thus, removing the barriers to pro-environmental behaviour is just one obstacle to overcome on society's way to a sustainable future.

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