What can we do for nature?
A systematic research approach to pro-nature conservation behaviours

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Contents

List of Tables and Figures

Figures

Tables

Preface

The work contained within this thesis has been solely authored by the doctoral candidate, with only guidance and direction given by the supervisory package. Where work has been submitted for publication and contained within this thesis, the candidate is the primary author, with only guidance given by the co-authors. The programme of research conducted for this thesis, the results obtained, and the wider reading and resulting thoughts and conclusions have been disseminated through various channels and are listed below:

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Abstract

Nature is in trouble. The current levels of anthropogenic biodiversity loss have been classed by experts as a mass extinction. This is likely to have grave consequences for humanity. However, with humanity causing the biodiversity loss, it can also be fought by humanity, presuming action is taken. Research is needed on which actions can be taken by the wider public and how people can be encouraged to do so. There is a multitude of literature on general pro-environmental behaviours, however, conservation practitioners lament the lack of research on nature specific actions. This thesis set out to create a systematic research approach to those nature specific actions which were named pro-nature conservation behaviours. Based on research in pro-environmental behaviours, four steps to this research were set: (1) Defining and measuring the behaviour; (2) Understanding the antecedents of the behaviour; (3) Developing targeted interventions; (4) Evaluating the interventions. This thesis completed the first step and provided some first insights into the second step.

Pro-nature conservation behaviours were defined based on both their ecological impact on nature and their goal orientation, meaning they need to objectively support nature conservation and subjectively be done by people with the aim to support nature conservation. An expert ranked list of possible behaviours was created, including small actions that one can take in their own garden as well as more politically driven actions, such as contacting local government about nature conservation issues. Then, using psychometric methods, a questionnaire scale measuring tool, the Pro-Nature Conservation Behaviour Scale (ProCoBS), was developed and validated. This resulted in a long and short form for adults, as well as a child version including only behaviours accessible to people under the ages of 16-18. The scale was found to have two subscales, one concerning behaviours in the garden and the other one civil actions.

An overview of the adoption of pro-nature conservation behaviours in the public and influences of some demographic factors showed that while there is engagement, this could be improved and demographic variables impact behaviour. For example, women acted more often than men and people living rurally acted more often than people living in urban areas. Age also had an impact, interestingly showing different directions depending on the subscale. Finally, the influences of variables known from general behavioural research as

well as research on pro-environmental behaviours on pro-nature conservation behaviours were examined. Based on the findings the efficiency of focusing on the so-called Value-Action gap was questioned, suggesting the Intention-Behaviour Gap to be more easily bridged. Further, it was shown that both an approach building on the Theory of Planned Behaviour, as well as an approach centring nature connectedness, could provide worthwhile insights into pro-nature conservation behaviours. Here, again, slight differences between the subscales were found.

Connecting people to nature could be a key step in the efforts to protect biodiversity. Future research may profit from focusing not only on how to use nature connectedness to encourage pro-nature conservation behaviours but also how pro-nature conservation behaviours can improve nature connectedness.

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1 Introduction

Society today is confronted with a range of environmental challenges. Human population growth and consumption behaviours all over the world have caused many threats to the planet and all its inhabitants. The most topical of these challenges is climate change, which has become a widely known issue. Many scientific disciplines have addressed climate change and it is a driver for new policies and legislation all over the world (e.g., IPCC, 2014). But there is another, far less commonly covered, environmental threat: biodiversity loss. The planet is facing an anthropogenic extinction of wildlife, which will have a grave impact on the environment and humans (Haines-Young & Potschin, 2012; IPBES, 2019). This extinction is already at a level that scientists call the 6th mass extinction event in the history of our planet (Ceballos et al., 2015). Further, while it gets far less attention from the media and politics, the threat which stems from this is arguably as dangerous to us as the impacts of climate change (Legagneux et al., 2018). Since the current threats to the environment are primarily caused by human behaviours, it is also up to us, humans, to prevent further damage or even reverse some of the damage already done to ecosystems (Ceballos et al., 2015). Ecologists and conservation biologists are now starting to increasingly recognise the role psychology plays in behaviour change related to the environment (Cinner, 2018). Based on this recognition, this thesis sets out to explore behaviours related to the conservation of biodiversity.

In the field of environmental psychology, there is an extensive body of research focusing on general pro-environmental behaviours (e.g., Barr, 2006; Kaiser & Wilson, 2004; Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). Research has shown that 72% of people report a gap between attitudes, intentions, and actions even without situational barriers (Van den Noortgaete & De Tavernier, 2014). This gap between people's attitudes toward sustainability and their willingness to act sustainably has been dubbed the 'Value-Action Gap' (Kollmuss & Agyeman, 2002). To study this gap and possible interventions, which allow for the encouragement of pro-environmental behaviours, effectively bridging the gap, the relevant behaviours need to first be measured with reliable and valid tools. For pro-environmental behaviours over 40 such measures exist (Markle, 2013). The majority of these are aimed at general sustainable behaviours, mostly positive inactions that minimize

negative impact on the environment (Christmas, Wright, Morris, Watson, & Miskelly, 2013). There is an overlap in behaviours that cause biodiversity loss and those that cause wider environmental issues such as climate change, with climate change itself being a threat to biodiversity (WWF, 2018). While the WWF's Living Planet Report (2018) highlights the importance of minimising the behaviours that drive biodiversity loss, the report also calls more direct conservation interventions crucial.

As of yet, little research has concentrated on positive actions, especially those that are aimed at wildlife conservation, which will be called pro-nature conservation behaviours hereafter. This is a significant gap in the literature, considering the possible detrimental effects of the current mass extinction (Ceballos, Ehrlich, & Dirzo, 2017). Indeed, no scale has been developed to measure active pro-nature conservation behaviours. Such a scale could be used to better understand the determinants of conservation behaviour and to develop and evaluate communications and interventions aiming to encourage these behaviours. Research on pro-nature conservation behaviours should draw on findings in pro-environmental behaviours because there are likely similarities in the main drivers of action. For example, in pro-environmental behaviours, emotions have recently become an important focus of research on the Value-Action Gap. In particular, connectedness to nature, a paradigm that describes an individual's emotional connection to nature has been shown to predict behaviours better than other variables (Otto & Pensini, 2017). Connectedness to nature is also related to positive well-being outcomes (Pritchard, Richardson, Sheffield, & McEwan, 2019). This indicates that interventions working to increase conservation behaviours via connectedness to nature may have a positive impact on human well-being. Research evaluating interventions for their effectiveness can benefit from further exploring said impact.

In conclusion, there is urgent need to develop research in two areas:

1. Development of a scale to measure pro-nature conservation behaviours grounded in ecological impact
2. Bridging the 'Value-Action Gap' by moving beyond rationalistic campaign models to cognitive science research that can show the primary role emotions have in changing attitudes and motivating action

To address these two areas in an appropriate way, the current status of literature must first be reviewed. The following chapter will first give an overview of the problem at hand: The 6th mass extinction and its meaning for humanity as well as the role that conservation practice can play to counteract this. Then, due to the absence of research on nature specific behaviours, more general pro-environmental behaviours will be discussed regarding their importance and conceptualisation but also the apparent lack of wider public engagement with them. Workable solutions will be presented, building on research and theory from more general behavioural psychology as well as environmentally specific behavioural research. Thus, clear aims and objectives for this thesis will be worked out.

2 Literature Review

2.1 The ongoing biodiversity loss - a mass extinction?

Environmental issues have become a focus of public attention, research, and policy makers in the last few decades (e.g., IPCC, 2014). Two widely acknowledged environmental issues are climate change and biodiversity loss. Both pose a significant threat to life on this planet and have surpassed safe limits (Rockström et al., 2013). However, the media and policy makers often prioritise climate change over biodiversity loss. For example, the IPCC, an intergovernmental initiative for climate change was founded twenty years earlier than the IPBES, an intergovernmental initiative for biodiversity and ecosystem services (Legagneux et al., 2018). Further, in English speaking countries, media coverage of climate change is up to eight times higher than coverage of biodiversity loss (Legagneux et al., 2018). This does not mean that biodiversity loss is less important: In fact, scientists are warning about the current extinction rates and their impact on the planet's integrity (Ceballos et al., 2015). The following paragraphs will go over the extent of the current biodiversity loss, which can be classed as an anthropogenic mass extinction. This will include its impact on human life as well as the causes and possible ways to avert a worst scenario outcome.

Currently, species extinction rates are accelerating and have reached a level big enough for many scientists to consider it the planet's sixth mass extinction (Ceballos et al., 2015). The extinction of wildlife does not only take place on a species level but also on population levels. For example, in Germany, a 75% decline in flying insect biomass was detected in protected areas over the past 27 years (Hallmann et al., 2017). The WWF reported a 60% decrease in wildlife populations between 1970 and 2014 (WWF, 2018). Currently, only about 4% of mammal biomass on earth is made up by wild mammals, the remaining 96% consist of humans and livestock (Bar-On, Phillips, & Milo, 2018). While population level extinctions are not considered in studies examining whether the planet is in a period of mass extinction, they also threaten ecosystems and are a first step to species level extinction (Ceballos & Ehrlich, 2009).

Loss of biodiversity in these dimensions will result in losses of ecosystem services. Ceballos and colleagues (2015) estimate that humans could be deprived of biodiversity benefits in as little as three human lifetimes. Ecosystem services are the benefits humans

reap from ecosystems (Mace, Norris, & Fitter, 2012). They are essential to human living and well-being (Díaz, Fargione, Chapin, & Tilman, 2006). The relationship between biodiversity and ecosystem services is multi-layered, with biodiversity playing a key role on various levels across a wide array of services (Mace et al., 2012). Biodiversity influences several ecosystem processes that lead to ecosystem outcomes, such as pollination. Pollination is an ecosystem service provided by flying insects (Ollerton, Winfree, & Tarrant, 2011). 87% of flowering plant species are pollinated by animals (Ollerton et al., 2011). Further, 35% of global food production relies on crops that are partially pollinated by animals (Kleijn et al., 2012). Thus, biodiversity loss of pollinating animals may have grave consequences.

Apart from the role biodiversity plays in several processes that lead to outcomes, which humans benefit from, it can be considered an outcome by itself (Mace et al., 2012). Many species of plants and animals have a cultural value and people often gain enjoyment from the aesthetics of nature (Zhang, Howell, & Iyer, 2014). Also, spending time in nature has been shown to improve well-being (Lee et al., 2011). Noticing nature, especially in spaces with higher visible biodiversity, can have positive well-being outcomes (Hamlin & Richardson, 2021; Richardson & Hamlin, 2021). Overall, nature's ecosystem services have an estimated value of 125 trillion US dollars. However, there is a movement towards an understanding of nature beyond a simple financial value by recognising other knowledge systems in local communities and indigenous peoples (WWF, 2018). Therefore, the true value of biodiversity may surmount those numbers by far.

The UK has a long and rich history of nature conservation, starting in the 19th century (D. Evans, 1991). Early on, the conservation movement was based on a love for nature's beauty and the resulting wish to protect it, as could be found, for example, in Wordsworth's writings about the Lake District (Brownlow, 2007). In the second half of the 19th century, the movement started to be reflected in legislation, such as the Wild Birds Protection Act in 1876 (Evans, 1991). A variety of trusts and societies with conservation aims were then formulated, some of them, such as the National Trust in 1895 and the Royal Society for the Protection of Birds (RSPB) in 1889, still exist and play a crucial role in nature conservation to this day (Evans, 1991). In the 1940s, the conservation movement gained a foot hold through the establishment of National Parks, which were protected under the National Parks Bill from 1939 (Evans, 1991). Throughout the 20th century, science started playing a larger role

in conservation practice. In the 1960s, a shift of perception of the place of science from secluded expert spaces to the wider public encouraged the incorporation of science in the public debate of conservation (Bocking, 2020). Ecology, and later conservation biology started to heavily influence policymaking when it came to nature conservation (Bocking, 2020).

Experts agree that the ongoing mass extinction of wildlife is anthropogenic in nature. Several common practices of modern society contribute to the destruction of habitats for a wide variety of flora and fauna. Primarily urbanisation and agriculture are named as the culprits (Maxwell, Fuller, Brooks, & Watson, 2016; Mcdonald, Kareiva, & Forman, 2008). On the bright side, this means that there is also vast opportunity for humans to act upon conservation in numerous ways (Ceballos et al., 2015). Research in the field, as well as resulting strategies of nature conservation, has often focused on ecological causes and solutions (Dicks et al., 2016; Knapp, Phillips, Clements, Shaw, & Osborne, 2020). But with the responsibility lying with humans, human and community centred solutions are essential and require interdisciplinary approaches to nature conservation (Knapp et al., 2020). The following sub-sections will outline the history and the current state of research on behaviours that benefit the environment as well as their psychological conceptualisation and approaches to behaviour change in general and for environment-based behaviours specifically.

2.2 Environmental Psychology and what we know about pro-environmental behaviours

All efforts to conserve nature require changes in human behaviour. But this often poses a challenge, with many efforts to achieve behaviour change proving ineffective (Reddy et al., 2017). More and more, the importance of psychology and behavioural science in encouraging environmentally friendly behaviours becomes apparent (Cinner, 2018).

The academic field of psychology that has specialised in environmental behaviours is environmental psychology. Environmental psychology, at its core, examines the relationship between humans and their environment (Steg, van den Berg, & de Groot, 2013). It is a relatively new field of psychology, with Egon Brunswick (1903-1955) and Kurt Lewin (1890-

1947) often being named as the founding fathers (Gifford, 2007). Early research in environmental psychology started in the 1940s and mainly focused on the effects of environments on human behaviour, especially built environments (Bonnes & Bonaiuto, 2002). Environmental issues became a focus during the late 1960s, when the first studies on the negative impact of humans on the natural environment were conducted (Steg et al., 2013). Only in the 1980s did environmental psychologists start to consider sustainable behaviour. At the time, these were primarily consumption based (e.g., Cone & Hayes, 1980).

Nowadays, there is a wide array of scientific literature on such sustainable behaviours. These are known, however, under a variety of terms, such as: conservation behaviour, ecological behaviour, environmental behaviour, or environmentally significant behaviour (Gkargkavouzi, Halkos, & Matsiori, 2018; Kaiser & Wilson, 2004; Kaiser, Wölfing, & Fuhrer, 1999; Stern, 2000). Many authors fail to explicitly define the term they utilise in their studies (Poortinga, Steg, & Vlek, 2004). The most commonly used term is pro-environmental behaviour, with literature giving several reasons for its suitability for the concerned construct It is a more accurate term than, for example, environmental behaviour, which could address any interaction a human has with their environment (Gkargkavouzi et al., 2018; Steg & Vlek, 2009). In contrast to that, the term pro-environmental behaviour emphasises the positive outcome for the environment. Therefore, this is the term to be used in this thesis from now on. These behaviours and what factors influence them have been studied for a couple of decades (Markle, 2013). Often, energy saving, or recycling behaviours are the key focus (e.g., Pothitou, Hanna, & Chalvatzis, 2016; Tonglet, Phillips, & Bates, 2004). However, there is still some confusion around what qualifies as pro-environmental behaviour (Gkargkavouzi et al., 2018). This is partially due to academics not adhering to one term. But even when this is overlooked, many ways to operationalise and critically evaluate pro-environmental behaviours can be found (Larson, Stedman, Cooper, & Decker, 2015).

Over time, two approaches have played an important role in the definition and conceptualisation of pro-environmental behaviours: Impact and intention. When pro-environmental behaviour is defined via its impact, it is a behaviour that leads to as little harm to the environment as possible or even affects it positively (Steg & Vlek, 2009). An intention focused definition on the other hand describes this behaviour as one which aims

to minimize one's negative impact on the environment (Kollmuss & Agyeman, 2002). The difference here lies between the actual outcome and the desired outcome. For a variety of behaviours there may be a discrepancy between those two aspects depending on context. Stern (2000) uses the example of US citizens avoiding spray cans with the aim of protecting the ozone layer even though due to regulations the spray cans did not contain any ozone destroying substances. Here, the behaviour is pro-environmental from an intentional perspective but not from an impact perspective. On the other hand, someone cycling to work rather than taking the car, with the only motive being that cycling may promote better health, does not classify as a pro-environmental behaviour from an intention perspective but does from an impact perspective. Thus, researchers have argued that both approaches are needed when assessing pro-environmental behaviour. The impact approach contributes to environmental changes while the intention approach contributes to behavioural change (Stern, 2000).

A further concern is the dimensionality of pro-environmental behaviours. Pro-environmental behaviours have a variety of facets, and different studies focus on different facets, often creating their own measurement tool ad hoc. This has led to over forty scales measuring pro-environmental behaviours, not all of which are validated. One scale, the Pro-environmental Behaviour Scale (PEBS) was specifically developed and validated to capture various facets of pro-environmental behaviour (Markle, 2013). The majority of studies focusing on pro-environmental behaviours regards their predictors in order to more effectively promote engagement with them. Some researchers have criticised this apparent lack of consideration of the structure of pro-environmental behaviours and proposed that the focus on predictors only has left two important questions unanswered (Larson et al., 2015): what behaviours should be considered "pro-environmental"? And to what extent should researchers distinguish between underlying groups of behaviours? Distinctions in behaviour groups become apparent from the range of pro-environmental behaviours from smaller household related behaviours, such as recycling to behaviours in the public domain that require more effort and may even have negative consequences for the people engaging in them. For example, several environmental activists have had to face legal consequences for their actions (Taylor, 2021). This, for many researchers, suggests that within the larger group of pro-environmental behaviours there are smaller groups of similar behaviours that

are called dimensions or domains. These dimensions are thought to depend on the difficulty of the levels of engagement of each behaviour, as well as a variety of social, individual, and contextual factors (Steg et al., 2013). For example, different behaviours may result from different motives (Lindenberg & Steg, 2007), or impact the environment more or less directly (Larson et al., 2015).

First attempts to measure and understand pro-environmental behaviours were unidimensional, meaning they viewed those behaviours as a unified group (Maloney & Ward, 1973). However, the current view of human behaviour is that it is too complex to be described in that way (Steg & Vlek, 2009). An early conceptualisation of the dimensionality of pro-environmental behaviours was proposed by Stern (2000). Stern differentiated between four types of what he called "Environmentally Significant Behaviour": (1) 'Environmental Activism', such as engagement with protests, as well as anything that could fall under the participation in social movements. This type of behaviour would count as highly committed (Gkargkavouzi et al., 2018). (2) 'Non-activist behaviours in the public sphere', including, for example, petitioning for environmental policies, or joining environmental organisations. These behaviours can be described as low commitment active citizenship since they are actions people take in their role as citizens by using the systems in place for political participation (Gkargkavouzi et al., 2018). Empirical evidence suggests that activism and non-activist behaviours in the public sphere are distinct behavioural domains (Stern, 2000). The third (3) domain is 'private sphere environmentalism'. Behaviours, such as recycling are household behaviours in the private sphere (Balzekiene & Telesiene, 2012). But this domain also includes consumer behaviours, such as the purchase of organic foods or the choice of energy provider (Stern, 2000). The final type (4) is 'other environmentally significant behaviours'. These are behaviours that may be specific to certain professional fields, such as engineers developing more environmentally friendly processes.

Other, newer, differentiations between dimensions tend to focus on two categories: personal practices and civic or environmental actions (Dono, Webb, & Richardson, 2010). These take up types two and three of Stern's suggested differentiation. Civic or environmental actions already show in their name that they refer to citizenship, just like Stern's non-activist behaviours in the public sphere. They include donating money, signing petitions, talking to others, participating in environmental organisations, etc. (Gkargkavouzi

et al., 2018). The differentiation between different groups of pro-environmental behaviour is psychologically meaningful (Stern, 2000). This has led to some researchers calling for the use of smaller scales rather than all-encompassing scales (Gatersleben, Steg, & Vlek, 2002). However, this focus on dimensionality is also criticised. Research has found that the dimensional space of pro-environmental behaviour is oblique (Kaiser & Wilson, 2004). This means that unlike Stern's (2000) idea of distinct and unrelated domains, the dimensions are related to one another. The study further found that while a multi-dimensional model of behaviour was statistically better than a unidimensional model, the difference was rather small. Thus, rather than viewing the dimensions of pro-environmental behaviour as a set of distinct groups of behaviour, which should be examined separately, an approach that recognises the behaviours as dimensional yet interrelated may be the most suitable. This approach still allows for the use of specified scales when appropriate for the research question (Kaiser & Wilson, 2004). In recent years, further research into the dimensionality of pro-environmental behaviours has gained popularity, often recognising the interrelated nature of the domains, at least in the research design, by using statistical methods suitable for oblique domains. Using this, Gkargkavouzi and colleagues (2019) have distinguished between six factors, including for example recycling and transport choices. Their research demonstrates one advantage of differentiating between the domains: Different predictor variables were shown to be more or less important for different domains. One disadvantage of examining domains separately may lie in a bias toward specific behaviours. Many studies focus on behaviours in the private sphere, often leaving other domains out and thus less understood. These private sphere behaviours are also referred to as personal practices or conservation lifestyle behaviours (Larson et al., 2015). They are umbrella terms to refer to any behaviour in the household setting that can possibly affect environmental sustainability. They are commonly examined due to being seen as universal actions, meaning that they are relevant to most people in their daily lives, and they tend to be publicly associated with environmentalism (Larson et al., 2015).

The focus here is on an individual's actions with the goal of a '*greener lifestyle*' (Gholamzadehmir, Sparks, & Farsides, 2019). This therefore opens up a discussion of environmental responsibility. Attempts to promote individual actions have been criticised as placing responsibility on individuals rather than bigger structural issues in society, often

indirectly blaming people with lower socio-economic status or people otherwise disadvantaged by our current societal structures. Those are the people who have least access to a green lifestyle and simultaneously also those who will suffer most from the consequences of environmental degradation. This power imbalance has repeatedly been pointed out: rich, privileged societies have most responsibility for climate change and most power to mitigate its effects, while the impacts affect poor and vulnerable societies first and most cruelly (Cuomo, 2011). For example, Cuomo (2011) discusses the case study of over 2000 deaths and 20 million displaced people, mainly women and children, after flooding in Pakistan (Patz, Campbell-Lendrum, Holloway, & Foley, 2005). However, this discussion rarely takes place within the academic field of environmental psychology but rather within other disciplines of humanities, such as philosophy, specifically ethics, or in non-academic publications (e.g., Cuomo, 2011; Fibieger Byskov, 2019; Koger & Winter, 2014). This does not mean that individual pro-environmental behaviours are not of importance but that they should be only considered with structural inequalities and a variety of levels of responsibility in mind. Responsibility can also be applied to corporations and governments (Cuomo, 2011). For example, a report has found that only 100 companies are responsible for 71% of global emissions since 1988 (CDP, 2017). These can be addressed through some individual action. For example, consumer behaviour might influence corporate behaviour and political behaviour might lead to governmental action. This approach is a way for behavioural psychologists to acknowledge different societal structures that carry responsibility, but a more explicit mention may also be required when discussing the topic.

While the consideration of environmental responsibility lies outside of environmental psychology, researchers have advocated for inclusion of domains outside of the private sphere in studies concerning pro-environmental behaviour. Especially civic actions should be included due to their possibly powerful influence on the environment (Larson et al., 2015).

With the public eye being on climate change rather than biodiversity loss, there is extensive existing research on general pro-environmental behaviours in environmental psychology as discussed above. Therefore, a more nature focused approach to human behaviour is needed. The distinction between pro-environmental and pro-nature conservation behaviours will be elaborated on in detail in chapter three. Since, so far, there

is very little research on nature conservation related behaviours, this thesis will have to rely on existing theories of pro-environmental behaviours and more general behaviours to then test whether these theories apply to pro-nature conservation related behaviours. Behavioural psychology can play a crucial role in changing people's personal behaviours and even in affecting policies and societal norms. However, psychologists might not have an insight into which behaviours are the most impactful in protecting and supporting biodiversity. Research on this often falls under the fields of ecology and conservation biology (e.g., Rundlöf, Persson, Smith, & Bommarco, 2014). Close, interdisciplinary collaboration is the key to creating a meaningful change.

Pro-environmental behaviours have been more and more carefully defined over the years by including both goal-based as well as impact-based approaches. Their conceptualisation has become to be understood as multi-dimensional, yet oblique in those dimensions. However, these conceptualisations have rarely been in the centre of research on pro-environmental behaviours. Instead, as mentioned above, the focus has been on how to encourage people to take action and engage in pro-environmental behaviours. The next sub-sections of the literature review will address a problem that is alluded to by this focus: The apparent lack of engagement with these behaviours and the resulting focus on explaining their antecedents.

2.3 Mind the Gap – when Values and Actions don't line up

Environmental issues, such as global warming, climate change and pollution are widely known and understood by the public (Park et al., 2012). Yet, engagement with environmentally friendly alternatives to harmful behaviours is rather low (Flynn, Bellaby, & Ricci, 2009). Due to the urgency of widespread engagement with pro-environmental behaviours, research has focused on exploring the cause of this lack of action.

This line of research on pro-environmental behaviours has brought attention to the so-called 'Value-Action Gap', a largely ubiquitous phenomenon, where people express concern about the environment but do not change their behaviours accordingly (Flynn et al., 2009). For example, researchers in the past have been unable to establish a link between attitudes towards recycling and participation in recycling schemes (Wang, Richardson, &

Roddick, 1997). While around 30% of people in the UK reported concern about environmental issues, market share of ethical foods was reported to be at only 5% in 2009 (Young, Hwang, McDonald, & Oates, 2010). Further, far more people report that they care about carbon emissions than there are people willing to change their habits to reduce their own carbon footprint (Whitmarsh, Seyfang, & O'Neill, 2011). This large disparity exists even when there are no perceived barriers to behavioural change (Van den Noortgaete & De Tavernier, 2014). The first to coin the term 'Value-Action Gap' were Kollmuss & Agyeman (2002) in their examination of probable causes of, and ways to bridge this gap. Ever since, this paradigm is the prevailing term and thus focus of research on pro-environmental behaviours. It is considered one of the most important behavioural barriers to climate change adaption (Gifford, 2011).

Kollmus and Agyeman (2002) alluded that, traditionally, knowledge was viewed as an important prerequisite of pro-environmental behaviour. This presumption was built on early, linear models of behaviour, which assumed that knowledge informed attitudes which in turn lead to behaviour (Allport, 1935; Kollmuss & Agyeman, 2002). Even though knowledge has since been shown to have little effect on actual behaviour (Frick, Kaiser, & Wilson, 2004), it remains widely regarded as a basis for behaviour change (Gifford, 2007). However, models attempting to explain behaviour have become more complex, accounting for a wider variety of factors. Since this first explicit mention of the Value-Action Gap research has built on existing models of behaviour but also investigated factors, variables, and even models specific to pro-environmental behaviour. Newer theories tend to acknowledge the complexity of behaviour as well as the specificity of pro-environmental behaviours by integrating existing models with each other (Wang & Yu, 2018). To get an overview of predictors of pro-environmental behaviours, the following sub-sections will start with general theories of behaviour and behaviour change. Then, more specific approaches to the antecedents of pro-environmental behaviour will be discussed.

2.4 Models of behaviour and behaviour change – an overview

Understanding and explaining human behaviour has been a key focus of psychologists for a long time. Research in that area has resulted in a multitude of theories and models

addressing both behaviour in general as well as specific behaviours (Prestwich, Kenworthy, & Conner, 2017). Theories, which are a systematic way of explaining and predicting events by illustrating the relationships between the factors influencing those events, are essential tools underpinning the development of behaviour change interventions (Davis, Campbell, Hildon, Hobbs, & Michie, 2015; Rimer & Glanz, 2005). Therefore, they are not only used in environmental psychology. Many theories are most commonly employed in health psychology, with some even being based on health behaviours, such as the Health Belief Model (Rosenstock, Strecher, & Becker, 1988). This is due to the important role health related behaviours such as smoking, physical activity, and diet play in the leading causes of death in many countries (Davis et al., 2015). However, especially the theories and models looking at behaviour more generally can be, and have been, also applied to environmental behaviours (Si et al., 2019).

Overall, 83 behaviour change theories have been counted (Michie, West, Campbell, Brown, & Gainforth, 2014). However, these often overlap and use the same or similar constructs (Prestwich et al., 2017). This sub-section will give an overview of the history of these theories and introduce some key concepts and models that are widely used today. Further, their use in environmental psychology will be outlined. Finally, criticism, as well as alternative and integrative ideas based on critique points, will be discussed.

Classical theories explaining behaviour are based on behaviourism. This means, they construe behaviour as being formed by outside influences rather than being innate (Prestwich et al., 2017). The focus here is specifically in learning behaviour through experiences. The two most prominent theories here are Operant Conditioning and Social Learning. According to Skinner (1953), behaviour is learned through operant conditioning. This means behaviour is formed by positive and negative experiences, such as reinforcements and punishments. Reinforcements which can be positive (a reward), or negative (taking away an adverse stimulus), encourage formation of a desired behaviour, while punishment is used to discourage undesired behaviour (Skinner, 1953). Bandura's (1971) Social Learning Theory on the other hand focuses on learning through imitation. Children observe the adults who play a significant role in their life and then imitate their behaviour (Bandura, 1971). This brings attention to the importance of social environment when examining behaviour. However, behaviourism has often been criticised for

discounting any inner states and subjective experiences (Moore, 1999). Nevertheless, they form an important groundwork for behaviour change theories. Many newer theories, while building on these, take a variety of cognitive and emotional factors of behaviour into account.

Bandura has further played a role in explaining behaviour by introducing the concept of self-efficacy (Bandura, 1978). In contemporary psychology, self-efficacy has played a central role in explaining a wide variety of behaviours (Vancouver, More, & Yoder, 2008). It is defined as people's confidence in their ability to solve a problem or accomplish a task (Bandura, 1994). This confidence in one's own abilities to achieve a goal affects people's actual abilities to achieve the goal (Bandura, 1978). Important here is the differentiation between self-efficacy and outcome beliefs. Self-efficacy only describes a person's confidence in executing a behaviour not whether they believe that the behaviour will have a positive outcome or significant effect on the goal of the behaviour (Bandura, 2006). Building on behaviouristic approaches, Bandura theorises self-efficacy to be formed by experiences and learning (Bandura, 1978). Self-efficacy is the key construct of Bandura's Social Cognitive Theory but has also frequently been used in other theories of behaviour by other authors. For example, it was added as an explanatory variable in the Health Belief Model, one of the prevalent models in health psychology (Rosenstock et al., 1988). Self-efficacy can be used as a general construct and measured as such. The Generalized Self-Efficacy Scale is a widely used measurement tool for this (Schwarzer & Jerusalem, 1995). Using self-efficacy in general as a 'one size fits all' construct has, however, been heavily criticised with the reasoning that people perceive themselves as having certain strengths but also weaknesses depending on the domain of a behaviour (Bandura, 2006). Instead, research often uses behaviour specific self-efficacy. Specific self-efficacy has often been shown to have a better predictive value for behaviours than generalised self-efficacy (Ajzen, 1988; Leganger, Kraft, & Røysamb, 2000; McAuley & Gill, 2016). Nevertheless, general self-efficacy is still used quite regularly in research in a range of psychological disciplines (Bradley, Browne, & Kelley, 2017; Fielding et al., 2016).

As such a widely used concept, self-efficacy has also been applied to several pro-environmental behaviours. Meinhold & Malkus (2005) found self-efficacy to moderate the relationship between pro-environmental attitudes and pro-environmental behaviours. It

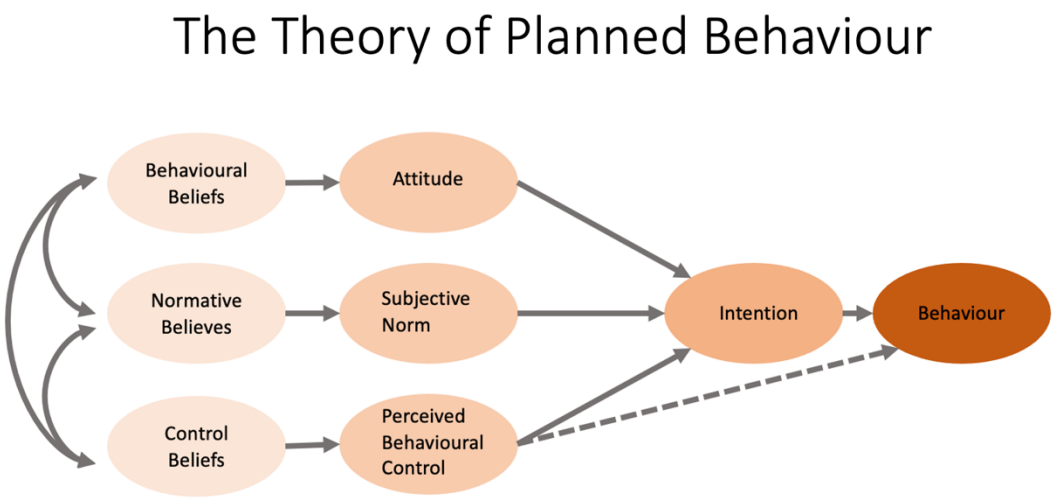
further has been shown to predict recycling behaviours (Tabernero & Hernández, 2011). When examining the effect of self-efficacy on pro-environmental behaviours, researchers have measured participants' perceived self-efficacy but some also added more specific questions which could be described as environmental self-efficacy (Meinhold & Malkus, 2005; Tabernero & Hernández, 2011). Climate change related self-efficacy has been found to indirectly affect a variety of pro-environmental behaviours through media use (Huang, 2016). Further, water protection related self-efficacy was identified as an important factor in encouraging especially more difficult or demanding behaviours aimed at protecting water quality by mediating a spill-over effect from easy to difficult behaviours (Lauren, Fielding, Smith, & Louis, 2016).

While self-efficacy is part of a variety of theories and models, it is, as shown above, often used as a construct independent from those models. There is also a variety of models that do not use self-efficacy explicitly but employ similar constructs. One example for this is the most widely used behaviour change model, the Theory of Planned Behaviour (TPB).

The Theory of Planned Behaviour (TPB) is based on the Theory of Reasoned Action (TRA) (Ajzen, 1991; Fishbein & Ajzen, 1975). In the centre of both of these theories is the idea that behaviour is determined by intentions, which in turn depend on a variety of social and cognitive factors (Prestwich et al., 2017). The TPB adds to the TRA in its consideration of a construct called Perceived Behavioural Control (PBC). This construct captures a similar essence as that of self-efficacy – so similar, in fact, that in the past there have been calls to replace PBC with self-efficacy (Schwarzer, 1992). The other two constructs influencing one's intentions are subjective norms and attitudes towards the behaviour. Subjective norms are an individual's perception of social pressure to engage or not engage in a behaviour (Ajzen, 1991). For subjective norms there is often an assessment of descriptive and injunctive norms. For descriptive norms, a questionnaire would ask whether other people engage in the behaviour, while for injunctive norms the question would be whether other people would approve of engagement with the behaviour (Ajzen, 2013). Attitudes towards a behaviour encompass a person's positive or negative appraisal and evaluation of a behaviour (Ajzen, 1991). When assessed, this can be as simple as a question about one's belief that engaging in the behaviour would be 'good' or 'bad' but might also tap into outcome beliefs (Ajzen, 2013). Each of the three predictor variables is thought to be

determined by beliefs. PBC is determined by control beliefs about the presence and absence of hurdles when attempting to engage in a behaviour, attitudes are formed through behavioural beliefs, including for example outcome beliefs, and subjective norms are a function of normative beliefs, meaning one's perception of existing norms and one's motivation to comply with those norms. A graphical depiction of the theory's model can be seen below (Figure 2.1).

Figure 2.1 *Visualisation of the TPB based on Ajzen (1991)*



The TPB has been successfully applied to a wide variety of behaviours (Armitage & Conner, 2001), includng pro-environmental behaviours. Reviews and meta-analyses have even named the TPB as a key theory explaining such behaviours (Klöckner, 2013; Li, Zhao, Ma, Shao, & Zhang, 2019). For example, one meta-analysis highlighted how the TPB impacts consumption of organic food (Scalco, Noventa, Sartori, & Ceschi, 2017). Recycling, energy saving, and traveling behaviours have also been studied through the lens of the TPB (Yuriev, Dahmen, Paillé, Boiral, & Guillaumie, 2020). And a few studies have even applied the TPB to a variety of nature conservation related behaviours, such as pollinator conservation, agriculture, and forestry (Knapp et al., 2020; Lalani, Dorward, Holloway, & Wauters, 2016; Primmer & Karppinen, 2010).

Regardless of the amount of empirical evidence supporting theories and models such as the TPB, there is a large body of criticism against them that points out several weaknesses. The most prominent criticisms raise concern about the correlational nature of studies supporting the TPB (Prestwich et al., 2017). Further, it assumes a variety of other variables to be of importance. Thus, utilisation of additional theories and concepts is necessary when applying the TPB (Si et al., 2019). Nowadays, the addition of variables to the TPB has become common practice in research, as it improves the predictive power of the model (Knapp et al., 2020).

Attempts to create more comprehensive models of behaviour have focused on the TPB's assumption that behaviour is intentional and that decisions are made consciously. This focus on deliberate cognitive factors is thought to lead to an unrealistic account of human behaviour (Hagger, 2016). Further the often-large gap between intention and behaviour supports the idea that intention as the predictor of behaviour is not sufficient (Hassan, Shiu, & Shaw, 2016). This gap is called the Intention-Behaviour Gap. Overcoming the Intention-Behaviour Gap is often the main goal of researchers and practitioners working in behaviour change (Hassan et al., 2016). Various integrated approaches addressing this gap use a dual-processing assumption. Dual-processing builds on the idea that information processing happens on two levels: a slower, 'reflective' (or 'explicit') level, which is intentionally accessed, drawing on knowledge of values and probabilities - as can be seen in the TPB, and a faster, 'impulsive' (or 'implicit') level, which is outside of one's awareness and builds on associations formed through past experiences (Hagger & Chatzisarantis, 2014; Sheeran, Gollwitzer, & Bargh, 2013).

These newer models paint a more complex picture of behaviours and behaviour change. When examining nature conservation related behaviours, the more modern approaches of integrating theories and supplementing with task or domain specific factors and constructs may be particularly valuable. Since there is very little research on nature conservation specific behaviours, key questions and constructs need to be borrowed from pro-environmental behaviours, especially in early research. An overview of the current discourse as well as a systematic approach to studying pro-environmental behaviours will be given in the following sub-section.

2.5 Borrowing from pro-environmental behaviours for a systematic approach to pro-nature conservation behaviour

Pro-environmental behaviour has been found to be explained by the more general models, at least to some extent, especially when those are subsidised with more specific variables. A variety of specific variables and even models have emerged over the past few decades and have been applied to a number of pro-environmental behaviours. This has led to a patchwork of variable combinations and more and more complicated models. In order to study nature related behaviours, these variables might prove to be of grave importance, but they can also present an unclear and confusing picture. Especially in early research on pro-nature conservation behaviours, a systematic approach is needed and can be borrowed from pro-environmental behaviours.

A systematic research agenda for pro-environmental behaviours has been laid out by Steg and Vlek (2009). Four steps for effective promotion of behaviour in order to close the Value-Action Gap have been identified based on Geller (2002):

1. Carefully select behaviours
2. Examine which factors cause them
3. Apply well-tuned interventions
4. Systematically evaluate the interventions

In the first step, the relevant behaviours need to be carefully selected and measured. Selected behaviours should significantly affect environmental quality but also be assessed regarding their feasibility and acceptability of consequences. While direct observations of behaviours would be an ideal measurement tool regarding reliability and validity, they tend to not be feasible, making self-reports of behaviour the most used and useful measurement technique. Some research supports the adequacy of self-reports (Fuj, Hennessy, & Mak, 1985). For the development of measurements for pro-nature conservation behaviours that fulfil the requirements for the choice of suitable behaviours as outlined above, a close collaboration between environmental scientists and psychologists is needed (Steg & Vlek, 2009).

The second step is the examination of factors causing the behaviours and will be the focus of the sub-section 2.7. Steg and Vlek (2009) identified three dominant lines of

research: the weighing of costs and benefits, moral and normative concerns, and affect. The third step is the application of well-tuned interventions which should be systematically evaluated in the fourth step. While this seems like a fairly simple and straightforward methodology, it consists of a multitude of steps each of which is straddling academic fields from environmental science over psychometrics, the science of measuring psychological constructs, to behavioural psychology. While research has accumulated and developed since Steg and Vlek described their key directions, they still play a role, and the area of affect has given rise to what is now seen as the most important explanatory variable for pro-environmental behaviour.

The third step of developing interventions should build on the second by acknowledging the antecedents of behaviour and working to enhance them. That said, one can identify barriers to the behaviour that emerge from research in the second step and work to remove them. The fourth and final step is the evaluation of these interventions. Experimental research designs can be used to assess the effectiveness of an intervention by comparing intervention groups with control groups. Especially long-term studies are of importance to ensure the sustained effectiveness of interventions.

The following sub-sections will go into more detail for the first two steps of this systematic approach, outlining and discussing the psychological standards for the definition and measurement of constructs, such as behaviour. The sub-sections regarding the second step will explore the three lines of research on predictors of pro-environmental behaviours and present some more recent insights in those fields.

2.6 Step 1: Defining and measuring behaviour

To systematically study a specific phenomenon, in this case a type of behaviour, it needs to first be clearly defined as a concept and transformed into something measurable. Reliable and valid measurement tools are essential for replicable and meaningful research (DeVellis, 2012).

To ensure that measurements of psychological variables have high quality and are useful in both research as well as practical settings, a whole branch of psychology has been developed, called psychometrics (Rust & Golombok, 2018). Psychometrics, the science of

psychological assessment covers characteristics of effective measurements as well as the methodology needed to achieve them. This is important as measurement quality can affect the quality of research results (Furr, 2014). While the assessment of people's skills and personality has a history of over 2000 years, modern psychometrics are based in more recent mathematical and statistical advances (Rust & Golombok, 2018). Nowadays, scales are used to measure behaviours, attitudes and personality traits, which are referred to as latent variables because they are assumed to not be assessable directly and through a single item (Boateng, Neilands, Frongillo, Melgar-Quiñonez, & Young, 2018). Therefore, often scales with a variety of items are used. The most common scale is a questionnaire scale. This is a collection of self-report questions (the 'items') where the responses are summed up to yield an overall score. The score should be indicative of the measured latent variables (Kyriazos & Stalikas, 2018). Behaviour rating scales have become one of the most common tools for assessing behaviour in a variety of contexts, such as research, but also in therapeutical or educational settings.

Scale development in this case becomes the act of assembling the most appropriate questions to assess the desired variables (Dorans, 2017). There is a large amount of different recommended procedure models for scale development, however all those models aim to maximise two characteristics of a scale: reliability and validity (Kyriazos & Stalikas, 2018; Rust & Golombok, 2018). Reliability is the degree of consistency a scale has (Porta, 2014). This can also be expressed as the effectiveness with which a scale measures only one variable (Rust & Golombok, 2018). A scale's validity on the other hand describes whether a test measures the latent variable that it was developed to measure (Raykov & Marcoulides, 2011). For both, reliability and validity, there are a variety of types and specific systematic development approaches used in scale development to test for and ensure each of these types (Streiner & Norman, 2008). Further, the dimensionality of a scale should always be assessed. While there are many differing procedure recommendations, there are several overlaps that can be summed up into some general methodological considerations (Kyriazos & Stalikas, 2018). These will be discussed in the following paragraphs.

Behaviour rating scales have become one of the most common tools for assessing behaviour in a variety of contexts, such as research, but also in therapeutical or educational settings (Hosp, Howell, & Hosp, 2003). They are popular due to their ability to

provide quantifiable information, which can be held to psychometric standards of reliability and validity, thus being useful when comparing people across groups, time or settings (Hosp et al., 2003). However, behaviour rating scales also have disadvantages, especially those that are self-report measures. Self-reports can suffer from inaccuracies caused by a variety of biases and other psychological factors. For example, often participants want to seem socially desirable (Mortel, 2008). This can affect the results, when participants give the response they think is "correct" instead of the response most accurate for them personally. Observational methods might be more accurate but also pose a variety of practical problems. For example, behaviour is seldom accurately measured by just one single snapshot in time, as it is about frequency, therefore requiring observations over a time frame (Bateson & Martin, 2021). Thus, self-report measures tend to have the advantage of easy and cheap administration (Lange & Dewitte, 2019).

There is some disparity between psychometric approaches when it comes to the exact number of developmental steps and their foci (Boateng et al., 2018; DeVellis, 2012; Furr, 2014; Kyriazos & Stalikas, 2018). Nevertheless, the general structure of scale development stays the same throughout various approaches. To begin with, the construct to be measured needs to be carefully defined and the need for a measurement scale should be justified (Furr, 2014; McCoach, Gable, & Madura, 2013). Following this, an item pool should be developed, including a response scale and careful wording of the items (Kyriazos & Stalikas, 2018). This pool then needs to be evaluated for content validity, usually by experts in the domain of the construct. Content validity considers whether the items sufficiently measure the construct they aim to measure (Hinkin, 1995). After this evaluation process, the item pool is further assessed through administration of the items to a sample of the target population. The resulting questionnaire scale is then psychometrically tested for various types of reliability and validity using several statistical methods (Boateng et al., 2018). In this step, researchers also examine the dimensionality of the scale. As described when discussing pro-environmental behaviours, behaviour is often multidimensional, meaning that there are underlying smaller groups of behaviour called latent factors. These can be extracted through a factor analysis (Kyriazos & Stalikas, 2018).

This often very detailed process of scale development is done to ensure a scale is reliable, valid, and easily administered to the target population, ensuring meaningful and

comparable research with potential for impact. Such research, when conducted systematically, should start by assessing the predictors of the behaviour in question. Predictors can range from general variables, as discussed in chapter 2.4, to behaviour specific factors. With the rather small amount of research on conservation specific behaviours, literature on pro-environmental behaviours may, again, be a useful source of relevant constructs.

2.7 Step 2: Environmentally specific predictors of behaviour

When the behaviour to be measured has been thoroughly defined and a reliable and valid measurement tool has been established, the predictors of said behaviour can be studied. While there is little to no research regarding nature specific behaviours, there is a multitude of research on the antecedents of pro-environmental behaviour using a wide range of factors. These factors have been grouped into three lines of research in the past, in an attempt to create an integrative review and systematic research agenda (Steg & Vlek, 2009). As described above, these three lines are the weighing of costs and benefits, moral and normative concerns, and affect. This sub-section will present variables and models in these three lines as presented in the original review, as well as some newer findings.

2.7.1 Costs and benefits

The area of weighing costs and benefits relies on models that conceptualise behaviours as reasoned choices. This would, for example, include the TPB, which is discussed in more detail in chapter 2.3, above. While there has been a large amount of criticism associated with the TPB, it has (as discussed earlier) been used to successfully explain a variety of pro-environmental behaviours, such as choice of travel mode, household recycling, and meat consumption (Bamberg & Schmidt, 2003; Harland, Staats, & Wilke, 1999; Kaiser & Gutscher, 2003).

2.7.2 Moral and normative concerns

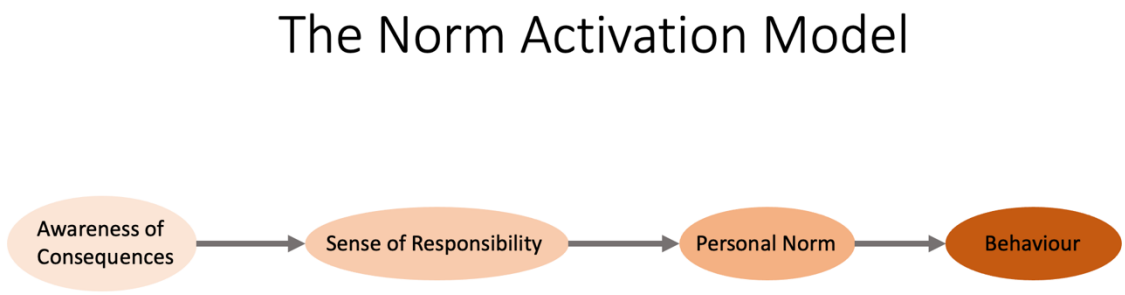
In moral and normative concerns, attitudinal factors and values can play an important role in explaining pro-environmental behaviours (Steg & Vlek, 2009). Steg and Vlek discern three sub-categories of these concerns: environmental concern, moral obligations, and subjective norms. Environmental concern, also referred to in other research as ecological worldview has repeatedly been found to be related to pro-environmental behaviours. An individual's ecological worldview consists of their primitive beliefs about the roles nature and humans play for each other (Dunlap, Van Liere, Mertig, & Jones, 2000). Ecological worldview is commonly measured with the New Environmental Paradigm (NEP: Dunlap & Van Liere, 1978). The NEP taps into five different components of ecological worldview, such as anti-anthropocentrism and fragility of nature's balance (Dunlap et al., 2000). This factor has been positively related to environmental behaviours (Davis, Le, & Coy, 2011) and has been at the centre of earlier research on pro-environmental behaviours, that started to look beyond knowledge as a predictor for behaviour (Stern, 2000). However, while there undoubtedly is an association between environmental concern and pro-environmental behaviours, the strength of this relationship is questionable if not weak (Steg & Vlek, 2009).

Some research differentiates between ecological worldview and environmental concern. Xiao, Dunlap, and Hong (2019) describe ecological worldview as the source of coherence in environmental concern. Environmental concern is in some respects similar to several questions of the NEP, especially those regarding environmental problems. But it focuses exclusively on concern about and awareness of ongoing environmental issues and their consequences (Steg & de Groot, 2012). This differentiation may be important for pro-environmental behaviours. The relationship between environmental concern and pro-environmental behaviours has often been found to be weak (Thøgersen & Ölander, 2006). However, recent research investigating different domains of pro-environmental behaviour has shown that environmental concern and ecological worldview might simply play more or less important roles depending on the behavioural domain. Gkargkavouzi and colleagues (2018), found that ecological worldview was especially predictive of environmental behaviours falling under the dimensions of civic actions, recycling, household behaviours and consumerism. Environmental concern on the other hand was a strong predictor for policy support and transportation choices. While the strength of ecological worldview and

environmental concern has been regarded as weak for over a decade now, especially the NEP seems to still be an important tool in research on pro-environmental behaviours, being used even in recent studies, some of which showing that its strength might be larger for certain behaviours.

The second sub-category of moral and normative concerns are moral obligations. Under this category some models such as the Norm Activation Model (NAM) and the Value-Belief-Norm theory (VBN) have been developed (Steg & Vlek, 2009). A meta-analysis in 2013 showed that up to this point those two models were the most commonly utilised models for pro-environmental behaviour after the TPB, with 39% of studies employing the TPB, 15% the NAM, 15% the VBN, and 13% a combination of variables from at least two of those theories (Klöckner, 2013). The NAM was first developed in relation to altruistic behaviours (Schwartz, 1977). It uses personal norms as a core variable determining behaviour: They are an individual's sense of moral obligation to perform said behaviour (Schwartz & Howard, 1980). Besides moral norm, two further concepts play a role: awareness of consequences and ascription of responsibility. An individual needs to be aware that performing or not performing a behaviour will have a desirable or non-desirable outcome and they need to have a sense of responsibility for the possible consequences (De Groot & Steg, 2010). The original authors did not elaborate on the formal structure of this model, resulting in various interpretations (Klöckner, 2013). Generally, awareness of consequences and ascription of responsibility are seen as prerequisites for the activation of personal norms (Klöckner, 2013). There is some evidence that it is a mediator model, with awareness of consequences being an antecedent of ascription of responsibility (De Groot & Steg, 2009; Onwezen, Antonides, & Bartels, 2013). This version of the model is displayed more clearly in Figure 2.2.

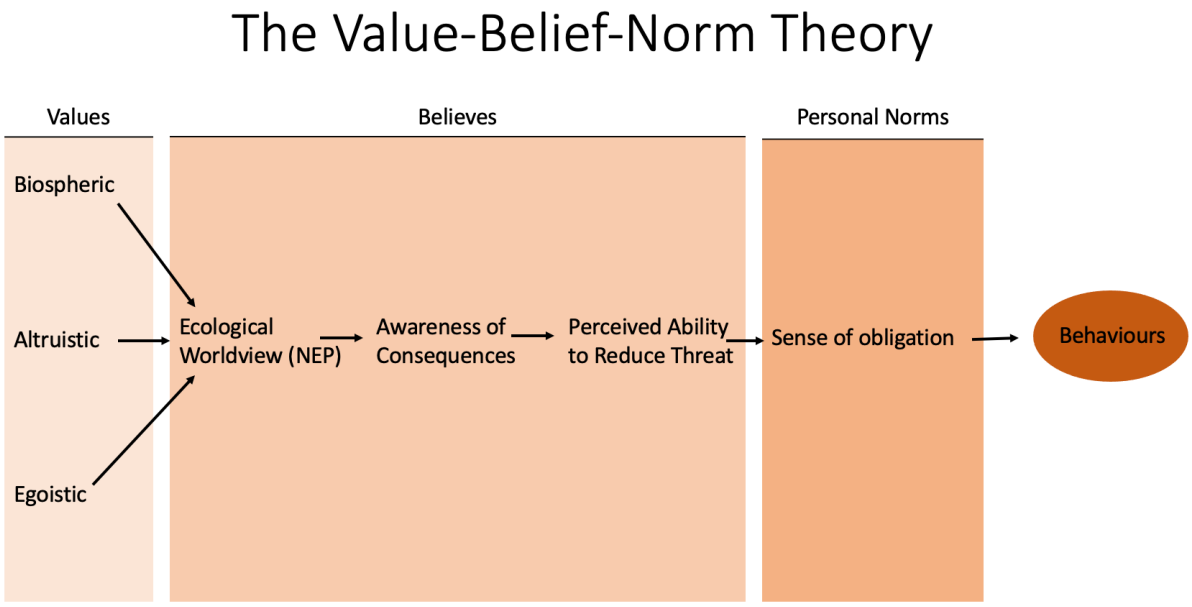
Figure 2.2 *Visualisation of the Norm Activation Model as structured by Onwezen and colleagues (2013)*



The VBN is based on the NAM and was developed by Stern in his conceptualisation of pro-environmental behaviours. It expands on the NAM by incorporating ecological worldview in the form of the NEP (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). In this theory, a sense of obligation is the direct predictor of pro-environmental behaviours. This sense of obligation in turn, depends on the concepts expanded on in the first sub-category of normative concerns: Values, specifically biospheric, altruistic, and egoistic values, are described to predict ecological worldview, measured with the NEP. The NEP is positively related to biospheric values, through which people place emphasis on whether something has benefits or costs for the environment, and altruistic values, where people place emphasis on costs and benefits of human groups, from communities to all of humanity (Stern & Dietz, 1994). Egoistic values, where cost and benefits for oneself are what matters, are negatively related to the NEP (Stern & Dietz, 1994). The NEP in turn is a predictor of the NAM variables, adverse consequences and sense of obligation with one's own ability being a mediator between those two (see Figure 2.3). These theories have mixed explanatory power (Bamberg & Schmidt, 2003; Steg, Dreijerink, & Abrahamse, 2005). Both have been criticised for not acknowledging other substantial variables (Gkargkavouzi, Halkos, & Matsiori, 2019; Klöckner, 2013). And they seem to work less in explaining repetitive behaviour (Klöckner, 2013). Some work has been undertaken to attempt an integration of those two models with the TPB and other variables, which has shown a high predictive power, supporting

integrative approaches over reliance on specific models (Gkargkavouzi et al., 2019). However, this was done specifically for private sphere behaviours. Public sphere behaviours may have different predictors (Gkargkavouzi et al., 2019).

Figure 2.3 *Visualisation of the Value-Belief-Norm Theory based on Stern (2000)*



The third sub-category of moral and normative concerns are social norms, which have been elaborated on in more detail in chapter 2.4, as part of the TPB.

2.7.3 Affect – how do people feel about nature?

When Steg and Vlek named affect as the third important line of research it was seen as a promising, relatively new approach. Especially behaviours with higher behavioural costs, such as car use, had been found to be significantly related to affective and symbolic factors (Gatersleben, 2007). Though, at the time, these investigations were exploratory and not theory based (Steg & Vlek, 2009). More recently, one specific affective variable has become an important focus of research on the Value-Action Gap and has shown the affective route to be important. This variable is nature connectedness. Nature connectedness is a psychological construct that, in addition to sense of self and cognitive beliefs, includes an individual's affective relationship to nature (Mayer & Frantz, 2004; Nisbet & Zelenski, 2013).

It can be defined as the perceived closeness in the relationship between an individual and nature (Mayer & Frantz, 2004; Otto & Pensini, 2017; Schultz, 2001). This means that people with high nature connectedness see themselves as a part of nature rather than apart from it. Those people also seem to be the ones most likely to engage in pro-environmental behaviours: Nature connectedness has been described as the strongest predictor of, or at least the most strongly associated concept to, pro-environmental behaviours (Otto & Pensini, 2017).

For a long time, people's love for and relationship with nature has been a recurring theme in the arts. For example, in the poetry of the period of romanticism starting in the late 18th century engagement with the beauty of nature is often portrayed as the key to happiness (ud-din sofi, 2013). In the past this apparent universal desire to connect with nature has been explained through the biophilia hypothesis, stating that humans have an innate affinity for nature (Kellert & Wilson, 1993). This innate affinity was theorised to be based in human evolution: throughout history, humanity was reliant on nature for survival but also needed to know and understand it to avoid threats (Kahn, 2011). Thus, humans were thought to have developed an innate emotional bond with nature, expressed through awe, reverence, and love, to help them easily learn to interact with it to survive (Gullone, 2002; Perkins, 2010). Currently, the focus on innateness has been replaced by research into learning through experiences. Also, the biophilia hypothesis is highly criticised for being difficult to verify (Kahn, 2011). Nevertheless, it has given rise to detailed research into the relationship between humans and nature and can be seen as an important base of the current knowledge of nature connectedness (Lumber, Richardson, & Sheffield, 2017). The concept of nature connectedness as it is used today is not uniform because it is a subjective and multi-dimensional construct (Nisbet & Zelenski, 2013; Tam, 2013). It combines cognitive, affective, experiential, and personality factors (Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009; Schultz, 2001). It does seem to boil down to one's concept of self and sense of belonging in relation to nature (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009). The common assumption here is that in post-modern western societies, there is a disconnect in this relation to nature going back to before the age of industrialisation. Since the 16th century, the dominant worldview in western society has been anthropocentric, leading to a disconnected relationship to nature (Merchant, 2006). This means, that nature

is seen as a commodity for humans, who are at the centre of the worldview, to make use of. Therefore, there is a call to reconnect humanity to nature (Lumber et al., 2017).

Research has focused on how exactly to enable people to connect with nature. While there is some evidence, that even simple contact or exposure to nature can foster a connection with nature, there are several routes that can be taken to deepen the emotional bond between humans and nature. These routes are called the five pathways to nature connectedness. The pathways consist of contact, emotion, compassion, meaning and beauty (Lumber et al., 2017). Contact refers to actively experiencing nature through all senses, for example listening to birdsong or touching a tree bark. The pathway of emotion requires people to evaluate how nature makes them feel, especially how nature makes them feel happy or in awe (Richardson et al., 2020). The pathway of beauty builds on the fact that humans seem to find beauty in various characteristics of nature and encourages people to engage through this, for example through art (Richardson et al., 2020). Meaning refers to the ways in which nature plays a role in our lives, for example through natural symbolism explaining more abstract concepts (Lumber et al., 2017). Finally, through compassion, people can take action to support nature. These pathways have been used in successful interventions aiming to enhance people's nature connectedness. For example, the three good things in nature intervention utilises the contact pathways by helping people actively use their senses to engage with nature and asking them to note down three good things they noticed every day for five days (Richardson & Sheffield, 2017). This also tapped into the pathways of beauty and emotion, by using related language in the instructions. The intervention was found to successfully help people to connect to nature.

Nature connectedness research plays an essential role in research on pro-environmental behaviours. In many studies, nature connectedness outperformed other variables or even full behavioural models such as the TPB (Otto & Pensini, 2017). Indeed, some academics go as far as calling it a necessary pre-requisite for pro-environmental behaviours (Frantz & Mayer, 2014). The importance of nature connectedness for pro-environmental behaviour has been confirmed by two recent meta-analyses (Mackay & Schmitt, 2019; Whitburn, Linklater, & Abrahamse, 2019). Another strength of this variable as a predictor is that its connection to pro-environmental behaviours is robust throughout

all stages of life from childhood to adulthood (Cheng & Monroe, 2012; Mayer & Frantz, 2004; Roczen, Kaiser, Bogner, & Wilson, 2014). It also leads to pro-environmental attitudes, which in turn increase pro-environmental behaviours through a will to sacrifice (Davis et al., 2011). One theory of how this relationship between nature connectedness, pro-environmental attitudes and pro-environmental behaviours works is that it provides an intrinsic motivation: If one perceives themselves as part of nature, then any harm to nature has a direct impact on oneself (Schultz, 2002). Thus, nature connectedness, while seemingly important as a standalone variable, might further be a potential concept helping to expand on value-based explanations of pro-environmental behaviour. Connectedness to nature might also play a similarly important role in pro-nature conservation behaviours. The relationship here may not be one-sided. Engaging in behaviours that aim to protect nature could help people to connect to nature via the compassion pathway. Similarly, if these behaviours take place in nature and are through active engagement with natural structures, they may activate the pathway of contact. Finally, even the pathway of beauty could be utilised when certain behaviours have a visible outcome, providing more biodiversity, which may be perceived as beautiful. Thus, the relationship between pro-nature conservation behaviours and nature connectedness might be shown to be interwoven or even circular. Through this, pro-nature conservation behaviours might also be connected to or even promote well-being. While this sub-section so far has focused on the relationship between nature connectedness and pro-environmental behaviour, there is another reason that research on nature connectedness has experienced a tremendous surge in interest over the past few years: Nature connectedness leads to a number of well-being benefits (Capaldi, Dopko, & Zelenski, 2014; Pritchard, Richardson, Sheffield, & McEwan, 2019).

A large body of research has considered the relationship between nature connectedness and wellbeing. Both hedonistic and eudaimonic well-being are consistently linked to nature connectedness (Capaldi, Passmore, Nisbet, Zelenski, & Dopko, 2015). Hedonistic well-being can be described as the feeling-good aspect of well-being while eudaimonic well-being presents the functioning well aspect of well-being (Keyes & Annas, 2009). Empirical studies have further found this link to be causal (McEwan, Richardson, Sheffield, Ferguson, & Brindley, 2019). And several well-being interventions have made use of this link successfully (McEwan et al., 2019; Richardson & McEwan, 2018). Using nature

connectedness as a way to encourage behaviour for nature can thus also act to improve people's well-being on a direct and individual scale in addition to ensuring human wellbeing through conservation of ecosystem services.

Research on pro-environmental behaviours has led to a vast number of models as well as separate variables that play an important role in explaining behaviours. These variables and models are not mutually exclusive. In fact, behaviour results from multiple motivations (Steg & Vlek, 2009). To understand pro-environmental behaviours, an integrative and flexible perspective is needed. Some models that used to be the gold-standard have become less important while other variables that used to be a promising perspective have taken the limelight. Sometimes integrating models may be more useful but for specific interventions a more focused lens on one or two variables may prove more practicable. These variables may also depend on specific behaviours. Especially between private and public sphere behaviours differences in predictors have been found (Gkargkavouzi et al., 2019).

Some predictors also lie outside those three lines of research. For example, even general demographic and socio-economic variables tend to play a role (Blankenberg & Alhusen, 2018). Women have been found to cross-culturally display more pro-environmental behaviours than men (Longhi, 2013). Older people tend to engage less in active behaviours but more so in home-based ones (Blankenberg & Alhusen, 2018). The lowest engagement with pro-environmental behaviours seems to be when people are around 30 years old, going back up for older ages (Longhi, 2013). Another factor that has been shown to be important and more impactful than variables such as income is education (Longhi, 2013). Higher education has a positive impact on engagement with pro-environmental behaviours (Johnson, Bowker, & Cordell, 2004). For some behaviours there are also differences between people depending on where they live: Especially in place-based behaviours there are evident disparities between urban and rural dwelling citizens (Huddart-Kennedy, Beckley, McFarlane, & Nadeau, 2009).

Pro-environmental behaviours seem to be highly complex (Darnton, 2004) and none of the large number of competing theories sufficiently explains these behaviours by itself (Anable, Lane, & Kelay, 2006). Therefore, there is often a focus on identifying key variables for pro-environmental behaviour rather than finding an all-encompassing model. In recent

years some factors have been shown to be particularly important in explaining behaviours in general, as well as pro-environmental behaviours specifically. While modern approaches to understanding pro-environmental behaviour are relying less on fully formed generalisable models, and instead turning towards specific variables, this does not mean that research does not need to be systematic. The systematic approaches to pro-environmental behaviour can provide an initial schedule for research on nature specific behaviours.

2.8 Conclusion and implications for this thesis

Biodiversity loss on earth has reached such a magnitude that it poses a threat to human well-being (Cardinale et al., 2012; Haines-Young & Potschin, 2012). Knowing that the causes of this biodiversity loss are anthropogenic gives us the chance to actively work to bring it to a halt, thus protecting and conserving nature (Maxwell et al., 2016; Mcdonald et al., 2008). This may seem like a simple enough statement, but its implementation requires work from a variety of academic and practical fields. To achieve long-term change in the way humanity impacts on nature and biodiversity, the wider public needs to adopt behaviours that support nature conservation and societal change. These behaviours therefore need to be firmly based in conservation science. However, just knowing which behaviours can be used to conserve nature is not sufficient. Human behaviour is complex, and behaviour change often takes enormous amounts of effort. While psychological research on nature specific conservation behaviours is sparse, there is a plethora of research on other behaviours ranging from health-related behaviours to pro-environmental behaviours. When studying nature specific conservation behaviours this research can be used as a base for conceptualisations but also for systematic research guidelines and predictors of behaviour. Nevertheless, a clear line between pro-environmental behaviour and nature specific conservation behaviour needs to be drawn. Conceptual theories on pro-environmental behaviours regarding definition via goal and impact as well as the dimensionality of behaviour may provide an essential approach to distinguishing pro-nature conservation behaviours from pro-environmental behaviours. There is important groundwork regarding the methodology and systematic approach to understanding pro-environmental behaviour, which can be used in research on nature specific behaviours as well. Especially the concept of nature connectedness is a promising factor that may have a close relationship with pro-

nature conservation behaviours. A review of literature on a wide range of behaviours has shown a difference in concept between different disciplines. In behavioural and health psychology, researchers attempt to close the Intention-Behaviour Gap. In environmental psychology there is focus on a gap as well, but it is the Value-Action Gap, as discussed. This opens up a question about whether only one of those gaps or possibly both apply to nature specific behaviours and where researchers and practitioners should lay their focus. A further question that can be carried over from pro-environmental behaviours is that of dimensionality: How does it apply to nature related behaviours? Are nature conservation specific behaviours unidimensional? Or are there different domains of behaviours that, while united by their common goal and impact have underlying psychological differences?

This thesis will apply the first two steps of the systematic approach suggested by Steg and Vlek (2009) to nature specific behaviours. First, these behaviours will be defined and conceptualised considering approaches also used in pro-environmental behaviours (see chapter 3.1). Then appropriate behaviours will be identified (see chapter 3.2). A measurement tool will then be developed (see chapter four). The second step according to Steg and Vlek is the investigation of predictors. Some initial exploratory research regarding the predictors of these behaviours will be carried out, using some concepts and variables from behavioural psychology as well as research into pro-environmental behaviours (see chapter five). To examine nature conservation specific behaviour, all those factors and models presented in the last two sub-sections may be a good starting point, since behaviours relevant for nature conservation may work similarly to pro-environmental behaviours. There are two further steps that look at interventions in the systematic approach. However, given the scope of a doctoral thesis, these steps will not be empirically included. Though based on this thesis' findings some recommendations are possible and will be discussed.

3 So, what can people do for nature?

3.1 Establishing the concept of pro-nature conservation behaviours

While, as explored in chapter two, there is an abundance of research on more general pro-environmental behaviours, as of yet, there is very little research on active behaviours that specifically support biodiversity conservation. Some research has considered conservation related behaviours and their determinants (Prévot, Cheval, Raymond, & Cosquer, 2018; Richardson et al., 2019). But each study assesses different behaviours, and the conceptualisation of these behaviours, specifically in relation to wider pro-environmental behaviours, is rarely considered. There is immediate need for a better understanding of pro-nature conservation behaviours, especially with recent research suggesting that these behaviours differ from general pro-environmental behaviours (Martin et al., 2020). The following paragraphs will build a rationale for examining pro-nature conservation behaviours separately from pro-environmental behaviours and define those pro-nature conservation behaviours. Further some of these behaviours will be introduced and discussed in relation to existing theory around pro-environmental behaviours.

In the development of a measurement scale, the definition of the construct to be measured is consistently named as the essential first step (Furr, 2014; Trochim & Donnelly, 2016). This is sometimes referred to as domain identification (Boateng et al., 2018). The construct should be defined as clearly and precisely as possible (DeVellis, 2012). It can also include specifics, such as ideas about internal structures, potentially relevant indicators, and external relationships with other constructs (Dimitrov, 2013). Further, in this step it should be clarified whether there is a need for a new scale: Do scales measuring the chosen construct already exist? Generally, no instruments that could serve the same purpose as the scale to be developed should exist (McCoach, Gable, & Madura, 2013). If scales do exist there may be a new scale needed because of theoretical or empirical advances (Kyriazos & Stalikas, 2018). If no scales exist, the research and/or market need for a scale should still be assessed (Kyriazos & Stalikas, 2018). After this prerequisite step, scholars recommend the generation of an initial item pool.

Before providing a definition of pro-nature conservation behaviours, their importance and role within environmental psychology needs to be established. Otherwise, they might be perceived as 'just the same' as or an unnecessary appendage to general pro-environmental behaviours, due to the interconnectivity of the issues of climate change and biodiversity loss. Both are major environmental problems, and counteracting climate change may also have a positive impact on nature conservation. This is due to climate change being one of the drivers of biodiversity loss (Cahill et al., 2013). However, especially on a more local level, there are behaviours that are purely specific to nature conservation and thus should be considered as pro-nature conservation behaviours, which are separate from more general pro-environmental behaviours, both from an ecological standpoint, as well as a psychological standpoint.

In order to achieve a psychologically and ecologically meaningful separation of pro-nature conservation behaviours and pro-environmental behaviours, both the aim and the impact of the actions are important to consider: Stern (2000) differentiates between two 'realities' of behaviour. A subjective reality, which refers to behaviours as means for people to achieve a goal, and an objective reality, which refers to the meaning of the behaviour and its consequences. As discussed in chapter 2.4, this has led to both a goal-directed and an impact-directed approach to pro-environmental behaviours. Kaiser and Wilson (2004) argue that researching environmental behaviours that are not goal-directed and therefore not tapping into the subjective reality component will not be psychologically meaningful. In contrast, behaviours with good intentions but no real impact on the ecosystem or biodiversity are of no interest to conservation practitioners. Therefore, when developing a definition of pro-nature conservation behaviours, it is important to address both realities in an inter-disciplinary manner. The behaviours falling under this definition should be tested using psychometric methods, but they must also be based in conservation biology and ecology, and reviewed by academic experts and conservation practitioners, to insure their impact. Further, pro-nature conservation behaviours must be clearly set apart from general pro-environmental behaviours on both the goal and the impact axis.

One could argue, that from a psychological standpoint, pro-nature conservation behaviours are merely another facet of pro-environmental behaviours and thus do not need to be classified and measured separately. The current consensus on pro-environmental

behaviour is that, while it is multi-faceted, the different dimensions of behaviour are all interconnected. However, some research into dimensionality supports both the need for more research on local nature-based behaviours as well as their possible separation from pro-environmental behaviours. Those behaviours, often revolving around direct local impact, for example on wildlife, are also called place-based behaviours (Larson et al., 2015). Those place-based behaviours are possibly a big part of pro-nature conservation behaviours and have been described as conceptually different from other pro-environmental behaviours, in some research regarded as its own group rather than a dimension (Halpenny, 2010). Evidence for this can be found, for example, in a study showing nature related behaviours to stand apart from pro-environmental behaviours in factor analyses (Martin et al., 2020). There is a call in environmental psychology for more research on these behaviours as they are seen to not be generalisable with other pro-environmental behaviours (Larson et al., 2015). Further, when taking a goal-directed perspective, one could argue that the differentiation in media coverage between climate change and biodiversity loss is likely to lead to different goals in relation to climate change and biodiversity loss (Legagneux et al., 2018). Thus, a differentiation between pro-environmental behaviours and pro-nature conservation behaviours is justified from a subjective reality perspective, especially regarding place-based behaviours, and further supported by direct calls for more research into these behaviours.

From an impact perspective this differentiation is also important. While there is some overlap between biodiversity loss and other environmental issues, they are often treated differently in the public eye, with the media focus being on climate change (Legagneux et al., 2018). However, especially when it comes to the practice of nature conservation, more specific behaviours than those generally regarded as pro-environmental behaviours may be needed. Indeed, conservation practitioners and researchers have shown interest in these more nature conservation specific behaviours, which are often not represented in pro-environmental behaviour scales. Several studies clearly expressed a difference between pro-environmental behaviours and nature conservation specific behaviours (Hughes, Richardson, & Lumber, 2018; Richardson et al., 2019). Research supported by the RSPB, one of the world's largest conservation organisations, referred to two types of behaviours: "pro-environmental behaviours focused on resource use and

energy saving, and pro-nature behaviours focused on wildlife- oriented actions" (Hughes et al., 2018, p.9). This distinction can also be found in research done in collaboration with and reports published by other conservation organisations (e.g., Richardson et al., 2019), showing a desire from conservation practitioners for a behavioural measure more specific to nature conservation. In fact, a study conducted in collaboration with the Wildlife Trusts lamented the lack of a measurement tool for nature conservation specific behaviours (Richardson, Cormack, McRobert, & Underhill, 2016). This lack of focus on more biodiversity specific behaviours has also been pointed out from an academic point of view by Prevot and colleagues (2018). Some studies have examined conservation related behaviours and their determinants, as well as possible communications and interventions (Prévot et al., 2018; Richardson et al., 2019). Similar to the psychological component, especially place-based behaviours seem to play a key role. Ecologists have, for example, pointed out the importance that private gardens can play for nature conservation specifically (Gaston, Smith, Thompson, & Warren, 2005).

There is evidence supporting a separation of pro-nature conservation behaviours from pro-environmental behaviours from both a goal as well as an impact perspective, even when considering the multi-dimensional nature of pro-environmental behaviours. Further, there is an established need for more research into pro-nature conservation behaviours. However, there is no consensus on which behaviours should be included in this research. In addition, a variety of different terms have been used to describe these behaviours, from pro-nature behaviours (Hughes et al., 2018), over pro-biodiversity practices (Deguines, Princé, Prévot, & Fontaine, 2020), to conservation engagement (Massingham, Fuller, & Dean, 2019). For scientific research into pro-nature conservation behaviours, validated and established measurement tools play a key role (Lange & Dewitte, 2019). Thus, a clear definition of the group of behaviours and carefully chosen behaviours to form this group are essential for comparable and impactful research in this field. This definition, choice of behaviours, and development of a measurement tool for the behaviours is the first step to a systematic research approach for pro-nature conservation behaviours (Steg & Vlek, 2009).

The term "nature conservation" needs clarification. While the term "conservation" often refers to nature conservation, it can also refer to the conservation of resources (e.g., water) or built heritage. In fact, the term "conservation behaviours" is often used to refer to

general environmental behaviours or resource conservation specific behaviours (Barr, Gilg, & Ford, 2005). Thus, the term "nature conservation" is used in this thesis. This is a widely used term by leading nature conservation organisations, for example by the RSPB and the UK government (GOV.UK, n.d.-a; RSPB, n.d.-b). These organisations see nature conservation as a response to the decline of biodiversity and seek to protect species, particularly wildlife, and habitats. The use of this phrase as apart from more general environmental protection is also in line with the history of the conservation movement in the UK, which clearly sets it apart from the newer environmental movement looking at wider environmental issues (D. Evans, 1991). For clarity, the term nature conservation is used rather than 'conservation' alone. The addition of the word 'pro' is due to the same argument as the addition of the word pro in pro-environmental behaviours: It adds a clear direction of support (Gkargkavouzi et al., 2018).

Considering the discourse on the approaches to defining pro-environmental behaviours, pro-nature conservation behaviours were defined as:

"Positive actions that aim to support nature conservation goals and have ecological impact on nature conservation"

This definition includes both a goal-based and an impact-based approach to pro-nature conservation behaviours. They are, through this definition, set apart from general pro-environmental behaviours, which are often positive inactions that indirectly impact wildlife via the reduction of, for example, one's carbon footprint or water use. Thus, with many pro-environmental behaviours there is a focus on avoidance of certain behaviours, such as meat consumption, car use, high electricity use or water wastage (Markle, 2013). This is also set in some definitions of pro-environmental behaviours, for both the goal and impact directed approaches. One impact-based definition states that pro-environmental behaviours "harm the environment as little as possible or even benefit it" (Steg & Vlek, 2009, p.309). And a goal directed definition uses the wording "consciously seek to minimize the negative impact of one's actions" (Kollmuss & Agyeman, 2002, p.240). Both these definitions are emphasising a reduction of harm to rather than an active support for the environment. Whether a more active and supportive definition of pro-nature conservation behaviour would be an indicator of a psychological difference in the behaviour is not clear,

but it defines a more ambitious goal. The drivers of dimensionality in pro-environmental behaviours are often based on effort needed to engage in a behaviour (Gkargkavouzi et al., 2018). This supports the idea of more active behaviours being separate from more passive behaviours.

Various conservation organisations already encourage some behaviours for wildlife and biodiversity conservation (The Wildlife Trusts, n.d.). However, some of these behaviours fall under pro-environmental behaviours, and for others their impact on biodiversity needs to be considered. The pro-nature conservation behaviours that were considered in this thesis were chosen based on research in the field of conservation biology and ecology, as well as opinions of subject matter experts. Ecologists have highlighted the importance of green spaces in urban areas as important wildlife habitats (Goddard, Dougill, & Benton, 2010). A large proportion of these green spaces is made up of private gardens, thus giving garden owners the possibility to support wildlife in their own homes (van Heezik, Dickinson, & Freeman, 2012). Simple changes to domestic gardens have the power to increase native biodiversity (Gaston et al., 2005). However, not everyone has access to a garden, especially people from lower income groups may be affected. This does not mean that those people cannot engage in pro-nature conservation behaviours. Behaviours regarding political participation for example are more widely accessible and can have an important influence on public policy decision making and social change (Bullard & Johnson, 2000).

In pro-environmental behaviours some conceptualisations of the dimensionality of the behaviours differentiate between private sphere and public sphere behaviours (Stern, 2000). Private sphere behaviours often take place in one's individual household while public sphere behaviours regard action people take in their role as citizens (Stern, 2000). Similar to pro-environmental behaviours, people can engage in pro-nature conservation behaviours in both the private and the public sphere. For example, gardening behaviours take place in the private sphere but there are many civil actions that can be taken in support of nature conservation as well.

The difference between private and public sphere behaviours addresses the highly debated question of responsibility and moral obligation. Many studies on pro-environmental behaviours focus on private sphere actions. This emphasises the actions

individuals should undertake and therefore shifts the moral obligations to the individual. While individual actions are important and everyone who has the means to engage in individual action should do so, wider structural changes in our society are essential. To achieve this, there needs to be a collective responsibility (Sinnott-Armstrong, 2005). A recent report highlighted that, since 1988, 100 companies have been responsible for 71% of global emissions (CDP, 2017). Changing the way these companies operate may therefore, by far, have a larger impact than individual behaviours. Some experts argue that individuals can influence these companies through private sphere behaviours, such as consumption choices (Starr, 2016). However, eco-friendly consumption choices are often more expensive than other choices and are therefore not attainable for many people (Green & Peloza, 2011). Public sphere activities can help acknowledge that conservation is a collective responsibility and achieve structural changes in society and large corporations, for example through political participation or activism. Including these behaviours in pro-nature conservation behaviours further acknowledges that some private sphere behaviours especially around gardening may not be accessible to everyone. An inclusive approach to pro-nature conservation behaviours that places emphasis on accessibility is important if wider societal change is the goal. Thus, both public and private sphere actions are included in the construct of pro-nature conservation behaviours as presented in this thesis. The following paragraphs will outline some key behaviours in each sphere.

Within the private sphere, many pro-nature conservation behaviours are related to gardening. Conservation work has started capitalising on green spaces in urban areas as important wildlife habitats (Goddard et al., 2010). A large proportion of these green spaces is made up of private gardens, thus giving garden owners the possibility to support wildlife in their own homes (van Heezik et al., 2012). Behaviours that support local wildlife in one's garden can include, for example, planting a tree or maintaining a wildlife friendly pond (Gaston et al., 2005). Several gardening practices have been shown to have a significant positive impact on nature conservation, such as planting pollinator friendly plants or leaving a wildflower patch (Prévot et al., 2018). This has a high importance considering that animals who contribute to pollination are particularly affected by the biodiversity decline (Hallmann et al., 2017; Oliver et al., 2015). As mentioned above, gardening behaviours may not be accessible to everyone. However, behaviours in the public sphere, such as political

participation, tend to be more accessible and still have considerable impact. For example, in the US, the election of pro-environmental state representatives has been linked to a decrease in carbon emissions when compared to states with non-pro-environmental representatives (Dietz, Frank, Whitley, Kelly, & Kelly, 2015). Political participation can include behaviours such as voting and communicating with officials (Uhlaner, 2015). Public sphere behaviours may also include other, less political behaviours that fall under what Stern (2000) classes as environmental citizenship. Similar to pro-environmental behaviours, petitioning and volunteering may constitute important aspects of pro-nature conservation behaviours.

Research suggests that there is a gap in the current discourse regarding nature conservation specific behaviours, from both an impact-directed and a goal-directed approach. Pro-nature conservation behaviours, defined as "*Positive actions that aim to support nature conservation goals and have ecological impact on nature conservation*", should be systematically approached from both an ecological and a psychological perspective relying on existing theory for pro-environmental behaviours and psychometrics. The next step after the creation of this definition is the consideration of which specific behaviours belong to this group of behaviours. Oftentimes, when the need for research on pro-nature conservation behaviours is discussed, researchers are referring to place-based behaviours, such as gardening practices. While these have been shown to play an important role in creating habitats for local flora and fauna, there are other behaviours that need to be considered. Models of the dimensionality of pro-environmental behaviour as well as wider discussions around the responsibility and efficiency of sustainable change put a different group of behaviours: behaviours in the public sphere, especially regarding citizenship. Both public and private sphere behaviours should be included in an inclusive approach to pro-nature conservation behaviours. To ensure that the behaviours that are examined in the study of pro-nature conservation behaviours fulfil both the goal-directed and the impact-directed part of the definition, expert reviews and a psychometric evaluation of possible behaviours is needed. The following sub-section will give an overview of behaviours that can fall under this definition and are assessed by experts on their impact on nature conservation.

3.2 An Expert Ranking of Pro-Nature Conservation Behaviours for Public Use

3.2.1 Introduction

Pro-nature conservation behaviours play an important role in the efforts to halt the ongoing mass extinction and to support the restoration of wildlife (Ceballos et al., 2017). Therefore, restoration centred conservation programmes should include assessment of, and efforts to increase pro-nature conservation behaviours, which can be undertaken by the general public. Such behaviours can enhance wider scale actions, for example the creation of reserves or designation of protected species. The first step to systematically researching such behaviour is the careful selection of the behaviours to be included in that research (Steg & Vlek, 2009). The previous chapter formed a crucial part of this step by providing a definition based on conceptual intricacies of pro-environmental behaviour and by mapping out two spheres that can be drawn on when collecting possible pro-nature conservation behaviours. However, for pro-nature conservation behaviours to become a useful tool within conservation, they need to fulfil a variety of conditions. Most importantly, they need to be, as indicated in their definition, ecologically impactful. But also, they need to be accessible and well communicated to the public, as these behaviours will only become impactful when the general public engages in them. This chapter will provide an expert ranked list of pro-nature conservation behaviours that are suitable for the wider public in the UK and Western Europe. This list can then be used as a long list of behaviours to further assess the behaviours for the psychological components of the definition and to create a measurement tool for future research. In addition, this list can also be used by conservation practitioners who are looking to encourage these behaviours.

There is opportunity for people to act upon conservation in various ways (Prévot et al., 2018). As explored in chapter 3.1, actions can be taken for example in people's gardens at home but also within the public sphere. Recently, there has been an increase in demand for action on nature conservation following recent press coverage of the loss of wildlife. Programs like Blue Planet II (Honeyborne & Brownlow, 2017) heighten the general public's awareness and concerns about environmental damage caused by humans and its consequences. Nevertheless, ecologists have noted the public's inexperience with these actions, for example in managing gardens for biodiversity (Goddard, Dougill, & Benton, 2013).

This discrepancy between expert and public opinions has been explored for other environmental behaviours as well (Larson et al., 2015). In these cases, it has led to a discussion of whether lists and measurements of these behaviours should be based on expert opinion or lay opinion. The consensus is that measurements based on expert judgement are often preferable (Larson et al., 2015). The definition of pro-nature conservation behaviours includes both an objective approach and a subjective approach. Assessing each of these approaches lies within different expertise areas. Before looking at psychological intricacies such as goal-direction and dimensionality in this thesis, the objective reality needs to be addressed first, as this is outside of my expertise as a psychologist. The objective reality concerns the ecological impact of the behaviours and therefore needs addressing through a review by conservation experts. With the aim of not only setting a list of potential pro-nature conservation behaviours for research but also providing clear recommendations for the public, this chapter explores various behaviours that can be adopted to support conservation in people's every-day lives. For this chapter, ecologists and conservation professionals gave their opinions on a list of behaviours directed at wildlife conservation, to create an accessible resource.

Several pro-nature conservation behaviours that may be of importance were considered in chapter 3.1. Researchers and conservation organisations see a great opportunity in gardening and land management behaviours in particular (Goddard et al., 2010). Conservation friendly gardening practices demonstrate how pro-nature conservation behaviours can start in people's homes and gardens. Several behaviours that were collected for the list therefore focused on behaviour changes in that area. Furthermore, since agricultural practices are a major factor associated with biodiversity loss (Norris, 2008), the wording of those behaviours was designed to also tap into land use, thus addressing people with gardens, landowners, and farmers. However, when considering pro-nature conservation behaviours for the general public to engage in, one needs to be aware that not everyone has the privilege of access to a garden or land. Therefore, behaviours from other areas of life that have a positive impact on biodiversity also need to be included. In this context, civil actions play an important role (Christmas et al., 2013). For example, the citizens of a country can influence its pro-conservation policies through voting and raising awareness (Koger & Winter, 2011). By including those different types of behaviours, pro-

nature conservation behaviours fall in line with the idea of private sphere and public sphere behaviours. There can be private sphere behaviours that do not require a garden, for example feeding birds may be possible without access to a garden, for example through feeders that adhere to windows.

The study presented in this chapter aimed to create a list of pro-nature conservation behaviours based on an expert review of positive impact on local, regional, or national wildlife biodiversity. Such a list could facilitate unambiguous and unanimous encouragement of these behaviours for the general public by conservation organisations or governing bodies. The list of behaviours collected for this study covered a wide range of behaviours, from gardening and land management to civil action. This list was then reviewed by experts, who rated every behaviour on its meaningfulness with regards to ecological impact. Further, experts provided written feedback on the list.

3.2.2 Methods

Participants

70 experts from different practical and academic conservation backgrounds answered an online questionnaire. Most respondents were UK based, with one respondent from Germany. Experts were contacted through contacts of the researcher and supervisors but also through the Wildlife Trusts who shared the questionnaire with experts they deemed important. Thus, a wide range of expertise was represented by the participants, including, for example, conservation practitioners working in the areas of policy, conservation education, habitat protection and management, as well as researchers in the areas of conservation, conservation biology, and zoology. Out of the 70 experts, 30 provided verbal feedback. All participants gave informed consent.

Materials

The online questionnaire was produced and distributed via Qualtrics, an online survey distribution provider. The longlist of behaviours, which was reviewed in this study, contained a total of 48 behaviours divided into three categories: At home and in nature (10),

civil actions (16), and gardening and land management (22). Each behaviour was expressed as a statement in first person singular (e.g., "*I maintain a wild-flower area"*).

Procedure

A long list of behaviours was put together based on an informal review of literature including academic literature regarding the efficacy of certain behaviours, as well as behaviours examined in studies on pro-nature conservation behaviours that had not worked with a thoroughly conceptualised definition of these behaviours yet (e.g., Deguines et al., 2020). Further, calls to action from experts and activists as well as conservation organisations, such as the Wildlife Trusts were considered (e.g., The Wildlife Trusts, n.d., 2021). A group of conservation experts was then contacted via e-mail. The e-mail included a short explanation of the study and a link to an online survey. The online survey first asked the participants to name their area of expertise and how or why they were experts in that area (academic, practical, etc.). Then a definition of pro-nature conservation behaviours was given: "*We define a pro-nature conservation behaviour as a positive action that has impact on local wildlife (rather than a positive inaction that has an indirect impact on wildlife conservation via reduction of e.g., the carbon footprint, water use, etc.)*". This is a slightly different definition to the one used in this thesis. However, since the review was done by conservation experts rather than environmental psychologists, the objective of this given definition was not to enclose both a subjective and objective reality but rather to clearly communicate that the behaviours should be assessed by their impact and that they should not be part of wider environmental behaviours. The definition was followed by a more detailed explanation of why certain pro-environmental behaviours, such as decreased meat consumption, were not included on the list even though they might have an indirect impact on wildlife conservation as well: Positive inactions that focus on the reduction of water use or CO2 production are related to broader environmental issues and usually captured in general pro-environmental behaviour lists, the list of pro-nature conservation behaviours focuses on active behaviours that are specific to nature conservation.

The participants were then presented with the long list and asked to indicate for each behaviour whether they believed it was an important pro-nature conservation behaviour with strong potential for ecological impact. The answer possibilities were *yes*, *no*,

and *I don't know*. The behaviours were separated into three categories based on accessibility of the behaviours, but also some more general grouping based on known dimensions of pro-environmental behaviours: 'Gardening' - only for people with access to a garden, 'At home and in nature' -private sphere behaviours probably accessible for people with no garden and 'Civil action' - public sphere behaviours. Further, since this long list is a base for a measurement, some behaviours were reverse coded, which is often recommended for measurement scales (Furr, 2014). This was clearly signed for each of the behaviours and the meaning and use of reverse coding had been previously explained to the experts. After rating the behaviours, participants had the possibility to give written feedback about specific behaviours or the list in general. This was included to allow for behaviours that might have been overlooked when originally creating the list to be included but also for experts to have the choice make a further point about why they rated certain behaviours in a specific way allowing for a more differentiated evaluation of the rating. For the full long list as well as the instructions given to the experts see Appendix B.

3.2.3 Results

Some of the qualitative feedback indicated that experts had an issue with the reverse coding. It seemed to lead with some confusion about the 'correct' way to answer whether they were impactful. To avoid confusion in the results, originally reverse coded items were rephrased to fit a positive impact on nature conservation.

Ranking

For each behaviour the percentage of participants voting for the behaviour to be an important pro-nature conservation behaviour was calculated. This percentage varied between behaviours from 28.99% to 97.14% (M=76.35). Then, the behaviours were ranked by this percentage from highest to lowest. This was done for each category of behaviours (At home and in nature/ Civil Actions/ Gardening and land management). The ranked lists can be found in Tables 3.1-3.3.

Table 3.1 *At home and in nature behaviours ranked by the percentage of SMEs who rated the behaviour as important (% yes)*

Rank	Behaviour	% yes
1	Install a nesting box for birds	92.75
2	Install a bat box	86.96
3	Provide food for animals	86.57
4	When walking in nature, try to avoid disturbing wildlife	85.71
5	Provide water for animals	80.60
6	Pick up litter	79.71
7	Compost at home	58.82
8	Move insects rather than killing them when finding them at home	57.97
8	Move small animals when finding them on a road	57.97
9	Avoid using insect repellents	45.71

Table 3.2 *Civil actions ranked by percentage of SMEs who rated the behaviour as important (%yes)*

Rank	Behaviour	% yes
1	Volunteer with a conservation organisation in the area of land management work	95.71
2	Volunteer with a conservation organisation in the area of surveying (e.g., garden bird watch/ bio-blitz/ etc.)	92.86
3	Support conservation friendly legislation (e.g., for agriculture, hunting, etc.) by voting for them when given the opportunity in local or national referendums/votes/etc.	86.96
3	Get in touch with local authorities about conservation issues and solutions	86.96
4	Vote for parties/ candidates with strong pro-conservation policies in elections	86.36
5	Talk to other people about the importance of wildlife conservation	82.86
6	Donate money to a conservation organisation	80.00
7	Participate in clean-up events	78.57
8	Attend local council/local authority meetings about conservation issues	76.81
9	Hold a membership with a conservation organisation	72.86
10	Volunteer with a conservation organisation in another area not mentioned above	71.01
11	Volunteer with a conservation organisation in the area of fund raising	70.59

Rank	Behaviour	% yes
12	Sign petitions supporting conservation efforts	68.57
13	Join activist activities (e.g., demonstrations)	67.14
14	Share posts and articles about conservation on social media	62.86
15	Go to talks/ watch documentaries about nature conservation issues or I otherwise educate oneself on the topic	49.28

Table 3.3 *Gardening and land management behaviours ranked by the percentage of SMEs who rated the behaviour as important (%yes)*

Rank	Behaviour	% yes
1	Plant pollinator friendly plants	97.14
1	Leave an undisturbed/ unmaintained area for wildlife	97.14
2	Install features that allow small mammals to pass through my garden/ land without problems	97.10
3	Maintain a wild-flower area	94.29
3	Avoid using insecticides	94.29
4	Maintain a wildlife friendly pond	92.86
4	Leave log piles or other materials that can be used as a home/ shelter by animals	92.86
5	Install a bee hotel	86.96
6	Maintain plants with berries/fruits	85.71
7	Install a hedgehog home	84.06
7	Plant native plants	84.06
8	Plant plants with different flowering seasons	82.86
9	Plant a tree	75.36
10	Avoid removing hedges	72.46
11	Avoid using weed killer	70.00
12	Avoid installing artificial turf	69.12
13	Avoid using synthetic fertilizer	65.71
14	Avoid using paving slabs/ otherwise exchanging green space for artificial alternatives	65.22
15	Avoid cutting down pre-existing trees	57.97
16	Avoid keeping the lawn neat and tidy	49.28
17	Avoid planting exotic plants	45.59
18	Rotate the annual plants and crops each year	28.99

Written Feedback

30 participants provided comments on the list of behaviours, as well as wider issues related to wildlife conservation. The comments consisted of criticism regarding specific behaviours, general remarks about the list, and ideas for new behaviours or changes to existing behaviours. Overall, several experts mentioned that they were happy with researchers approaching this project because they saw it as an important gap in existing work. Further a general feeling that the long list was apprehensive was expressed.

Some participants mentioned specific behaviours that they felt did not necessarily have a conservation impact. These mentioned behaviours tended to be behaviours ranking towards the bottom of the list, with a low percentage of participants indicating them as impactful. For example, several comments mentioned the potential benefits of exotic plants for pollinators. This means "A*void planting exotic plants*" might not belong on a list of pro-nature conservation behaviours. Further behaviours that were criticised were: "*Avoid keeping the lawn neat and tidy", "Avoid cutting down pre-existing trees", "Avoid removing hedges", "Avoid using paving slabs".* The experts' reasoning why these behaviours are not strong pro-nature conservation behaviours was quite consistent across behaviours and participants, which brought up a possibly more general issue. All these behaviours were identified as being dependent on context and balance. For example, some commentators mentioned that tree or hedge removal can be pro-conservation if, for example, a leylandii hedge (an example used by this specific commentator for invasive species that may have adverse effects on native flora) is removed, or a plantation of trees is removed to restore the habitat that previously existed in that location. Similarly, it was stated that a neat lawn can still provide opportunities for biodiversity, especially if paired with wildflower patches. This idea of balance or combination of features was mentioned several times. For example, some experts argued that the instalment of paving slabs or the maintenance of a neat lawn (as highlighted above) were not inherently bad for conservation, as long as they didn't cover the majority of a piece of land. The written criticism is in line with these behaviours being rather low in the ranking and scoring relatively low percentages of agreement on being essential for the list.

Avoiding removal of hedges was the highest ranking of these behaviours, with 72.46% of participants rating the behaviour as an essential pro-conservation behaviour. One expert indicated that this behaviour could be expanded and should include more specific details. The suggested specific behaviour was not cutting hedges in spring/summer when birds are breeding. Including this behaviour rather than the original one might be a solution that accounts for all comments regarding hedges and its status as the highest-ranking behaviour of the criticised behaviours. Trimming hedges is also legislated but not always very clearly, and especially homeowners might be unaware of these regulations (Department of the Environment, 1997). Changing "*Avoid removing hedges"* to *"Do not cut/trim hedges during bird breeding season (March-July)"* helps to have a clearly defined behaviour that does not have ambiguous impact on conservation.

As indicated with hedgerows, there were a few other instances where more specificity was called for as the impact of some behaviours might depend on context and factors related to the behaviour. For example, with the behaviour "*When walking in nature, try to avoid disturbing wildlife"*, three experts indicated that these disturbances were mostly due to dogs, making it worthwhile mentioning dogs specifically. Therefore, the behaviour has now been adjusted to: "*When walking in nature alone or with a dog, try to avoid disturbing wildlife".*

Some behaviours, which were not on the longlist were mentioned repeatedly as essential for wildlife conservation. These behaviours were 'reduced meat consumption (or vegetarianism/veganism)' and 'water use'. It was decided prior to creating the longlist not to include those behaviours because they were positive inactions, which had a more general impact on the environment and were about reducing harm rather than directly and proactively helping wildlife. Another comment given by several experts included concerns over the list of behaviours in its collective. Remarks suggested that a large proportion of the pro-nature conservation behaviours may require prior knowledge of the topic. One way to include that into the list would be the behaviour "G*o to talks/watch documentaries about nature conservation issues or otherwise educate oneself on the topic*". However, less than half of the panel viewed this behaviour as important. A further general remark that appeared repeatedly was that some behaviours might be a bit vague and required

specification. This often tied in with the remarks about knowledge, as some behaviours might be pro-nature conservation in certain contexts but detrimental in others.

Recommendation Summary

All behaviours that reached an agreement rate over 60% were collected into Table 3.4 and some of them were changed according to conclusions from the qualitative feedback. The following behaviours may be useful behaviours to encourage the general public to engage in.

Further, to provide a more communication friendly version of these behaviours the most important "Top 5" behaviours of each category were compiled and presented in summarising infographics (Figures 4-6). Some of the behaviours in this infographic are a summation of several behaviours on the list for simplification and to avoid repetition, for example the volunteering behaviour. Summarising the volunteering behaviours with the highest percentages of agreement allowed to include a larger variety of behaviours on the infographic. While these infographics are not a comprehensive list, they may be easier to process for someone from the general public who just wants a 'quick look' at what they can do to support nature conservation.

Table 3.4 *Gardening/ Land management (Garden), Civil Action (Civil), and At home/ In nature (Home) behaviours that reached 60%+ in the expert rating ranked by the percentage of SME's who rated the behaviour as important (% yes)*

Domain				
Garden	**Civil**	**Home**	**Behaviour**	**% yes**
x			Plant pollinator friendly plants	97.14
x			Leave an undisturbed/ unmaintained area for wildlife	97.14
x			Install features that allow small mammals to pass through my garden/ land without problems	97.10
	x		Volunteer with a conservation organisation in the area of land management work	95.71
x			Maintain a wild-flower area	94.29
x			Avoid using insecticides	94.29
	x		Volunteer with a conservation organisation in the area of surveying (e.g., garden bird watch/ bio-blitz/ etc.)	92.86

Domain				
Garden	**Civil**	**Home**	**Behaviour**	**% yes**
x			Maintain a wildlife friendly pond	92.86
x			Leave log piles or other materials that can be used as a home/ shelter by animals	92.86
		x	Install a nesting box for birds	92.75
		x	Install a bat box	86.96
	x		Support conservation friendly legislation (e.g., for agriculture, hunting, etc.) by voting for them when given the opportunity in local or national referendums/votes/etc.	86.96
	x		Get in touch with local authorities about conservation issues and solutions	86.96
x			Install a bee hotel	86.96
		x	Provide food for wild animals	86.57
	x		Vote for parties/ candidates with strong pro-conservation policies in elections	86.36
		x	*When walking in nature alone or with a dog, try to avoid disturbing wildlife*	85.71
x			Maintain plants with berries/fruits	85.71
x			Install a hedgehog home	84.06
x			Plant native plants	84.06
	x		Talk to other people about the importance of wildlife conservation	82.86
x			Plant plants with different flowering seasons	82.86
		x	Provide water for animals	80.60
	x		Donate money to a conservation organisation	80.00
		x	Pick up litter	79.71
	x		Participate in clean-up events	78.57
	x		Attend local council/local authority meetings about conservation issues	76.81
x			Plant a tree	75.36
	x		Hold a membership with a conservation organisation	72.86
x			*Do not cut/trim hedges during bird breeding season (March-July)*	72.46
	x		Volunteer with a conservation organisation in another area not mentioned above	71.01
	x		Volunteer with a conservation organisation in the area of fund raising	70.59
x			Avoid using weed killer	70.00

Domain				
Garden	**Civil**	**Home**	**Behaviour**	**% yes**
x			Avoid installing artificial turf	69.12
	x		Sign petitions supporting conservation efforts	68.57
	x		Join activist activities (e.g., demonstrations)	67.14
x			Avoid using synthetic fertilizer	65.71
x			Avoid using paving slabs/ otherwise exchanging green space for artificial alternatives	65.22
	x		Share posts and articles about conservation on social media	62.86

Figure 3.1 *Infographic for Top 5 pro-nature conservation behaviours in the category 'At home and in nature'*

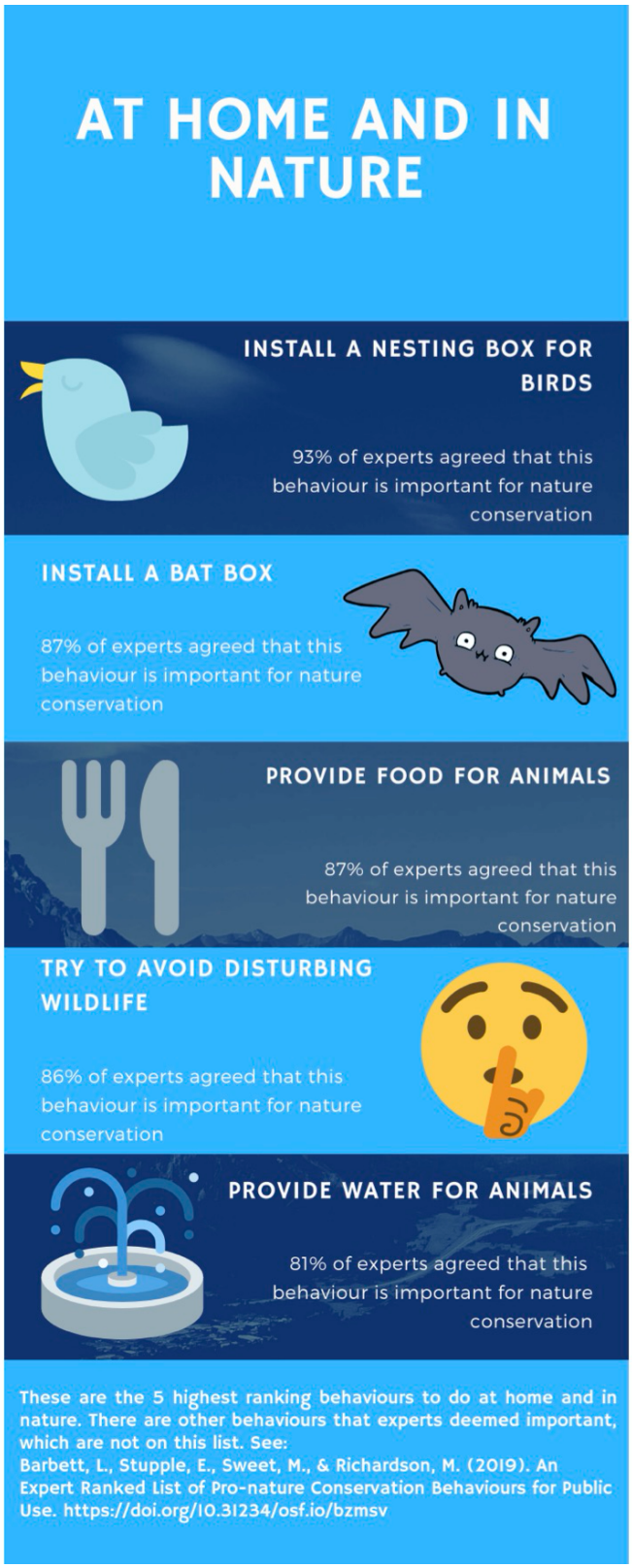
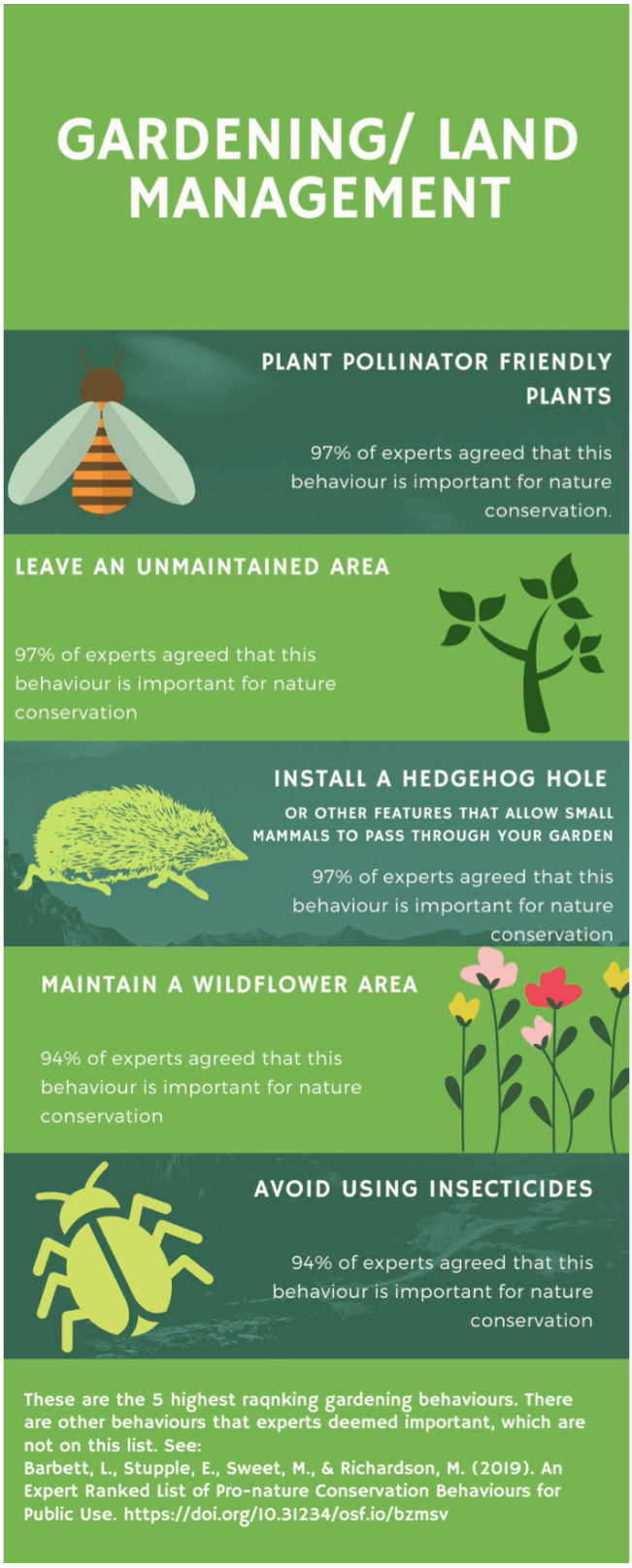


Figure 3.2 *Top 5 pro-nature conservation behaviours in the category 'Civil Actions'*

Figure 3.3 *Top 5 pro-nature conservation behaviours in the 'Gardening and lad-management' category*



3.2.4 Discussion

Overall, this study has produced a comprehensive list of impactful pro-nature conservation behaviours. For the majority of the behaviours that were assessed, there was a high agreement rate amongst the experts. Among the highest-ranking behaviours were some of the gardening and land management related behaviours that are often promoted by conservation organisations, such as leaving an unmaintained area and planting pollinator friendly plants. Other, non-gardening related behaviours that were deemed important by a large majority of the experts were volunteering in different areas, mainly habitat management and surveying (e.g., bioblitz), as well as voting behaviour in elections and referendums. There were connections between behaviours that reached a low percentage of experts deeming them important and behaviours that were criticised in the qualitative feedback. These were mainly behaviours that might depend on context, such as cutting down a tree or planting exotics.

The results of this study align with research in a variety of academic areas. Goddard and colleagues (2010) pointed out the large potential of private gardens in nature conservation. They are urban greenspaces that can provide important resources for flora and fauna (Smith, Gaston, Warren, & Thompson, 2016). Private gardens offer a large potential that outweighs that of public green spaces in many areas, such as Paris (Mimet, Kerbiriou, Simon, Julien, & Raymond, 2019). Several of the high-ranking gardening and household behaviours from the list have been recognised as simple behaviours that can increase native biodiversity, such as maintaining a wildlife friendly pond, and installing a nesting box (Gaston et al., 2005). The use of wildflowers, for example has been closely assessed both in private gardens and in agriculture. Wildflower strips around crop fields consistently lead to higher abundance of insects both in numbers and diversity (Haaland, Naisbit, & Bersier, 2011). Specifically, pollinator friendly plants are theorised to prove even more effective (Haaland et al., 2011). Planting pollinator friendly species is a behaviour which has a high importance considering that pollinators are particularly affected by the biodiversity decline (Hallmann et al., 2017; Oliver et al., 2015). Pollinators play an important role for society in providing an ecosystem service crucial to food production, with more than 87% of flowering plant species being pollinated by animals (Ollerton et al., 2011). The behaviour of maintaining plants with different flowering seasons can further support insect

diversity in gardens and/or agricultural land. For example, adding late-season flowering plants to fields of early-season flowering crops has been shown to have a positive influence on bumble bee density (Rundlöf et al., 2014). In addition to this, the behaviour of planting native plants has benefits beyond supporting native plant biodiversity: In Australia and the USA native plants in domestic gardens have been found to increase bird and butterfly diversity (Burghardt, Tallamy, & Gregory Shriver, 2009; Daniels & Kirkpatrick, 2006).

Many of these behaviours might go beyond nature conservation in providing positive changes for humans. These actions, for example maintaining wildflower-patches, help deliver experiences of nature, both for the person carrying out the action and others (e.g., neighbours), that can increase personal commitment towards biodiversity conservation (Prevot et al., 2018). Ecologically managed gardens have been found to contain a higher variety of species, which in turn led to a higher perceived aesthetic of those gardens (Lindemann-Matthies & Marty, 2013). Further, such positive actions and care for nature are also one of the pathways to nature connectedness (Lumber, Richardson, & Sheffield, 2017). Thus, engagement with these behaviours could affect nature connectedness.

Within the at home and nature group behaviours that had particularly high expert agreement were instalment of bird or bat boxes as well as the provision of food and water for animals. 48% of UK households provide food for wild birds (Davies et al., 2009). This behaviour has been shown to have a positive effect on avian abundance (Fuller, Warren, Armsworth, Barbosa, & Gaston, 2008). In addition to the ecological impact, bird feeding has been shown to be related to connection to nature and well-being, specifically relaxation (Cox & Gaston, 2016). While some ecologists have pointed out potential drawbacks of manmade nesting boxes for birds, the overall advantages outweigh them, making them an important tool in conservation (Mainwaring, 2015).

Civil actions, while very different from gardening behaviours or other more direct behaviours at home and in nature, have been recognised as important drivers of social change (Christmas et al., 2013). And recent research on environmental behaviours as well as conservation behaviours have included civil actions, such as voting intentions and talking to friends and family about environmental issues in their studies (e.g., Prevot et al., 2018, Markle, 2013). In this study, several civil actions got similarly high agreement rates as

gardening and household behaviours, which indicates that conservation experts value these behaviours just as much as the more traditional conservation efforts in gardens, which are often advertised on conservation organisations' websites. Political engagement within the area of nature conservation has recently gained more coverage, including through conservation organisations. For example, in 2021, the Wildlife Trusts are promoting a petition to end the sale of peat for compost (The Wildlife Trusts, 2021). The impact of political action can seem more abstract than that of, for example, the introduction of pollinator friendly plants, but evidence suggests that it plays an important role: For example, within the UK's political system, petitions made through the governmental channels are considered for debate in parliament when reaching 100,000 signatures and require a governmental response from 10,000 signatures (UK Parliament, n.d.).

The dimensionality of pro-environmental behaviour was discussed in the literature review as well as in chapter 3.1. The wide variety of behaviours deemed impactful by experts suggests that dimensionality may play a role in pro-nature conservation behaviours, as well. While the behaviours were grouped for this study, these groups do not necessarily form the dimensions that underly pro-nature conservation behaviours. The dimensionality of these behaviours needs to be assessed using appropriate psychological methods. Nevertheless, this split provided a useful tool to demonstrate to the experts that the aim was to find a wide spread of impactful behaviours that can be engaged in by everyone, not only citizens with a garden. They further can help to simplify communications, such as the presented infographics.

The methodology of this study had some disadvantages. In the list of behaviours some behaviours were reverse coded and while they were marked and there was an explanation of what reverse coding means, comments revealed that this caused confusion for some of the participants. In a future study, it might therefore be better to not use any reverse coded behaviours. Also, a large proportion of the participants were reached through the same conservation organisation. This means that the views given by experts may disproportionately represent this organisation and if a more diverse sample might have led to slightly different results. The feedback showed that for some behaviours their impact might not be as clear-cut as it seems, which makes it difficult to recommend them as pro-nature conservation behaviours. This was highlighted by the number of comments about

cutting down trees, cutting down hedges and avoiding exotic plants and incorporated into the final list of behaviours in Table 3.4. Other topics that were brought up by the experts were wider environmental behaviours and their impact on nature conservation, as well as the question of understanding and intention. These themes that were repeatedly mentioned in the comments show the importance of a clear definition of pro-nature conservation behaviours.

Further, the behaviours in the Gardening category were somewhat particular to the UK and possibly Western/Northern Europe. While this can be seen as a disadvantage, different ecosystems require different measures for conservation, thus it is important to have some behaviours, such as the gardening behaviours specific to local ecosystems in order to support conservation not only on a more abstract, global level but also concretely on a local level. The behaviours that this applies to are those that are often called place-based behaviours. Place-based behaviours do need to be place-specific as well, working within the often unique local ecological and communal structures - this has led to their exclusion from other environmental behaviour scales where the goal was generalisability (Larson et al., 2015). Changing this approach may open up a multitude of opportunities, not only for behaviours that can be encouraged but also for intervention approaches: These behaviours might be more related on people's connection to place than other more general behaviours (Halpenny, 2010). Not all the behaviours that were considered impactful by the experts are place-based though: The behaviours under the Civil Action category should be more widely and internationally applicable.

The importance of a focus on pro-nature conservation behaviour was confirmed by the feedback received by the conservation experts. Several of them explicitly expressed their belief that the list, as well as the overall aim to study pro-nature conservation behaviours more specifically than the more widely used pro-environmental behaviours, mattered to them and fills a gap in environmental work. Also, concerns were mentioned by experts about public knowledge regarding pro-nature conservation behaviours. These concerns can be addressed by both the more comprehensive recommendation list and the infographic summary as they can both be used as tools by conservation organisations to send a clear and coherent message about which behaviours people can engage in. Thus, the general tone of feedback from the conservation experts confirms the rationale of this thesis:

There is a gap in research around environmental behaviours for specific pro-nature conservation behaviours. Beyond academic research, moreover there is a need for practical tools to help communicate these behaviours to the public.

The infographics play an important role for this: While an expert-based list of behaviours is important to ensure that all behaviours included fulfil the impact-based aspect of the definition the list needs to be in line with public perception as well (Larson et al., 2015). There is evidence for a significant disconnect between expert and public perception in pro-environmental behaviours (MacDonald, Milfont, & Gavin, 2015). The behaviours that the general public sees as pro-environmental are not necessarily those that experts deem important. This disconnect might also exist in pro-nature conservation behaviours. This was a worry expressed in the written feedback section of the study presented in this chapter. Experts tended to be wary of behaviours that might depend on context in order to avoid harm or non-impactful action due to a lack of knowledge in the general public. Thus, to achieve widespread engagement with pro-nature conservation behaviours, academics and practitioners need to ensure a clear communication to the public. Simple infographics, like these can act as the first steppingstone to spreading awareness of impactful pro-nature conservation behaviours.

At a time of increasing recognition of the crisis of biodiversity loss and its impact on human health, there is a need for a transformative new relationship with nature (IPBES, 2019). Levers for change include values and actions, inclusion in conservation, visions of a good life, education and knowledge (IPBES, 2019). The expert-ranked pro-nature conservation behaviours presented above provide the knowledge for people to act, to be included in the solutions and to help create a vision of a good life where creating homes for nature is valued more than consumer goods. The ranked list can be used to inform policy makers and conservation organisations seeking to encourage the general public to create a sustainable future. Especially use of infographics, like those provided in the results section may prove important in educating the wider public on which actions can be taken. Aside from these practical applications of the list, it plays a crucial part in the development of research on pro-nature conservation behaviour. Those behaviours that rank highly fulfil the impact-based aspects of pro-nature conservation behaviour. To further develop this list, a psychological assessment of the behaviours addressing the goal-based aspects is needed.

The following chapter will use the methodologies of psychometrics, a field of psychology concerned with the measurement of personality and behaviour to develop such a measurement. Systematic research relies on replicability of studies and therefore on well-developed and tested measurement tools for the phenomena that are examined (DeVellis, 2012). With pro-nature conservation behaviours having not been systematically studied as of yet, the current aim in this research topic is the development of such a tool. Therefore, the development of a measurement scale for pro-nature conservation behaviour is at the core of this thesis. The following chapter will use the methodologies of psychometrics, a field of psychology concerned with the measurement of personality and behaviour to develop such a measurement

4 Measuring Actions for Nature: Introducing the Pro-Nature Conservation Behaviour Scale

This thesis set out to systematically approach pro-nature conservation behaviours from a psychological perspective. With the possible importance of these behaviours in times of a mass extinction level event the goal of the research approach should be their encouragement in the wider public. As explored in chapter two, there is a useful blueprint for systematic research with this aim, which can be adopted from pro-environmental behaviour (Steg & Vlek, 2009). This research agenda proposes four essential steps based on literature on effectiveness of behaviour promotion (Geller, 2002). The first step is the careful selection of behaviours. In the second step the factors causing those behaviours are examined. Then, well-tuned interventions are applied, and finally, in the fourth step, the effects of those interventions are evaluated. Within the scope of this thesis the first two steps will be considered. In the current chapter one of the most important tasks of step one will be completed: The development of a measurement scale. Measurement of psychological constructs is its own academic field, due to the importance of reliable and valid measurement tools for research called psychometrics. These tools need to ensure that the construct in question is captured and that the results will be comparable (DeVellis, 2012). Especially for the measurement of behaviours, there is a variety of options, each coming with advantages and weaknesses. The most used technique here is, as with other psychological constructs, self-report measurement, which has been revealed to be adequate (Steg & Vlek, 2009). While observational measurements of behaviour might be less prone to confounding variables, such as the respondents' biases and potential of lying, these measurements tend to be less feasible and are therefore less versatile and appropriate for a variety of research (Steg & Vlek, 2009).

The systematic study of pro-nature conservation behaviours relies on the development of a psychometrically sound self-report measurement scale for these behaviours. This development takes a variety of steps (DeVellis, 2012). There is a lot of disparity in guides on how exactly all the involved tasks should be grouped into steps and/or phases. Popular

process guides range from 5 to 15 steps, sometimes separated into phases (Kyriazos & Stalikas, 2018). For example, one suggestion includes the following 5 steps (Furr, 2014):

1. Construct Definition
2. Response Format Choice
3. Initial Item Pool Generation
4. Selection and Revision of Items
5. Evaluation of Psychometric Properties

Another suggestion uses 9 Steps separated into the following three phases:

1. Item Development
2. Scale Development
3. Scale Evaluation

Overall, a theme that can be found in the various phases and steps is a trend to first define the construct and give a rationale for the need of a scale (Boateng et al., 2018; DeVellis, 2012; Furr, 2014; Kyriazos & Stalikas, 2018; Streiner & Norman, 2008). Then, or sometimes in combination with the domain definition, an item pool is developed. This item pool then needs to be transformed into a scale through selection of items. Here, many scholars divide the selection into two separate steps or phases. The first selection process is through an assessment of content validity often through an expert rating (Boateng et al., 2018; DeVellis, 2012; Trochim & Donnelly, 2016). Here, some guides include specific steps separately, while others include those steps in the overall steps of item development and evaluation, such as the choice of a response format (Furr, 2014; Kyriazos & Stalikas, 2018). After this all steps rely on the administration of the item pool: a variety of tests follows to select the items that will be used, or as it is often phrased to reduce the item pool and then the psychometric properties are tested as the scale is evaluated. Here, too, some specific tests may fall into different phases or steps depending on the guide, for example, some scholars count the initial extraction of factors as part of the scale development process while others count it as the scale evaluation process (Boateng et al., 2018; Kyriazos & Stalikas, 2018). Since often this first look at the scales dimensionality, the Exploratory Factor Analysis (EFA) is done with the same dataset as the item reduction, it may be worth

counting this step within that phase. For the purpose of structure and clarity, these guides were adapted into four phases rather than the three suggested by Boateng and colleagues (2018) or the five as suggested by Furr (20014) as well as Kyriazos and Stalikas (2018).

1. Domain Definition and Rationale
2. Item pool construction and evaluation
3. Scale development (Item reduction and EFA)
4. Scale Evaluation (Psychometric properties)

The domain definition is highlighted separately from the scale development in the first step of the systematic approach to pro-environmental behaviour. Especially considering the novelty of pro-nature conservation behaviours, it is important to develop a definition based on existing theory and conceptualise the domain as an independent first step of the scale development. Chapter three conceptualised pro-nature conservation behaviours and rationalised the need for a scale to measure them based on a gap in literature, which had been alluded to by various academics (e.g., Hughes, Richardson, & Lumber, 2018). There are no existing scales for this group of behaviours since it has rarely been studied specifically until now. With no instruments to measure pro-nature conservation behaviours, the development of a scale is essential (McCoach et al., 2013). Therefore, the first phase of scale development has been concluded.

The following three phases will be the topic of this chapter: the longlist from the expert ranking in chapter three provides a potential initial item pool for a scale. However, this item pool needed more psychometric assessment before the item pool construction and evaluation steps can be regarded as complete. After that, the suggested steps of scale development are more focused on the choice of appropriate items based on psychometric standards as well as the assessment of their psychometric properties and dimensional structure in steps three and four. Each of the three phases includes a variety of steps, which will be explained in more detail in the according sub-sections.

The second step will be a separate sub-section, chapter 4.1: First, the items need to be evaluated by experts. While a ranking had already taken place, more specific methods are used for this in scale development. In chapter 4.2, phase three and four will be presented: The included steps in scale development were completed through the statistical

analysis of data collected through administering the chosen items (DeVellis, 2012; Kyriazos & Stalikas, 2018). The further reduction of the items, analysis of dimensions, as well as assessment of reliability and validity of a scale measuring pro-nature conservation behaviours will be presented in that sub-section. As highlighted previously, the accessibility of those behaviours is essential to create measurement tools suitable for a large proportion of the population. This has been mostly in terms of socio-economic factors regarding access to a garden. But especially with the more politically focused behaviours, age restrictions apply as well. Thus, a child friendly scale measuring pro-nature conservation behaviours was developed in chapter five.

4.1 Evaluation of the item pool

Chapter 3.2 presents an expert ranked list of effective pro-nature conservation behaviours, which constitutes an important tool for anyone wanting to engage in pro-nature conservation behaviours or encourage others to do so. However, for this list to turn into a pro-nature conservation behaviour scale, the behaviours need to be systematically evaluated using established scale development methods. This step is often regarded as the second step in scale development and thus part of the item development phase, as was adopted for this thesis as well (Boateng et al., 2018).

Depending on the model of development, this phase can be one or several steps, with some models giving specific attention to one or more sub-steps. An item pool should be produced through one or more of multiple possible methods, such as a review of existing research, other scales or practical work in the topic, expert opinions, or interviews with the target group (Boateng et al., 2018; Kyriazos & Stalikas, 2018). The item pool should be considerably larger than the intended length of the final scale. However, there is a variety of guidance on this, ranging from 2-5 times as long, but some agreement seems to lie with twice as long (Boateng et al., 2018; DeVellis, 2012; Kline, 2013; Schinka, Velicer, & Weiner, 2012). In the construction of this item pool, several considerations need to be taken into account, including the overall form, the wording and the response format of the items. Some scholars even suggest making the selection of the response format a separate step in the scale development process (Furr, 2014). Questionnaire scales tend to use the format of

closed questions, as that permits a statistical data analysis (Kyriazos & Stalikas, 2018). These questions usually have a Likert Scale as the response format (Barker, Pistrang, & Elliott, 2005; Likert, 1932). Likert Scales are comprised of integer values (1,2,3,…) that are paired with verbal descriptors ascending in intensity, thus creating a meaningful ordinal response format (Krosnick & Presser, 2010). While there is some criticism of the way that this abstractly quantifies measurement levels, especially since it often gets treated as interval data rather than ordinal data, Likert scales have been shown to be an effective tool to discriminate levels of various constructs (Furr, 2014; Haladyna, 2012; Saville & MacIver, 2017). Verbal descriptors are often measuring agreement. However, for behaviour the most used descriptors assess frequency with the wording ranging from '*Never*' to '*Always'* (Kyriazos & Stalikas, 2018). Further, each item should be worded unambiguously, easy to understand for the target group of the scale and concisely worded (McCoach et al., 2013). Some scholars recommend balancing the item pool by introducing reverse coded items (Furr, 2014). Those are items where a low score on the response scale indicates a high score on the measured construct. So, for example, in an item pool measuring behaviours in support of nature conservation this would be a behaviour with a negative impact on conservation.

When an initial item pool has been generated, it needs to be evaluated. This step checks for content validity (Boateng et al., 2018). Content validity describes whether the items in a questionnaire scale actually measure the construct they aim to measure (Hinkin, 1995). One of the most common and recommended practices of item evaluation is expert judgement, with a variety of quantified methods to examine each item's content validity (Boateng et al., 2018). A Subject Matter Expert Review according to Lawshe (Lawshe, 1975) is widely regarded as a sophisticated approach to this (Kyriazos & Stalikas, 2018). Some newer approaches like the Delphi method are becoming more common but can be more time intensive (Linstone & Turoff, 1976).

This sub-section will apply typical considerations of the item-pool selection that had been left out of the ranking as well as the item evaluation steps to the longlist of behaviours used for the expert ranking. However, this will be done in a slightly different order than usually. With the collection process for the items already being complete, the various evaluations of the items will be separated into two parts according to the two aspects of the

definition of pro-nature conservation behaviours: The first part will concern the impact-based aspect of the definition of pro-nature conservation behaviours: After assessment of each behaviour's suitability for a behavioural measurement scale based on an appropriate response scale, a Subject Matter Expert Review will be applied. This can determine which items are important for a pro-nature conservation behaviour scale because of their positive impact on nature and wildlife. The second part of the item evaluation process will assess the item wording, which is needed to assure a well-functioning scale that is easy to administer to the general population. Further, this step ensures that the scale goes beyond measuring impactful behaviour by including intentionality in the wording and thus evaluating the items in regard to the second part of the definition of pro-nature conservation behaviour.

4.1.1 Item Evaluation through a Subject Matter Expert (SME) Review

4.1.1.1 Introduction

Psychometric scholars disagree on the exact length that an initial item pool should have. Since the item evaluation process as well as later psychometric testing will reduce this item pool significantly, recommendations for the initial length range from twice to four times as long as the desired length of the scale (DeVellis, 2012). While for the pro-nature conservation behaviour scale no specific final length was decided in advance, this scale should be no longer than 15-20 items to assure that all items on the scale are achievable yet effective behaviours. As such, the initial list of 48 behaviours given in chapter 3.2 is long enough to be transformed into the item pool for a scale. Before this list is used in upcoming steps of scale development, a variety of requirements for items on a scale questionnaire needs to be fulfilled, starting with consideration of a suitable response scale.

A Pro-Nature Conservation Behaviour Scale should aim to measure behaviours that people can engage in continuously in order to reflect their current behaviour rather than past behaviour. Thus, behaviours such as planting trees in one's garden may not be suited for the item pool as they tend to be rather rare actions that one would not engage in regularly. Further, these "one-off" behaviours would therefore be easier to capture on a dichotomous "Yes"/"No" scale than a larger Likert Scale. While there are no set standards on the length of response scales, a dichotomous scale may produce lower reliability in the

developed questionnaire scale (Krosnick & Presser, 2010; Streiner & Norman, 2008). Longer response scales allow for finer gradations and thus fulfil their requirement to discriminate differences. Behaviours such as feeding the birds can be engaged in more regularly and thus fit on an appropriate response scale for behaviours ranging from Always to Never. A 7-point scale was chosen because a variety of research supports this response scale length: A Likert scale's reliability increases with its number of points, but only until a length of 7 points (Krosnick & Presser, 2010). Further, when a response scale becomes too large, respondents can no longer make meaningful discriminations between all scale points (DeVellis, 2012). This seems to be the case for scales beyond 7 points (Hawthorne, Mouthaan, Forbes, & Novaco, 2006). Some researchers prefer response scales without a middle point, especially during the scale development process (Krosnick & Presser, 2010). On the other hand, the omission of a middle point can lead to participants randomly selecting a response choice, which is why the inclusion of a mid-point is preferable (Krosnick & Presser, 2010).

When an initial item pool is built according to the considerations regarding response scale above the items need to be evaluated by experts to ensure content validity (Boateng et al., 2018). One systematic way of doing this is a Subject Matter Expert Review (SME) using Lawshe's Content Validity Ratio (CVR) (Lawshe, 1975). This approach is often regarded as a more sophisticated way of testing content validity as it quantifies the expert responses. This method was originally developed in the context of job performance and skill tests: A chosen panel of experts is asked to rate each item as either essential, useful but not essential, or not necessary. Then the expert consensus on essential items is quantified by calculating the CVR, using the following formula:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

In this formula n_e is the total number of experts and N the number of experts who regard the item as essential. Thus, the CVR reflects the proportion of experts who regard the item as essential. There are some even more highly regarded methods for item evaluation. The Delphi method for example is more systematic in the collection and selection of items. However, it also tends to be more time consuming for both the

researcher and the experts and requires more detail in its preparation (Fink-Hafner, Dagen, Doušak, Novak, & Hafner-Fink, 2019). Since the aim of this thesis was to go beyond the development of a scale and into the examination of predictors of pro-nature conservation behaviours, an SME was chosen instead.

4.1.1.2 Methods

Participants

With the CVR minimum values according to Lawshe not being available for such a high number of experts as in the original sample of experts in chapter three, a subset of the first 25 SMEs who had answered the review questionnaire was chosen (Lawshe, 1975). Most respondents were UK based; however, one international expert was from Germany. They were contacted by the researchers because of their expertise in the area. Further, 29 SMEs provided verbal feedback to the longlist. All participants gave informed consent for their answers to be used for the scale development.

Materials

The behaviours analysed for the SME review were a subset of the longlist in chapter 3.2. All items on that list were evaluated for their suitability for a 7-point Likert scale.

All items that were deemed suitable only for a dichotomous scale because they were referring to one-time instalments of features were excluded from the SME resulting in a 38 (8 At home and in nature; 16 Civil Action; 14 Gardening/ Land Management) item longlist (See below in results).

Procedure

Some chosen experts were contacted via e-mail. The e-mail included a short explanation of the study and a link to an online survey. The online survey first asked the participants to name their area of expertise and how or why they were experts in that area (academic, practical, etc.). Then a definition of pro-nature conservation behaviours was given: "*We define a pro-nature conservation behaviour as a positive action that has impact on local*

wildlife (rather than a positive inaction that has an indirect impact on wildlife conservation via reduction of e.g., the carbon footprint, water use, etc.)". This was followed by a more detailed explanation of why certain pro-environmental behaviours, such as decreased meat consumption, were not included on the list even though they might have an indirect impact on wildlife conservation as well. Further, it was explained what a reverse coded item is as there were some reverse coded items in the list.

The participants were asked to indicate for each item on the longlist whether they believed it belonged on an impact-based questionnaire for pro-nature conservation behaviours. The answer possibilities were *yes*, *no*, and *I don't know*. This shows a deviation from the original SME methodology. However, since only ratings of items as essential are considered for the CVR, the *useful but not essential* option was removed. Instead, the *I don't know* option was included to give experts who were unsure about certain items the option of choosing this answer instead of guessing whether it was an important behaviour or not. After rating the items, participants had the possibility to give written feedback about specific items or the questionnaire in general (For instruction and item wordings see Appendix B).

4.1.1.3 SME – Results

Content validity was examined using Lawshe's (1975) formula for the Content Validity Ratio (CVR) for each item:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

In this questionnaire n_e was the number of SMEs voting "Yes" on an item. The CVR was then compared with the minimum value required to satisfy the 5% level of a one tailed test, as provided by Lawshe (1975). For a sample size of 25 participants this value is 0.37. Items with a lower CVR than the threshold were discarded.

A total of 20 items remained on the list (At home: 3; Civil Action: 9; Gardening/Land management: 8). The CVI of the remaining items is M(CVR)=0.71. However, with several

items reaching a value just below the threshold, those items that reached a CVR of 0.36 were also included in the list of items to be administered making the list 25 items long. All computations can be seen in Table 4.1. Items that are marked green in Table 4.1 are those that reached the minimum CVR and were retained in the questionnaire. Items marked blue are items with a CVR of 0.36.

Table 4.1 *Items from the longlist with their ne values and CVRs*

Item	Yes (ne)	CVR
At home/in nature		
Food for animals	18	0.44
water for animals	13	0.04
pick litter	21	0.68
move insects	15	0.20
avoid disturbance on walks	23	0.84
compost at home	11	-0.12
move small animals	15	0.20
avoid insect repellents	12	-0.04
Civil Action		
I donate money	18	0.44
fund raising volunteering	14	0.12
land management volunteering	25	1
surveying volunteering	23	0.84
other volunteering	17	0.36
participate in clean-ups	21	0.68
membership with a conservation organisation	15	0.20
talk to others	21	0.68
activist activities	15	0.20
vote in referendums	20	0.60
attend MP meetings	17	0.36
sign petitions	18	0.44
write to MP	21	0.68
share content on social media	17	0.36

Item	Yes (ne)	CVR
vote in elections	22	0.76
inform yourself	10	-0.20
Gardening/Land management		
remove hedges (RC)	17	0.36
cut down trees (RC)	14	0.12
pollinator friendly plants	24	0.92
plants with different flowering seasons	21	0.68
avoid insecticides	23	0.84
synthetic fertiliser (RC)	17	0.36
weed killer (RC)	19	0.52
log piles or similar	24	0.92
keep lawn neat (RC)	12	-0.04
unmaintained area	24	0.92
plants with berries/fruits	21	0.68
native plants	20	0.60
exotic plants (RC)	13	0.04
Rotate plant/crops annually	8	-0.36

Based on the qualitative feedback discussed in chapter 3.2, the item remove hedges was changed to trimming hedges during bird breeding season. This item was then given to another 9 experts for rating and achieved a CVR of 0.8 (N= 10 (expert who suggested + 9), ne=9). The minimum CVR for a panel size of 10 is 0.62, so the item was adopted into the scale. The final resulting list of items was 25 items long. Lawshe suggests the calculation of a Content Validity Index (CVI) which is the mean of the CVRs of chosen items (Lawshe, 1975). For the remaining items here, a CVI=0.66 was calculated.

4.1.1.4 Discussion

The SME Review led to a 25-item-long list of behaviours. Slight changes to the traditional administration of an SME were made in order to accommodate experts, such as the

inclusion of an *I don't know option* and the option to give qualitative feedback. This helped to improve one of the items, which was shown in the difference of the CVR size of the original item *"I removed hedges"* (CVR=0.36) and the new item *"I do not cut/trim my hedges during bird breeding season (March-July)"* (CVR=0.8). The overall CVI of 0.66 shows that even the inclusion of five items (one of them later changed to an item with high CVR) that were just below the threshold did not affect the overall high expert agreement regarding the impact of the behaviours. To put this in perspective: The items that were included despite being below the threshold had a CVR of .36. A CVR of 0 indicates half of the experts regarding the item as important while a CVR of 1 indicates all experts regarding the items as important.

This provides a solid item pool for the administering of the items for item reduction based on psychometric methods. Before this can take place, the items will be evaluated regarding their wording.

4.1.2 Goal-directed considerations and wording

The expert ranking in chapter 3.2 and the more psychometrically appropriate SME review only assessed the impact-directed aspect of the items. All remaining items are considered to have an important positive impact on nature conservation. While some scale developers do not use experts but rather the target population of the scale, experts were chosen here to ensure that the impact-directed aspect of the definition of pro-nature conservation behaviours is fulfilled. Experts are the better choice for this due to known discrepancies between expert and public judgement of pro-environmental behaviours (MacDonald et al., 2015). However, when deciding whether the items show the goal-directed aspect of pro-nature conservation behaviours, conservation experts may not be as suitable as advisors. Further, some psychometric considerations regarding item wording need to be completed before the scale administration to ensure their suitability for the general public.

These considerations to go into the selection of the items regard item wording. Since wording can determine responses, the language used is extremely important (Saris & Gallhofer, 2007). There are many aspects to pay attention to create items that are clear and

easy to interpret for participants without skewing their answers through leading phrases or other factors (Kyriazos & Stalikas, 2018). For clarity and simplicity, experts suggest items that are no longer than 20 words (Kyriazos & Stalikas, 2018). Each item on the list was assessed regarding length and the longest item was *"I add log piles or other materials that can be used as a home/ shelter by wildlife"* (17 words long), thus making all items suitable for participants in terms of length.

Further, double negatives, as well as terms suggesting absoluteness (e.g., only/just/etc.) should be avoided (Kyriazos & Stalikas, 2018). Some scholars recommend balancing the item pool by introducing reverse coded items (Furr, 2014). Those are items where a low score on the response scale indicates a high score on the measured construct. While this practice is often regarded necessary, some evidence suggests that it may be ineffective (DeVellis, 2012). Only two items with reverse coding made it onto the list that passed the SME review stage. This is in favour of an approach measuring pro-active behaviours. While the reduction of behaviours with a negative impact is important, the majority of pro-nature conservation behaviours should reflect the activeness that is ingrained in their definition. Further, including more pro-active into the measurement, creates a measurement tool that provides the base for restorative and constructive behavioural changes (Gresham, 2002)

For pro-nature conservation behaviours, the wording needs to adhere to the goal-based aspect of the definition. While a review by experts will ensure the impact-based aspect by sifting out behaviours with less positive impact on nature conservation, wording can signal goal-directed behaviour and ensure that participants answering the resulting scale do not score high on specific items without an intent to support nature conservation. This has been an issue in some pro-environmental behaviours. When one does, for example, measure public transport use as a pro-environmental behaviour in comparison to car use without including environmental intent in the wording, some people who take public transport for financial reasons, but not environmental reasons would score highly, which might impact findings about predictors of pro-environmental behaviours. An example of intentionality can be seen by the rewording of the reverse coded item regarding hedges. The original item was simply reverse coded, stating that one had removed hedges. Simply responding that one has done that does not necessarily reflect a lack of concern for nature.

Actively avoiding this behaviour however shows an intentionality behind the action. Thus, here the wording was changed to reflect this using the specificity of bird breeding season and then further adapted, using the word '*avoid*' (See Appendix C). Many actions show intentionality in itself: While there may be many other motives for donating to a conservation organisation, it is an action that is inherently pro-conservation and can thus be assumed to be carried out with nature conservation being at least a factor. Further, inclusion of small wordings like "*to avoid disturbing wildlife"* or "*pollinator friendly"* in some of the items can help to show the intention of supporting wildlife and biodiversity. This was not done with every single item to avoid repetitive wording. However, a majority of behaviours clearly expresses intentionality, suggesting this to the person answering the questionnaire even for those behaviours that do not explicitly express intentionality regarding nature conservation.

Finally, the items were reassessed regarding accessibility of behaviours. While providing food for animals can be carried out in parks it is sometimes discouraged there, due to problems with overcrowding (Weston, 2021). Further, often, birdfeeders are marketed towards garden owners. While feeding animals is still possible for people without a garden, as a behaviour it is often connected to gardening and often easier for garden owners as it does not require going to a park or another greenspace where one may find wild animals. Thus, this behaviour was moved into the Gardening category.

The current item pool reflects behaviours that are both impact and goal oriented in supporting nature conservation. The following steps in scale development regard the item reduction based on psychometric methods and the assessment of the psychometric properties of the remaining items.

4.2 Development and validation of the Pro-Nature Conservation Behaviour Scale

4.2.1 Introduction

In the last sub-section and item pool to be used in the scale development phase has been developed and evaluated. this completes the first two steps of the scale development as set out in the introduction of this chapter. Following these phases, the next steps concern the specific psychometric scale development and the evaluation of said scale. This sub-section

will introduce the Pro-Nature Conservation Behaviour Scale (ProCoBS). Following standard psychometric procedures, the development and validation of this Scale, as well as a short form version of the ProCoBS, was developed.

The first two phases were based on two different suggestions of the general structure of Scale development. Similar to Furr (2014) the phase of the construct definition was separated from the phase of item generation, but like Boateng the response format choice was included in the item generation phase. However, for the final stages, both of those suggestions use the same two phases: A scale development, or item selection and revision stage and an evaluation stage that assesses the psychometric properties of the scale.

These final two phases are consisting of a multitude of steps: After the items deemed valid by the experts are chosen in the second phase, the scale is administered to an appropriately sized sample, which is sometimes referred to as a pilot study, in order to further reduce the item pool (Kyriazos & Stalikas, 2018). In this step, statistical analysis is used to test item-total correlations and sometimes inter-item correlations (Boateng et al., 2018). Items where these correlations are too low or too high are removed, to ensure that all items in the scale are measuring the same construct without being redundant. Items with low item-total correlations may not be tapping into the same constructs as the other items, whereas items that have extremely high correlations to another item might be too similar, and thus make the questionnaire unnecessarily long.

Following this, in the final steps, the psychometric properties of the scale resulting from the previous steps were analysed (Kyriazos & Stalikas, 2018). First, the dimensionality of the items is explored, and the underlying factors are extracted using an Exploratory Factor Analysis (EFA) (Boateng et al., 2018). Dimensionality is an important recurring theme in pro-environmental behaviours and may therefore also play a significant role in pro-nature conservation behaviours. Pro-environmental behaviours are often not a homogenous group of actions but have underlying structures of smaller behavioural groups that cluster together (Larson et al., 2015). The EFA extracts underlying (latent) factors within the measured construct, showing whether certain items tend to group together into smaller domains within the whole scale (Boateng et al., 2018). This step is used for further item reduction, as items whose relation to the found factors is below a certain threshold are

removed (Comrey & Lee, 1992). Thus, the exploratory factor analysis is often counted as part of the scale development phase, even though it already assesses some psychometric qualities.

The dimensionality was then evaluated through a new administration of the remaining items to a new, large set of participants: Here, the extracted factor model is tested using a confirmatory factor analysis (CFA)(Brown, 2015). Then, reliability and validity of the scale are tested, using a range of statistical analyses. Internal reliability, which describes to what degree the items measure the same construct is assessed using Cronbach's alpha. There is some discourse on whether Cronbach's Alpha is the most suitable estimate for internal consistency (Cronbach & Shavelson, 2004). It has been pointed out that for ordinal data, which is produced by a Likert response scale Cronbach's Alpha can tend to underestimate the lower bounds of internal consistency (Zumbo, Gadermann, & Zeisser, 2007). However, it has remained a widely reported standard in scale development and was shown to perform well when the administered response scale had more than five points (Zumbo et al., 2007). Another type of reliability that is commonly assessed is test-retest reliability. Test-retest reliability describes the measurement's consistency across time (Raykov & Marcoulides, 2011). This is assessed by administering the scale to the same sample at two different points in time. A scale with high test-retest reliability should have high correlations between the scores at the two separate time points (Boateng et al., 2018). For validity, scales are assessed in terms of criterion and construct validity. Criterion validity assesses how similar the results of the new scale are to existing measures of the construct. For this, so called gold standard measures of the construct are used (Boateng et al., 2018). However, these criteria or gold standard measures might not exist for every construct, which is why criterion validity cannot always be assessed (Raykov & Marcoulides, 2011). Construct validity describes the association of the new scale with existing measures of other constructs in the same domain. Here it is expected that there are relationships with measures of variables theorised to be related to the measured constructs (convergent validity) but not so similar, that it is just a reflection of those variables (discriminant validity) (Boateng et al., 2018). Further assessments of validity can include differentiation by known groups, where participants can be separated into groups through categorical variables likely to affect the construct and the differences in scores for those groups are

examined (Boateng et al., 2018). Finally, one frequent method of assessing construct validity is correlational analysis (Boateng et al., 2018). Using all those steps should lead to a scale that accurately and reliably measures the defined construct. This is important, since effective measurement is seen as the cornerstone of scientific research (DeVellis, 2012), leading to reliability, accuracy, consistency, and replicability (Kyriazos & Stalikas, 2018).

For the development of the ProCoBS construct validity will be mainly measured through convergent validity. Convergent validity is the extent to which the scale yields similar results to scales that measure the same or similar constructs. It is generally assessed by correlating the new scale with existing measures of the measured construct or if that is not possible with measures of constructs that are theorized to be related to the measured construct (Boateng et al., 2018). Due to the lack of substantial literature on pro-nature conservation behaviours, not all chosen variables were based on research in this area. They were primarily based on research regarding pro-environmental behaviours. The constructs of Self-efficacy, connectedness to nature, ecological worldview, and well-being were central to the development of the ProCoBS, further pro-environmental behaviours were also included in the validation measures. All of these constructs will be briefly reintroduced in the following paragraphs.

Self-efficacy is a widely used key concept in explaining a variety of behaviours (Vancouver et al., 2008). It is defined as people's confidence in their ability to solve a problem or accomplish a task (Bandura, 1994) and affects people's actual abilities to achieve the goal (Bandura, 1978). As such a widely used concept, self-efficacy has also been applied to pro-environmental behaviours. For example, water conservation related self-efficacy was identified as an important factor in water protection behaviours. Thus, the ProCoBS should correlate with perceived self-efficacy.

Recently, emotions have become an important focus of research on the Value-Action Gap. One such emotion is connectedness to nature, which is the psychological construct of an individual's affective relationship to nature (Mayer & Frantz, 2004; Nisbet & Zelenski, 2013). Nature connectedness has been found to outperform other predictors of pro-environmental behaviour (Otto & Pensini, 2017), which was confirmed by recent meta-analyses (Mackay & Schmitt, 2019; Whitburn et al., 2019). It was predicted that connectedness to nature would be similarly important in conservation behaviours. It may

not only act as a predictor: spending time in nature through wildlife friendly gardening could evoke a feeling of connectedness to nature, as it constitutes a compassionate behaviour towards nature. Compassion towards nature has been found to be a pathway to nature connectedness (Lumber et al., 2017).

Another key variable in research on pro-environmental behaviours is the ecological worldview. An individual's ecological worldview consists of their primitive beliefs about the roles nature and humans play for each other (Dunlap et al., 2000). Ecological worldview is commonly measured with the New Environmental Paradigm (NEP; Dunlap & Van Liere, 1978). This construct has been positively related to environmental behaviours (Davis et al., 2011). Further, Gkargkavouzi, Halkos, & Matsiori (2018), found that ecological worldview and connectedness to nature were especially predictive of environmental behaviours falling under the dimensions of civic actions, recycling, household behaviours and consumerism. Pro-nature conservation behaviours include civic actions and household behaviours and may therefore be predicted by those two constructs in particular.

Bridging the Value-Action Gap in conservation behaviours may not only have a positive impact on ecosystems. Well-being benefits to those who engage in some behaviours from the pro-nature conservation behaviour item pool have been found. These benefits could be related to several aspects of a pro-conservation behaviour intervention. Volunteering with conservation organisations can lead to significant improvement of mental well-being (Rogerson, Barton, Bragg, & Pretty, 2017). Further, caring for nature is a pathway to nature connectedness (Lumber et al., 2017), which itself has well-being benefits (Pritchard et al., 2019). More generally, just spending time in nature can positively affect stress relief and mood (Lee et al., 2011). Engaging in pro-nature conservation behaviours, which include volunteering with conservation organisations, as well as activities taking place outdoors in nature, might therefore improve well-being.

This study developed and evaluated a questionnaire scale to measure pro-nature conservation behaviours (ProCoBS) according to the current standard for psychometric scale development (e.g., DeVellis, 2012). All items on the scale were based on their ecological impact and were reviewed by a panel of SMEs to ensure content validity. The resulting item pool was administered to a sample of the general UK population. The item list was reduced using internal consistency tests to achieve reliability and an EFA was executed to examine

dimensionality and further shorten the item list, leading to the finished ProCoBS. Test-retest reliability and convergent validity were investigated in a second study. One month after the first study, the ProCoBS was administered to a subsample of the original participants, in conjunction with measures of possibly related constructs. Based on the existing literature, as outlined above, it was hypothesized that pro-nature conservation behaviours are related to pro-environmental behaviours, nature connectedness, ecological worldview, self-efficacy, and well-being. A CFA conducted by Barbett and colleagues (2020) will be introduced in the discussion.

4.2.2 Methods

Item Generation

For item generation, a Subject Matter Expert Review according to Lawshe [50] was used. Materials included scientific peer reviewed published studies found through search words, such as conservation behaviours, nature conservation behaviours, biodiversity conservation behaviours. Further, grey literature, such as behaviours encouraged by big conservation organisations, as well as calls for action by conservation activists, was reviewed. As explained in the previous sub-sections, the Subject Matter Expert Review left an item pool of 24 behaviours. Out of these items, 11 were behaviours focused on gardening (hereafter referred to as gardening behaviours) and 14 were behaviours that people without access to a garden can engage in (hereafter referred to as non-gardening behaviours). The initial separation of "*at home and in nature* "and "*Civil Action"* as seen in the expert ranking was removed as to not impose dimensionality in advance of the administering of the scale.

Study 1: Scale Development

Participants

A convenience sample of 300 participants living in the UK were recruited via Prolific Academic. This number of participants was chosen according to a number of guidelines considering both item number dependent sample size guidelines (item number x 10; (Nunnally & Bernstein, 1994)) and item-number independent sample size guidelines proposing 200-300 participants (Boateng et al., 2018; Andrew L. Comrey, 1988). Their age ranged from 18 to 69 years, with the mean age at 34.4 years, (SD=10.53). 71% of the

participants were female and 29% were male. Out of the 300 Participants, 225 (75%) had access to a garden.

Materials and Procedure

The study was granted ethical approval by the University of Derby. All participants gave informed consent and were debriefed. They were also informed before participation that after a month there would be a follow-up study to be completed by participants who had completed the first study. Participants answered an online questionnaire, which included demographics (age and gender) and the 25-item behaviour questionnaire. Participants were asked to indicate how often they engaged in each behaviour on a 7-point Likert scale based on Vagias ((Vagias, 2006); 1-Never, 2-Rarely, 3-Occasionally, 4-Sometimes, 5-Frequently, 6-Very Frequently, 7-Always).

Participants first answered the non-gardening items, followed by the question whether they had access to a garden at home, via a community garden or if they were landowners. If they indicated that they had access to a garden or land, they completed the gardening items and then the demographic questions (for the full item list as presented in the survey see Appendix C). Those participants that did not have access to a garden or land did not complete the gardening items. Thus, for those participants only a non-gardening score could be calculated. Scores for the whole scale were only calculated for participants answering both parts, to avoid a difference in whole scores between those who answered gardening questions and those who did not. Due to the difficulty in comparing impact of behaviours directed at societal change with more direct behaviours, such as creating habitats in one's garden no weighting based on impact was given to the items, since the SME review had assured that all items used were seen as impactful by experts in the field. The data was analysed using internal consistency tests and an exploratory factor analysis to reduce and refine items and determine factors within the scale. The data was also used to create a short form of the resulting scale.

Study 2: Test-Retest Reliability and Validity of the New Measure and its Subscales

Participants

All participants from study 1 were approached with the survey for study 2. 225 out of the original 300 participants (74.33%) from the first study answered this second study. The age

range was similar, 19-69, with a slightly increased mean of 35.43 (SD=10.52). Further, the same sex ratio occurred (71% female, 29% male). 164 participants (equaling 72.89%) had a garden.

Materials and Procedure

Participants who had completed the first study were contacted via their Prolific account number. All answers were collected via an online questionnaire. The same demographic questions and pro-nature conservation behaviour items were administered in study two. In addition to these, a variety of scales measuring constructs that were hypothesised to be related to pro-nature conservation behaviours was included.

To assess nature connectedness, two scales were utilised; the Inclusion of Nature in Self (INS) scale and the Nature Relatedness Scale (NRS) (Nisbet & Zelenski, 2013; Schultz, 2001). The INS is a single-item measure (Schultz, 2001), which uses graphic representations of 'self' and 'nature' as two circles. Participants selected one of seven choices where the circles have different levels of overlap. This scale is a cognitive measure of the construct of nature connectedness (Geng, Xu, Ye, Zhou, & Zhou, 2015). In contrast, the six item NRS focuses on affective aspects of the construct using a 5-point Likert scale ranging from 'disagree strongly' to 'agree strongly'. Items include, for example, 'I feel very connected to all living things and the earth' (Nisbet & Zelenski, 2013).

The New Ecological Paradigm (NEP) Scale was utilised to measure ecological worldview (Dunlap & Van Liere, 1978). This scale contains 15 items, such as 'Humans have the right to modify the natural environment to suit their needs', which are rated on a 5-point Likert scale (from 1= Strongly agree to 5= Strongly disagree).

To compare conservation behaviours with general environmental behaviours, the 19-item Pro-environmental Behaviour Scale (PEBS) was employed (Markle, 2013). The scale covers four sections, which use seven different response scales. For example, the first section, 'Conservation' (of energy & water), includes seven items (e.g., 'How often do you turn off the lights when leaving the room?').

Well-being was measured using the WHO Wellbeing Index (WHO-5; (World Health Organisation, 1998). The WHO-5 enquires about participants' feelings in the past two weeks

using 5 items, such as “I have felt calm and relaxed”. Items were rated on a 6-Point Likert scale (1=All of the time; 6=At no time).

Finally, the 10-item Generalised Self-Efficacy Scale (GSE; (Schwarzer & Jerusalem, 1995) was administered. Example items included: ‘I can always manage to solve difficult problems if I try hard enough’. Items were rated on a 4-point Likert scale from ‘not at all true’ to ‘exactly true’.

The data was analysed using internal consistency tests and correlations between test and retest data, as well as retest data and related scales for both the long form and short form scales as developed in study one. Further, a regression analysis was used to examine how far the related constructs explained pro-nature conservation behaviours.

4.2.3 Results

Study 1

Item-Total correlations were calculated for each item, first separately for gardening and non-gardening, then together, and all items with $r<.3$ were excluded (as suggested by Nunnally and Bernstein (1994)). Thus, one item was excluded due to low item-total correlations in the non-gardening behaviours, and two items were excluded from the gardening behaviours. After their removal, item-total correlations for the separate and full lists were calculated and all remaining items had a correlation of $r>.3$. This left 22 items (9 gardening, 13 non-gardening) for inclusion in the factor analysis. (For tables depicting this process and inter-item correlations see Appendix D)

Factor Analysis

Kolmogorov-Smirnoff and Shapiro-Wilk tests for the remaining items revealed violations of normality for several items. Thus, Principal Axis Factoring (PAF) using a promax rotation with Kaiser normalisation was chosen for the factor analysis. First, gardening and non-gardening items were examined separately. Following this, PAF was performed for the full list of remaining items. The Kaiser-Mayer Olkin Measure and Bartlett’s test of Sphericity suggested factorability (KMO=.886, χ^2=2293.226, df=231, $p<.001$). Further, low off-diagonal anti-image correlation values supported this (Tabachnick & Fidell, 2012). A factor loading threshold of

.45 was set based on Comrey and Lee (Comrey & Lee, 1992). After removal of two items falling below this threshold the two subscales were examined separately using only the remaining items. This was done due to the above-mentioned possible issues with accessibility of the gardening related behaviours which were grouped onto one subscale. Assessing the subscales separately might help with the use of the scale in later studies, as it allows separate use of the subscales when needed due to low numbers of participants with access to a garden. The Kaiser-Meyer Olkin (KMO) measures for each subscale suggested that the data was suitable for a factor analysis (gardening KMO=.863, non-gardening KMO=.857). Further, the Bartlett's test for Sphericity was significant for both (gardening: χ^2= 961.948, df=36, p<.001; non-gardening: χ^2= 1377.199, df=55, p<.001). Both had low off-diagonal anti-image correlation values, a further indicator of suitability for factor analysis.

For the gardening subscale, no items were below the threshold. For non-gardening behaviours, one item with factor loadings below the threshold of .45 was removed from the non-gardening list as well as the full list.

After running a Factor Analysis on the now remaining items for the full scale, one further item from the non-gardening behaviours had a factor loading below the .45 threshold and was removed.

Principal Axis Factoring with promax rotation (w. Kaiser normalisation) was run for the combined item list ("ProCoBS"; 18 items), as well as the two separate item lists (9 items each). Factors were extracted based on eigenvalues ≥1 and the scree plots. The separate lists each had two factors and the ProCoBS had four factors, splitting into the same factors as the two separate lists (See Tables 4.2 - 4.4). The non-gardening behaviours were labelled "Civil Action" with the two factors "Individual Engagement" and "Organised Engagement. The gardening items were labelled "Gardening", splitting into the two factors "Planting" and "Wildlife". These four factors explained 64.77% of variance of the complete scale. When considering the Civil Action subscale separately, the two factors explained 63.67% of variance. The two factors found when examining the Gardening behaviours by themselves explained 63.89% of variance.

Table 4.2 *Pattern matrix of rotated factor loadings for the full ProCoBS (showing all factor loadings ≥.45). Eigenvalues are reported in brackets behind the factor names*

Item	Individual Engagement (6.521)	Planting (2.197)	Organised Engagement (1.855)	Wildlife (1.085)
I attend local council/local authority meetings about nature conservation issues	.911			
When I see litter, I pick it up	.835			
I get in touch with local authorities on nature conservation issues	.798			
I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.	.585			
I vote for parties/ candidates with strong pro-nature conservation policies in elections	.528			
I plant pollinator friendly plants		.931		
I plant plants with different flowering seasons		.924		
I plant native plants		.795		
I maintain plants with berries/fruits		.471		
I volunteer with a conservation organisation in habitat management work			.807	
I volunteer with a conservation organisation in another area not mentioned above (e.g., fundraising, education, etc.)			.705	
I participate in organised clean-up events			.651	
I sign petitions supporting nature conservation efforts			.565	
I leave an undisturbed/ unmaintained area for wildlife				.780
I avoid cutting/ trimming hedges during bird breeding season (March-July)				.557
I avoid using insecticides				.551
I add log piles or other materials that can be used as a home/ shelter by wildlife				.543
I provide food for wild animals such as birds				.462

Table 4.3 *Pattern matrix of rotated factor loadings for the Civil Action items (showing all factor loadings ≥.45). Eigenvalues are reported in brackets behind the factor names*

Items	Individual Engagement (4.043)	Organised Engagement (1.687)
I attend local council/local authority meetings about nature conservation issues	.902	
When I see litter, I pick it up	.808	
I get in touch with local authorities on nature conservation issues	.769	
I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.	.709	
I vote for parties/ candidates with strong pro-nature conservation policies in elections	.583	
I volunteer with a conservation organisation in habitat management work		.739
I participate in organised clean-up events		.672
I volunteer with a conservation organisation in another area not mentioned above (e.g., fundraising, education, etc.)		.672
I sign petitions supporting nature conservation efforts		.637

Table 4.4 *Pattern matrix of rotated factor loadings for the Gardening items (showing all factor loadings ≥.45). Eigenvalues are reported in brackets behind the Factor names*

Items	Planting (4.520)	Wildlife (1.230)
I plant pollinator friendly plants	.933	
I plant plants with different flowering seasons	.927	
I plant native plants	.800	
I maintain plants with berries/fruits	.451	
I leave an undisturbed/ unmaintained area for wildlife		.820
I avoid cutting/ trimming hedges during bird breeding season (March-July)		.568
I avoid using insecticides		.563
I add log piles or other materials that can be used as a home/ shelter by wildlife		.558
I provide food for wild animals such as birds		.549

Reliability

Cronbach's alpha was calculated to assess internal reliability. Reliability was high for the ProCoBS (α=.893), the two separate scales (Civil Action α=.858; Gardening α=.872) and all four factors (Individual Engagement α=.864; Organised Engagement α=.797; Planting α=.876; Wildlife α=.781).

Study 2

Test-Retest Reliability

Cronbach's Alpha was used to examine internal reliability changes of the scale and its subscales. A Cronbach's alpha of the retest data more than .2 lower than the initial data would indicate significant measurement error (Nunnally & Bernstein, 1994). The data from the second study showed that all subscales had high reliability and did not differ more than .2 from the initial data's reliability (see Table 4.5).

The combined scale, the separate scales, and the subscales from the retest data were correlated. All scales and subscales were significantly correlated ($p<.001$) with almost all $r \geq .7$, thus all being strong, positive correlations (see Table 4.5) (Cohen, 1988).

Table 4.5 *Cronbach's alpha at baseline and retest, as well as their difference; Pearson's r test-retest correlation coefficients*

Scale	Test α	Retest α	Difference	Test-Retest Correlation
ProCoBS	.893	.908	+.010	.851**
Civil Action	.858	.861	+.003	.765**
Gardening	.872	.883	+.011	.849**
Factor				
Individual Engagement	.864	.785	-.079	.704**
Organised Engagement	.797	.783	-.059	.675**
Plants	.876	.890	+.014	.794**
Wildlife	.781	.785	+.004	.824**

**Correlation is significant at the .001 level (2-tailed

Validity

Pearson's r was calculated between related constructs and the scale for the ProCoBS and the separate Civil Action and Gardening scales. All scales were significantly ($p<.001$) and positively correlated with all measured constructs, r ranged from weak (.260) to strong (.651) (see Table 4.6) (Cohen, 1988). Further, all Factors were positively correlated with the validation constructs, demonstrating a similar range of correlation strengths (see Table 4.7).

Table 4.6 *Pearson's r correlation matrix of the scale and subscales with the validation measures*

Validation Construct	Full ProCoBS	Civil action	Gardening
Self-efficacy	.306**	.280**	.304**
Wellbeing	.303**	.284**	.270**
Pro-environmental behaviour	.563**	.587**	.529**
New environmental paradigm	.296**	.286**	.295**
Nature relatedness	.645**	.570**	.608**
Inclusion of nature in self	.520**	.414**	.496**

** Correlation is significant at the 0.001 level (2-tailed).

Table 4.7 *Pearson's r correlation matrix of the factors with the validation measures*

Validation Construct	Individual Engagement	Planting	Organised Engagement	Wildlife
Self-efficacy	.307**	.302**	.188**	.254**
Wellbeing	.271**	.211**	.254**	.276**
Pro-environmental behaviour	.594**	.475**	.445**	.491**
New environmental paradigm	.337**	.227**	.153**	.305**
Nature relatedness	.564**	.567**	.476**	.541**
Inclusion of nature in self	.402**	.437**	.359**	.461**

**Correlation is significant at the 0.001 level (2-tailed).

Short Form

Data from Study 1 was used to develop a short form of the 18-item ProCoBS scale. The first step examined the SME data and removed the poorest performing item from each of the four factors of the ProCoBS. Then, item-total correlations were computed removing all items with r-values <.4, leading to the removal of three Civil Action items. One item pair correlated at ≥.8 ("*I plant pollinator friendly plants*" and "*I plant plants with different flowering seasons*"), the item with the lower SME score was removed. After these items were removed, PAF was performed on the remaining items. A Promax rotation with Kaiser normalisation extracted two factors with Eigenvalues ≥1, supported also by the scatter plot. The same threshold of .45 used for the long form was applied, leading to the removal of two Gardening items. PAF was performed on the resulting 8-item ProCoBS short form (ProCoBS-SF). There were two factors with eigenvalues ≥1 and the scree plot suggested two factors. All items had a factor loading of ≥.45 and no cross-loading ≥.45. The Civil Action and Gardening items separated into one factor each (see Table 4.8).

Table 4.8 *Pattern matrix of rotated factor loadings for the ProCoBS Short Form (showing all factor loadings ≥.45)*

Behaviour	Civil Action	Gardening
I get in touch with local authorities on nature conservation issues	.864	
When I see litter, I pick it up	.728	
I vote for parties/ candidates with strong pro-nature conservation policies in elections	.676	
I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.	.620	
I maintain plants with berries/fruits		.829
I add log piles or other materials that can be used as a home/ shelter by wildlife		.660
I plant pollinator friendly plants		.647
I provide food for wild animals such as birds		.522

Cronbach's alpha was calculated to examine the internal reliability of the ProCoBS-SF and its subscales. Reliability was high for the full short form (α=.825) and both subscales (Civil Action-SF α=.805; Gardening-SF α=.769). The full short form and its subscales also

showed reliable strong positive correlations with the long form and its subscales (ProCoBS-SF – ProCoBS r=.935, p<.001; Civil Actions-SF – Civil Actions r=.940, p<.001; Gardening-SF – Gardening r=.941, p<.001). Test-retest reliability was assessed with correlations between the data from study 1 and the data from study 2, which suggested a good test-retest reliability (ProCoBS r=.793, p<.001; Civil Action r=.699, p<.001; Gardening r=.827, p<.001). The short form and short form subscale scores from study 2 were also correlated with the same validation constructs as the long form. All correlations were significant at the .001 level and the Pearson's r sizes were similar to the ones of the long form (see Table 4.9).

Table 4.9 *Pearson's r correlation matrix between the short form (Full, Civil Action, Gardening – from Study 2 data) with the validation measures*

Validation Construct	Full SF	Civil Action SF	Gardening SF
Self-efficacy	.348**	.299**	.302**
Wellbeing	.290**	.241**	.272**
Pro-environmental behaviour	.609**	.605**	.485**
New environmental paradigm	.371**	.379**	.274**
Nature relatedness	.652**	.570**	.599**
Inclusion of nature in self	.480**	.403**	.470**

** Correlation is significant at the 0.001 level (2-tailed).

4.2.4. Discussion

The ProCoBS and the ProCoBS-SF were developed and validated using standard psychometric procedures (for the full questionnaire scales see Appendix E) Results demonstrated that both the full scale with its two subscales, as well as the short form scale, have high internal reliability and test-retest reliability. Validation analyses found that both the full scale and the short form scale are correlated to constructs that were hypothesized to be related to pro-nature conservation behaviours, providing strong support for the construct validity of the scale. Further, analyses distinguished four factors of pro-nature conservation behaviours. Further, Barbett and colleagues (2020) published a Confirmatory Factor Analysis (CFA) of the ProCoBS-SF based on a YouGov data set with a stratified sample of 1298 adult participants. This CFA indicated a good-fit with the two-factor structure found

in the Exploratory Factor Analysis, thus indicating that the proposed factor structure was psychometrically robust.

In the full scale, civil actions were split into two factors: “Individual Engagement” and “Organised Engagement”. Both consisted of behaviours that may be similar to ‘non-activist behaviours in the public sphere’ in pro-environmental behaviours (Stern, 2000). This divide between behaviours may reflect a divide also found in general environmental behavior. Kaiser and Wilson (Kaiser & Wilson, 2004) theorized that found differences may be explained by differences in difficulties between behaviours. Engaging in behaviours that are organized by the individual may represent different challenges than participating in a pre-organised activity. This separation is supported by the difference in correlation sizes between the Factors and the self-efficacy measures: The Individual Engagement items were more highly correlated with self-efficacy than the Organised Engagement items.

Behaviours that were grouped under Individual Engagement were behaviours that may require individual organisation and motivation. A large proportion of the behaviours in this factor were political behaviours, which related to opportunities whereby citizens in a democracy can influence legislation and policies around nature conservation. In general, political participation is an important means for citizens to communicate their views to the government and includes behaviours such as voting and communicating with officials (Uhlaner, 2015). Both of these behaviours grouped into the Individual Engagement factor. Voting behaviour specifically has also been included in existing research on conservation related behaviours (Prévot et al., 2018). And in pro-environmental behaviours, support for public policies is an important part of non-activist behaviours in the public sphere (Stern, 2000). Interestingly, picking up litter fell into this factor as well, even though it is not political participation. Further, and in contrast to the above, the behaviour of taking part in clean-up events fell into the Organised Engagement factor. This specific difference shines a light on the difference between the two factors found within Civil Actions: while both behaviours have the same objective outcome (removal of litter), litter picking is coming from a place of individual effort and organization whereas taking part in a clean-up is attending an event organized by someone else. However, the item “I attend local council/local authority meetings about nature conservation issues” does not seem to be fully in line with the other items in this factor, because these meetings are pre-organised

activities that individuals can participate in. More research is required into how this behavior may differ from other pre-organised activities, and in which way it may present different challenges than behaviours in the “Organised Engagement” factor.

Items in the Organised Engagement factor also take place in the public sphere but are less directly related to political action but rather focused on social aspects of citizenship. Behaviours, such as petitioning are also included in some measures of general pro-environmental behaviours, where they are classed under environmental citizenship (Stern, 2000). The other items in this factor relate more to practical volunteering within a conservation framework. Volunteering within the more general environmental sector has been examined and found to be related to positive well-being outcomes (Binder & Blankenberg, 2016), as well as the more specific volunteering with a conservation organisation (Rogerson et al., 2017).

In Gardening there were also two factors: The first one is ‘Planting’ and the second one ‘Wildlife’. ‘Planting’ and refers to which type of plants an individual maintains in their garden. It includes a variety of behaviours that were based on academic evidence of their efficiency in nature conservation and had high ratings in the Subject Matter Expert Review. Planting behaviours such as planting pollinator friendly species, plants with different flowering seasons and native plants have repeatedly been shown to support the density and diversity of a variety of flying pollinators (e.g., Burghardt, Tallamy, & Gregory Shriver, 2009; Daniels & Kirkpatrick, 2006; Rundlöf, Persson, Smith, & Bommarco, 2014).

Behaviours in the ‘Wildlife’ factor relate to the creation of a less artificially maintained garden and the introduction of features that can provide resources and/or habitats for wild plants and animals. Leaving an unmaintained area, or ‘wildflower patch’ is a widely recommended action and has been used as an indicator of conservation friendly behaviour in past research (Prévot et al., 2018). Another behaviour in this factor is feeding birds, a behaviour that does not only have a positive effect on avian abundance but also on people’s connection to nature and well-being (Cox & Gaston, 2016; Fuller et al., 2008).

To test the construct validity of the ProCoBS the scale was correlated with pro-environmental behaviours. As predicted, the full scale and its subscales as well as the short form and its subscales were significantly positively correlated with the pro-environmental behaviours. While little is known on which specific pro-environmental behaviours and pro-

conservation behaviours are related to each other, there often seems to be an overlap, and participation in wider environmental activities has been linked to wildlife-friendly gardening (Goddard et al., 2013). However, existing research (Martin et al., 2020) suggests that pro-conservation behaviours and pro-environmental behaviours are separate constructs. Further, it was predicted that pro-conservation behaviours would be related to similar psychological concepts as pro-environmental behaviours. Especially the two scales employed to measure nature connectedness had a strong (Cohen, 1988), significant correlation with the ProCoBS, which supports that prediction. This also is in line with findings from other studies that people with higher connectedness to nature are more likely to engage in pro-nature conservation practices, such as adding wild-flower patches to their garden or considering biodiversity in their voting intentions (Prévot et al., 2018). Pro-nature conservation gardening directly operationalises the compassion pathway to nature connectedness (Lumber et al., 2017) and may also provide meaningful experiences with nature, thus improving nature connectedness (Clayton, 2007; Shaw, Miller, & Wescott, 2013).

In order to prevent a further acceleration of biodiversity loss and its consequences, a better understanding of which behaviours have a positive impact on biodiversity, and how the general public can be encouraged to engage in those behaviours is needed. The ProCoBS constitutes a crucial tool for research on pro-nature conservation behaviours. Measuring tools for behaviours can be used to examine what influences those behaviours and to develop and evaluate communications and interventions aiming to them (Lange & Dewitte, 2019).

The ProCoBS is a self-report measure. Self-report measures have the advantage of being easy to administer at a low cost, thus providing an ideal tool for large scale research (Lange & Dewitte, 2019). The developed short form can facilitate engagement with the scale from conservation organisations, who wish to use the scale in evaluating their projects in time pressured settings. However, researchers should be aware of possible inaccuracies in self-report measures. Inaccuracies can be caused, for example, by over-reporting or differing perceptions between participants of what the frequency markers like “often” mean (Barr, 2007; Kormos & Gifford, 2014). Apart from the limitations of self-report measures, a possible limitation of the ProCoBS specifically might be that it was developed with the UK

and central Europe in mind. All SMEs were UK based (with only a few originating from mainland Europe) and all participants were from the UK. Nevertheless, the political participation items might be applicable to other countries with similar democratic governments and the organised engagement items may relate to all societies with similar social and cultural structures. However, it is likely that the Gardening items might be more specific to the UK and central European ecosystem. The methodology used in this chapter could be adopted in developing equivalent measures in heterogenous ecosystems. More research, with a greater international reach, should therefore be undertaken to explore how the ProCoBS performs in different geographical and cultural settings.

On the other hand, while international research is highly important, when it comes to pro-nature conservation behaviours, a global approach might be not only difficult but also not realistic in terms of both practical and theoretical applications. Scholars have highlighted the growing importance of place-based behaviours from a psychological perspective (Larson et al., 2015). But from an ecological perspective, this is equally important: Ecosystems vary between locations and may need specific actions for support that are unique to the area. Thus, having some place-based behaviours, such as the gardening behaviours in the ProCoBS that vary between different versions of the scale might be the key to a global solution of pro-nature conservation behaviour research.

The ProCoBS may be used as a complete scale for people who have access to a garden, but when focusing on a sample where some people have access while others do not, the two subscales should be used separately. This makes the scale more adaptable, which could be a strength, but it may also prove to be a limitation: Further research on whether this scale should be used as one or whether the two subscales may be more useful as separate scales is needed. A separate use would then be in line with the idea of varying place-based behaviours since the civil actions in the scale promise to be more globally applicable than the gardening actions.

Future research should employ the ProCoBS in different contexts to further establish its validity and reliability. The ProCoBS can be used to explore the extent of the value-action gap for pro-nature conservation behaviours and how to close this gap. Some of the constructs used for the validation of the scale, such as connectedness to nature, are likely to be important predictors of pro-nature conservation behaviours. Research on the different

predictors of pro-nature conservation behaviours and their interaction is crucial in understanding and encouraging these behaviours.

Biodiversity loss will have similarly devastating global consequences as climate change, yet behaviours to counter biodiversity loss are, by far, less studied than behaviours relating to climate change. The ProCoBS constitutes a reliable and valid measurement tool for active behaviours supporting nature conservation. As the first scale of its type, the measure can have international impact given valuable potential uses in research as well as practical conservation work. The ProCoBS facilitates the examination of underlying motives and factors that determine pro-nature conservation behaviours and allows intervention and communication programmes encouraging these behaviours to be evaluated. With the development of this Scale, the first step of the systematic approach to pro-nature conservation behaviours could be considered complete. However, the scale may not be suitable to one very important population group: Children and adolescents. Before this thesis will consider the second step of the systematic approach, the assessment of predictors of the behaviours, a child scale will be developed in chapter five.

5 Won't somebody please think of the children? – A ProCoBS for Children and Adolescents

5.1 Introduction

So far, this thesis has explored and assessed behaviours that people can engage in to successfully support biodiversity conservation with the aim of creating a measurement tool for a systematic research approach to these behaviours. Labelled as 'pro-nature conservation behaviours', they illustrate a range of activities that anyone can engage in to try to effectively counter biodiversity loss. In order to efficiently encourage action, a greater understanding of the predictors associated with pro-nature or pro-environmental behaviours must be established. This must start with a validated measurement of such behaviours in the first place. The previous chapter created two versions of such a measure. However, these may not be suitable for every part of the population. Specifically, children and adolescents may require a separate measurement tool. This chapter will present the development of a child version of the Pro-Nature Conservation Behaviour Scale.

There is a need to understand both the overall aims and expected outcomes of any such behaviour when attempting to measure them. Stern (2000) describes these as the two realities of behaviour – the subjective and objective. The subjective reality describes behaviour as an individual's means to achieve an aim, thus identifying an appropriate aim is important. The objective reality describes the outcome of a behaviour, and whether it has a meaningful impact on achieving the broader goals of the individual. In order for a pro-nature conservation behaviour measure to be meaningful, it needs to capture both these realities. This was ensured through the two aspects of the definition as introduced in chapter three. Further, the 'conservation specificity' clearly outlined in both the aims and outcomes in the definition of pro-nature conservation behaviours separates pro-nature conservation from general pro-environmental behaviours. This separation in the objective reality is supported by research as well as by practitioners in the field of nature conservation (Barbett, Stupple, Sweet, Schofield, & Richardson, 2020). Research, especially when conducted in collaboration with conservation organisations often makes a clear distinction between general pro-environmental behaviours and conservation related behaviours, while pointing out a lack of pro-nature conservation behaviours in research regarding pro-

environmental behaviours (Hughes et al., 2018; Prévot et al., 2018; Richardson et al., 2019). From a subjective perspective, there is evidence that pro-nature conservation behaviours are a psychologically different construct than pro-environmental behaviours, as shown by a large-scale factor analysis (Martin et al., 2020). There is a need to address the limited literature on pro-nature conservation behaviours through research based on reliable and valid measurement tools.

The ProCoBS, as developed in chapter four, is a psychometrically validated measure of pro-nature conservation behaviours. It was designed using an adult sample in the phases of scale development that rely on administration of the items and with adults in mind during the earlier phase of item generation. However, it is important that such measures capture relevant behaviours from all age groups and several behaviours featured in the ProCoBS may not be accessible for children and adolescents. For example, the ProCoBS includes questions around voting which has age restrictions associated with it (minimum voting age in the UK is 18 years - UK Parliament, 2020). Further, while there is no official minimum age for volunteering, some positions may only be accessible to adolescents aged 16 or older (due to insurance reasons for example - GOV.UK, n.d.). Therefore, the original scale as it stands (and its corresponding short form) may not be a suitable measure to capture the pro-conservation behaviours of children and adolescents. As this age group is of particular importance, being key stakeholders in the positive change movement for the environment now and in the future, it is vital to ensure research on pro-nature conservation behaviours includes them. Indeed, this age group has been labelled, rightly so as the “future leaders of society” (de Leeuw et al., 2015; Ojala, 2012). Implementing child friendly pro-nature conservation behaviours from a young age might help children and young adults to carry these behaviours into adulthood and to then further include the adult appropriate behaviours in their future. Children are also more likely to experience the detrimental effects of the ongoing biodiversity loss. In fact, 27% of 10-14-year-olds in an Australian study believed that environmental issues may contribute to the end of the world during their lifetime (Tucci, Mitchell, & Goddard, 2007). Thus, while their behaviour as future adults is important, they can already take impactful action now. Although it is important to acknowledge that the behaviour of younger generations is influenced by their parents, this intergenerational influence can go in both directions: children may learn about

environmental issues at school and then successfully encourage their families to change household behaviours (Ballantyne, Fien, & Packer, 2001; Grodzińska-Jurczak, Bartosiewicz, Twardowska, & Ballantyne, 2003). The importance of young people taking action has been in a media spotlight recently, after students, led by 2019 Nobel peace prize nominee Greta Thunberg, organised a wave of global school strikes.

Aside from this, the need for a child friendly scale became apparent when the National Trust used the ProCoBS in a large-scale survey. During the development of the survey, it became quickly apparent, that the sub-survey, which was aimed at children needed a specific measure for pro-nature conservation behaviour. Thus, the frame in which the child friendly version was developed was this survey. Items were chosen from the existing SME review and then validated using data from the National Trust survey.

In pro-environmental behaviours, researchers have found various types of behaviours fall into the theoretical framework of two spheres (Stern, 2000): the private sphere, which includes behaviours people engage in at home, and the public sphere such as petitioning. The adult ProCoBS was found to load on to four factors, which concur with the categories found in pro-environmental behaviour. For the ProCoBS there are two primary categories of behaviour which are then divided across two factors each. These categories are Gardening behaviours and Civil Action. Both these factors can and do play an important role in nature conservation. Gaston and colleagues (2005) found that even small changes to urban gardens for example, can turn them into a safe and resource rich space for a variety of flora and fauna, thus giving people the opportunity to support local wildlife within their private sphere. Civil Action behaviours on the other hand tap into public sphere behaviours aimed at achieving larger societal change, which many experts argue is needed even more than personal behaviour change (Sinnott-Armstrong, 2005). Further, Civil Actions are more widely accessible, including people of lower socio-economic status who may not have a garden at home. A child and adolescent version of the scale should also tap into these two dimensions.

The child version of the ProCoBS will be validated using similar constructs as the adult ProCoBS. The four constructs that were used are pro-environmental behaviour, nature connectedness, environmental concern and well-being. Pro-nature conservation behaviours are decidedly separate from pro-environmental behaviours (Martin et al., 2020), however

people who are engaging with nature conservation may also be active in counteracting wider environmental concerns. Thus, both pro-environmental behaviours and environmental concern can be expected to show a relationship with pro-nature conservation behaviours. Nature connectedness is an emotional construct, describing an individual's relationship to nature (Nisbet & Zelenski, 2013). This may be one of the most important predictors of pro-nature conservation behaviours (Richardson et al., 2020). Further, for the adult ProCoBS, a positive relationship with well-being was found, a similar relationship is hypothesised for children as well (Barbett et al., 2020).

This chapter will present a version of the ProCoBS that is suitable for children and adolescents based on the same subject matter expert review as the adult ProCoBS. Items were assessed for their suitability for children aged 8 and up based on readability and accessibility. The scale's reliability was then tested using internal consistency tests, and an exploratory factor analysis was used to examine the dimensionality of the scale. Further construct validity was assessed by correlating the scale with measurements of the constructs described above. It was hypothesized that those constructs would be related to pro-nature conservation behaviours.

5.2 Methods

Item Generation

Each item in the existing short form scale of the ProCoBS for suitability for children and adolescents aged eight and up and discarded those that were deemed unsuitable. Those items were then, where possible replaced by items from the long form ProCoBS. For example, items regarding voting behaviours were removed, as children aged 8-15 do not have access to those behaviours.

Remaining items were selected from a list of 25 behaviours that had passed a Subject Matter Expert (SME) Review. This review was taken from Barbett and colleagues' (2020) paper on the development of the adult ProCoBS. Here, researchers picked the highest-ranking items that were deemed suitable for children and adolescents. This resulted in an eight-item scale, which like the adult short form ProCoBS consisted of four gardening related and four non-gardening related behaviours. These behaviours were then assessed

for child-friendly wording and amended were necessary or appropriate. For example, the item "*I plant pollinator friendly plants"* from the adult scale was reworded to "*I grow flowers and/ or plants that insects and birds will like".*

The resulting items, as well as the question prompts, were then evaluated for reading level using a variety of standard readability tests (Flesch Reading Ease Formula, Flesch-Kincaid Grade Level, Fog Scale, SMOG Index, Coleman-Liau Index, Automated Readability Index, Linsear Write Formula; Coleman & Liau, 1975; Eltorai et al., 2015; Flesch, 1948; GH, 1969; Gunning, 1952; Kincaid, Fishburne Jr., Rogers, & Chissom, 1975; Smith & Senter, 1967). These tests consider sentence length, whether children will know the words that are used, and other metrics. Results indicated that the text was easy to read and suitable for children as young as age 8-9. For the final questionnaire see Appendix E.

Participants

1051 children and adolescents aged 8-15 (M=11.45, SD=2.31) took part in a YouGov run survey. Therefore, the survey abided to the ESOMAR ethics guidelines and the participants who came from a large participant panel were collected through active sampling to represent the British population. 53.1% of participants were male, and 46.9% were female. 7% of the participants stated that they did not have access to garden either at home or through an allotment or community garden and 1.6% did not know whether they had access or not, meaning that 91.4% did have access to a garden or piece of land.

Materials and Procedure

The pro-nature conservation behaviour items were a small part of a larger YouGov survey commissioned by the National Trust. The following parts of the survey are included in this chapter:

YouGov provided information on a variety of Demographic variables. Participants ages was given in the groups 8-9, 10-11, 12-13, and 14-15. Gender was given as "*Male*" and "*Female*"

For pro-nature conservation behaviours, the four non-gardening-related items were presented to all participants who were asked to rate how often they engaged in each behaviour on a 7-point Likert scale for frequency (1- Always; 7- Never). They were then asked whether they had access to a garden or land, either at home, through an allotment

they helped look after, or in a community garden (e.g., at school). Only participants who stated they had access to at least one of those options were then presented with the 4 gardening related items. These were again, rated on a 7-point Likert scale for frequency depending on how often they did the behaviour by themselves or with someone else.

Happiness was assessed with a single item measure (Abdel-Khalek, 2006). This measure asks the participants to rate their general happiness on an 11-point Likert scale ranging from 0- Not at all happy to 10- Very happy. Similarly, Environmental concern was measured using a single question. Participants rated the statement "*I am concerned about the decline in wildlife (such as birds, animals, insects, etc.)*" on a 5- point Likert Scale from 1- I agree with this a lot to 5- I disagree with this a lot.

To assess nature connectedness the Inclusion of Nature in Self (INS) scale was utilised. The INS is a single-item measure (Schultz, 2001), which uses graphic representations of 'self' and 'nature' as two circles. Participants select one of seven choices where the circles have different levels of overlap.

Pro-Environmental Behaviours were measured using five different behaviours (e.g., "*Walked, cycled or used public transport (such as trains, bus etc.) instead of being driven in a car*". Participants indicated whether they had ever engaged in each behaviour or not (Yes/No response format).

5.3 Results

Item total correlations were calculated for the full scale as well as the two subscales (gardening/ non-gardening). Applying a cut-off point for items below .3 as suggested by Nunnally and Bernstein (1994) did not lead to any item deletions. Thus, all eight items were included in the Factor Analysis.

Assumptions of normality were violated (Kolmogorov-Smirnov and Shapiro-Wilk tests <.001), therefore, principal axis factoring (PAF) was the chosen extraction method for the factor analysis. The Kaiser-Maier Olkin measure =.888, and Bartlett's test were significant ($p<.001$), suggesting that the data was suitable for a factor analysis. This was supported by low off-diagonal anti-image correlation values (Tabachnick & Fidell, 2012). Two Factors had Eigenvalues ≥1. These factors were extracted using a varimax rotation with

Kaiser normalisation (See Table 5.1). A cut-off was applied for factor loadings below .45 (Andrew Laurence Comrey & Lee, 1992). No items fell below this threshold and no items had a cross-loading over .45. One of the items that was initially part of the non-gardening behaviours, mapped onto a factor with the gardening behaviours and was therefore moved to the gardening related behaviour subscale. Concurrent with the adult ProCoBS, the two factors were dubbed "Civil Action" (3 items) and "Garden Action" (5 items).

Table 5.1 *Pattern matrix of rotated factor loadings (showing all factor loadings ≥.45) using a promax rotation (Kappa=1)*

Item	Garden Action	Civil Action
Make homes for nature (such as insects, hedgehogs, etc.)	.776	
Grow flowers and/ or plants that birds and insects will like	.751	
Put food out to feed garden birds	.683	
Leave an area of lawn/ flowerbed to grow wild	.635	
Take part in a wildlife survey (such as Garden Bird Watch, Bio-Blitz, etc.)	.500	
Talk to other people (such as family, friends, etc.) about the importance of looking after nature and the environment		.661
Pick up litter to help nature have a better home		.644
When walking in nature by myself or with a dog, I try to avoid disturbing wildlife		.518

Reliability

Due to the moving of one item between subscales, item-total correlations were re-calculated for each subscale. No item-total score fell below the .3 threshold. The Cronbach's alphas for the full scale (α=.857), as well as for both subscales (Civil Action α=.713; Garden Action α=.848) indicated a high internal reliability.

Validity

The full scale, as well as each subscale was correlated with the constructs that were hypothesised to be related to pro-nature conservation behaviours using Pearson's r. In advance to this, some variables were recoded so that low values indicated low agreement/engagement in behaviours and higher values indicated high agreement/engagement in behaviours for all measures. For pro-environmental behaviours the sum of behaviours the participant indicated engagement in was used. All measurements (Happiness, Nature Connectedness, Environmental Concern, and Environmental Behaviours) were significantly ($p<.001$) and positively correlated with the full scale as well as the two subscales (see Table 5.2). The correlation strengths ranged from weak to moderate, being lowest for happiness and highest for the INS (Cohen, 1988).

Table 5.2 *Pearson's r correlation matrix of the full scale and subscales with the validation measures - all correlations are significant (p<.001)*

Validation Construct	Full Scale	Civil Action	Garden Actions
Happiness	.158	.140	.150
INS	.427	.378	.384
Concern	.399	.413	.308
Environmental Behaviours	.361	.357	.292

5.4 Discussion

The results suggest that the Pro-Nature Conservation Behaviour Scale for Children and Adolescents (ProCoBS-C) is a suitable measurement tool for children age 8 to 15. Using items from an SME reviewed list ensured content validity and the reliability analysis revealed a high internal reliability. The scale correlated significantly with the constructs related to pro-nature conservation behaviours, which supports the construct validity of the scale. While the correlations were not quite as strong as those found in the adult scale, a similar pattern was found, with the well-being measure happiness having the weakest correlation and the nature connectedness measure having the strongest correlation.

Nature connectedness has been shown to be an important predictor of pro-nature conservation behaviours in adults (Richardson et al., 2020) and the moderate positive

correlation between the ProCoBS-C and the Inclusion of Nature in Self (INS) supports the hypothesis that this relationship exists in children and adolescents as well. Barbett and colleagues (2020) found that the NR-6 measure of nature relatedness, which is a more emotional measure than the INS (Geng et al., 2015; Saunders et al., 2006; Schultz, 2001), was more highly correlated with the ProCoBS than the INS. Future studies on pro-nature conservation behaviours may look into whether this difference exists in children as well. While there is evidence that pro-environmental behaviours and pro-nature conservation behaviours are separate behaviour categories (Martin et al., 2020), some overlap and relation can be expected (Goddard et al., 2013). The moderate correlation between the ProCoBS-C and pro-environmental behaviours further supports this. The final construct used for the validation of the ProCoBS-C was environmental concern. A single-item question measured specific concern about biodiversity loss. Both general and specific environmental concern should be expected to be linked to pro-nature conservation behaviours (Poortinga et al., 2004). A moderate positive correlation between the ProCoBS-C and the measurement of environmental concern was found, supporting the construct validity of the Scale. Finally, the Child PRoCoBS was weakly, positively correlated with Happiness, which was employed as a measure of well-being.

The factor analysis revealed two factors: Garden Actions and Civil Action. These Factors are consistent with the adult ProCoBS because the adult ProCoBS was divided into Gardening and Civil Action in both the short form and the long form. Though, when addressing children and adolescents the wording of Gardening may not be appropriate. Children are less likely to have full responsibility of a garden but might still take action in those gardens, likely with the support of an adult. Therefore, when addressing children instead of Gardening the term Garden Action was used. The behaviours on the Gardening and Garden Action subscales mainly tap into private sphere behaviours (Stern, 2000). Wildlife friendly gardening behaviours can turn private gardens into nourishing habitats for local flora and fauna (Goddard et al., 2013). And with a large portion of UK urban greenspace being made up of private gardens they offer immense potential for biodiversity conservation (van Heezik et al., 2012). Behaviours in this scale are based on positive ecological impact. For example, feeding birds has been shown to increase bird abundance (Fuller et al., 2008). Civil Actions on the other hand include behaviours that fit better within

the range of public sphere behaviours (Stern, 2000). The items in this factor relate to children's and adolescent's behaviour towards wildlife when they are in nature (e.g., avoiding disturbing wildlife on nature walks or picking litter) as well as behaviours aimed at achieving wider societal change (talking to others about the importance of conservation).

It is notable that the behaviour "*Take part in a wildlife survey (such as Garden Bird Watch, Bio-Blitz, etc.)*" which, in the adult version of the ProCoBS, was asked with the non-garden behaviours, grouped into the Garden Action factor. This might be due to a variety of popular wildlife surveys taking place in private gardens. For example, the RSPB's "Big Garden Bird Watch" is the world's biggest wildlife survey and is most accessible to children whose families own gardens (RSPB, n.d.-a).

It is important to keep in mind that some of the behaviours, especially those around gardening, may be specific to the UK and Northern Europe. There is a need for research into whether the scale works in other cultural and geographical contexts or whether it may need amendments for different countries. A limitation that is more specific to the ProCoBS-C is due to the length restriction of the survey questionnaire. While the collaboration with the National Trust was an important opportunity that not only highlighted the need for a child-friendly version of the ProCoBS but also gave the opportunity to validate such a version with a large, stratified sample, it also posed some challenges. The survey was run for a wide scale report on the relationship between British citizens and nature. Thus, a wide variety of other measures was included in the survey, meaning that each included questionnaire scale needed to be as short as possible in order to keep the overall survey at a participant-friendly length. This was the primary reason for using several single-item measurements for the construct validity, which differed from the measurements in the Adult ProCoBS validation. However, this will likely not have impacted the validation, as several single-item measurements, for example for Happiness, or the INS have been validated and shown to be highly useful measurement tool (Abdel-Khalek, 2006; Schultz, 2001). Further, the correlations were not dissimilar to those found with adults. The length of the ProCoBS-C is the same as that of the Adult ProCoBS-SF (8 items). This is also due to the length restriction of the survey and did not allow for item reduction, as typically done in scale development.

However, as the results demonstrated the resulting scale showed high internal reliability and clear latent dimensions, nonetheless. The shortness of the ProCoBS-C makes it

is well suited for questionnaires with length restrictions, such as this one. This may be a big advantage of the scale, as it is easier to employ by conservation organisations who often face length restrictions in their surveys and evaluations of their activities, similar to the restrictions of this study. Further, the collaboration with the National Trust imposed time restrictions in the item collection and evaluation phases. Rather than systematically building a large item-pool with child friendly behaviour and running a specific SME review, possibly even with experts who have worked in nature conservation projects aimed at children, items had to be chosen from the adult specific list and adapted in wording to suit children and young adults.

Overall, the ProCoBS-C was shown to be a reliable and valid measurement of pro-nature conservation behaviours, which is suitable for children and adolescents aged 8-15. With the recent rise in public awareness of the role that young people can play in positive change for the environment, this scale will be highly useful in research investigating the pro-nature conservation behaviours of children and their motivations.

5.5 Discussing the development of the ProCoBS in its versions

Chapters four and five create an important base for research on pro-nature conservation behaviours. Having valid and reliable measurements that are then employed throughout various pieces of research can ensure meaningful, comparable, and replicable results. In research on pro-environmental behaviours, there is often a tendency to use ad-hoc measurements of behaviours, which has led to the existence of over 40 measurements (Markle, 2013). While there can be an advantage in focusing on specific dimensions of a behaviour to examine predictors that may be unique to those dimensions, it can also lead to non-systematic research that is less comparable and therefore more susceptible for a loss of applicability in pro-environmental practice. Especially within the sphere of environmental and nature conservation practice, a close collaboration between different academic fields and practitioners is highly important to foster effective programmes and projects. Thus, the aim of the development and validation of the ProCoBS, was to create a measurement tool based in the academic fields around both conservation and ecology as well as environmental psychology, but also in conservation practice. This tool should also fulfil the

requirements of academic research and use by practitioners. Further, the dimensionality of the measured behaviours needed to be assessed to gain an understanding of possible sub-groups within the larger definition of pro-nature conservation behaviours.

Using psychometric methodology, three different versions of the ProCoBS were developed and validated. Two versions were focused on behaviours suitable for adults. A long and a short version. For children, only a short form scale was developed due to methodological constraints. All three scales had high internal reliability and were significantly correlated to the validation constructs, showing convergent construct validity. Both the adult and the child short forms had two latent factors, being Gardening (or Garden Action) and Civil Action. Within the long form, these two factors were further separated into a total of four latent factors, two in each of the subscales. The adult versions also showed high test-retest reliability and thanks to the use of the ProCoBS-SF by the National Trust, a CFA confirmed its factor model as found during the EFA (Barbett et al., 2020). These results suggest that the developed scales are reliable and valid measurement tools. Some implications of the methodology and results, especially in regard to future use of the scale both in academic and practical contexts have been discussed and will be summarised in the following paragraphs to reach a clear outline of questions and suggestions for both, the following chapters of this thesis and wider research on pro-nature conservation behaviours.

Psychometrics is a large academic field with a variety of differing guidelines. Differences can be found not only in the details of cut-off points suggested in specific statistical tests but even in the overall structure of the scale development process. Individual emphases become apparent in different authors' suggestions (Boateng et al., 2018; Furr, 2014; Kyriazos & Stalikas, 2018). Especially in a project like this thesis, scale development needs to be a balancing act between thorough research and practicability. Overall, a four-phase development methodology was chosen based on suggestions by different scholars (Boateng et al., 2018; Furr, 2014). Mainly the deviation from the original suggested phases resulted in only small changes regarding the chapter structure of this thesis rather than the actual steps involved. For example, due to the novelty of pro-nature conservation behaviours as a topic, the step of domain definition and rationale was explored in its own chapter rather than as a part of the item development phase as suggested by Boateng and colleagues (Boateng et al., 2018). However, the item

development phase did bleed into that first phase in the expert rating sub-section, which gave a rough overview of possible useful behaviours within the domain. Some methodological decisions were further made due to other, practical constraints and opportunities presented to me.

A scale development project can take up several years. However, with the time constrictions of a PhD, as well as the obvious need for a scale as expressed in research resulting from collaborations of academics with nature conservation practitioners (Hughes et al., 2018), a faster development was preferable. Thus, instead of creating a highly recommended Delphi method study, a SME review was used. This still allowed for a systematic evaluation of items but within a shorter time frame. Similarly, running studies with large samples can be costly or time-consuming. Here, a collaboration with the National Trust posed some methodological hurdles but ensured large scale data collection. While only the short form was employed, it allowed a CFA with a large, stratified sample. Similarly, in the development of the child version, standard methods of item evaluation and reduction could not be applied as usual but, again, the tests of reliability, validity and dimensionality could be executed using a large sample, which is desirable.

Having different versions of the ProCoBS makes it more adaptable to the needs of specific projects and studies: While a long version may be more complete, especially in the context of conservation practice, a short version is essential due to time constrictions. This became apparent in the first use of the ProCoBS outside of the research specific to this thesis. The use of the short form in the National Trust survey demonstrated the advantages of having a short form of the ProCoBS for its practical use.

Throughout the development of not only the scale but also the concept of pro-nature conservation behaviours, two themes have been recurring: Accessibility and dimensionality. Both these themes have been assessed to some extent in the development of the ProCoBS, for example through the inclusion of items that are relevant to the British ecosystem, such as the avoidance of hedge trimming during bird breeding season – a behaviour even included in British legislation. In addition, the inclusion of behaviours that people with no access to a garden, and the development of a child friendly version have contributed to a measurement tool adaptable to a variety of populations with different means due to restrictions regarding socio-economic status or age. The separation between

gardening and non-gardening behaviours did not only show in the accessibility behaviours but was also reflected in the dimensionality of the scale. Civil Actions are often found as a dimension within pro-environmental behaviours as well, whereas gardening behaviours may fit more into the idea of place-based behaviours which are regarded as possibly apart from pro-environmental behaviours (Halpenny, 2010; Huddart-Kennedy et al., 2009). This is an interesting concept to keep in mind when employing the scale. While it was conceptualised as one scale, both the practical application of the scale and research on predictors may demonstrate that using the two subscales separately is beneficial to their usability and outcomes. This possibility should be kept in mind in the following chapters when the antecedents of pro-nature conservation behaviours are explored – it may be the case that the factors differ between the two subscales.

The idea of place-based behaviours further helps in the evaluation of what may be considered a limitation of the ProCoBS at first glance: its specificity to UK ecosystems in the gardening behaviours. There is a drive to make research applicable in global contexts and to work with global, multicultural samples (Van De Vijver, 2013). However, in the case of pro-nature conservation behaviours this may not be the most utile approach from both an ecological impact view and from a psychological perspective. Ecosystems vary around the world, and with it the local flora and fauna. Natural feats that play a role in the UK, such as hedges, or specific animals like hedgehogs and badgers, which UK conservation organisations focus on may not be as important in other areas in the world (e.g., The Wildlife Trusts, n.d.). Thus, ecosystem specific behaviours are required, and it may not be possible to find gardening related behaviours that apply globally. In fact, in some contexts, it may be useful to omit gardening related behaviours completely – for example in big cities around the world where private gardens are a rarity. Psychologically it makes sense to make these place-based behaviours place-specific: They seem to be predicted by connection to place, a relationship possibly strengthened by place specificity in the behaviour (Larson et al., 2015). This leaves multiple possibilities for the use of the ProCoBS outside of the UK: testing how well it works within an international context using both expert opinion and samples from the general public or the development of place specific measures for international context using psychometric methods. This, most likely, only applies to the

Gardening/ Garden Action subscale. The behaviours on the Civil Action subscale should be, as discussed in the ProCoBS development, applicable to all democratic systems.

The aim of this thesis is to provide the first steps to a systematic approach to pro-nature conservation behaviours. The first step to this is the careful definition and selection of behaviours to examine, as well as the development of a suitable measurement tool (Steg & Vlek, 2009). Following recommendations for a systematic approach to studying behaviour and psychometric methodology, this thesis has now established the definition of pro-nature conservation behaviours, a ranked list with possible actions, and a palette of reliable and valid measurement tools. The second step is the examination of predicting factors (Steg & Vlek, 2009). Due to the very small amount of existing literature on nature specific behaviours, the initial research on predictors of these behaviours can benefit from literature on behaviours in general, as well as pro-environmental behaviours. The following chapter will be concerned with examining these possible predictors. Throughout this, the possible differences between Gardening and Civil Action will be considered.

6 Adoption of pro-nature conservation behaviours in the UK public and influences of demographic variables

6.1 Introduction

With three established tools to measure pro-nature conservation behaviours, the second step in a systematic approach to pro-nature conservation behaviours, the establishment of an understanding of the behaviours and their antecedents, can now be considered. To begin with, an overview of how pro-nature behaviours are represented in the general public and what demographic and social factors may play a role can provide useful insights, especially for policy makers. This chapter will present an overview of the distribution of pro-nature conservation behaviours and the specific measured behaviours in a large, stratified UK sample, as well as an analysis of differences in engagement with the ProCoBS behaviours between varying demographic groups.

When studying pro-nature conservation behaviours with the aim of understanding them to develop effective methods to encourage them, the assumption is that there is a need to improve the public's engagement with those behaviours. While, from an ecological perspective, there is an immediate need to change the impact of humans on biodiversity (Ceballos et al., 2015), the actual adoption of pro-nature conservation behaviours in the public has not yet been examined. With new psychometric scales, often the final step is a standardisation (Kyriazos & Stalikas, 2018). This standardisation is done to create a norm score that allows an understanding of individual scores, for example the IQ score 100 represents the societal mean (Maltby, Day, & Macaskill, 2017). For diagnostical scales, certain values are chosen as cut-off points to indicate whether a disorder is present according to diagnostic standards or not (e.g., Krabbenborg et al., 2012). The ProCoBS is not a diagnostic scale, with such cut-off points. Thus, no such standardisation is necessary. However, understanding where the general public falls on the scale scores on average, is an important first insight into pro-nature conservation behaviours and how people engage with them. Further, scales concerning abilities tend to include an examination of the difficulties of items: Some items are easier or harder for people to achieve a high score on, thus allowing the scale to measure a large range of ability levels, which is examined in detail for those scales using Item Response Theory (Velozo, Seel, Magasi, Heinemann, & Romero,

2012). While the ProCoBS does not require such detailed approaches as it is not meant to be used in clinical or other diagnostic environments, a closer look at how participants respond to each item can offer an understanding of how easy or difficult some behaviours on the ProCoBS may be to engage in.

In any behaviour, skill, or personality trait, such as intelligence, demographic factors can play a more or less important role (Maltby et al., 2017). Thus, they tend to be one of the first variables to be examined, with research on gender differences being prominent in many fields of psychology (e.g., Endendijk et al., 2017; Maltby et al., 2017; Xiao & Hong, 2010; Zhao et al., 2020). In Pro-environmental behaviours, a variety of demographic factors have an effect on different behaviours. One commonly studied variable here is gender. Evidence suggests that women are more likely to engage in pro-environmental behaviours (Meyer, 2016; Sánchez, López-Mosquera, & Lera-López, 2016). This may be related to findings of women being more environmentally conscious (Xiao & Hong, 2010). However, gender differences might differ between dimensions of pro-environmental behaviour. Women show more behaviours inside the home (Xiao & Hong, 2010). But some research on environmentally friendly consumer behaviour has found higher engagement in men than women (Patel, Modi, & Paul, 2017). Another frequently assessed variable is age. Often, a significant effect of age is found but there seems to be no consensus on the exact effect (Patel et al., 2017). Some research shows behaviours increasing with age, while other research found mid age to present a high point with lower engagement at younger and older ages (Melo, Ge, Craig, Brewer, & Thronicker, 2018; Patel et al., 2017).

Socio-economic status seems to play a role as well, with some research suggesting that income has a negative relationship with pro-environmental behaviour (Melo et al., 2018). Other findings suggest that the effect of socio-economic status may depend on the dimension of pro-environmental behaviour that is assessed (Huddart Kennedy, Krahn, & Krogman, 2015). Demographic factors may also play a role in pro-nature conservation behaviours. Age, gender, and socio-economic grade together have been shown to make up a significant amount of variance in pro-nature conservation behaviours in adults (Richardson et al., 2020). Specifically, age may play a developmental role here: In nature connectedness, which can be expected to be an important predictor of pro-nature conservation behaviours, there appears to be a dip during the mid-teens (Hughes, Rogerson, Barton, & Bragg, 2019).

This dip may be mirrored in pro-nature conservation behaviours, making these age groups a crucial target group for interventions.

In comparison to psychographic variables socio-demographic variables tend to show weak effects on pro-environmental behaviours, with differences between research findings often leading to a lack of consensus (Patel et al., 2017). These differences may be due to differences between the exact dimensions of pro-environmental behaviour that are measured, as the effect of socio-demographic variables has been found to be dependent on the specific behaviours (Patel et al., 2017). Especially in an early attempt at understanding pro-nature conservation behaviours demographic variables are worth examination, since it can be assumed that both psychographic and socio-demographic factors play an important role in explaining pro-environmental but also pro-nature conservation behaviours (Getzner & Grabner-Kräuter, 2004).

One demographic variable that may be interesting for pro-nature conservation behaviours, which is often disregarded in pro-environmental behaviours is residential location. Whether someone lives in an urban or rural area shows no effect on pro-environmental behaviours (Melo et al., 2018). As mentioned throughout the previous chapters, some pro-nature conservation behaviours, specifically the garden related subscale tap into place-based behaviours (Halpenny, 2010; Huddart-Kennedy et al., 2009). Here, place-specific variables, such as residential location may become important. Rural residents in Canada, while not showing higher environmental concern, did report higher priority of the environment and higher participation in recycling and stewardship behaviours (Huddart-Kennedy et al., 2009).

With the novelty of pro-nature conservation behaviours as a specific behavioural group in the focus of psychological research, some overview on their adoption in the general public is an initial insight into those behaviours. While socio-demographic variables are likely not the main predictors of pro-nature conservation behaviours, they can be expected to play a role, though possibly different roles for the separate dimensions. Further, differences in demographic groups may help identify target groups for interventions to encourage pro-nature conservation behaviours. This chapter aims to provide describe the reported engagement with pro-nature conservation behaviours of the British public and an understanding of the differences between demographic groups.

Data from two YouGov surveys was analysed for this, including the ProCoBS, as well as the demographic variables gender, age, social grade (a British measure of socio-economic status), and residential location. It was hypothesised that there would be differences between the response distributions of the various ProCoBS items for different demographic groups. Also, it was hypothesised that there would be differences in ProCoBS scores between groups for all demographic variables on both subscales (Civil Action and Gardening).

6.2 Methods

Participants

Data from two samples was provided by the National Trust. One sample with children and adolescents and one with adults.

1051 children and adolescents aged 8-15 (M=11.45, SD=2.31) took part in a YouGov run survey., YouGov is a public opinion and research data group which is member of ESOMAR, councils, as well as the British Polling council, and as such follows their guidelines on research with children. In line with these guidelines, informed consent from both a responsible adult, as well as the child, were collected prior to the data collection. Prior to the use of this secondary data the researchers consulted the local ethics committee. The participants, who came from a large participant panel were collected through active sampling to represent the British population. 53.1% of participants were male, and 46.9% were female. 7% of the participants stated that they did not have access to garden either at home or through an allotment or community garden and 1.6% did not know whether they had access or not, meaning that 91.4% did have access to a garden or piece of land.

A stratified sample of 2096 adults was collected through the same YouGov process as outlined above. 990 Men (47.2%) and 1106 women (52.8%) responded to the survey. Ages ranged from the age group 16-24 to 55+, with 169 participants (8.1%) in the 16-24 group, 532 participants (25.4%) in the 25-39 group, 536 participants (25.6%) in the 40-54 group and 859 participants (41%) in the 55+ group. 17.1% responded that they had no access to a garden in any of the given capacities (“A garden at home”, “An allotment I help

look after", "A community garden I help look after (such as at work, my local area etc.)") meaning 82.9% of participants had access to a garden in at least one of those ways.

Materials and Procedure

The data used in this chapter was a small part of a larger YouGov survey commissioned by the National Trust. The following parts of that survey were included in this chapter:

Participants in the adult sample answered the ProCoBS-SF with slightly reworded items (see figure 6.1 and 6.2). The children and adolescents sample answered the child version of the ProCoBS as introduced in chapter five.

YouGov provided information on a variety of Demographic variables. Participants ages was given in the groups 8-9, 10-11, 12-13, and 14-15 in the child sample and in the groups 16-24, 25-39, 40-54, and 55+ for the adult sample. Gender was given as "*Male*" and "*Female*", the parents' or guardians' social grade, according to the UK ONS socioeconomic classification system, were provided as either "ABC1" indicating the participants as part of either grade A, B, or C1 (high/intermediate managerial, administrative or professional; supervisory, clerical, and junior managerial, administrative or professional) or as "C2DE", thus part of either grade C2, D, or E (skilled manual worker, semi- and unskilled manual workers, state pensioners, casual or lower grade workers, unemployed with state benefits only). Further information was available for whether the participants lived in a rural, town or fringe, or urban area.

6.3 Results

6.3.1 Adults

Out of the adult sample, 1630 participants had responded to all Civil Action items. The average Civil Action score was M= 3.21 (SD=1.34). 1618 participants had responded to all Gardening items, showing a mean score of M=3.77 (SD=1.8). For the full ProCoBS-SF, 1298 participants had responded to all items, with an average score of M= 3.55 (SD=1.36). Means and standard deviations for each item were calculated (see table 6.1). The distribution of responses to each item can be found in figure 6.1 and 6.2.

Table 6.1 *Means and standard deviation of responses to each item*

Item	Mean	Standard Deviation
When I see litter, I pick it up	3.97	1.60
I get in touch with local authorities on nature conservation issues	2.00	1.37
I vote for nature or wildlife conservation friendly legislation in local or national referendums/ votes etc.	3.42	2.02
I vote for parties/ candidates with strong pro-nature conservation policies in elections	3.46	1.89
Plant pollinator friendly plants (i.e., ones that are good for bees and other insects)	4.15	2.15
Add log piles or other materials that can be used as a home/ shelter by wildlife	2.88	2.05
Maintain plants with berries/ fruits (e.g., trimming them, etc.)	3.86	2.17
Provide food for wild animals (e.g., birds, squirrels, etc.)	4.20	2.23

Figure 6.1 *Response frequency distributions for each of the Civil Action items*

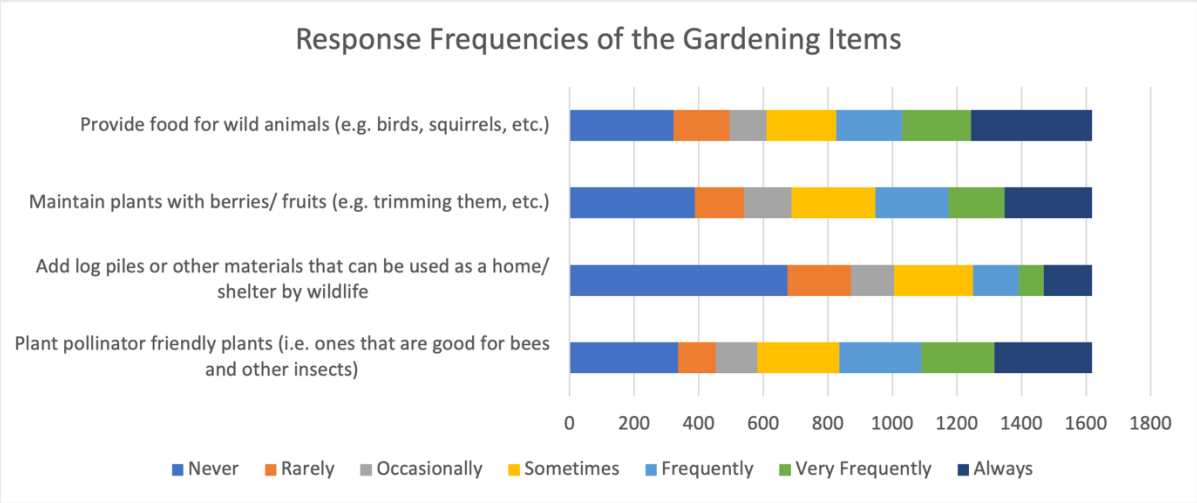
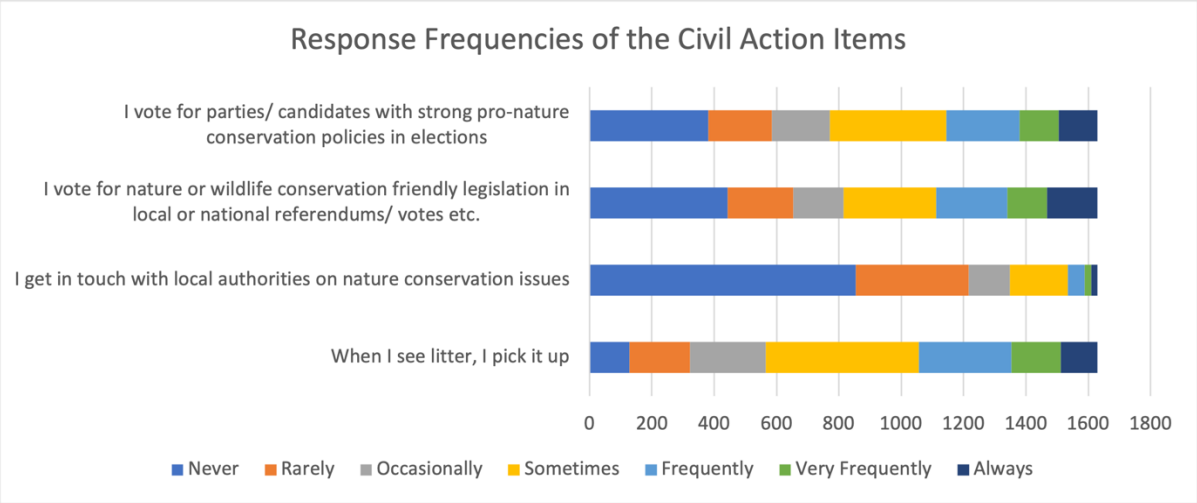


Figure 6.2 *Response frequency distributions for each of the Gardening items*



The data was screened and found to not be normally distributed for either Civil Actions (Kolmogorov-Smirnov: D(1630)=.080, p<.001, Shapiro-Wilk: W(1630)=.974, p<.001) or Gardening (Kolmogorov-Smirnov: D(1618)=.073, p<.001, Shapiro-Wilk: W(1618)=.955, p<.001). Therefore, non-parametric tests were chosen. To test the difference in scores on the ProCoBS-SF subscale between genders, Mann-Whitney tests were calculated. Men showed significantly lower engagement with Civil Actions (M=3.14, SD=1.32, Mdn=3) than women (M=3.28, SD=1.35, Mdn=3.25), U(N_{men}=804, N_{women}=826)= 312810 z=-2.028, p=.043 (see figure 6.3). The effect size here was very small, r= .050. For Gardening men also showed significantly lower engagement (M=3.64, SD=1.80, Mdn=3.75) than women (M=3.89, SD=1.79, Mdn=4), U(N_{men}=747, N_{women}=871)=299966.5, z=-2.709, p=.007 (see figure 6.4). The effect size was very small, r=.067.

Figure 6.3 *Bar graph of means and standard deviations (as error bars) for Civil Action scores in men and women*

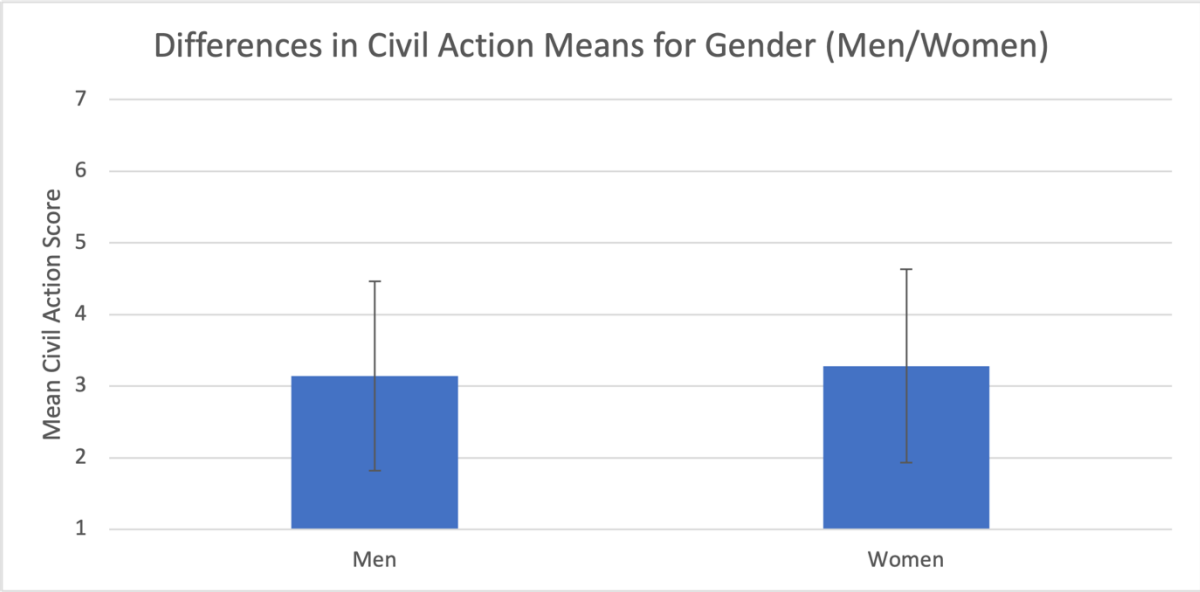
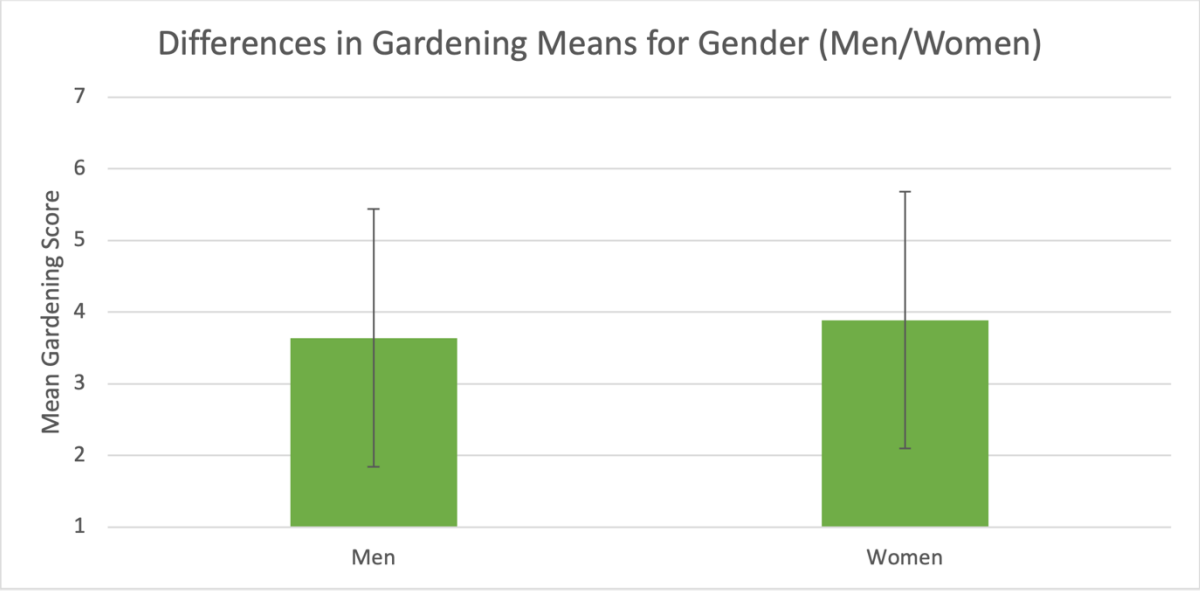


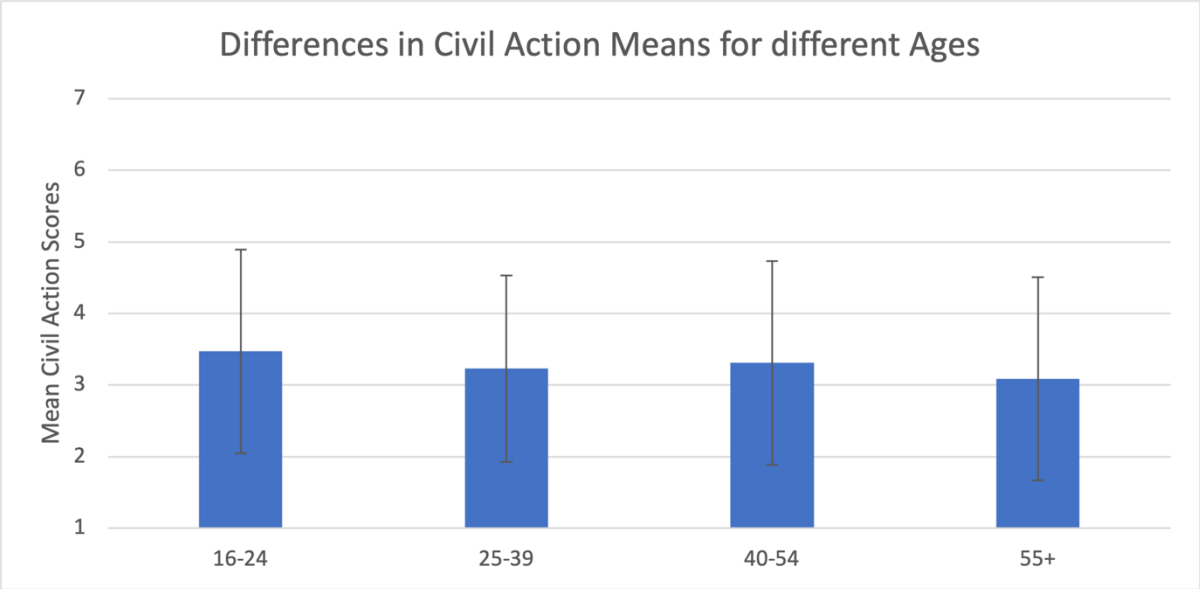
Figure 6.4 *Bar graph of means and standard deviations (as error bars) for Gardening scores in men and women*



For the differences between different age groups one-way ANOVAs were used. In Civil Actions, the Levene's test indicated that equal variances could not be assumed, F(3,1626)=3.178, p=.023, thus a Welch's ANOVA was calculated. A significant effect of age on Civil Action was found, F(3,466.234)=3.857, p=.010, the effect size was d=.286 (Lenhard

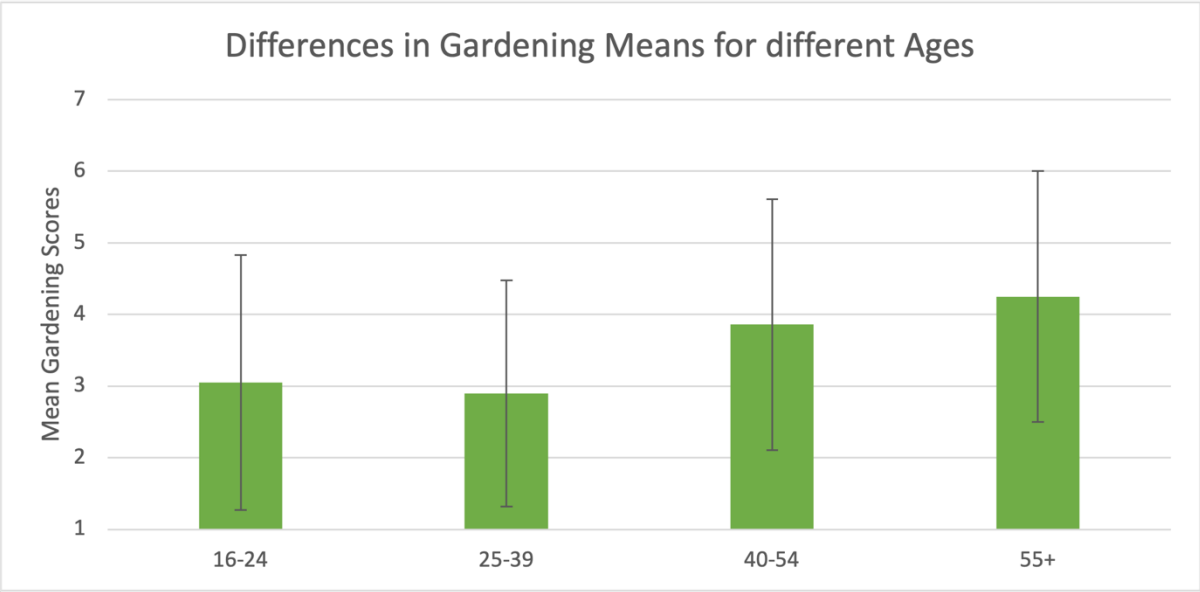
& Lenhard, 2016). Means for the different age groups were as follows: 16-24: M=3.47 (SD=1.42), 25-39: M=3.23 (SD=1.30), 40-54: M=3.31 (SD=1.42), 55+: M=3.09 (SD=1.27). A post-hoc test (Games-Howell) indicated that Civil Action scores of 55+ year-olds were significantly lower than those of 16-24 year-olds (p=.038). A full table of post-hoc results can be found in Appendix G.

Figure 6.5 *Bar graph of means and standard deviations (as error bars) for Civil Action scores in different age groups*



For the differences between Gardening in different age groups, the Leven's test was significant (F(3,1614)=2.681, p=.045) and equal variances could not be assumed. Therefore, a Welch's ANOVA was calculated. There was a significant difference in Gardening between age groups, F(3,380.496)=60.110, p<.001 d=.787. Mean scores for the age groups were calculated: 16-24: M=3.05 (SD=1.78), 25-39: M=2.90 (SD=1.58), 40-45: M=3.86 (SD=1.75), 55+: M=4.25 (SD=1.75). Post-hoc tests (Games-Howell) indicated that 55+ year-olds had significantly higher scores than all other age groups and 40-54 year-olds significantly higher scores than all the younger age groups (for post-hoc table see Appendix G).

Figure 6.6 *Bar graph of means and standard deviations (as error bars) for Gardening scores in different age groups*



Differences in scores were assessed between adults living in urban, town and fringe, and rural areas. Some participants were uncoded for where they lived. Those were removed before the test. For Civil Actions the Levene's was not significant (F(2,1592)=.825, p=.438) and equal variances were assumed. There was a significant difference in Civil Action scores between the groups, F(2,1592)=5.447, p=.004, d=.254. Means were as follows: Urban: M=3.16 (SD=1.35), Town and Fringe: M=3.27 (SD=1.29), Rural: M=3.50 (SD=1.29). Post-hoc tests (Tukey HSD) showed that participants in urban areas had significantly lower scores than those in rural areas, p=.003 (see Appendix G). For Gardening, participants in urban areas scored on average M=3.60 (SD=1.78), in town and fringe areas M=4.11 (SD=1.77), and in rural areas M= 4.49 (SD=1.69). The Levene's test was not significant (F(2,1574)=1.30, p=.273). Thus, homogeneity of variances was assumed. There was a significant difference between groups, F(2,1574)=27.03, p<.001 d=.504. Post-hoc tests (Tukey HSD) showed that participants in urban areas had significantly lower Gardening scores than those in town and fringe (p=.001), as well as rural areas (p<.001) (see Appendix G).

Figure 6.7 *Bar graph of means and standard deviations (as error bars) for Gardening scores in participants who live in "Urban", "Town and Fringe", or "Rural" areas*

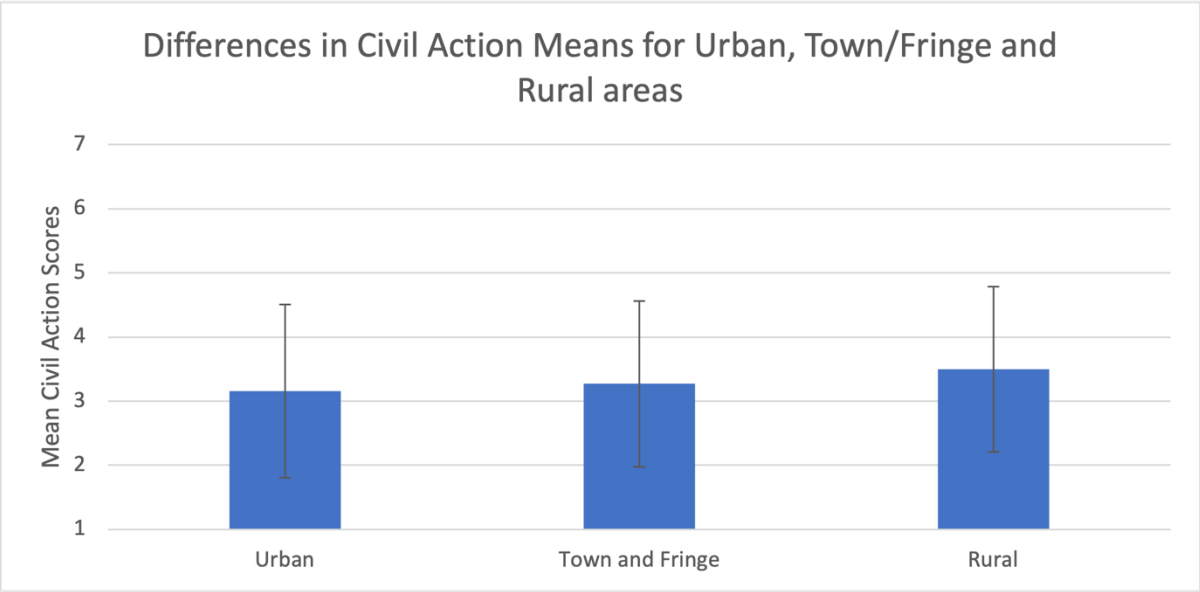
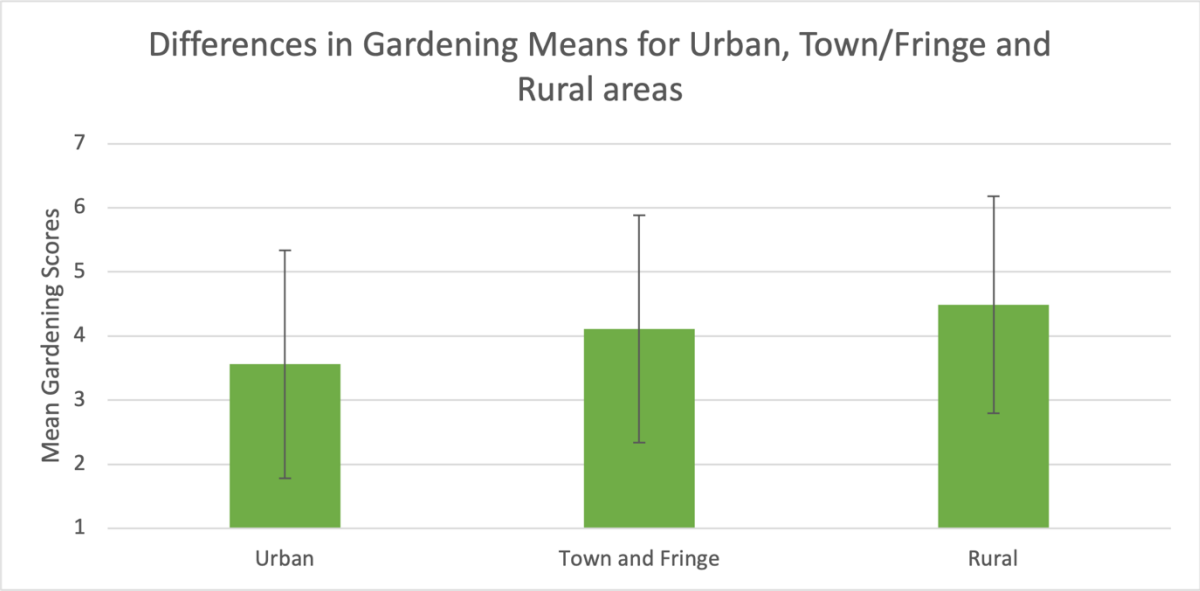


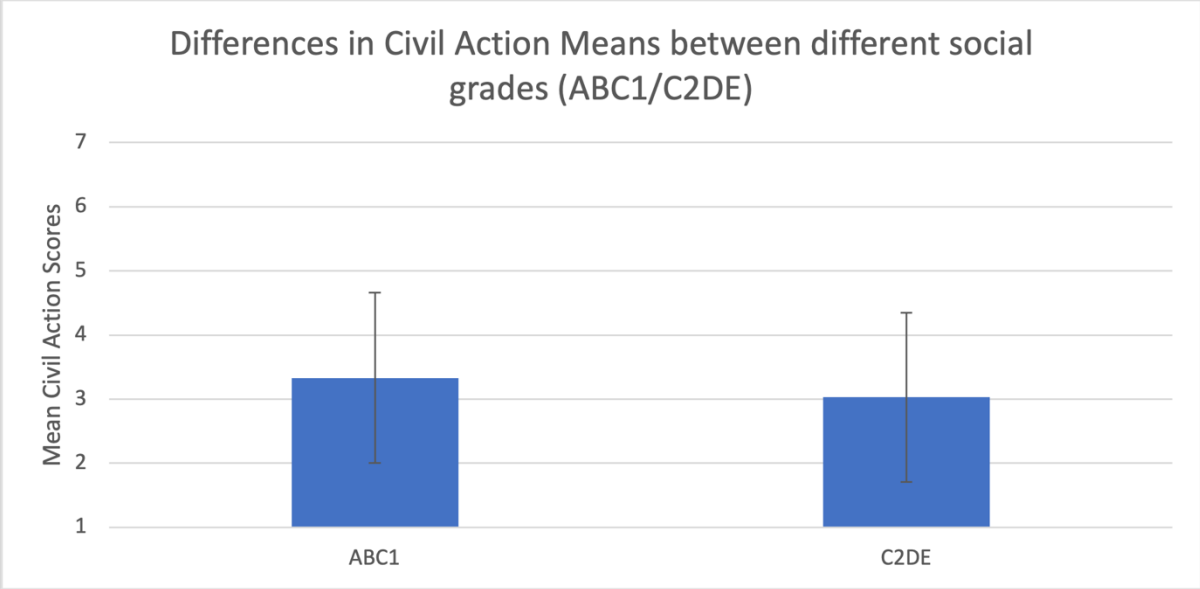
Figure 6.8 *Bar graph of means and standard deviations (as error bars) for Civil Action scores in participants who live in "Urban", "Town and Fringe", or "Rural" areas*



To investigate the differences in behaviour for different social grades, Mann-Whitney U tests were calculated. For Civil Action, there was a significant difference between the ABC1 group (M=3.33, SD=1.33) and the C2DE group (M=3.03, SD=1.32), $U(N_{ABC1}=1006, N_{C2DE}=624)=273455$, $z=-4.382$, $p<.001$, $r=.109$. For Gardening behaviours, there was no

significant difference, U(NABC1=1005, N(C2DE)=613)=306517, z=-.166, p=.868. Also, neither group was more likely to report to not have access to a garden in any capacity (chi-square $X^2(1, N=2096)=1.032$, p=.310).

Figure 6.9 *Bar graph of means and standard deviations (as error bars) for Civil Action scores in different social grades*



6.3.2 Children and Adolescents

In the children and adolescent sample 887 participants responded to all Civil Action items, 878 to all Garden Action items and 780 to all items of the ProCoBS. For Civil Action the average score was M=3.78 (SD=1.23), for Garden Action it was M=3.48 (SD=1.65), and for the entire ProCoBS child version it was M=3.70 (SD=1.30). Means and standard deviations for each item were calculated (see table 6.2). Distribution of responses to the separate items can be found in figures 6.10 and 6.11.

Table 6.2 *Means and standard deviation of responses to each item*

Item	Mean	Standard Deviation
Take part in wildlife surveys (such as Garden bird watch, Bio-Blitz, etc.)	2.35	1.57
Pick up litter to help nature have a better home	3.96	1.72
Talk to other people (such as family, friends, etc.) about the importance of looking after nature and the environment	3.96	1.62
When walking in nature, by myself or with a dog, I try to avoid disturbing wildlife	4.84	1.68
Grow flowers and/ or plants that birds and insects will like	3.84	1.98
Make homes for nature (such as insects, hedgehogs, etc.)	2.98	1.84
Put food out to feed garden birds	3.75	2.04
Leave an area of lawn/ flowerbed to grow wild	3.35	2.11

Figure 6.10 *Response frequency distributions for each of the Civil Action items*

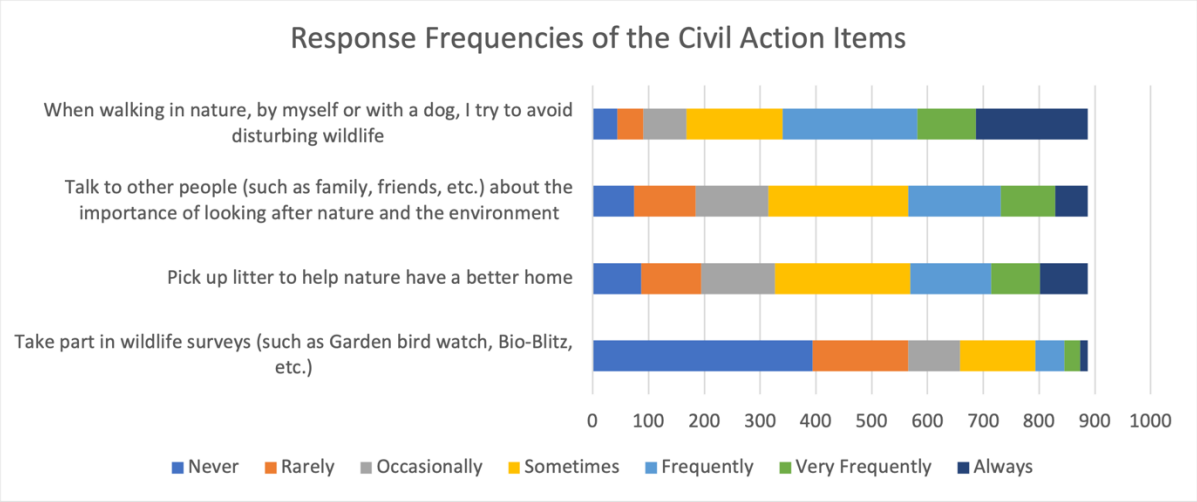
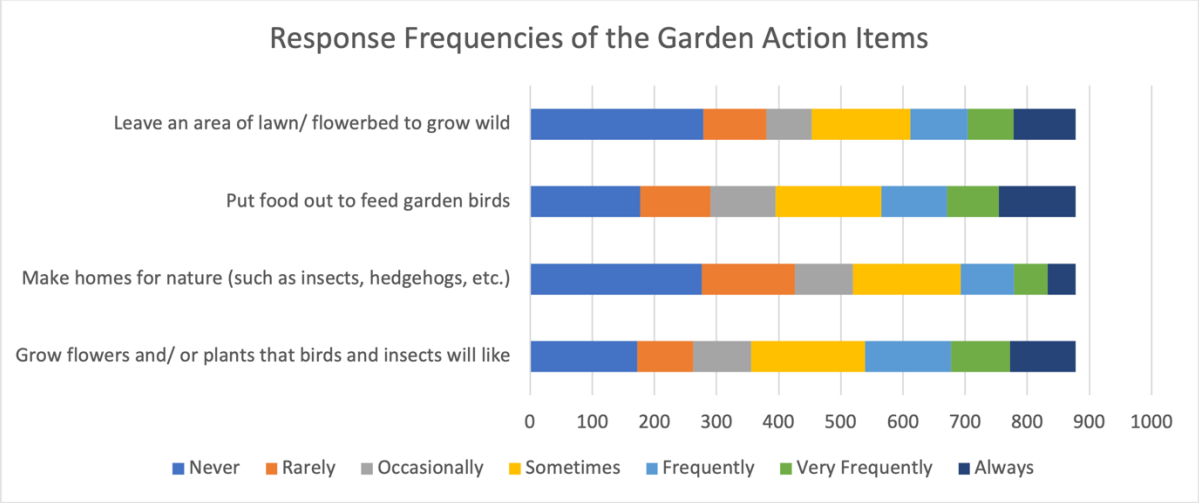


Figure 6.11 *Response frequency distributions for each of the Garden Action items*



Data in the child sample was not normally distributed for both Civil Actions (Kolmogorov-Smirnov: $D(887)=.055$, $p<.001$; Shapiro-Wilk: $W(887)=.992$, $p<.001$) and Garden Action (Kolmogorov-Smirnov: $D(878)=.074$, $p<.001$; Shapiro-Wilk: $W(878)=.963$, $p<.001$). Differences in behavior between genders were examined. Boys had a mean Garden Action score of 3.36 (SD=1.62) and a mean Civil Action score of 3.65 (SD=1.23). Girls had a mean Garden Action score of 3.60 (SD=1.64) and a mean Civil Action score of 3.93 (SD=1.21) (Figure 6.12 and 6.13). There was a significant difference in Garden Action behavior between boys (Mdn=3.25) and girls (Mdn=3.67), Mann-Whitney $U(N_{boys}=466, N_{girls}=412)=86737.50$, $z=-2.47$, $p=.013$ $d=.083$. Similarly, there was a significant difference in Civil Actions between boys (Mdn=3.75) and girls (Mdn=4) (Mann-Whitney, $U(N_{boys}=467, N_{girls}=420)=85869.50$, $z=-3.209$, $p=.001$). The effect size here was similarly small ($r=.108$).

Figure 6.12 *Bar graph of means and standard deviations (as error bars) for Civil Action scores in boys and girls*

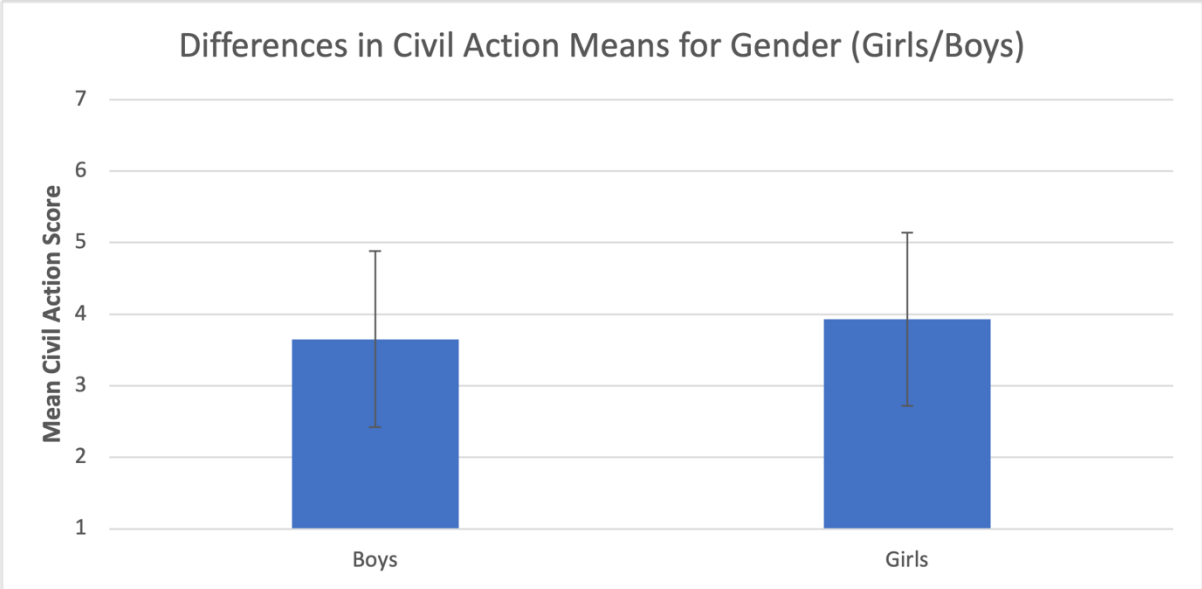
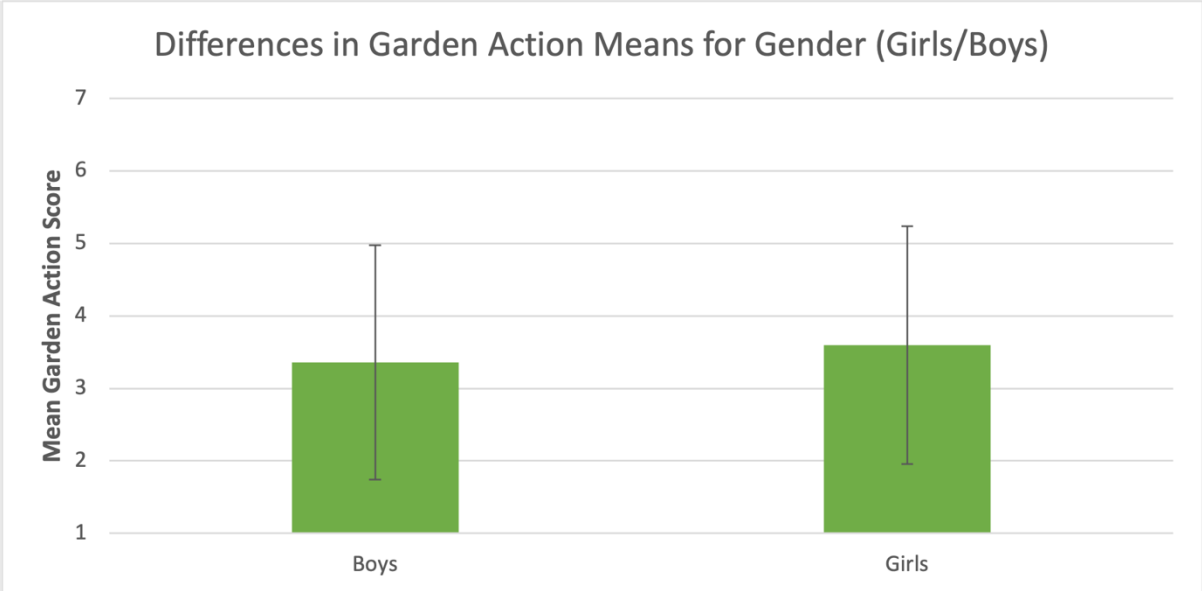


Figure 6.13 *Bar graph of means and standard deviations (as error bars) for Garden Action scores in boys and girls*

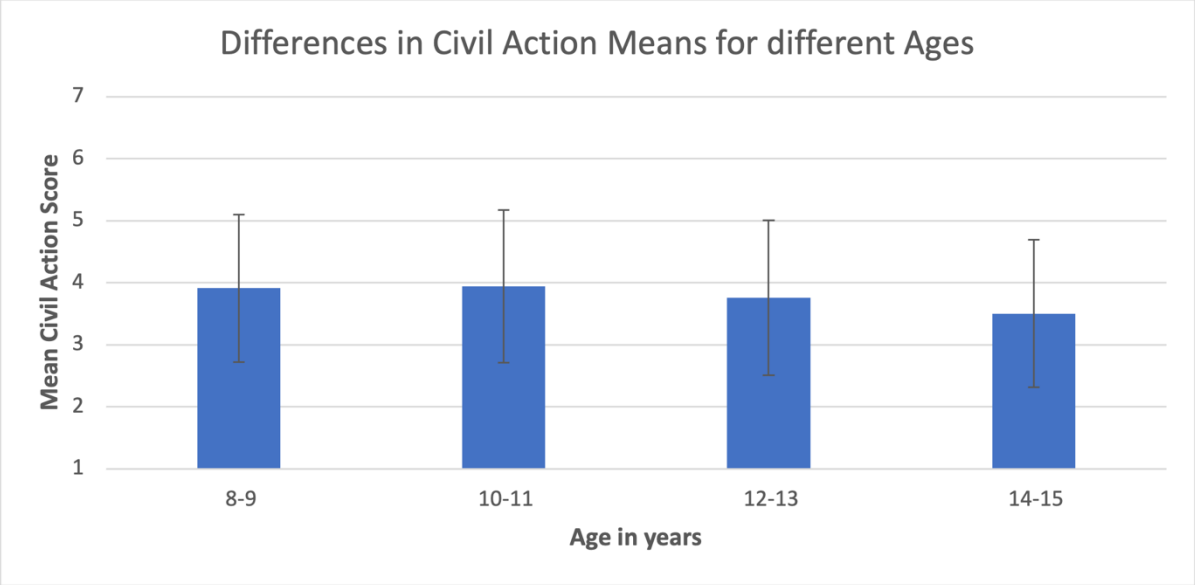


To examine differences in the Civil Action scores between the different age groups, a one-way ANOVA was conducted.

For Civil Actions, a Levene's test was not significant (p=.572), thus equal variances were assumed. There was a significant difference associated with age on Civil

Actions, F(3,883)=6.179, p<.001, d=0.362 (Lenhard & Lenhard, 2016). The Civil Action score means were then calculated for each age group: 8-9 years M=3.91 (SD= 1.18), 10-11 years M=3.94 (SD=1.23), 12-13 M=3.76 (SD=1.25), and 14-15 years M=3.50 (SD=1.19) (Figure 6.14). There were significant differences between the score for the 8-9 year-olds and that of the 14-15 year-olds (Tukey HSD p=.002) and between 10-11 year-olds and the 14-15 year-olds (Tukey HSD p=.001)(full post-hoc table in Appendix G).

Figure 6.14 *Bar Graph of means and standard deviations (as error bars) for Civil Action scores in different age groups*



For Garden Action, the Levene's test was not significant (p=.308), thus equal variances were assumed. There was a significant difference associated with age on Garden Action, (ANOVA F(3,874)=16.653, p<.001, d=.59) (Lenhard & Lenhard, 2016). Means were calculated as above; for 8-9 years M=3.75 (SD=1.54), for 10-11 years M=3.92 (SD=1.60), 12-13 year-olds M=3.24 (SD=1.65), and for 14-15 years M=2.97 (SD=1.62) (Figure 6.15). There were significant differences between behaviours of the 12-13 year-olds and the 8-9 year-olds (Tukey HSD p=.005) and between the 12-13 year-olds and the 10-11 year-olds (p<.001). Further, there was significant differences between the 14-15 year-olds and both the 8-9 (p<.001) year-olds and the 10-11 year olds (p<.001) (post-hoc table in Appendix G). To provide an overview of pro-nature behaviours throughout life, Figures 6.16 and 6.17 visualise the mean scores of Civil Action and Garden Action/ Gardening scores respectively.

When interpreting these graphs, it should be noted, that the scales used to assess the scores are different, especially the Civil Action one, which may account for differences in scores.

Figure 6.15 *Bar graph of means and standard deviations (as error bars) for Garden Action scores in different age groups*

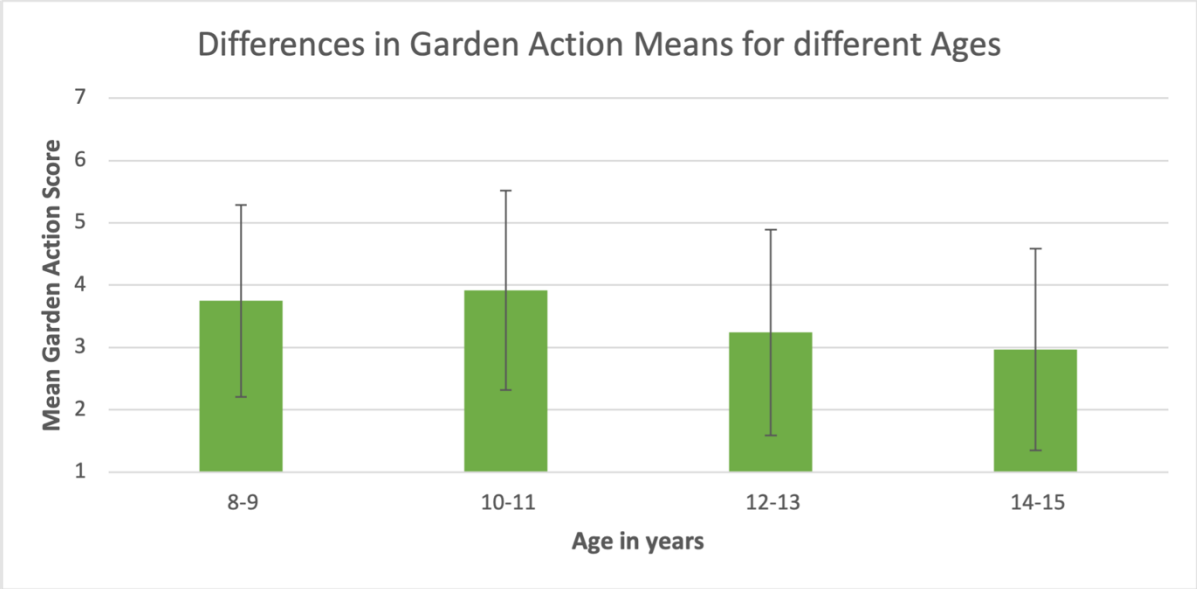


Figure 6.16 *Bar graph of means and standard deviations (as error bars) for Civil Actions in different age groups in both the children and adult sample*

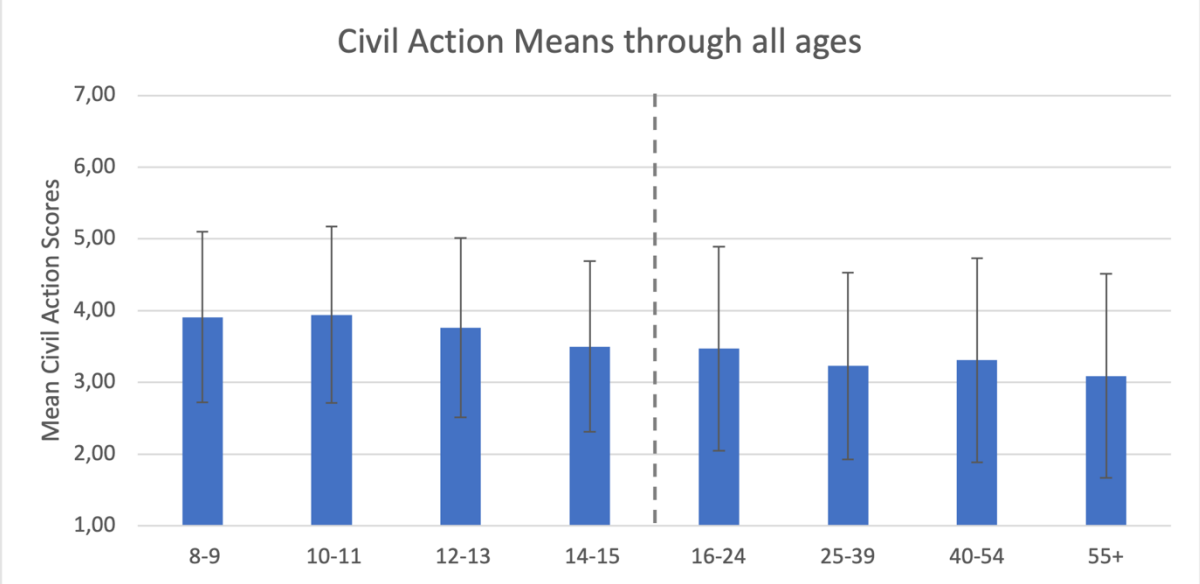
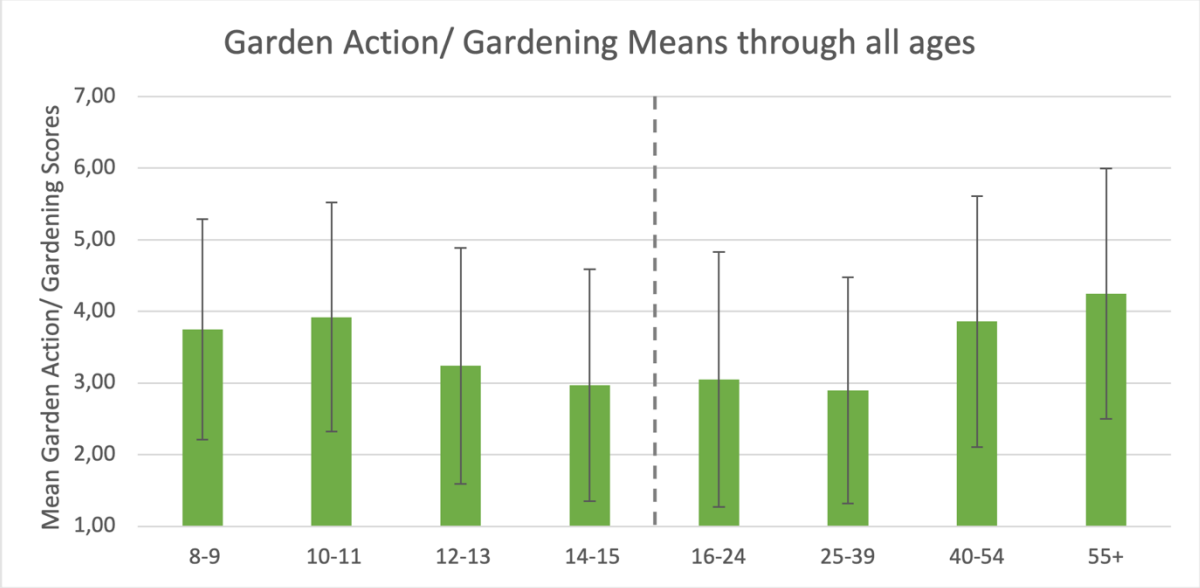


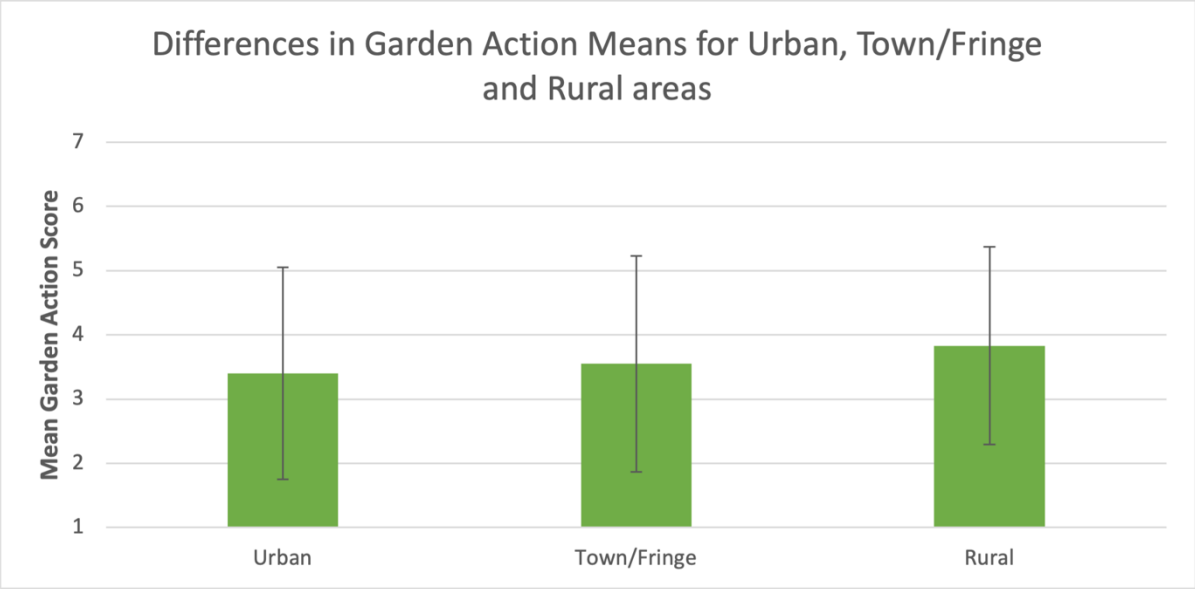
Figure 6.17 Bar graph of means and standard deviations (as error bars) for Garden Actions/ Gardening in different age groups in both the children and adult sample



Differences in behaviour, were also investigated between children living in urban, town and fringe or rural areas. For Civil Actions, the Levene's was significant (p=.008), therefore, equal variances were not assumed, and a Welch ANOVA test was used. There was no significant difference between the groups F(2, 203.50)=2.611, p=.076.

For Garden Action, the Levene's test was not significant (p=.626), therefore, equal variances were assumed, and a one-way ANOVA was conducted. There was a significant difference in behaviours between groups (F(2,874)=3.421, p=.033, d=.262) (Lenhard & Lenhard, 2016). Children living in urban areas had a mean score of M=3.40 (SD=1.65), children in town and fringe scored on average M=3.55 (SD=1,68), and children in rural areas M=3,83 (SD=1,54) (Figure 6.16). Children in the rural group had a significantly higher score than children in urban areas (Tukey HSD p=.028)(Post-hoc table in Appendix G).

Figure 6.18 *Bar graph of means and standard deviations (as error bars) for Garden Action scores in participants who live in "Urban", "Town and Fringe", or "Rural" areas*



A Mann-Whitney U-test revealed no significant difference between the ABC1 parents' or guardians' socio-economic grade group (Mdn=3.75, M=3.70, SD=1,30) and the C2DE group (Mdn=3.5, M=3,55, SD=1,30) for Civil Actions, $U(N_{ABC1}=613, N_{C2DE}=274)=79247.50$, p=.179. There was no significant difference in Garden Action between the ABC1 group (Mdn=3.5, M=3,50, SD=1,60) and the C2DE group (Mdn=3.25, M=3.4, SD=1.70), $U(N_{ABC1}=612, N_{C2DE}=266)=76998.00$, p=.202. However, participants from the C2DE group were significantly more likely to report, 'not having access to a garden at home or through other opportunities' (10.4%), compared to participants from the ABC1 group (5.5%), (chi-square $X^2(1, N=1051)=8.60$, p=.003).

6.4 Discussion

The goal of this study was to examine the engagement with pro-nature conservation behaviours in the British public and the differences between different demographic groups. Overall, there was engagement with behaviours on both subscales in the overall samples as well as the different demographic groups examined. However, means ranging between 3 and 4 indicated that the engagement tends to be "Occasionally" or "Sometimes" on average.

The results suggest that the items have varying levels of engagement. For example, only 20 participants reported to “Always” get in touch with their local authorities regarding conservation issues but 118 reported to “Always” pick-up litter that they encountered. This may be due to different levels of difficulty or frequency of opportunity of the behaviours. Picking up litter that one comes across is fairly low in effort while contacting local authorities may require far higher levels of agency. Unlike what some literature on pro-environmental behaviour suggests, those varying levels of difficulty do not seem to cause dimensionality here, as both mentioned behaviours fall into the same domain not only on the ProCoBS-SF, which was used here, but also on the long form, which has a further factor split beyond the two subscales (Gkargkavouzi et al., 2018). For the child sample, similar differences in response distributions could be found, for example between taking part in wildlife surveys and avoiding disturbance of nature while on walks. This suggests that the ProCoBS-SF and Child version are both capable of measuring a range of behaviours regarding effort and opportunity frequency, thus not only capturing very low effort behaviours that may not represent further engagement or only measuring high effort behaviours that only a few people have the means to engage in.

For almost all demographic variables there were significant differences in both Gardening and Civil Actions between the groups for both children and adults. However, most of these had small effect sizes, indicating that other, more important, factors may be at play. For gender, there were only small effect sizes. Nevertheless, women (or girls) showed consistently higher engagement with both the Gardening and the Civil Action subscales than male participants. This is a commonly and cross-culturally found difference in gender for pro-environmental behaviours, as well (Longhi, 2013). In pro-environmental behaviours, this is particularly found in private-sphere behaviours and therefore possibly related to women often having more household related responsibilities than men (Huddart Kennedy & Kmec, 2018). In this study the difference was also found for Civil Action, where most of the included items can be classed as public sphere behaviours. Nevertheless, the explanation of gendered responsibilities can still be used here, with women also being expected to be more compassionate and therefore more likely to be responsible for care work, if one assumes that pro-nature conservation behaviours can be in some capacity counted as care work for nature (Huddart Kennedy & Kmec, 2018). This is a more

metaphorical interpretation of pro-nature conservation behaviours, but it does raise important questions about gender inequalities regarding unpaid labour performed by women. This discussion has already been opened in the realm of pro-environmental behaviours. It is important to continue this conversation within nature conservation, since several wider issues of gender inequality can be found here, for example, the pay gap. The RSPB 2019 gender pay gap report revealed that in the quartile of highest paid roles only 40% of employees were female, while in the lowest paying quartile 71% were female (RSPB, 2019). In this study on pro-nature conservation behaviours, the effect of gender was only small, but nevertheless wider societal issues need to be addressed to create a sustainable local and global conservation practice.

Effects for ages differed between the subscales and were not as straightforward as some findings on pro-environmental behaviours that suggest a positive relationship between behaviour and age (Melo et al., 2018). In the sample of children, the differences between age groups were similar to those found in nature connectedness for both subscales (Hughes et al., 2019; Richardson et al., 2019). There was a dip in the teenage years, with the 14–15 age group scoring particularly low on both factors of the ProCoBS-C. This teenage dip has been explained in terms of developmental psychology by highlighting that adolescent years tend to present a challenge to young people in regard to identity formation, which means that engagement with nature might simply not be a priority at that point in life (Richardson et al., 2019). Further, school stressors may be more pressing in this age group: This sample was from the UK, where the GCSEs, one of the most important qualifications at the level of secondary education, are completed mostly between the ages of 15 and 17 (Gill, 2010). In adults, the differences between age groups were specific to the subscale. For Civil Actions, engagement dropped with age, while for Gardening, engagement increased with age. Both these findings may be explained by wider demographic phenomena. Older people were found to not only have more experience in gardening than younger people but also spend more time in the garden than younger people, which can contribute to age playing a role in higher biodiversity levels being found in the gardens of older people (Philpott et al., 2020). On the other hand, research has found political participation to be differently distributed across different age groups. While a study looking at the UK, Germany, and France found that elderly people were more likely to vote, younger people engaged more in

active political participation, such as demonstrations (Melo & Stockemer, 2014). Overall voting engagement is high in elderly people. However, their political affiliations tend to be more conservative. Age is one of the most important dividers in British politics, with only 21% of 18-24 year-olds voting Conservatives in the 2019 UK election, whereas in the same election 67% of 70+ year-olds voted Conservatives (McDonnell & Curtis, 2019). With the Conservative Party's environmental record often being publicly condemned by scientists and climate advisors, their voters may not consider nature conservation as much as voters of other parties (Laville & Taylor, 2019). The difference in age-related patterns between the two subscales provides further support to the idea that the behaviours on the subscales may be worth being examined separately in some contexts. The effect sizes were small for Civil Action in both samples but medium in both samples for Gardening, suggesting that here age played a larger factor.

For location of residence, there was more engagement the more rural participants lived. This effect was more pronounced in Gardening behaviours than in Civil Actions, with no significant effect being found in the child sample for Civil Actions. These findings are in line with earlier speculation of the importance of residential location for the place-based behaviours based on research in Canada (Huddart-Kennedy et al., 2009). Especially in the light of discussions around the importance of green spaces for children, the results regarding residential location are interesting: Children in rural areas scored significantly higher for Garden Action than children in urban areas. This underlines the growing concern about children in cities engaging less with nature (Freeman & van Heezik, 2018). If this is the case, this would be worrisome due to the positive effects nature experiences and connectedness can have for children's mental health in urban settings (Piccininni, Michaelson, Janssen, & Pickett, 2018; Sobko, Jia, & Brown, 2018). However, this perceived disconnect with nature may not be due to a city dwelling related nature deprivation as is often theorised but rather have cultural or socio-economic causes (Freeman, van Heezik, Hand, & Stein, 2015; Freeman, Stein, Hand, & van Heezik, 2018). In the light of this, the interplay of cultural and socio-economic variables in the pro-nature conservation engagement of urban living children may be of interest for researchers and policy makers and will be discussed in relation to this study's findings in the next paragraph.

In the child sample, there was no significant difference in either Gardening or Civil Action between the socio-economic grade groups. It is important to note though, that children whose parents were grouped in lower socio-economic groups were more likely to report not having access to a garden at home or via community gardens. This is in line with Freeman and colleagues' (2015) findings, that children from low-income households tend to access less biodiverse spaces. This was found to possibly be due to a variety of restrictive factors, from parental restrictions to independent mobility. Mobility is especially important for children from deprived areas, which tend to be less rich in biodiverse nature (UK National Ecosystem Assessment, 2011). With the importance that managed greenspaces like gardens have for nature conservation within the UK (Goddard et al., 2013), it is important to ensure access to these spaces for all children, when one wants to encourage pro-nature conservation behaviours in all children. This is an issue not only for nature conservation but also for creating equity in other societal areas: Access to biodiverse spaces can be regarded as an ecosystem service due to its well-being benefit, and children from all socio-economic groups should have this access and the opportunities to take advantage of them (Mace et al., 2012; Zhang et al., 2014). Engagement with biodiverse spaces in the form of pro-nature conservation behaviours could be part of school curriculums, for example in the form of wildlife friendly school gardens taken care of by students with support of teachers. In the adult sample, there was no significant difference between social grades for Civil Actions, however there was a small difference in Civil Actions, with participants in social Grades C2DE scoring lower than those in ABC1. This is in contrast to findings on pro-environmental behaviour suggesting that with higher income the engagement in the behaviours drops (Melo et al., 2018).

The findings of this study support some assumptions about the effects of demographic variables. For most of the variables, participants showed differences in ProCoBS scores, however, often the effect size was small, with age and residential location being the exception but only for Gardening. Most findings were in line with research on pro-environmental behaviours or nature connectedness, however some interesting oddities can be noted. Specifically, the differences in age between the two subscales may be important in tailoring communication programmes. It seems as though it may be useful to target older parts of the population when addressing civil actions, such as political behaviours but target

younger people with interventions regarding garden related conservation practices. Further, the differences in effects between the two subscales supports the idea of generally using the two subscales separately rather than together. While the Scale development showed that they were highly correlated and thus suitable for use as a complete scale, differences in predictors may prove the scale to be more useful for practical purposes when used separately. Further, the results highlighted the importance of wider social issues regarding inequalities in access to natural spaces and in social responsibility. These topics are extremely important for policy makers and should be considered before the application of any kind of communication or intervention measure.

The data set provided by the National Trust presented an important opportunity to investigate some descriptives, as well as some demographic differences using a large, stratified sample. Even though many participants had not responded to the complete ProCoBS questionnaire, a large number of participants still did. Some limitations were provided by the data set. For example, a closer look at response differences between the items of the full ProCoBS in its long version would have been interesting but with the ProCoBS being only a small part of the survey, the short version was used to keep the survey from taking up too much of the participants' time. Further, for adults, age and social grade were only provided in rather large groups not allowing for a more detailed analysis. Nevertheless, the data provided sufficient information for an important initial insight into pro-nature conservation behaviours.

This chapter provided an overview of the adoption of pro-nature conservation behaviours in the British public and offered insights into the differences in engagement between different socio-demographic groups. As predicted, the effects here were rather small. Research including psychographic variables and building on theory and research in behavioural and environmental psychology is likely going to show more important antecedents of pro-nature conservation behaviours and will therefore be introduced in the next chapter. Nevertheless, the findings here have important implications for policy makers, as they, for example, reiterate the importance of creating more biodiverse spaces in deprived areas.

7 Mind the gap - but which one? Values, intentions, and other predictors of Pro-Nature Conservation Behaviours

7.1 Introduction

With an established concept and a validated measure of pro-nature conservation behaviours, as well as an overview of its occurrence in the UK general public and the distribution among different demographic groups, it is now of importance to examine the predictors of and barriers to the adoption of these behaviours. Due to the novelty of the specific conceptualisation of pro-nature conservation behaviours there is, as of yet, very little research addressing these. This chapter will build on research and theory in behavioural and environmental psychology to assess whether there are similar gaps between values, intentions and behaviour, as found in other behaviours, specifically in pro-environmental behaviour. And it will explore possible predictors based on existing behavioural models and other known predictors of environment related behaviours.

Pro-Nature Conservation behaviours, such as those recommended by experts in the ranking in chapter three have the potential to enrich nature conservation efforts on local levels but also more widely through social change and pressure on political bodies and other world leaders. However, to fulfil this potential, they need to be adopted by a large proportion of the population. The last chapter showed that only about 30% of a stratified sample of UK citizens stated to vote for candidates or parties with strong nature conservation policies more often than “Sometimes”. While 49% of those with a garden responded that they planted pollinator friendly plants more than “Sometimes”, only 23% said they kept log piles or similar materials in their garden for wildlife to use as shelter more than “Sometimes”. This, as well as the overall mean scores of 3.77 for Gardening and 3.21 for Civil Actions out of a score scale from 1 to 7 demonstrates that while there is some engagement with pro-nature conservation behaviour, it is not very high in the general population. In order to develop effective public communications and programs aimed at engaging the wider population in these behaviours, a better understanding of the predictors of pro-nature conservation behaviours needs to be established. In the previous chapter some demographic variables were found to have a significant but very small effect on engagement with these behaviours. Other socio-psychological variables may have a far

larger impact on pro-nature conservation behaviours. So far, only one study considering the predictors of pro-nature conservation behaviours has been published: Richardson and colleagues (2020) found that nature connectedness and engaging in simple actions in nature were the most important predictors of pro-nature conservation behaviours. Other variables that were found to have a significant impact were for example indirect engagement with nature, knowledge about nature and concern about nature. All these tested variables were very directly related to nature. But research on a wider range of behaviours has found further variables that may play a role in the adoption of most behaviours and are therefore worth an investigation. Some key models and variables in behavioural and environmental psychology were introduced in the literature review. The next paragraphs will revisit them and their importance for this chapter.

The two most well-established socio-psychological theories of behaviour in general are the Social Cognitive Theory and the Theory of Planned Behaviour (TPB) (Ajzen, 1991; Bandura, 1994). The key construct in the Social Cognitive Theory is the concept of self-efficacy (Bandura, 1978). Self-efficacy describes an individual's confidence in their ability to perform a behaviour and has been shown to affect one's actual ability to perform said behaviour (Bandura, 1994). Self-efficacy can be measured generally but also specifically for a domain or behaviour. General self-efficacy describes someone's beliefs in their abilities overall. However, this general approach has been criticised, based on the fact that people tend to perceive themselves to have certain strengths but also weaknesses, meaning that self-efficacy may differ between behaviours (Bandura, 2006). Currently, researchers tend to employ specific measures of self-efficacy, as they have been shown to have a higher predictive power for behaviours than general self-efficacy (Leganger et al., 2000). Self-efficacy has become one of the most important psychological concepts to explain behaviour and as such has been applied to a wide variety of behaviours including pro-environmental behaviours (Meinhold & Malkus, 2005; Tabernero & Hernández, 2011; Vancouver et al., 2008).

The TPB, based on the Theory of reasoned Action (TRA), is the most adopted and empirically supported model of behaviour (Yuriev et al., 2020). The main assumption under which this model operates is that behaviour is predicted by intentions, thus, it is important to know how intentions are formed (Prestwich et al., 2017). Ajzen (1991) theorises three

main variables to form intentions: Perceived Behavioural Control (PBC), subjective norms, and attitudes towards the behaviour. PBC as a construct is highly similar to self-efficacy and describes a person's belief in the control they have over a behaviour in question. Subjective norms describe the perceived social pressure to perform a certain behaviour, based on what people that matter to an individual think and do and the individual's own wish to conform to them. Attitudes towards the behaviour can include general appraisals (positive or negative) of the behaviour as well as outcome beliefs, for example "If I exercise 3 times a week, I will be happy". These constructs have been successfully applied to a wide range of behaviours, including pro-environmental behaviours and even nature conservation specific behaviours (Knapp et al., 2020; Yuriev et al., 2020). However, the premise on which the TPB functions has been highly criticised. Many studies, when adapting the TPB failed to look beyond intentions, based on the assumption that these would reliably predict behaviour (Hassan et al., 2016). This is a faulty assumption: A variety of processes need to take place to transform intentions into behaviour (e.g., Hagger & Chatzisarantis, 2014; Hassan et al., 2016). This can lead to an often-large gap between people's intentions and their actual behaviour. A variety of evidence has been found for this gap and the phenomenon has been dubbed the "Intention-Behaviour Gap" (Hassan et al., 2016).

Based on this criticism of the TPB, there has been a vast amount of research on the Intention-Behaviour Gap. Systematic reviews and Meta-analyses confirmed the existence of this gap and its size in different behavioural domains, for example in ethical consumption choices and physical activity (Hassan et al., 2016; Rhodes & De Bruijn, 2013). One important factor in this research was found to be the phrasing of intentions. In order to accurately measure the Value-Action Gap, intentions need to follow the principle of compatibility (Sutton, 1998). This means that the intended actions, their context and even the response format used to measure them need to line up with the desired behaviours. Further research has looked at processes happening after intention formation and how they may influence behaviour. For example, dual processing theory acknowledges the existence of two different routes to behaviour, one is explicit, as assumed in the TPB, via rational, conscious processes (Hagger & Chatzisarantis, 2014). But another one, the implicit route, which is disregarded in the TPB, functions via impulsive, non-rational processes (Hagger & Chatzisarantis, 2014). In addition, there is a multitude of possible interventions to target the Intention-Behaviour

Gap, for example action planning or coping planning (Hagger, 2016; Schwarzer et al., 2003; Sniehotta, Schwarzer, Scholz, & Schüz, 2005). These interventions go beyond a simple intention by specifying the intentions into plans, in coping planning for example by anticipating possible situational barriers to the behaviour and making plans on how to overcome them (Sniehotta et al., 2005).

Interestingly, in environmental psychology researchers are concerned with a different gap: the Value-Action Gap (Kollmuss & Agyeman, 2002). This gap describes the apparent incoherence between the concern someone expresses about the current environmental problems and their own behaviour (Barr, 2006; Flynn et al., 2009). It is often being treated as one of the most important barriers to climate change adaption (Markowitz & Shariff, 2012). However, unlike the Intention-Behaviour Gap there seems to be very little research examining the Value-Action Gap in detail. In fact, research on environmental behaviours often tends to unintentionally examine a Value-Intention Gap by operating under the assumption that intentions reliably predict behaviour (Grimmer & Miles, 2017). Thus, instead of measuring behaviour, many researchers only measure intentions (Hagger, 2016). This poses the question of whether interventions based on research only assessing the Value-Intention Gap are useful for pro-environmental and pro-nature conservation behaviours. A scoping review of the use of the TPB to explain pro-environmental behaviours found an average difference of 22.5% of explained variance between studies assessing the influence of the TPB on intentions and studies assessing its influence on behaviour (Yuriev et al., 2020). Further, when examining models like the TPB it becomes apparent that while values do seem to play a role in behaviour it may be questionable to use them solely as the basis of behaviour and then examining the gap between this one predictor variable and behaviour rather than other, similarly important variables. There is a need to assess the existence and size of both the Value-Action, as well as the Intention-Behaviour Gap for pro-nature conservation behaviours.

Another criticism of the TPB addresses that a variety of further variables, not included in the model, has a significant impact on behaviours (Si et al., 2019). Therefore, researchers tend to apply additional theories and concepts when researching behaviours through the lens of the TPB. This improves the predictive power of the model (Yuriev et al., 2020).

For theory and research on the predictors of pro-nature conservation behaviour specifically rather than behaviour in general, literature on pro-environmental behaviours can act as a baseline. In their suggestion for a systematic research approach to pro-environmental behaviour, Steg and Vleg (2009) discuss three categories of important antecedents of the researched behaviours, as well as some models. For the first two categories, rational models of behaviours, such as the TPB are mentioned, as well as normative models. The normative models tend to be specific to pro-environmental behaviours. For example, the Value-Belief-Norm Theory employs ecological worldview, measured with the New Environmental Paradigm (NEP) as a measure of beliefs and attitudes. While the importance of the NEP in pro-environmental behaviours is questionable, there is a definite link between the two concepts, which is why it has been prevalent in a variety of research (Steg & Vlek, 2009). Integration of models like the Value-Belief-Norm Theory, or a similar model, the Norm Activation Model (see chapter 2.7.2 for a discussion of these Models) with the TPB has shown to improve the predictive power in comparison to separate models (Gkargkavouzi et al., 2019). A third category of predictors, which since its emergence has become a key factor in pro-environmental behaviour research is formed by affectional variables (Steg & Vlek, 2009). The most important concept in this category is nature connectedness. Nature connectedness as an affective construct describes an individual's emotional closeness to nature (Mayer & Frantz, 2004; Otto & Pensini, 2017). One important advantage of high nature connectedness is its apparent benefit for wellbeing (Capaldi et al., 2015). Research on nature connectedness has highlighted its importance not only for well-being but also for pro-environmental behaviours (Capaldi et al., 2014; Mackay & Schmitt, 2019; Whitburn et al., 2019). The predictive strength of nature connectedness for pro-environmental behaviours in comparison to other variables has positioned it as an essential antecedent of those behaviours (Frantz & Mayer, 2014; Otto & Pensini, 2017). Early research on pro-nature conservation behaviours suggests that it may be similarly important here: Nature connectedness was found to be one of the most important predictors of pro-nature conservation behaviours in a study assessing mainly nature-related variables (Richardson et al., 2020). Further, it has been employed as an additional variable together with the TPB for conservation related behaviours: Nature connectedness improved the predictive power of the TPB when applied to pollinator specific conservation behaviours (Knapp et al., 2020). Another advantage of looking at nature

connectedness is its opportunities for interventions, should it be shown to be an important predictor of pro-nature conservation behaviours. Nature connectedness can change throughout the lifespan, and it can be purposefully fostered by using established techniques, such as the three good things in nature intervention that make use of the five pathways to nature connectedness by encouraging participants to actively notice three good things in nature every day (Lumber et al., 2017; Richardson & Sheffield, 2017). The five pathways describe possible routes to foster nature connectedness, such as contact, which concerns the active perception of nature through various senses (Lumber et al., 2017).

Despite its limitations, the TPB and its included predictive variables may be a suitable starting point for exploratory research on the determinants of pro-nature conservation behaviour. Not only has it been successfully employed with a variety of behaviours ranging from health behaviours to pro-environmental behaviours, but it has also been found to predict pollinator conservation-specific behaviours. Thus, applying it to wider pro-nature conservation behaviours measured with the ProCoBS may provide important insights into their antecedents. However, while the TPB is still a widely used model and plays a key role in contemporary understanding of the formation of behaviours, its supplementation with further behaviour specific variables and in combination with different behavioural models has been shown to improve its predictive power and has therefore become standard practice (Yuriev et al., 2020). Thus, in this chapter, a modified version of the variables included in the TPB will be used in an exploratory manner. The following paragraphs will introduce the changes and additions made to the original variables of the TPB.

There is very little difference between the concept of self-efficacy and PBC. Some scholars have described the main difference to lie in the questions used to measure them: PBC tends to ask about difficulty with executing a behaviour while for self-efficacy questions about one's confidence in the own ability to execute said behaviour are employed (Wallston, 2015). Others have even called for the use of self-efficacy within the TPB instead of PBC (Schwarzer, 1992). Further, there is an advantage in the existence of both, a general measure, as well as detailed guides on measuring specific self-efficacy (Bandura, 2006; Schwarzer & Jerusalem, 1995). Self-efficacy measures tend to assess not only confidence in one's ability to engage in a behaviour in general but also under different circumstances and difficulties, giving a nuanced picture (Bandura, 2006). Further, general self-efficacy was

shown to be significantly and positively correlated to the ProCoBS in chapter four. Thus, both general self-efficacy, as well as pro-nature conservation specific self-efficacy will be used in this study, rather than a PBC measure. This will also help to make the research comparable to work on pro-environmental behaviours, where self-efficacy is an often-used construct (Klöckner, 2013; Meinhold & Malkus, 2005; Tabernero & Hernández, 2011). It has even been employed with some nature conservation related behaviours (Clayton, Prevot, Germain, & Saint-Jalme, 2017).

To make the assessment of attitudes comparable to research on pro-environmental and nature conservation related behaviours, a commonly used concept should be employed. Ecological worldview has become a standard construct used to assess people's beliefs and values regarding nature and the relationship of humans and nature (Dunlap et al., 2000). As such a widely used concept in pro-environmental behaviour research, it has often been shown to play a role in predicting behaviours as well as other variables that are of importance in explaining pro-environmental behaviours (Davis et al., 2011; Gkargkavouzi et al., 2018). It has also been used in the form of the NEP in pro-environmental behaviour specific models, such as the Value-Belief-Norm Theory (Stern, 2000). This chapter will use the NEP as an indicator for attitudes in the TPB instead of creating a specific measure based on guidelines regarding the creation of TPB questionnaires.

Intention has been a critical aspect of the TPB, often in the focus of research and discourse regarding the theory's weaknesses (Hassan et al., 2016). In the context of environmental psychology, it raises the question of the gap location. Research in health psychology has criticised the TPB for not accounting for the Intention-Behaviour Gap, while a similar key word in research on pro-environmental behaviour has been the Value-Action Gap. As alluded to above and in chapter two, these gaps should be examined for pro-nature conservation behaviours. Thus, values, intentions and behaviours need to be assessed. In the TPB, typically the intention to engage in a specific behaviour is examined. This can be done for pro-nature conservation behaviours by rephrasing the ProCoBS items as intention. Many people may not have such specific intentions for the items on the ProCoBS but rather a general intention to act in support of nature conservation. Intention specificity may play a large role at this level of intention setting. For example, a popular approach to closing the Intention-Behaviour Gap are implementation intentions, which specify the intention to

engage in the behaviour by adding the how, when and where (Mairs & Mullan, 2015). Both, the intention to engage in specific ProCoBS items and the general intention to support nature conservation, will be looked at in terms of the gap from the intentions to the behaviours. For the Value-Action Gap, the NEP will be used again. While this is used as a measurement of attitude in the TPB variables, it is also suitable as a measure of values here, as it is thought to be predicted by biospheric, altruistic and egoistic values but constitutes a more environment specific variable (Stern & Dietz, 1994).

Finally, the variable of nature connectedness will be added due to its apparent importance in not only pro-environmental behaviours but also pro-nature conservation behaviours and other conservation related behaviours (Davis et al., 2011; Knapp et al., 2020; Richardson et al., 2020).

This study aimed to explore the Value-Action Gap, the Intention-Behaviour Gap, as well as predictors of pro-nature conservation behaviours by applying concepts from the TPB and variables applied during the development of the ProCoBS. In an online survey, participants from one international sample and one UK sample filled in a number of questionnaire scales including the ProCoBS and the chosen predictor variables: Nature connectedness, ecological worldview, generalised self-efficacy, nature conservation specific self-efficacy, subjective norms regarding nature conservation, general intentions to support nature conservation, and specific intentions to engage in pro-nature conservation behaviours.

For the aspect of this study focussing on the gaps, it was hypothesised (H1) that ecological worldview, general intentions and specific intentions would be related to the ProCoBS but that there would be differences in the strengths of these relations, with specific intentions being the strongest and ecological worldview the weakest. This means that the study expected to find a Value-Action Gap (ecological worldview-ProCoBS), and that this gap would be bigger than the Intention-Behaviour Gap (between general intention to support nature conservation or specific intentions to engage in the ProCoBS behaviour and the ProCoBS score). Further the specificity of intentions was expected to make a difference in the size of the gap, with specific intentions showing a stronger relation to pro-nature conservation behaviours. For the examination of predictors, two different approaches were taken, both based in theory and research. The first approach was based on the importance

of the TPB in behavioural psychology, and the common practice to use it as a base model that is then supplemented with other variables. Here, it was hypothesised (H2) that the TPB variables (conservation specific self-efficacy, ecological worldview, subjective norms) would significantly explain variation in the ProCoBS and would be improved by the addition of nature connectedness and self-efficacy. In the second approach, a nature connectedness focus was taken. Research has shown the role of nature connectedness in pro-environmental but also nature conservation related behaviours, often indicating it to be possibly the most important, essential prerequisite for those behaviours (Frantz & Mayer, 2014; Otto & Pensini, 2017; Richardson et al., 2020). Thus, the second approach suggested that (H3) nature connectedness by itself would significantly predict the ProCoBS but could be improved in its predictive power by addition of the TPB variables and general self-efficacy.

7.2 Methods

Participants

350 participants filled out an online questionnaire, which was approved by the University of Derby Psychology Ethics Committee. These participants were from two separate samples. One international sample with no information on nationality consisting of 200 participants and one sample of UK citizens consisting of 150 participants. In the international sample 96 (48%) of the participants identified as male, and 100 (50%) as female. One participant (0.5%) identified outside of the gender binary and 3 participants (1.5%) preferred to not disclose their gender. The ages of participants ranged from 18 to 59 with a mean age of 26 (SD=8.279). 132 participants (66%) stated to have access to a garden in some form. In the UK sample, 75 participants (50%) were female and 75 (50%) were male. Their ages ranged from 18-72 with a mean age of 32 (SD=12.74). 120 participants (80%) had access to a garden at home or through a different kind of garden, such as a community garden. For the international sample, no information on residency or citizenship was available, as its collection was attributed to an error in the data collection, which was then expanded to capture a purely UK based sample based on the possible UK specificity of the ProCoBS.

Nevertheless, the data from the international sample was analysed as it offered a first glance at possible issues with an international use of the ProCoBS.

Materials

Overall, eight variables were measured using appropriate questionnaire scales: (1) Pro-nature conservation behaviour as the outcome variable, with (2) general intention to support nature conservation, (3) specific intentions to engage in pro-nature conservation behaviours, and (4) ecological worldview as predictor variables for the first hypothesis (H1) regarding the Value-Action and Intention Behaviour Gap. Then, for the second and third hypothesis looking at predictor variables from both a TPB focused and a nature connectedness focused approach, further variables were measured: three variables to be part of the TPB, (4) ecological worldview, (5) conservation specific self-efficacy, and (6) conservation related subjective norms. Finally, (7) nature connectedness and (8) general self-efficacy were measured

To assess (1) Pro-nature Conservation Behaviours, both Gardening and Civil Action, the adult version of the ProCoBS was used. The ProCoBS includes 18 items, 9 for Gardening Behaviours and 9 for Civil Action. Items include, for example: “I volunteer with a conservation organisation in habitat management work” on the Civil Action Subscale and: “I plant plants with different flowering seasons” on the Gardening subscale. Participants were asked how often they engage in the behaviours described in the questions and rate each item on a 7-point Likert scale from “Never” to “Always”. The participants’ intentions were measured both on a (2) general as well as a (3) specific level. General intention to support nature conservation was measured with one item: “I intend to take action for nature conservation in my daily life”, to be rated on a 7-point Likert scale from “Strongly disagree” to “Strongly agree”. To measure intentions to engage in pro-nature conservation behaviours specifically, the ProCoBS items were reworded for each item to start with “I intend to”, rather than “I do”. The instructions were to rate items by how often, regardless of one’s own current behaviour, one **intended** to engage in the behaviour in each item on a 7-point Likert Scale from “Never” to “Always”. The only small changes in wording as well as the same response scale as the ProCoBS were used to ensure compatibility and scale correspondence (Sutton, 1998).

The New Environmental Paradigm (NEP) was used to assess (4) ecological worldview (Dunlap & Van Liere, 1978). This scale includes 15 items of which seven are reverse coded. Similarly to the NR-6 the items, such as “We are approaching the limit of the number of people the Earth can support”, are rated on a 5-point Likert scale indicating agreement, from strongly agree to strongly disagree

(7) Nature connectedness was measured using the six item Nature Relatedness Scale (NR-6), a well-established measurement tool for Nature Connectedness (Nisbet & Zelenski, 2013). The six items on the scale tap into different aspects of Nature Connectedness, such as spirituality (“My connection to nature is part of my spirituality”) and are rated on a 5-point Likert Scale from “Disagree strongly” to “Agree strongly”. (8) General Self-efficacy was measured with Schwarzer and Jerusalem’s (1995) General Self-Efficacy Scale. Ten items, for example “I can always manage to solve difficult problems if I try hard enough”, are rated on a 4-point Likert Scale ranging from “Not at all true” to “Exactly true”.

With the novelty of systematic research on Pro-nature Conservation Behaviours, self-efficacy specific to those behaviours (5) had not been assessed prior to this study. Thus, a short questionnaire scale was constructed based on work by Bandura (2006) and other assessments of specific self-efficacy in environmental psychology. Bandura (2006) advises researchers to beware of including items that measure outcome beliefs, which are an individual’s beliefs regarding the impact of the behaviour, rather than self-efficacy, as those are two different concepts. As explained above, for self-efficacy the belief in one’s ability to perform a behaviour is essential, not the belief in one’s ability to achieve a specific outcome through said behaviour. Further, he emphasizes the importance of phrasing around capability: *I can* statements are suited for assessment of self-efficacy, while *I will* statements measure intentions. Another important aspect to capture mentioned by Bandura are gradations of challenge, as the same behaviour may have different levels of difficulty depending on the situation.

Three environmentally specific self-efficacy scales were used to assess how specific self-efficacy has been measured in environmental psychology: Huang (2016) measured self-efficacy in relation to the mitigation of global warming using four items, each tapping into a different aspect of self-efficacy and using different wordings to express confidence in one’s abilities. Item (c), for example, addresses Bandura’s call to account for different levels of

difficulty by adding the phrasing: “Although it may cause inconvenience”. Item (d) assesses the generality of the self-efficacy by adding the wording “in every way”. Phrases to express self-efficacy used by Huang are: “I believe that I have the ability to take action”, “I can still change my behaviour”, and “I can try my best”. However, at a closer look, the first item (a), “As long as actions are taken to mitigate global warming, climate change can be effectively reduced”, presents an outcome belief rather than self-efficacy.

Lauren, Fielding, Smith, and Louis (2016), on the other hand measured self-efficacy in relation to water conservation. They based their scale on previous work by Tabernero and Hernández (2011), which focused on recycling behaviour. In those two versions of self-efficacy scales the wordings “To what extent do you feel capable”, “I feel capable” and “I feel confident” were used in combination with different aspects of recycling behaviour and water conservation. For Pro-nature Conservation Behaviour specific self-efficacy, phrasings from both Huang’s as well as Lauren and colleagues’ scales were used but with adjusted items to fit the specificity of pro-nature conservation behaviours, and to be worded as simply as possible. The following four items were chosen: “I feel confident that I can help support nature conservation”, “I have the capability to take action to support nature conservation”, “Although it may cause inconvenience, I am able to change my behaviour to support nature conservation”, and “I am able to do everything I can to support nature conservation”. The items were rated on a 5-point Likert scale ranging from “Disagree strongly” to “Agree strongly”. Bandura (2006) suggests a 100-point scale. However, research has shown that smaller scales up to 7 points may be more suitable for questionnaires (DeVellis, 2012; Hawthorne et al., 2006). The 5-point scale chosen here is identical to the NR-6 scale, and thus keeps the answering format continuous, making it easier and more accessible for participants.

Similar to self-efficacy, no subjective norms questionnaire specific to pro-nature conservation behaviour (6) existed prior to this study. For the construction of this questionnaire, a guide by Ajzen was utilised (Ajzen, 2013). He emphasised the difference between descriptive and injunctive norms. Descriptive norms describe what someone perceives other people to do themselves, while injunctive norms concern one’s belief about what other people would want you to do. Another important factor to consider is the referent. The referents are the people or institutions that the subjective norms depend on,

and they need to be considered an important influence by the person answering the questionnaire. This can be family, friends, co-workers, or even the government, depending on the behaviour in question. This plays into one's motivation to comply, which captures how important it is to someone what the referents do or think you should do. In order to capture subjective norms Ajzen suggests the formula: $\propto \Sigma\, norm_i\, motivation\ to\ comply_i$. This multiplies each norm with its motivation to comply, thus capturing a wide variability in people's norms based on not only through their perceived norm itself but also in relation to the importance they give to the norm. By then using the sum of those composites for both norms, the two separate norms (inductive and descriptive) are seen as equally important. Based on this information the following four items were created to measure subjective norms regarding pro-nature conservation behaviour: "My friends and family believe I should do something to support nature conservation"(inductive norm), "What my friends and family think I should do about nature conservation is important to me"(inductive motivation to comply), "My friends and family engage in behaviours to support nature conservation" (descriptive norm), and "What my friends and family do about nature conservation influences my own actions" (descriptive motivation to comply). These items were rated on a 5-point Likert scale ranging from "Disagree strongly" to "Agree strongly", again this scale was identical to the NR-6 scale.

Procedure

The online questionnaire was distributed via Prolific Academic, meaning that participants were recompensated for filling out the questionnaire. After giving informed consent participants were asked whether they had access to a garden at home, an allotment or a community/work garden or whether they were landowners/ managers. Only if participants answered yes to that question, they were given the Gardening subscale of the ProCoBS and the specific intention scales later in the survey. After this question the other questionnaire scales were presented to each participant in a randomised order. At the end of the questionnaire participants were asked about their gender and age before receiving a debrief.

Analysis

As the ProCoBS had previously only been tested on a UK sample, the two samples were analysed separately, though in the same manner. The reliability of the ProCoBS subscales, as

well as the specific intentions, specific self-efficacy, and subjective norms scales, were assessed using Cronbach's Alpha. As discussed in chapter 4.2.1, while there is some discussion around the Cronbach's Alpha's suitability as an indicator of internal consistency, it does remain a widely reported standard and was thus chosen here (Zumbo et al., 2007). For the further analysis the items on the questionnaires were summarised to form a variable score. For subjective norms, this score was calculated using the formula described in the Materials sub-section and then the mean between the descriptive and inductive norms were used. For each of the other scales the mean of the responses on the Likert scales were calculated. Based on the rather large proportion of participants who did not have access to a garden (34.2% in the international sample), as well as some of the earlier made points regarding the possibility of differences between the two domains based on results in chapter six, the two subscales of the ProCoBS were kept separate, thus looking at Gardening and Civil Action as two different outcome variables.

To address the first hypothesis, that ecological worldview, general intentions and specific intentions would be related to the ProCoBS but that there would be differences in the strengths of these relations, with specific intentions being the strongest and ecological worldview the weakest and investigate the gaps specifically, correlations were used. The effect sizes of the correlations were then compared.

Finally, the chosen predictor variables and their impact on both Gardening and Civil Action were assessed using multiple linear regressions. Here, intentions were not included, similar to recent research on pollinator conservation actions (Knapp et al., 2020). Based on the Intention-Behaviour Gap often found in literature and in the examination of H1 of this study, the impact of the predictor variables on the behaviour itself, was of interest. Statistically, a multiple regression is an appropriate analysis tool for the impact that variables of the TPB have on a behaviour by applying them to the behaviour directly instead of including intentions. Though here, it is important to report the adjusted R^2 for explained variance to avoid biases (Hankins, French, & Horne, 2000). The explained variance has been found to be under-reported in studies applying the TPB to green behaviours, even though this is the principal indicator of how influential the used predictor variables are (Yuriev et al., 2020). To test the TPB focused hypothesis (H2), that the TPB variables would significantly account for variability in the ProCOBS scores, a hierarchical multiple linear regression was

used. This is a theory-based approach where the chosen variables and their order of importance are grounded in existing research and theory, which shines a light on changes in predictability from the step-by-step inclusion of further variables, the order of which is defined beforehand (Cohen, 2013; Petrocelli, 2003). With the TPB being a major predictor of pro-environmental behaviours, often an approach is taken where the model is considered a given, which is then enriched with further variables (Knapp et al., 2020; Si et al., 2019; Yuriev et al., 2020). Thus, the three variables ecological worldview, conservation specific self-efficacy, and subjective norms were entered as a block at the first stage. At the second stage, nature connectedness was included as this had been found to be a key variable for pro-environmental behaviours as well as pro-nature conservation behaviours (Mackay & Schmitt, 2019; Richardson et al., 2020). Finally, general self-efficacy was included. This was assumed to have less impact than the specific measure included in the TPB block, but based on the positive, significant correlation with the ProCoBS during the scale development it could be assumed that it would have some predictor power. The TPB has been heavily criticised in the past (Hagger, 2016; Prestwich et al., 2017; Sniehotta, Presseau, & Araújo-Soares, 2014). Additionally, recent research suggests that, not only in pro-environmental but also pro-nature conservation behaviours, nature connectedness might outperform other predictors (Richardson et al., 2020). Based on this, a third hypothesis was created (H3), stating that nature connectedness would significantly predict the ProCoBS with the TPB and general self-efficacy adding to the explanatory power. To test this hypothesis, a second hierarchical multiple linear regression was computed where the first block of TPB variables was moved to the second stage and nature connectedness was moved to the first stage. General self-efficacy remained in the third stage.

Based on the results from those two regressions, a third regression was computed. The hierarchical regressions showed that while both approaches worked, there seemed to be differences between the two subscales and, further, not all the TPB variables contributed significantly. Therefore, and to gain clarity over whether (one or multiple) TPB variables or nature connectedness was the statistically most reliable predictor of each of the ProCoBS subscales, a bidirectional stepwise multiple linear regression was run. This form of a regression can help to identify variables that do not significantly improve the prediction of the dependent variable without requiring previous theory (Venables & Ripley, 2002). In the

past this has been used for data mining, specifically in attempting to find significant variables in a large number of variables. However, stepwise regression becomes less effective with larger numbers of variables (Smith, 2018). In this study, where there were only five variables included, it can act as a useful tool to get an understanding of which are the most statistically meaningful variables but should not be seen as a theory generator.

7.3 Results

7.3.1 International sample

Reliabilities of used scales and Descriptives (International)

The two ProCoBS subscales, as well as the scales developed for this study, all showed high internal reliabilities (see Table 7.1). For subjective norms both the reliability of all included items as well as the reliability between the two items inductive norms (=$norm_{inductive}$$motivationtocomply_{inductive}$) and descriptive norms ($norm_{descriptive}$$motivationtocomply_{descriptive}$).

Table 7.1 *Internal reliabilities of the questionnaire scales in the international sample: Cronbach's alpha (For inter-item correlations see Appendix I)*

Scale	Cronbach's Alpha
ProCoBS Civil Action	.860
ProCoBS Gardening	.791
Civil Action Intentions	.878
Gardening Intentions	.818
Specific Self-efficacy	.733
Subjective Norms (all items)	.797
Subjective Norms (according to formula)	.772

On average respondents scored 3.18 points (SD=.935) on the Civil Action ProCoBS and 4.32 points (SD=1.13) on the Gardening ProCoBS with a possible range of 1-7 points. For intentions the mean score was 3.75 (SD=1.18) for Civil Action and 4.68 (SD=1.08) for Gardening, with the same range of possible scores.

Value-Action vs. Intention-Behaviour Gap and further correlations (International)

To compare the influence of values (ecological worldview), general intentions and specific intentions, correlations were calculated. For Civil Actions, the correlation with ecological worldview was not significant and had a very small, negative effect size, indicating a negative relationship. General intentions and specific intentions, both had a positive significant correlation with Civil Action. This correlation's effect size was medium for general intentions and large for specific intentions. For Gardening, all three variables were significantly positively correlated, here, too, there was a clear difference in the strength of the correlations, with ecological worldview and general intentions showing a small Pearson's r and specific intentions a large Pearson's r (see Table 7.2).

Table 7.2 *Correlations of NEP, general intentions, and specific intentions (Gardening intentions for Gardening and Civil Action intentions for Civil Action), as well as the further chosen predictor variables with Civil Action and Gardening in the international sample: Pearson's r and p-value*

	Civil Action		**Gardening**	
Variables	**r**	**p**	**r**	**p**
Ecological Worldview	-.007	.920	.227**	.009
General Intentions	.348**	<.001	.234**	.007
Specific Intentions	.792**	<.001	.752**	<.001
Subjective Norms	.331**	<.001	.300**	<.001
Conservation Self-efficacy	.286**	<.001	.316**	<.001
Nature Connectedness	.490**	<.001	.459**	<.001
General Self-efficacy	.173*	.015	.180*	.038

Before assessing how the chosen predictor variables accounted for variance of the ProCoBS subscales through multiple regressions depending on different possible theoretical models, all predictor variables (nature connectedness, subjective norms, ecological worldview, conservation specific self-efficacy, and general self-efficacy) were correlated with the subscales (see Table 7.2). For Civil Actions all predictor variables, except for ecological worldview were positively and significantly correlated with the score.

Civil Action (International)

To analyse the effect of the TPB variables on Civil Action in the international sample and the further contribution of nature connectedness and self-efficacy a three-stage hierarchical multiple linear regression was calculated with Civil Action as the dependent variable (see Table 7.3 for summary). At stage one, the predictor variables of the TPB, subjective norms, conservation specific self-efficacy, and ecological worldview were entered. At stage two, nature connectedness was entered, and finally, at stage three, general self-efficacy was entered. The assumptions of collinearity and normal distribution were met according to VIF values and P-P plots.

At stage one, the entered variables contributed significantly to the regression model, $F(3, 196)=19.37$, $p<.001$, with an $R^2=.165$ and an adjusted $R^2=.152$. All three TPB variables showed a significant contribution, however, ecological worldview had a negative beta coefficient, indicating a negative relationship (see Table 7.4 for standardised beta values and p-values). At stage two, the addition of nature connectedness showed a significant change in F, $p<.001$, with an overall $F(4, 195)=20.53$, $p<.001$. The new amount of variance explained was $R^2=.296$, adjusted $R^2=.282$. Nature connectedness had a positive coefficient, indicating that Civil Action scores increased with an increase in nature connectedness scores. However, with nature connectedness added, conservation specific self-efficacy no longer had a significant coefficient. The addition of general self-efficacy to the regression model in stage three did not result in a significant change in F, $p=.916$, at an overall $F(5,194)=16.35$, $p<.001$ and $R^2=.296$, adjusted $R^2=.278$.

Table 7.3 *Model summary and ANOVA of the hierarchical regression with Civil Action as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy at stage three*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.165	.152	<.001	12.90	<.001
Model 2	.296	.282	<.001	20.54	<.001
Model 3	.296	.278	.916	16.36	<.001

Table 7.4 *Coefficients of the hierarchical regression with Civil Action as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy added at stage three*

Model		**Standardised Coefficient Beta**	**p**
1	Ecological Worldview	-.162	.024
	Conservation Self-efficacy	.254	.001
	Subjective Norms	.275	<.001
2	Ecological Worldview	-.166	.012
	Conservation Self-efficacy	.050	.517
	Subjective Norms	.207	.002
	Nature Connectedness	.434	<.001
3	Ecological Worldview	-.165	.013
	Conservation Self-efficacy	.047	.557
	Subjective Norms	.207	.002
	Nature Connectedness	.433	<.001
	General Self-efficacy	.007	.916

A second hierarchical regression with Civil Action as the dependent variable was calculated with a focus on nature connectedness. Here, nature connectedness was added at stage one, the TPB variables were added at stage two and self-efficacy was added at stage three. The assumptions were met.

At stage one, nature connectedness significantly explained variance in Civil Action, $F(1,198)=62.446$, $p<.001$, with an $R^2=.240$ and adjusted $R^2=.236$. Adding the TPB variables

resulted in a significant change (p=.002) to F(4,195)=20.533, p<.001. Again, the coefficients of conservation specific self-efficacy were not significant and those of ecological worldview were negative (see model 2 in table 7.4). Finally, the addition of general self-efficacy did not result in a significant change to F, p=.916.

A stepwise multiple linear regression was used to determine the statistically most reliable order for the inclusion of predictor variables for Civil Action. With Civil Action as the dependent variable, nature connectedness, ecological worldview, subjective norms, conservation specific self-efficacy and general self-efficacy were entered as possible independent variables. At each step variables were chosen based on probability of F (p-values). Assumptions were met.

The resulting suggested model included the three variables nature connectedness, subjective norms, and ecological worldview, which were entered in that order. The final model significantly explained variance in Civil Action, F(3,196)=27.32, p<.001, R^2=.295, adjusted R^2=.284. Nature connectedness and subjective norms had positive coefficients while ecological worldview had negative coefficients. For the separate contributions to variance and coefficients of each of the three stepwise model leading up to the final model, see Table 7.5 and 7.6

Table 7.5 *Model summary and ANOVA of the stepwise regression with Civil Action as dependent variable, and the TPB variables, nature connectedness and general self-efficacy as possible predictor variables*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.240	.236	<.001	62.45	<.001
Model 2	.2273	.266	.003	37.01	<.001
Model 3	.295	.284	.015	27.32	<.001

Table 7.6 *Coefficients of the stepwise regression with Civil Action as dependent variable, and the TPB variables, nature connectedness, and general self-efficacy as possible predictor variables*

Model		Standardised Coefficient Beta	p
1	Nature Connectedness	.490	<.001
2	Nature Connectedness	.427	<.001
	Subjective Norms	.193	.003
3	Nature Connectedness	.455	<.001
	Subjective Norms	.215	.001
	Ecological Worldview	-.153	.015

Gardening (International)

To analyse the effect of the TPB variables on Gardening and the further contribution of nature connectedness and self-efficacy a three-stage hierarchical multiple linear regression was calculated with Gardening as the dependent variable. At stage one, the predictor variables of the TPB, subjective norms, conservation specific self-efficacy, and the ecological worldview were entered. At stage two, nature connectedness was entered, and finally, at stage three, general self-efficacy was entered. The assumptions of collinearity and normal distribution were met according to VIF values and P-P plots.

At stage one, the entered variables contributed significantly to the regression model, $F(3, 128)=7.41$, $p<.001$, with an $R^2=.148$ and an adjusted $R^2=.128$. Within the three variables, only conservation specific self-efficacy and subjective norms showed a significant contribution (see the summary in Table 7.7 for standardised beta values and p-values). At stage two, the addition of nature connectedness showed a significant change in F, $p<.001$, with an overall $F(4, 127)=9.461$, $p<.001$. The new amount of variance explained was $R^2=.230$, adjusted $R^2=.305$. However, this left the TPB variables with non-significant coefficients (see Table 7.8). The addition of general self-efficacy to the regression model in stage three did not result in a significant change in F, $p=.564$, at an overall $F(5,126)=7.60$, $p<.001$ and $R^2=.232$, adjusted $R^2=.201$.

Table 7.7 *Model summary and ANOVA of the hierarchical regression with Gardening as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy at stage three*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.148	.128	<.001	7.41	<.001
Model 2	.230	.205	<.001	9.46	<.001
Model 3	.232	.201	.564	7.60	<.001

Table 7.8 *Coefficients of the hierarchical regression with Gardening as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy added at stage three*

Model		**Standardised Coefficient Beta**	**p**
1	Ecological Worldview	.096	.291
	Conservation Self-efficacy	.202	.034
	Subjective Norms	.208	.019
2	Ecological Worldview	.063	.469
	Conservation Self-efficacy	.053	.596
	Subjective Norms	.109	.216
	Nature Connectedness	.362	<.001
3	Ecological Worldview	.067	.446
	Conservation Self-efficacy	.027	.803
	Subjective Norms	.109	.020
	Nature Connectedness	.362	<.001
	General Self-efficacy	.051	.564

A second hierarchical regression with Gardening as the dependent variable was calculated with a focus on nature connectedness. Here, nature connectedness was added at stage one, the TPB variables were added at stage two and self-efficacy was added at stage three. The assumptions were met. At stage one, nature connectedness significantly explained variance in Gardening, $F(1,130)=34.67$, $p<.001$, with an $R^2=.211$ and adjusted $R^2=.204$. Adding the TPB variables did not result in a significant change, $p=.375$ to $F(4,127)=9.46$ $p<.001$. Finally, the addition of general self-efficacy did not result in a significant change to F, $p=.564$.

A stepwise multiple linear regression was used to determine the statistically most reliable variables for the inclusion of predictor variables for Gardening. With Gardening as the dependent variable, nature connectedness, ecological worldview, subjective norms, conservation specific self-efficacy and general self-efficacy were entered as possible independent variables. At each step variables were chosen based on probability of F (p-values). Assumptions were met.

The final resulting suggested model included only nature connectedness with no other variables making a significant contribution. The final model significantly explained variance in Gardening $F(1,130)=34.67$, $p<.001$, $R^2=.211$, adjusted $R^2=.204$.

7.3.2 UK Sample

Reliabilities of used scales and Descriptives (UK)

Similar to the international sample, all scales showed high internal consistency, with the ProCoBS and its specific intentions showing slightly higher alphas than in the international sample, especially for the garden subscale (both behaviour and intentions, see Table 7.1 and 7.9).

Table 7.9 *Internal reliabilities of the questionnaire scales in the UK sample: Cronbach's alpha (For inter-item correlations see Appendix I)*

Scale	**Cronbach's Alpha**
ProCoBS Civil Action	.865
ProCoBS Gardening	.874
Civil Action Intentions	.893
Gardening Intentions	.905
Specific Self-efficacy	.811
Subjective Norms (all items)	.770
Subjective Norms (according to formula)	.781

On the Civil Action ProCoBS participants scored an average of M=2.87 points (SD=1.11) and on the Gardening ProCoBS M=4.30 points (SD=1.36). For intentions the mean score was 3.60 (SD=1.21) for Civil Action and 4.91 (SD=1.39) for Gardening.

Value-Action vs. Intention-Behaviour Gap and further correlations (UK)

To compare the influence of values, general intentions and specific intentions, correlations were calculated. For both, Civil Actions and Gardening, all three variables were significantly and positively correlated. And for both, there was a clear difference in the strength of the correlations, with ecological worldview showing a small Pearson's r for both ProCoBS subscales, general intentions showing a medium Pearson's r for both subscales and specific intentions a large Pearson's r for both subscales (see Table 7.10).

Table 7.10 *Correlations of NEP, general intentions, and specific intentions (Gardening intentions for Gardening and Civil Action intentions for Civil Action), as well as the further chosen predictor variables, with Civil Action and Gardening in the UK sample: Pearson's r and p-value*

	Civil Action		Gardening	
Variables	**r**	**p**	**r**	**p**
Ecological Worldview	.176*	.031	.205*	.025
General Intentions	.469**	<.001	.473**	<.001
Specific Intentions	.795**	<.001	.833**	<.001
Subjective Norm	.430**	<.001	.370**	<.001
Conservation Self-efficacy	.481**	<.001	.421**	<.001
Nature Connectedness	.453**	<.001	.526**	<.001
General Self-efficacy	.182*	.026	.290**	.001

* significant at 0.05 level (2-tailed); ** significant at 0.01 level (2-tailed)

Civil Action (UK)

Before assessing how the chosen predictor variables accounted for variance of the ProCoBS subscales through multiple regressions depending on different possible theoretical models, all predictor variables (nature connectedness, subjective norms, ecological worldview, conservation specific self-efficacy, and general self-efficacy) were correlated with the subscales (see Table 7.10). For Civil Actions, all predictor variables were positively and significantly correlated with the score.

To analyse the effect of the TPB variables on Civil Action and the further contribution of nature connectedness and self-efficacy, a three-stage hierarchical multiple linear

regression was calculated with Civil Action as the dependent variable (see Table 7.11). At stage one, the predictor variables of the TPB, subjective norms, conservation specific self-efficacy, and ecological worldview were entered. At stage two, nature connectedness was entered, and finally, at stage three, general self-efficacy was entered. The assumptions of collinearity and normal distribution were met according to VIF values and P-P plots.

At stage one, the entered variables contributed significantly to the regression model, $F(3, 145)=19.37$, $p<.001$, with an $R^2=.286$ and an adjusted $R^2=.271$. However, within the three variables only conservation specific self-efficacy and subjective norms showed a significant contribution (see the summary in Table 7.12 for standardised beta values and p-values). For both of those variables, there was a positive relation – when they increased so did the Civil Action Score. At stage two, the addition of nature connectedness showed a significant change in F, $p=.002$, with an overall $F(4, 144)=17.90$, $p<.001$. The new amount of variance explained was $R^2=.332$, adjusted $R^2=.314$, again with a positive relation. The addition of general self-efficacy to the regression model in stage three did not result in a significant change in F, $p=.732$, at an overall $F(5,143)=14.26$, $p<.001$ and $R^2=.333$, adjusted $R^2=.309$.

Table 7.11 *Model summary and ANOVA of the hierarchical regression with Civil Action as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy at stage three*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.286	.271	<.001	19.37	<.001
Model 2	.332	.314	.002	17.90	<.001
Model 3	.333	.309	.732	14.26	<.001

Table 7.12 *Coefficients of the hierarchical regression with Civil Action as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy added at stage three*

Model		Standardised Coefficient Beta	p
1	Ecological Worldview	<.001	.998
	Conservation Self-efficacy	.360	<.001
	Subjective Norms	.261	.001
2	Ecological Worldview	-.072	.343
	Conservation Self-efficacy	.259	.003
	Subjective Norms	.230	.004
	Nature Connectedness	.266	.002
3	Ecological Worldview	-.069	.369
	Conservation Self-efficacy	.250	.006
	Subjective Norms	.233	.004
	Nature Connectedness	.263	.002
	General Self-efficacy	.025	.732

A second hierarchical regression with Civil Action as the dependent variable was calculated with a focus on nature connectedness. Here, nature connectedness was added at stage one, the TPB variables were added at stage two and self-efficacy was added at stage three. The assumptions were met.

At stage one, nature connectedness significantly explained variance in Civil Action, $F(1,147)=38.02$, $p<.001$, with an $R^2=.206$, adjusted $R^2=.200$ and a coefficient beta of .453 (Since Model 2 and 3 are identical to that in the previous regression, please refer to Table 7.11 And 7.12 For further detail). Adding the TPB variables resulted in a significant change ($p<.001$) to $F(4,144)=17.90$, $p<.001$. Again, the ecological worldview's coefficients were not significant. Finally, the addition of general self-efficacy did not result in a significant change to F, $p=.732$.

A stepwise multiple linear regression was used to determine the statistically most reliable order for the inclusion of predictor variables for Civil Action. With Civil Action as the dependent variable, nature connectedness, ecological worldview, subjective norms, conservation specific self-efficacy and general self-efficacy were entered as possible

independent variables. At each step variables were chosen based on probability of F (p-values). Assumptions were met.

The resulting suggested model included the three variables conservation specific self-efficacy, nature connectedness and subjective norms, which were entered in that order. The final model significantly explained variance in Civil Action, $F(3,145)=23.58$, $p<.001$, $R^2=.328$, adjusted $R^2=.314$. For the separate contributions to variance and coefficients of each of the three stepwise model leading up to the final model, see Table 7.13 and 7.14.

Table 7.13 *Model summary and ANOVA of the stepwise regression with Civil Action as dependent variable, and the TPB variables, nature connectedness and general self-efficacy as possible predictor variables*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.233	.228	<.001	19.37	<.001
Model 2	.290	.280	.001	29.77	<.001
Model 3	.328	.314	.005	23.58	<.001

Table 7.14 *Coefficients of the stepwise regression with Civil Action as dependent variable, and the TPB variables, nature connectedness, and general self-efficacy as possible predictor variables*

Model		**Standardised Coefficient Beta**	**p**
1	Conservation Self-efficacy	.483	<.001
2	Conservation Self-efficacy	.339	<.001
	Nature Connectedness	.278	.001
3	Conservation Self-efficacy	.252	.004
	Nature Connectedness	.242	.003
	Subjective Norms	.224	.005

Gardening (UK)

The correlation matrix (Table 7.10) showed that all chosen predictor variables were positively and significantly correlated with the Gardening subscale.

To analyse the effect of the TPB variables on Gardening and the further contribution of nature connectedness and self-efficacy a three-stage hierarchical multiple linear regression was calculated with Gardening as the dependent variable (Table 7.15). At stage one, the predictor variables of the TPB, subjective norms, conservation specific self-efficacy, and ecological worldview were entered. At stage two, nature connectedness was entered, and finally, at stage three, general self-efficacy was entered. The assumptions of collinearity and normal distribution were met according to VIF values and P-P plots.

At stage one, the entered variables contributed significantly to the regression model, $F(3, 115)=11.20$, $p<.001$, with an $R^2=.226$ and an adjusted $R^2=.206$. However, within the three variables, only conservation specific self-efficacy and subjective norms showed a significant contribution (see the summary in Table 7.16 for standardised beta values and p-values). Both of these had a positive beta value, indicating that when the score on their measurement increased so did the Gardening score. At stage two, the addition of nature connectedness showed a significant change in F, $p<.001$, with an overall $F(4, 114)=14.80$, $p<.001$, again with a positive beta value. The new amount of variance explained was $R^2=.342$, adjusted $R^2=.319$. However, after this addition both conservation specific self-efficacy and subjective norms no longer showed significant coefficients. The addition of general self-efficacy to the regression model in stage three resulted in a significant change in F, $p=.016$, at an overall $F(5,113)=13.54$, $p<.001$ and $R^2=.375$, adjusted $R^2=.347$. The relationship here was positive. Here, subjective norms had a significant coefficient again, indicating that in the final model, subjective norms, nature connectedness and general self-efficacy significantly explained variance in Gardening scores. All three had a positive relation to Gardening.

Table 7.15 *Model summary and ANOVA of the hierarchical regression with Gardening as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy at stage three*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.206	.206	<.001	11.20	<.001
Model 2	.342	.319	<.001	14.80	<.001
Model 3	.375	.347	.016	13.54	<.001

Table 7.16 *Coefficients of the hierarchical regression with Gardening as dependent variable, TPB variables as block one, nature connectedness added at stage two and general self-efficacy added at stage three*

Model		Standardised Coefficient Beta	p
1	Ecological Worldview	.084	.329
	Conservation Self-efficacy	.300	.002
	Subjective Norms	.221	.018
2	Ecological Worldview	-.023	.785
	Conservation Self-efficacy	.151	.110
	Subjective Norms	.165	.058
	Nature Connectedness	.414	<.001
3	Ecological Worldview	.015	.858
	Conservation Self-efficacy	.079	.411
	Subjective Norms	.202	.020
	Nature Connectedness	.385	<.001
	General Self-efficacy	.197	.016

A second hierarchical regression with Gardening as the dependent variable was calculated with a focus on nature connectedness. Here, nature connectedness was added at stage one, the TPB variables were added at stage two and self-efficacy was added at stage three. The assumptions were met.

At stage one, nature connectedness significantly explained variance in Gardening, $F(1,117)=47.13$, $p<.001$, with an $R^2=.287$ and adjusted $R^2=.281$. Adding the TPB variables resulted in a significant change ($p<.001$) to $F(4,114)=14.80$, $p<.028$. Again, ecological worldview's coefficients were not significant. Finally, the addition of general self-efficacy resulted in a significant change to F, $p=.016$ (For coefficients of the second and third model please refer to table 7.16, as they are the same in both hierarchical regressions).

A stepwise multiple linear regression was used to determine the statistically most reliable variables for the inclusion of predictor variables for Gardening. With Civil Action as the dependent variable, nature connectedness, ecological worldview, subjective norms, conservation specific self-efficacy and general self-efficacy were entered as possible

independent variables. At each step variables were chosen based on probability of F (p-values). Assumptions were met, tested the same way as described above.

The final resulting suggested model included the three variables nature connectedness, subjective norms, and general self-efficacy which were entered in that order. The final model significantly explained variance in Gardening $F(3,115)=22.55$, $p<.001$, $R^2=.370$, adjusted $R^2=.354$. For the separate contributions to variance and coefficients of each of the three stepwise model leading up to the final model, see Table 7.17 and 7.18.

Table 7.17 *Model summary and ANOVA of the stepwise regression with Gardening as dependent variable, and the TPB variables, nature connectedness and general self-efficacy as possible predictor variables*

	Model Summary			ANOVA	
Model	**R^2**	**Adjusted R^2**	**F Change Sig.**	**F**	**F Sig.**
Model 1	.287	.281	<.001	47.13	<.001
Model 2	.327	.315	.010	28.15	<.001
Model 3	.370	.354	.006	22.55	<.001

Table 7.18 *Coefficients of the stepwise regression with Gardening as dependent variable, and the TPB variables, nature connectedness, and general self-efficacy as possible predictor variables*

Model		**Standardised Coefficient Beta**	**p**
1	Nature Connectedness	.536	<.001
2	Nature Connectedness	.463	<.001
	Subjective Norms	.212	.010
3	Nature Connectedness	.417	<.001
	Subjective Norms	.229	.004
	General Self-efficacy	.213	.006

7.4 Discussion

7.4.1 Findings

The study aimed to test the sizes of the Value-Action Gap and the Intention-Behaviour gaps, one gap between general intention to support nature conservation and pro-nature

conservation behaviour and one between specific intentions to engage in pro-nature conservation behaviour and actual pro-nature conservation behaviour. It was hypothesised, that the gap would grow smaller from Value-Action to specific Intention-Behaviour. Further, predictor variables based on the TPB as well as previous research on pro-environmental and pro-nature conservation behaviour were assessed in an exploratory manner, including conservation specific self-efficacy, subjective norms, ecological worldview, nature connectedness, and general self-efficacy. Here, two similar hypotheses were tested: It was assumed (H2) that the TPB related variables (conservation specific self-efficacy, subjective norms, and ecological worldview) would significantly account for variance in pro-nature conservation behaviours and that that account would be improved by adding nature connectedness and general self-efficacy. Taking a more nature connectedness focused approach it was also hypothesised (H3) that nature connectedness by itself would account for a significant amount of variance in pro-nature conservation behaviours with a significant improvement to the model when the TPB variables and self-efficacy were added. These three hypotheses were tested on both an international and a UK based sample.

The reliability analyses of the scale questionnaires developed for this study, which were ProCoBS specific intentions, nature conservation specific self-efficacy and nature conservation specific subjective norms all showed a high internal consistency, making them suitable for this research. However, for the international sample the Cronbach's alpha was significantly lower in Gardening for both the ProCoBS and the specific intention scale than for the UK based sample. This suggests a merit in exploring alternative measurement for that subscale of the ProCoBS when studying non-British samples. Thus, while the results of the international sample will be briefly mentioned here, the focus lies with the results from the UK sample.

To test the first hypothesis regarding the Value-Action Gap and the Intention-Behaviour Gap, the relationship between pro-nature conservation behaviour and values (ecological worldview), general intentions as well as specific intentions to engage in pro-nature conservation behaviours, were assessed. While all three variables were found to be significantly related, there was a clear difference in the strength of that relationship for both Civil Action and Gardening. In the UK sample, for both sob-scales the relationship between ecological worldview and behaviour was small, indicating a large Value-Action Gap. For

general intentions there was a medium strength relationship with behaviour, indicating a medium Intention-Behaviour gap when measured as a general intention to support nature conservation. Finally, specific intentions to engage with the behaviours on the ProCoBS showed a strong relationship to those behaviours. Thus, the gap here between intentions and behaviour was small. The results for the international sample weren't quite as clear cut, with ecological worldview having no significant relationship to the Civil Action scale, for example. Nevertheless, the same trend was found here. This supports the Hypothesis (H1), that there is both a Value-Action Gap and an Intention-Behaviour Gap but that the size of the Gap decreases from values to specific intentions.

Then, the influence of the TPB variables was assessed with the addition of nature connectedness and general self-efficacy. Here, a difference between the two subscales was found. In the UK sample, for Civil Actions the three TPB variables (ecological worldview, conservation specific self-efficacy, and subjective norms) were found to significantly account for 27% of variance in the reported behaviour. However, ecological worldview did not have a significant coefficient, so could be assumed to not significantly contribute to that explanation. The addition of nature connectedness significantly improved the model, now explaining 31% of variance. The final addition of self-efficacy, however, did not significantly improve the model. There were similar findings in the international sample regarding general self-efficacy and nature connectedness. However, here, ecological worldview had a significant but negative effect on behaviour, while conservation specific self-efficacy was only significant before nature connectedness was added to the regression model. Thus, for Civil Action the hypothesis was only partially supported: The TPB variables did significantly account for variance in behaviour and the addition of nature connectedness did improve this account. However, general self-efficacy did not improve the model and not all of the TPB variables significantly contributed to the variance.

For Gardening a slightly different pattern was found: Again, the TPB variables significantly accounted for 21% of variance with ecological worldview not showing a significant coefficient. The inclusion of nature connectedness significantly improved the model to account for 32% of variance. After the addition the two TPB variables that had significant coefficients, conservation specific self-efficacy and subjective norms, no longer showed significant coefficients, suggesting that in this model nature connectedness was the

main contributor to variance. The addition of self-efficacy led to a significant improvement of the model, now accounting for 35% of variance in behaviour. After this addition, subjective norms, nature connectedness, and general self-efficacy had significant coefficients. In the international sample, similar patterns were observed regarding the addition of nature connectedness, and the coefficients of the TPB variables (ecological worldview not significant, the other two not significant when nature connectedness added, subjective norms significant again after inclusion of general self-efficacy). However, the addition of general self-efficacy did not improve the regression model significantly. For the UK sample the hypothesis (H2) was fully supported, though it should be noted that not all variables contributed significantly.

The third hypothesis (H3) was similar to the second, but it predicted a switch in place between the TPB variables and nature connectedness based on research regarding the importance of nature connectedness. For Civil Actions, nature connectedness significantly accounted for 20% of variation in behaviour. The addition of the TPB led to a significant improvement of the model, now accounting for 31% of variance (as above, since after the inclusion of the TPB variables the models were the same for both H2 and H3). Here, as could be expected from the results regarding the second hypothesis (H3), self-efficacy did not improve the model and ecological worldview did not show a significant coefficient. In the international sample, nature connectedness accounted for 24% of variance in Civil Action. The TPB variables improved the model significantly, but general self-efficacy did not. Again, as after the inclusion of the TPB variables, the models were the same as in the previous hypothesis, ecological worldview had a negative significant coefficient and conservation specific self-efficacy did not have a significant coefficient. Thus, similarly to the second hypothesis, the third hypothesis was partially supported for Civil Actions.

For Gardening behaviours, the third hypothesis was fully supported in the UK sample. Nature connectedness accounted for 28% of variance in behaviour. The addition of both the TPB and general self-efficacy improved the model to an overall 35% of variance explained. Nevertheless, ecological worldview and conservation specific self-efficacy did not have significant coefficients in the final full regression model. In the international sample, nature connectedness by itself accounted for 20% of variance, but neither the TPB variables

nor general self-efficacy significantly improved the regression model. For this sample, the hypothesis (H3) was only partially supported.

Based on the findings for hypotheses two and three, a further test was run: There were some differences between Civil Action and Gardening, for example in the contribution of self-efficacy. Also, not all variables from the chosen variables representing the TPB were significant. Especially ecological worldview was often not significant. Further, some findings suggested that the TPB and nature connectedness might have different levels of importance between the behaviours, for example in the international sample for Gardening. While the difference in the international sample may have been due to inaccuracy of the measurement due to place-specific actions, there was also a difference between the tests for hypothesis two and three in how much variance was explained in the first step, as well as which specific variables from the TPB variables were significant. Thus, a stepwise multiple linear regression was computed for Civil Action as well as Gardening. While this analysis is not a model building tool as it is not theory driven, it can be useful in getting an overview of which variables are the most statistically reliable in the sample that one looks at (Smith, 2018).

Here, for Civil Action conservation specific self-efficacy came out as the first chosen variable, followed by nature connectedness and subjective norms, the final model accounting for 31% of variance in behaviour in the UK sample. In the international sample it was nature connectedness, subjective norms, and ecological worldview, the last one having a negative relationship to behaviour, accounting for 28% of variance. For Gardening, nature connectedness came out as the first variable, followed by subjective norms and then general self-efficacy, overall accounting for 35% of variance in behaviour. For the international sample only nature connectedness was chosen, accounting for 20% of variance in behaviour. To summarise the important findings from hypotheses two and three as well as the additional analysis, nature connectedness, as well as subjective norms and self-efficacy (specific in Civil Action and general in Gardening) play an important role in predicting pro-nature conservation behaviours. Both a TPB focused as well as a nature connectedness focused approach can be worthwhile though the merits might differ between the two subscales of the ProCoBS. There are some differences between the UK

sample and the international sample. However, results from the international sample should be treated with caution, especially with the Gardening subscale.

7.4.2 Value-Action vs Intention-Behaviour Gap

This study found both a Value-Action and an Intention-Behaviour Gap for pro-nature conservation behaviours. Whether the phrasing of Value-Action Gap or Intention-Behaviour Gap should be used in the discourse of pro-nature conservation behaviours may depend on the specific research designs, but there are certainly some considerations to take away from this study. For example, it is questionable whether the concept of a Value-Action Gap is useful when ecological worldview has very small or even non-significant predictive power for behaviours. While this does confirm the existence of a Value-Action Gap for pro-nature conservation behaviours, it seems to be so large that other variables may be more worthwhile to focus on. An approach that aims to create environmental value and from there encourage behaviours may prove to be an ineffective if not fruitless effort. Especially in the analyses for hypothesis two and three, ecological worldview was not found to have a significant predictive value for either Civil Action or Gardening.

Whether the Value-Action Gap is an appropriate construct for pro-nature conservation behaviours should be questioned in further research rather than just assumed as an important challenge in conservation specific behaviour change, which is the way it is treated in more climate related psychological research (Markowitz & Shariff, 2012). However, further investigation is needed, for example using more conservation specific measurements of values, rather than ecological worldview. The strength of ecological worldview as a predictor of behaviour has been questioned for pro-environmental behaviour as well (Steg & Vlek, 2009). While its consistent use in models and research on pro-environmental behaviour justified its investigation in this study, more detailed research on the Value-Action Gap in pro-nature conservation behaviour may profit from examining other measures of values more tailored towards nature conservation.

Another important consideration is one that has been pointed out by researchers in various behavioural domains and was confirmed through the finding of an Intention-Behaviour Gap, especially when looking at general intentions: One should not use

the terms behaviour and intention interchangeably: Often, when studies claim to be examining the Value-Action Gap, they are actually focussing on a Value-Intention Gap (Hassan et al., 2016). As research in health psychology, as well as the results of this study, have shown, there is still a considerable gap between intentions and behaviour (Hassan et al., 2016). Thus, it would be inaccurate to claim a bridge of the Value-Action Gap when the outcome measure that was used are intentions. However, as described above, due to the high predictive power of specific intentions, they may still be valuable research tools, as long as the research acknowledges the still existing gap between these intentions and actual behaviour.

In fact, when researching pro-nature conservation behaviours, a study design using specific intentions rather than the actual ProCoBS may still produce viable results. The specific intentions did not predict all variation in pro-nature conservation behaviours but a large amount, especially in comparison to values or general intentions. Some research designs may not be suitable for use of the ProCoBS. For example, when examining how certain messaging tactics affect people's intentions to engage in pro-nature conservation behaviours it is important to measure intentions rather than behaviours, which won't change as immediately. This research has shown that due to the high predictive power of specific intentions, they are a valid variable to be examined. The used measurement questionnaire for ProCoBS specific intentions could prove to be a useful tool in further research on pro-nature conservation behaviours when the study design does not work with a measure of behaviours, as suggested above. The scale showed high internal reliability and its high correlation with the ProCoBS suggests convergent validity, which is the extent to which a measurement yields similar results as measurements that based on a theoretical basis be similar (Boateng et al., 2018). Convergent validity is a form of construct validity, describing a measurements' ability to measure the construct of concern and is related to similar measures and constructs (Boateng et al., 2018). However, some more detailed testing of the specific intention questionnaire may be necessary, including for example exploratory and confirmatory factor analyses. And, as alluded to above: while in some research designs measurements of intentions are more practical, they cannot replace the ProCoBS as a measure of behaviours, as there still is a gap between specific intentions and reported behaviours.

The strong reduction of the Intention-Behaviour Gap from general to specific intentions has two interesting implications for further research into interventions and communications aiming to encourage pro-nature conservation behaviour. It suggests that behaviour change tactics already employed in health psychology may be effective for pro-nature conservation behaviours, too. These tactics often use specific intention setting techniques, such as action planning or coping planning (Sniehotta et al., 2005). Action planning is a technique where people who want to change their behaviour make specific plans for this. They go beyond setting an intention for what behaviour to engage in and set the when, where and how of the behaviour. This is also used in a similar technique called implementation intentions (Mairs & Mullan, 2015). Setting these very specific intentions and plans helps individuals to bridge the Intention-Behaviour Gap. Similar to the results from this study, it has been found that the level of specificity plays an important role: maximal specificity is crucial, for example when setting implementation intentions to engage in more physical activity (De Vet, Oenema, & Brug, 2011). This was also found for action planning: specificity of action plans influenced whether GPs addressed smoking with their patients (Verbiest et al., 2014). Coping planning works slightly differently. People are asked to anticipate obstacles to the intended behaviour changes and to think of ways to overcome these obstacles in advance (Sniehotta et al., 2005). Techniques like these may be beneficial for people who have already formed relatively specific intentions for pro-nature conservation behaviours, supporting them in bridging the Intention-Behaviour Gap. However, they may be less useful for people who have not formed these specific or even general intentions to support nature yet. Here, different approaches should be considered.

Additionally, the difference between the predictive power of general intentions and specific intentions highlights the importance of a clear communication of effective and impactful behaviours that the general public can engage in. In recent years there has been a growing communication of sustainable gardening practices through nature conservation organisations. These behaviours are, for example, encouraged through the organisations' websites (The Wildlife Trusts, n.d.). However, these actions are not necessarily assessed for their impact. Further, behaviours building on civil action, such as political behaviours have only recently moved into focus, through movements like Fridays for Future or Extinction Rebellion. Communicating both aspects of pro-nature conservation behaviours efficiently is

important to help people form more specific intentions rather than general intentions, which do not seem to predict actual behaviour as well. In doing so, practitioners can fall back on a variety of methods and knowledge from psychology. Looking at the infographics from chapter three for example, these may be useful not only because they communicate specific behaviours that have been assessed as particularly useful in terms of impact, but also because they use expert power. Expert power is a concept from social psychology often used to describe the particular persuasiveness of communicators with high expertise (Klucharev, Smidts, & Fernández, 2008). Persuasiveness and credibility have been found to increase with the expertise of the communicator of a message aiming to change someone's attitude (Cialdini & Goldstein, 2004; Priester & Petty, 2003). Thus, the inclusion of expert rankings in the infographic may help people to perceive these behaviours as worthwhile, increasing their outcome expectations. This possibility should be investigated further.

This study opened the discourse on gaps between pro-nature conservation behaviours and their predictors and which gaps may be worthwhile investigating with the goal of closing it in terms of efficiency. As shown above, there are opportunities to close the Intention-Behaviour Gap by utilising well-known techniques in communications and interventions that aim to make intentions more specific, be a change from general intentions to support nature conservation to specific intentions to engage in various pro-nature conservation behaviours, or in creating implementation intentions for pro-nature conservation behaviours. However, closing the Value-Action Gap might be less fruitful, with the lack of significant predictive power of ecological worldview suggesting that when looking at gaps to close other predictor variables may be more useful. For example, it could be useful to focus on how to close the gap between nature connectedness and behaviour. Nature connectedness was found in this study and previous research to be an important predictor of pro-nature conservation behaviours, other conservation behaviours, and pro-environmental behaviours (Knapp et al., 2020; Otto & Pensini, 2017; Richardson et al., 2020). By focussing on this gap, researchers and practitioners could capitalise on the large body of research on how to improve people's nature connectedness. This will be discussed in more detail in the next subsection, discussing the implications of the findings on the predictor variables considered in hypotheses two and three.

7.4.3 How to predict and encourage pro-nature conservation behaviours

Traditionally, a TPB focused approach has been used to explain behaviours, with other variables being used as additives (Si et al., 2019). However, recent findings on emotional variables suggest that a shift in focus may be advantageous for environmentally specific behaviours. Especially nature connectedness has been shown to have a causal link to pro-environmental behaviours and is theorised to be an essential prerequisite for engagement in those behaviours (Frantz & Mayer, 2014; Mackay & Schmitt, 2019). Findings in this study revealed that both an approach centring the TPB and one focusing on nature connectedness work for pro-nature conservation behaviours. The results confirmed the importance of nature connectedness in pro-nature conservation behaviours, which was to be expected based on previous findings (Knapp et al., 2020; Richardson et al., 2020). There are some possible explanations for its influence on behaviour based on what is known about nature conservation. On the one hand, nature connectedness is partially formed through compassion (Lumber et al., 2017). Thus, the concept is likely related to any behaviour that requires compassion towards nature or could be classed as a compassionate act for nature, which pro-nature conservation behaviours can be seen as. A further possible explanation lies in the idea of oneness with nature. One, very simple, measure of nature connectedness uses images of circles, one representing nature and one the own self (Schultz, 2001). Low nature connectedness is indicated when the circles are far apart and high nature connectedness by overlap of the circles. Thus, people with high nature connectedness see themselves as one with nature. It has been suggested that this means that acting for nature becomes an act of self-preservation, which could explain the strong relationship between nature connectedness and any pro-environmental or pro-nature conservation behaviour (Schultz, 2002).

Focusing on (a) increasing nature connectedness and then (b) closing the Connectedness-Action gap could prove to be an important research path due to extensive literature on nature connectedness and its already promising role in pro-nature conservation behaviours. Easy interventions, like the simple practice of noticing only three good things in nature have been shown to help people connect with the nature around them (Richardson & Sheffield, 2017). Further, by using specific pathways to nature connectedness, such as contact and emotion, nature connectedness can be improved

(Lumber et al., 2017). This can be seen, for example, in the 30 Days wild project by the Wildlife Trusts in the UK, where participants can choose small actions in nature that build on these pathways to complete every day for 30 days (Richardson et al., 2020; Richardson et al., 2016). Future research could examine whether these activities result in longer term connectedness as well as how to bridge the gap between nature connectedness and behaviour, rather than focusing on encouraging ecological worldview and then bridging the rather large gap from there to behaviour.

In fact, the NEP which has formed an integral part in behavioural models tailored to pro-environmental behaviours had no significant effect on pro-nature conservation behaviours. While research on pro-environmental behaviours has consistently found a connection between behaviours and ecological worldview, its impact on behaviours seems to be weak and often indirect (Steg & Vlek, 2009). This seems to be similar for pro-nature conservation behaviours: While the scale development found a significant positive correlation (see chapter four), the predictive power found in this study was weak, mostly non-significant, and sometimes (in the international sample) even negative. However, the NEP measures rather general environmental attitudes and values. Research wanting to focus on the impact of attitudes and values on pro-nature conservation behaviours may want to focus on more specific measures. This may also improve findings on predictive power of the TPB, as the NEP was the only measure employed as a TPB variable that was not created specifically to relate to pro-nature conservation behaviours. Subjective norms on the other hand were found to be one of the statistically most reliable predictors for variability in both ProCoBS subscales, supporting the use of the TPB when explaining pro-nature conservation behaviours.

The other TPB related and additional variables were more dependent on the subscale of the ProCoBS that they were applied to. For Civil Action conservation specific self-efficacy was an important variable while for Gardening general self-efficacy was predictive. This was unexpected, considering that literature suggests specific self-efficacy to be more important for specific behaviours than general self-efficacy (Bandura, 2006). This could indicate that other, less conservation specific skills and efficacies play a role in gardening. Rather than just believing in one's competences to support nature one needs to be confident in further skills, including physical labour in a garden, knowledge about gardening,

etc. This could be in line with findings that experience in gardening in general improves biodiversity in one's garden (Philpott et al., 2020). Further, while in Civil Action subjective norms was the statistically most reliable variable, for Gardening this was nature connectedness. Here, the difference may be explained through the direct interaction with nature required for and provided by gardening. In fact, this could form a two-way relationship, with nature connection not only increasing pro-nature conservation behaviours in the garden but the gardening behaviours also improving nature connectedness through the pathways of contact and compassion (Lumber et al., 2017).

Nevertheless, self-efficacy was found to be important in both subscales which could indicate another possibly important variable: Outcome expectations are a further important variable in behaviour change, they are an individual's beliefs of what engaging in a specific behaviour will result in. While sometimes they are used in self-efficacy measures, Bandura has stated clearly that they do not form part of self-efficacy as self-efficacy only relates to beliefs in one's own abilities not their consequences (Bandura, 2006). Outcome beliefs have been found to influence a variety of behaviours, such as engagement with peer aggression and physical activity (Pornari & Wood, 2010; Williams, Anderson, & Winett, 2005). However, they may present a challenge in environment related behaviours: While outcome expectations may be quite clear in behaviours like physical activity ("If I exercise three times a week, I will lose weight"), they are far more abstract and not as measurable in individual actions aiming to address a wider ecological problem. An individual's contribution here might have a rather small and non-discernible outcome (Gifford, 2011). This may be a strong contributor to a wider apathy that has been observed in pro-environmental behaviours (Collado & Evans, 2019). Thus, encouraging behaviours that experts deem impactful, may be a good way to support pro-nature conservation behaviours by increasing outcome expectations. Their relatedness, even through the clear distinction, to self-efficacy could make outcome beliefs a valuable addition to studies assessing the predictors of pro-nature conservation behaviours through either a nature connectedness or a TPB focused lens.

The TPB, while still being one of the most employed models of behaviour, has been criticised heavily. One of the most prevalent critiques being the model's focus on intentional behaviour and rational decision making (Hagger, 2016). In this study, the problem was avoided by analysing the predictor variables in relation to behaviour directly to investigate

their impact on behaviour rather than intention, in line with previous research on conservation specific behaviours (Knapp et al., 2020). The addition of the nature connectedness measure may go beyond a rational model of behaviour since it measures an emotional concept. Affect may play an important role in more implicit processes of behaviour: Dual processing models of behaviour propose that while rational decision making, or explicit processes, as theorised by the TPB does influence behaviour, there are also non-conscious, or implicit processes impacting on behaviour (Hagger & Chatzisarantis, 2014). Implicit attitudes, which are automatic affective reactions tend to impact behaviour via the implicit route (Sheeran et al., 2013). Here nature connectedness may play a role, as its emotional aspect would align with the implicit route. To investigate this further, implicit measurements of nature connectedness, using modified versions of an Implicit Association Test (IAT), could be employed (Schultz, Shriver, Tabanico, & Khazian, 2004).

One criticism of the use of the TPB in environmentally related behaviours specifically has been the incomplete use of the TPB, which this study can be considered as "guilty" of as well (Yuriev et al., 2020). This pertains the disregard of the model structure of the TPB. The TPB has a clear structure, with the three main predictor variables influencing behaviour via intention. Further all three predictors are assumed to be determined by specific beliefs, such as control beliefs determining PBC. Especially those beliefs are often disregarded in research applying the TPB to pro-environmental behaviours. This study, due to its more exploratory nature was more interested in whether the three main predictor variables had any influence on pro-nature conservation behaviours, however, future studies should pay more attention to the exact build of the model. The above-mentioned outcome beliefs come into play here, as they form part of the beliefs that determine attitudes towards the behaviour, which as alluded to previously may need to be measured more specifically than was done in this study. Further, when assessing the specific structure of the model, the place of supplemental variables needs to be examined. For example, nature connectedness may not only play a role in the rational process of forming intentions, but also in more implicit processes included in transforming intentions into behaviours due to its affective component, which was discussed above.

Additionally, the often-correlational nature of research using the TPB has been highlighted as a weakness (Prestwich et al., 2017). This study was correlational in nature due

to its role as an exploratory piece of research on a behaviour with very little existing literature. Now that some possibly important antecedents have been identified future research should employ experimental methods to confirm the variables' role in pro-nature conservation behaviours. The criticisms of the TPB also include the often not sufficient explanatory power of the model (Sniehotta et al., 2014). In this study the employed TPB variables in combination with nature connectedness did explain variability in both gardening related and civil action related pro-nature conservation behaviours. However, this still left unexplained variability.

7.4.4 Further implications and conclusions

There were some differences in which variables were significant between samples and the two ProCoBS subscales. While many of the Civil Action items take place in the public sphere and are therefore more visible by others, the Gardening items can be classed as private sphere behaviours, as they often take place in people's homes. Research on pro-environmental behaviours has shown that some predictors vary between private sphere and public sphere behaviours, one of them being subjective norms, which were found to be more important in public sphere behaviours (Hansmann & Binder, 2020). Some research on place-based behaviours suggests that rather than forming part of a wider group of behaviours, they may be a separate domain (Larson et al., 2015). The differences in predictors between Civil Action and Gardening here indicate that this could be the case. However, more detailed research is needed before it can be indicated. However, for practical reasons a separate use of the ProCoBS may be desirable, especially when looking at samples from different countries.

So far, research on the ProCoBS had focused solely on a British population. While the questionnaire scale showed a high internal reliability with the international sample, further testing, especially regarding content validity of the Gardening subscale in varying international contexts is needed. The Gardening scale showed a lower internal consistency for the international sample than the UK sample. In the multiple regressions, the only significant variable was nature connectedness, while for the UK sample Gardening was predicted by nature connectedness, general self-efficacy, and subjective norms. This

suggests that gardening behaviours differ between the samples. These findings may simply be due to cultural differences regarding gardening, but it may also be a sign, that locally specific versions of the Gardening scale are needed or in some countries should be left out or replaced by a different second subscale. In some countries, garden ownership or opportunity to engage with gardens might not be as prevalent as it is in the UK. In fact, while 80% of the UK sample stated to have access to a garden, only 66% of the international sample responded that they had access.

Further, the differences between the sample may be due to the specificity of the behaviours on the Gardening subscale to the British ecosystem and culture. For example, in the UK, experts specifically highlighted the importance of hedges (Barbett, Stupple, Sweet, & Richardson, 2019). These have been an important ecological and cultural part of British landscapes (Oreszczyn & Lane, 2000). However, they may not have the same status in other countries, even those with similar climates and ecosystems. Differences in eco systems and culture around gardening are an important rationale for locally specific subscales of the ProCoBS. This was further supported by this study's data. Since there was no information on specific countries of the participants available, no in-depth analysis of the possible causes of the differences could be made. Nevertheless, the found differences are in line with the earlier expressed possible limitations of the ProCoBS regarding space-based behaviours. Future research directions could concern the development of locally appropriate subscales of the ProCoBS that measure place-based behaviours but also international differences in pro-nature conservation behaviours and their antecedents.

Future research on pro-nature conservation behaviour may want to focus on the further investigation of antecedents, by confirming additional predictors of behaviour. Integrating various models has often been shown to yield higher predictive power (Yuriev et al., 2020). However, human behaviour is likely so complex, that no model regardless of how many variables are accounted for will be sufficient in explaining behaviour (Anable et al., 2006). Thus, for research focusing on intervention development and evaluation, approaches that identify key variables and how to (a) enhance them in people and (b) transform them into behaviour change may be more effective than large, encompassing models.

This chapter examined a variety of antecedents of pro-nature conservation behaviours. While variables from the TPB were found to explain some variability, nature

connectedness seemed to be the key variable. Thus, a focus on this concept is an important direction for further research. However, there were still gaps found, even between specific intentions and behaviour. Future studies may want to examine how to transform nature connectedness and specific intentions into pro-nature conservation behaviours. This could be done by drawing on a solid body of research from environmental psychology examining interventions to improve nature connectedness. But research from the wider field of behavioural psychology can also be employed, especially regarding techniques to bridge the Intention-Behaviour Gap.

8 Discussion

8.1 Summary

Anthropogenic biodiversity loss has accelerated and reached a level where experts consider the current situation a mass extinction (Ceballos et al., 2015). To avert the highly dangerous consequences of this mass extinction, human action is needed immediately (Ceballos et al., 2015). To achieve this, interdisciplinary research exploring both the ecological impact of various actions, as well as their psychological components (antecedents and possible interventions for example), will be key. This thesis aimed to create a systematic research approach to pro-nature conservation behaviours within the field of environmental psychology.

The structure of this thesis was built on a systematic research agenda originally devised for general pro-environmental behaviours (Geller, 2002; Steg & Vlek, 2009). Briefly this included;

1. Carefully selecting the behaviours
2. Examining which factors cause them
3. Applying well-tuned interventions
4. Systematically evaluating interventions

Due to the length and time restrictions of a doctoral thesis only the first two steps were set as objectives. For the first step, a careful conceptualisation of pro-nature conservation behaviours was conducted, along with an assessment of behaviours which loosely fell into the same category. This was then followed by the creation of a measurement tool (Steg & Vlek, 2009). For the second step, a variety of research and theory regarding behaviour was consulted using literature from both general behavioural psychology and environmentally specific behaviours. A study to examine some general levels of pro-nature conservation behaviours in the UK public and the influence of some demographic variables was conducted. Finally, exploratory research including psychological antecedents of pro-nature conservation behaviours was undertaken. The following paragraphs will reiterate the most important theoretical and methodological considerations of the sub-steps outlined above, as well as the findings and their implications.

8.1.1 What are pro-nature conservation behaviours?

To establish a conceptualisation and definition of pro-nature conservation behaviours, a rationale to examine them separately from the more widely researched general pro-environmental behaviours was needed. Theory on pro-environmental behaviour was utilised to show a clear separation between pro-environmental and pro-nature conservation behaviours. Specifically, the differentiation between the objective and the subjective reality of pro-environmental behaviour was beneficial to this. The objective reality of pro-environmental behaviour refers to its actual impact on the environment, whereas the subjective reality concerns the intention behind the behaviour to benefit the environment (Stern, 2000). From the perspective of objective reality, there are some important differences between wider environmental issues, where there is often a very clear focus on climate change, especially within the media (Legagneux et al., 2018). However, ecologists have been warning that biodiversity loss, while intertwined with climate change, is its own threat that has not been taken seriously enough (Glaubrecht, 2021). Further, conservation practitioners and academics have lamented the lack of research on conservation specific behaviours (Richardson et al., 2016).

For the subjective reality, research on both, dimensionality of pro-environmental behaviour and possible pro-nature conservation practices provides evidence for a separation between pro-environmental behaviours and pro-nature conservation behaviours. While pro-environmental behaviour is multi-faceted in its construct, place-based behaviours appear to fall outside of this behaviour grouping (Halpenny, 2010). Further, research on both pro-environmental behaviours and some conservation specific practices indicated that there were different patterns between the responses to the questionnaire scales for each (Martin et al., 2020). The two realities play an important role in the further study of pro-nature conservation behaviours. Any behaviour assigned to this category in the future should be both environmentally useful and psychologically meaningful. As such we defined pro-nature conservation behaviours as;

"*Positive actions that aim to support nature conservation goals and have ecological impact on nature conservation*".

Using this definition, academic and grey literature was consulted to create a long list of possible behaviours falling under this category. It became apparent that many recommended behaviours were specific to people with access to a garden, i.e., behaviours in the private sphere (e.g., The Wildlife Trusts, n.d.). However, in order to achieve wider societal change, behaviours in the public sphere such as political engagement are also necessary (Christmas et al., 2013). Such categorisation of behaviours matched with the current line of thought associated with pro-environmental behaviours, where there seemed to be different latent factors based on private and public spheres (Stern, 2000). The long list of behaviours was evaluated by various conservation experts who indicated for each behaviour whether they considered it to be an action with a significant positive impact on nature conservation. These experts also had the opportunity to give written feedback. Based on this, a ranked list of recommended pro-nature conservation behaviours was created. The higher-ranking behaviours included, for example, volunteering with conservation organisations or planting pollinator friendly plants in one's garden.

8.1.2 Development and Validation of the ProCoBS (+ Short Form and Child version)

The development and validation of appropriate measurement tools is a crucial step in research on any concept. These tools help to ensure that studies measure the desired construct reliably and are comparable to each other (DeVellis, 2012). Following well-established guidelines on scale development for psychometrics, a variety of measurement tools were created for pro-nature conservation behaviours (Boateng et al., 2018; DeVellis, 2012; Furr, 2014; Kyriazos & Stalikas, 2018). First, the long list from chapter three was evaluated for use on a scale including not only considerations regarding possible response formats and wording but also a Subject Matter Expert (SME) review. The SME review set a threshold for required expert agreement on each item's usefulness, thus ensuring the content validity of the remaining items (Kyriazos & Stalikas, 2018; Lawshe, 1975). The remaining items were administered to a sample of 300 UK residents. Using psychometric analysis methods, items were further reduced, resulting in an 18-item scale, called ProCoBS. Since the scale was developed with nature conservation organisations in mind i.e., those who may in many instances need short measurement tools to save on time, further item-reduction was employed to create an 8-item short form, the ProCoBS-SF. Both versions

showed high reliability. By administering the questionnaire again, to the same sample, with a response rate of 74% in comparison to the first administration, the test-retest reliability was assessed and found to be high. Further, the second administration included validation variables to examine convergent validity, with all variables showing significant correlations to the scales.

The dimensionality of both the long and the short form was assessed exploratorily. The long version had four factors including two covering behaviours associated with gardening (Planting and Wildlife) and two with non-gardening behaviours (Individual Engagement and Organised Engagement). For the short form, there were only two factors, Gardening and Civil Action. A confirmatory factor analysis, not part of this thesis but published with the ProCoBS development and validation, confirmed the short form's dimensional structure (Barbett et al., 2020). This was an expected result based on research in pro-environmental behaviours and their dimensionality regarding the private and public spheres, as well as place-based behaviours (Larson et al., 2015; Stern, 2000). One of the underlying foci of the thesis was to make the researched behaviours as accessible as possible. This had partially been achieved by widening the focus from gardening behaviours to civil actions. However, for one large and particularly important group of people the ProCoBS and ProCoBS-SF may not be suitable: Children and adolescents. Several behaviours, such as voting, have age restrictions and are therefore not accessible to this age bracket. Using data from a large, national stratified sample, collected through the National Trust, a child friendly version of the ProCoBS was developed. This was a short form with eight items. This scale, too, showed convergent validity and high reliability, as well as a split into Gardening and Civil Action items. All three scales were shown to be reliable and valid measurement tools that can be used for research and practical purposes due to the adaptability between the different versions. The scales can be used as complete scales or by using the subscales of the two overarching domains, Civil Action and Gardening.

8.1.3 Demographic influences on pro-nature conservation behaviours

After the conceptualisation of pro-nature conservation behaviours and the development and validation of three measurement tools, an initial overview of the British public's engagement with the behaviours measured by the ProCoBS was provided. Data analysis was executed on a national data set from a stratified sample of approximately 2000 adults and 1000 children and adolescents. Descriptives of the ProCoBS-SF and the ProCoBS child version suggested that while the behaviours are adopted by the public, the frequency of reported engagement tends to be relatively low, sitting on average between "Occasionally" and "Sometimes". Both scales included items that can be assumed to assess different levels of engagement effort based on the distribution of the responses in the sample.

Four socio-demographic variables were assessed and the differences between groups within these variables for pro-nature conservation behaviours were investigated. There were small differences between men (or boys) and women (or girls), with the female participants showing higher scores on both subscales of the ProCoBS. For age, a teenage dip was found in the children and adolescent sample for both subscales, mirroring a phenomenon known from nature connectedness (Hughes et al., 2019; Richardson et al., 2019). In adulthood, there seems to be a difference in the effect of age on behaviour: While Gardening increased with age, Civil Actions decreased. Residential location played a role in Gardening behaviour for both samples but only for the adult sample in Civil Action. Here, when participants lived in more rural areas, their engagement with the ProCoBS behaviours was higher. Finally, social grade, an indicator of socio-economic status appeared to have no measurable effect in the child sample but did affect the participants' access to a garden. In the adult sample there was a small difference in Civil Actions with participants in the lower Social Grades (C2DE) reporting lower engagement than those in the higher Grades (ABC1). Overall, most effect sizes here were small, indicating that while socio-demographic factors do play a role and can be used to identify potential target groups for interventions (e.g., focusing on elderly people for Civil Actions but younger people for Gardening) it is likely that psychographic variables are more salient predictors of pro-nature conservation behaviours.

8.1.4 Psychological antecedents of pro-nature conservation behaviours

Finally, psychological antecedents of pro-nature conservation behaviour were investigated. The TPB, while not without important critique points, remains a key model explaining not just behaviours in general but also pro-environmental behaviours (Yuriev et al., 2020). When used in the context of pro-environmental behaviours, it is often supplemented or modified to fit with more environmentally specific models (Si et al., 2019). This was done here as well. To represent the TPB model in a way appropriate for pro-nature conservation behaviours, the variables ecological worldview (for attitudes), conservation specific self-efficacy (for perceived behavioural control), and nature conservation specific subjective norms were chosen to be examined. These variables were supplemented with nature connectedness based on its apparent importance in explaining both more general pro-environmental behaviours and conservation specific behaviours (Mackay & Schmitt, 2019; Richardson et al., 2020). Further, general self-efficacy was added as it was found to be connected to the ProCoBS in chapter four. A brief discussion of existing literature revealed that while the TPB was a prevalent model in explaining behaviour, it was also heavily criticised, one key issue being with the assumption of intentions being a good predictor of behaviour (Hagger & Chatzisarantis, 2014). Research has found that this is not necessarily the case and that there is an Intention-Behaviour Gap. Considering the often-discussed Value-Action Gap in environmental psychology, this raised the question of which gaps could be found in pro-nature conservation behaviour and which one may be suitable foci for future research with the aims of bridging the gap.

An online questionnaire study was conducted using both a UK based and an international sample, measuring various variables to assess their impact on pro-nature conservation behaviours in relation to the above discussed literature: ecological worldview, general intentions, pro-nature conservation specific intentions, conservation specific self-efficacy, subjective norms, nature connectedness and general self-efficacy. The first hypothesis of the study addressed the question of gaps: It was hypothesised, that while values (ecological worldview), general intentions and specific intentions would all be related to pro-nature conservation behaviours, the strengths of that relationship would grow from values being the weakest to specific intentions being the strongest. This Hypothesis was supported by correlations.

Hypothesis two assumed that the TPB variables would significantly predict pro-nature conservation behaviour with the predictive power being improved by the addition of pro-nature conservation behaviours and general self-efficacy. Hypothesis three was similar but took a nature connectedness centred approach, assuming that nature connectedness by itself would significantly predict pro-nature conservation behaviours and would be improved by the addition of the TPB variables. A series of regression analyses revealed that both a TPB focused approach (H2) and a nature connectedness focused approach (H3) were predictive of behaviour. However, there were some differences between the subscales. The statistically most reliable variables for Civil Actions were conservation specific self-efficacy, nature connectedness and subjective norms, and for Gardening, nature connectedness, subjective norms and general self-efficacy. A further comparison between the British and the international sample revealed that country specific subscales of space-based behaviours (Gardening in the UK) may be an important research tool. Based on the low connection of ecological worldview with pro-nature conservation behaviour, the usefulness of research on the Value-Action Gap should be questioned. Instead, one could take advantage of the importance of nature connectedness and the vast literature regarding the fostering of connectedness by focusing on closing the far smaller gap existing between nature connectedness and behaviour. Further investigation into psychological antecedents of pro-nature conservation behaviours is needed but the current findings can already support efforts to create effective intervention and communication programmes.

8.2 Implications and questions for the future

Several intricacies and questions pertaining pro-nature conservation behaviours and their appropriate research tools emerged throughout the course of the thesis. The two main themes of these regarded the dimensionality of pro-nature conservation behaviours, including its consequences for the applicability of the ProCoBS in international contexts, as well as the practical and academic benefits of different theoretical approaches to behaviour and behaviour change in the specific case of pro-nature conservation behaviours. Both these themes will be discussed in detail in this sub-section. Also, some findings indicate that specific directions may be fruitful in future research aiming to understand and encourage pro-nature conservation behaviours.

8.2.1 Considerations for the Use of the ProCoBS

Based on research on pro-environmental behaviours, pro-nature conservation behaviours were expected to show dimensionality. In pro-environmental behaviours, the dimensions tend to be oblique, meaning they are inter-related. During the process of the development and validation of the ProCoBS, various oblique dimensions were found. However, based on both practical and theoretical considerations, the question of whether the scale should be used as one complete scale or as two separate subscales arose. The internal reliability of the complete ProCoBS shows, that the use as a complete scale is possible. However, with the behaviours one of the subscales being only applicable to people who have access to a garden, it may be advisable, at least in certain samples to look at the two separately. This way, one can capture the behaviours of those people that do not have access to a garden. Based on slightly different average scores in the large sample of adults in the UK, combining scores of those who have answered the complete scale and those who have only answered the Civil Action subscale could confound statistical results. There are also arguments supporting a separate investigation of Gardening and Civil Actions emerging from research on pro-environmental behaviours. In pro-environmental behaviours, some predictor variables seem to not get a consensus between studies, this may be explained by differences in antecedents of the various domains of pro-environmental behaviours (Patel et al., 2017).

In addition, one theoretical aspect that has been repeatedly touched upon but not explored in much detail is the idea of place-based behaviours. Place-based behaviours in an environmental context are not easily generalisable and tend to regard local wildlife and other place-specific natural features (Larson et al., 2015). These behaviours had been pointed out in research on pro-environmental behaviours as both under-researched and conceptually different from other pro-environmental behaviours (Halpenny, 2010; Huddart-Kennedy et al., 2009; Larson et al., 2015). The behaviours in the Gardening subscale seem to fall into that category due to their specificity to local flora and fauna. This does not only support the rationale for research in pro-nature conservation behaviours as a separate concept from pro-environmental behaviours but also poses the question of whether there is a conceptual distinction within the dimensions of pro-nature conservation behaviours. As lamented by various researchers, there is a lack of research on place-based behaviours

(Larson et al., 2015; Richardson et al., 2016). Thus, there is little literature to build further speculations on how this might affect pro-nature conservation behaviours, leaving a gap in the conceptualisation of those behaviours for future research to consider in more detail. Further, as part of this conceptualisation, the name choice should be addressed. In this thesis Gardening for adults and Garden Actions for children were chosen. However, with their role as place-based behaviours rather than necessarily garden specific behaviours these names may not be the most appropriate choice. Further, especially the name Gardening could refer to wider behaviours in the garden that are not related to nature conservation. Alternative names could use the idea of place-based action or their characteristic of being direct actions in nature, using for example "Actions in Nature".

The idea of place-based behaviour also highlights another issue for the use of the ProCoBS. Since place-based behaviours are place-specific, they may not be applicable in an international context. It can be expected that many behaviours on the ProCoBS Gardening subscale are important in a British context but may be less useful elsewhere. For example, the behaviour "*I avoid cutting/ trimming hedges during bird breeding season (March-July)*", found on the ProCoBS long version, is based on the importance of hedges in British landscape and culture (Oreszczyn & Lane, 2000). In other countries this may not be the case. In chapter seven the comparison between the UK based and the international sample showed that the Gardening subscale showed lower reliability in the international sample than the UK sample for both behaviour and intention. Further, the predictor variables showed a far lower effect size in the multiple regression for Gardening in the international sample with only nature connectedness being significant. While there was some difference between the two samples for Civil Action as well, those differences were decidedly smaller. The considerations based on psychological research, local differences in ecosystems, and the results from chapter seven suggest an adaption of the Gardening subscale to specific local contexts when used internationally. Creating those subscales to be comparable to the UK ProCoBS subscale is one possible future direction for international researchers interested in pro-nature conservation behaviours. Further, the Civil Action subscale may need more testing in international contexts for validation. Research on pro-environmental behaviours has revealed cultural relevance to play a role in certain predictors and behaviours for students in Hawai'i, which means that cultural differences worldwide need to

be examined in more detail (Gould, Krymkowski, & Ardoin, 2018). As alluded to above, this may be important for pro-nature conservation behaviours, specifically the place-based subscale.

8.2.2 So, what now?

This thesis proposed a systematic approach to pro-nature conservation behaviours. The first step of such an approach, conceptualising these behaviours and carefully selecting behaviours to be researched, was completed in chapters three and four. Then, the second step, the examination of predictors of behaviours, was initiated. The results already included some key variables in the formation of pro-nature conservation behaviour with possible routes emerging to take in the third and fourth step, the development and evaluation of communication and intervention programmes to encourage pro-nature conservation behaviours. However, this systematic approach is not necessarily a linear, but rather a circular, recursive process. As discussed above, some aspects of the concept and the measurement of pro-nature conservation behaviours should be revisited. And while nature conservation has emerged as an important factor in the engagement with those behaviours, there is still much room to explore both the exact ways in which nature connectedness plays a role and possible additional variables. The following paragraphs will introduce some suggestions for further research directions regarding steps two and three based on the findings in this thesis as well as literature from behavioural and environmental psychology.

The first contribution of this thesis to future research concerning both the study of antecedents of pro-nature conservation behaviour and the evaluation of interventions is the ProCoBS, which can be employed as a measure in such endeavours. But future research can further build on the results from this thesis.

The findings regarding nature connectedness in particular provide a plethora of possible directions for future research, ranging from research on the exact influence nature connectedness has, to possible interventions and communications, to even research on well-being benefits of pro-nature conservation behaviours. The known pathways of nature connectedness are contact, emotion, compassion, meaning, and beauty (Lumber et al.,

2017). Contact refers to actively experiencing nature with all senses, emotion to the happiness and wonder one can find in nature; beauty can be just noticing the beauty of nature or engaging with it through any form of art; meaning can be found in the cultural importance many aspects of nature have in our culture ranging from the ways cycles of nature influence our daily life to the ways that natural phenomena are used in art or even just idioms; finally, compassion is all about the question of what we can do for nature (M. Richardson et al., 2020). These pathways have been successfully employed in programs aiming to foster nature connectedness (Richardson et al., 2020; Richardson & Sheffield, 2017).

Many of the pathways can be directly linked to behaviours on the ProCoBS. For example, behaviours such as planting wildflowers have the prerequisites to easily tap into the pathways of contact, beauty, and compassion. Planting wildflowers, when done mindfully, engages the senses of touch (when touching the earth while planting), sight (looking at the wildflowers), smell (smelling the wildflowers), and possibly even sound (hearing the bees in the wildflowers). Thus, it follows the contact pathway (For an example of how this may look in real life situations see Figure 8.1). Due to the often-perceived beauty of flowers, it can also tap into the beauty pathway, and with the impact that wildflower patches can have on local pollinators it can also employ the compassion pathway. Thus, the relationship between nature connectedness and pro-nature conservation behaviours may not only go in one direction but be more intricate. Evidence for this can be found in some first research using the ProCoBS. One finding from a study examining a variety of possible predictor variables found that not only nature connectedness but also small actions in nature were the most important predictors within the assessed factors (Richardson et al., 2020). These actions included both active behaviours, such as taking photos of and painting nature, or collecting natural features like shells or pebbles, as well as passive actions focused more on noticing nature, such as listening to birds or watching the sunrise. Similar patterns have also been found in pro-environmental behaviours, where certain interactions with nature in childhood were linked to higher engagement with pro-environmental behaviours in adulthood (Asah, Bengston, & Westphal, 2012).

Figure 8.1 *Screenshot of a Social Media post of a German student living in a City (Used here with his permission). The image shows some wildflowers in a flowerpot with a bumble bee sitting on one of the flowers. The caption translates to "My biggest flex in Life is that every time I am on my balcony, I can watch the bumble bees".*

Building on those findings, analyses of data from the People and Nature Survey has provided further insights into the relationship between nature connectedness, pro-nature conservation behaviours, and well-being (Hamlin & Richardson, 2021; Richardson & Hamlin, 2021). This has resulted in the proposal of the Noticing Nature Model (Hamlin & Richardson, 2021). The model builds on correlational and experimental evidence, that higher nature connectedness leads to higher well-being (Martin et al., 2020; McEwan et al., 2019). This relationship has been shown to be related to noticing nature (McEwan et al., 2019). Further, this thesis, as well as some literature suggests that nature connectedness predicts pro-nature conservation behaviours (Richardson et al., 2020). Similar to previous arguments, the authors of the model theorise that this connection may go both ways, since several pro-nature conservation behaviours tap into the pathways to nature connectedness and can lead to outcomes that can be observed, thus encouraging the noticing of nature (Hamlin & Richardson, 2021). Finally, based on holistic models of health, it is argued, that pro-nature

conservation behaviours have a direct impact on well-being through the preservation of biodiversity and planetary health, which is a pre-requisite to human health (Nelson, Prescott, Logan, & Bland, 2019; Rabinowitz, Pappaioanou, Bardosh, & Conti, 2018). Thus, the authors created a model where there is a feedback loop between pro-nature conservation behaviours and nature connectedness, as well as an impact of both nature connectedness and pro-nature conservation behaviours on well-being (Richardson & Hamlin, 2021). Evidence was found for this model, including the finding that actions improving visible biodiversity predicted nature connectedness (Hamlin & Richardson, 2021). With the impact of nature connectedness on pro-nature conservation behaviour, this suggests that future research could benefit from research on place-based behaviours with direct and timely impact on visible biodiversity.

The feedback loop may also play a role outside of the specific place-based behaviours improving visible biodiversity, such as planting wildflowers, within the context of spill-over theory. 'Behavioural spillover' refers to the idea that engagement with one behaviour within a behavioural domain also changes engagement with the other behaviours in that domain (Thøgersen, 1999). For example, in pro-environmental behaviour, taking public transport instead of the car could lead to changes recycling behaviour. The high positive correlation between pro-environmental behaviours supports this idea, specifying it to the theory that engagement with one pro-environmental behaviour increases other pro-environmental behaviours (Lanzini & Thøgersen, 2014; Marian, Chrysochou, Krystallis, & Thøgersen, 2014). This spillover effect seems to be mainly positive. Some research found positive spillover effects between pro-environmental behaviours that require similar resources but no spillover between behaviours that require dissimilar resources (Margetts & Kashima, 2017). In an experimental study, encouragement of green consumption behaviours led to positive spillover into a variety of other pro-environmental behaviours, some of which were not related to buying behaviour, such as recycling (Lanzini & Thøgersen, 2014).

The theoretical baseline for this phenomenon lies in the goal orientation of the behaviours. Goal theory suggests that underlying goals may be broad, in this case, to protect the planet, but they require multiple specific choices to be attained, such as the various pro-environmental behaviours (Dhar & Simonson, 1999). Another theory looks into self-identity:

Engaging in one environmentally friendly behaviour is thought to feed into one's self-identity as someone who is active for the environment, which in turn increases action for the environment (Van der Werff, Steg, & Keizer, 2014). While the exact mechanisms of spillover are not fully understood yet, there is evidence for a number of moderators coming into play in this phenomenon. The feedback loop between certain biodiversity improving actions within pro-nature conservation behaviours and nature connectedness, could provide an important factor within the idea of spillover in the realm of pro-nature conservation behaviours. As of yet, there is no research on this, but some findings on pro-nature conservation behaviours provides evidence, that it could be a worthwhile field of exploration. The questions of whether there is spillover from place-based behaviours to civil action or whether any spillover stays within place-based behaviour would be particularly interesting to investigate.

The importance of nature connectedness can further play a role in the design of effective communications aiming to encourage pro-nature conservation behaviours. Emotional attachment to nature may form through anthropomorphising nature (Lumber et al., 2017). This is due to anthropomorphised imagery provoking feelings of similarity and empathy (Tam, Lee, & Chao, 2013). With nature connectedness including the idea of oneness with nature and compassion for nature, those feelings can improve nature connectedness (Lumber et al., 2017; Mayer et al., 2009). There is rich evidence from pro-environmental behaviours suggesting that anthropomorphised nature can impact behaviours: Anthropomorphism is the assignment of human characteristics to non-human entities (Kwan & Fiske, 2008). This can often be found in environmental discourse, most prevalently in the term 'mother nature' which is used in many cultures (e.g., in the form of the goddess 'Pachamama' in various South and Central American cultures). In Bolivia, this figure of Pachamama even has legal protection (Tola, 2018). In general, the attribution of a perceived ability to sense and feel in a way similar to humans, makes people more reluctant to harm non-human characters (Gray, Gray, & Wegner, 2007). Some scholars suggests that humanising nature may act as a facilitator to empathy towards nature (Batson, 2011). Others go further by assigning the belief that the natural world has emotion and cognition parallel to that of humans an essential role in concern for nature (Clayton, Fraser, & Burgess, 2011).

These ideas are based in the way that connectedness to nature tends to mirror relatedness to other human beings (Davis, Green, & Reed, 2009; Mayer & Frantz, 2004). The role of anthropomorphised language and visualisations in pro-environmental behaviours has been experimentally examined: Participants, who in one of three experiments created posters (whether anthropomorphism was used or not depended on participants), read articles using the words 'mister nature' rather than 'nature' (= control condition) or evaluated the anthropomorphic posters from the first experiment (with the non-anthropomorphic posters as control group), showed higher pro-environmental intentions and environmental support than those in the control groups (Tam et al., 2013). This effect was mediated by nature connectedness (Tam et al., 2013). While many nature connectedness interventions require nature contact, anthropomorphised messaging could promise to provide a way for people to connect with nature in a time where people spend about 90% of their time in buildings (G. W. Evans & McCoy, 1998; Tam et al., 2013). In the realm of pro-environmental behaviours and nature connectedness, anthropomorphism could provide an impactful, yet low-cost strategy to foster and encourage behavioural change and to connect people to nature (Tam et al., 2013).

Figure 8.2 *Screenshot from the Wildlife Trusts' promotional short film 'The Wind in the Willows | Official Trailer |' using anthropomorphised animal characters typical for the British countryside from the 1908 novel 'The Wind in the Willows' to raise awareness of ongoing biodiversity loss (The Wildlife Trusts & Don't Panic, 2019).*

Figure 8.3 *Logo of the 'Volksinitiative Artenvielfalt NRW' a political initiative by leading German nature conservation organisations demanding more action on biodiversity loss on federal government level in North Rhine Westphalia. The Logo shows an anthropomorphised bee (Volksinitiative Artenvielfalt NRW, n.d.).*

This can be adapted to nature conservation. Especially the focus on wildlife provides an opportunity for anthropomorphism and anthropomorphised imagery of wildlife has repeatedly been used by conservation organisations (see figures 8.2 & 8.3)(The Wildlife Trusts & Don't Panic, 2019; Volksinitiative Artenvielfalt NRW, n.d.). In fact, much research on anthropomorphism has been conducted using animals. The attribution of higher mental capacities to animals has led to higher empathy towards them and expressions of higher support for animal rights (Hills, 1995; Plous, 1993). Further, taking the perspective of animals being harmed and the consideration of their emotional experiences increases concern about them (Berenguer, 2007; Schultz, 2000). Anthropomorph animals have also been a recurrent theme in literature and film, such as the well-known novels the 'Wind in the Willows' and 'Watership Down', or many Disney films, for example 'The Lion King' (Adams, 1972; Allers & Minkoff, 1994; Grahame, 1908).

Future research could focus on the effect of anthropomorphised images of wildlife on pro-nature conservation behaviours. One simple experiment here could use three groups, one control group, where unrelated images are shown, one experimental group with non-anthropomorphised images of local, culturally relevant, wildlife, for example badgers or bees in a UK context, and one experimental group with anthropomorphised images of the same animal. Since just by showing images, it is unlikely to see an immediate effect on actual behaviour, specific ProCoBS intentions could be measured, since they have high predictive power for pro-nature conservation behaviours in comparison with general

intentions. Further, inclusion of a nature connectedness measure could prove useful. While research suggests that even just a short interaction with such anthropomorphised material can increase behaviour or at least intentions, the processes involved here may not be rational and explicit. Especially, since it is likely to affect emotions, the route to behaviour here might be more implicit. Implicit processes are thought to be more impulsive and include the activation of certain schemata through cues or environmental triggers (Hagger & Chatzisarantis, 2014). Such schemata are stored scripts for behaviours based on previous experiences (Hagger & Chatzisarantis, 2014). The anthropomorphised images could act as such a cue for schemata. Thus, including implicit measures of nature connectedness in addition to the more traditional measures could allow a deeper understanding of how anthropomorphised images of wildlife affect nature connectedness. The development of an implicit measure of pro-nature conservation behaviours could also come in handy for such a study. Such measures already exist for pro-environmental behaviours, for example in the form of offering candy to participants before leaving after the experiment in the form of chocolate bars in plastic bags or not in plastic bags. The choice of a bar without plastic bag over one in a plastic bag is then interpreted as an implicit indicator of pro-environmental behaviour, with the choice of flavour between chocolate bars acting as a distraction from the bag choice to ensure it is a spontaneous decision (Geng et al., 2015).

All the considerations and suggestions above build on nature connectedness as a key factor in pro-nature conservation behaviours. In the development of communications and interventions focus on one key variable can be useful, as it avoids creating over complicated programmes. However, there are likely other predictors of pro-nature conservation behaviours. For example, chapters six and seven show that socio-demographic factors and various variables from the TPB play a role in explaining the behaviours. A further variable that was examined based on environmentally specific models of behaviours was ecological worldview (Stern et al., 1999). This was found to either not predict pro-nature conservation behaviours or even have a small negative effect in chapter seven. The TPB is a prevalent model in behavioural psychology, and environmentally specific models are named within the main predictive theories of pro-environmental behaviour in the systematic research approach used as a blueprint for this thesis (Steg & Vlek, 2009). While this thesis found evidence that the TPB predicts pro-nature conservation behaviours to some extent, it has

been heavily criticised in the past for missing possibly crucial variables by assuming behaviour to be rational, a criticism that can be extended to environmentally specific models (Gkargkavouzi et al., 2018; Hagger, 2016; Klöckner, 2013; Si et al., 2019).

Adding additional variables or integrating models could lead to higher predictive powers (Si et al., 2019). Especially the use of models that account for non-rational components of behaviour, such as the dual processing theory, can be beneficial. This theory proposes that behaviours are formed through two routes, or processes (Hagger, 2016): a conscious process, as is expected in the models used in this theory, where intentions and decisions are formed based on values, and other psychometric variables; and a non-conscious process that is more impulsive and likely includes habitual actions and implicit attitudes, as well as stored experiences from past behaviours (Hagger & Chatzisarantis, 2014). Various integrated models have been suggested, even a model specific to pro-environmental behaviour (Hagger & Chatzisarantis, 2014; Ohtomo & Hirose, 2007). These models could be a worthwhile exploration into pro-nature conservation behaviour and enrich experiments, such as the suggested study regarding anthropomorphism above, as alluded to in the description of possibly relevant measures. However, it is likely that, like behaviour in general, pro-nature conservation behaviour is highly complex and not easily explained by one model, even when it integrates various models (Anable et al., 2006; Darnton, 2004).

Especially for more practice-oriented research, a focus on a few powerful variables may be the key to developing effective interventions. In the past, affective measures had only been a promising field of possible predictors of pro-environmental attitudes (Steg & Vlek, 2009). But since, evidence has accumulated to support the importance of affective variables, especially nature connectedness for pro-environmental behaviour with some recent findings, including in this thesis, showing similar results for pro-nature conservation behaviours (Richardson et al., 2020). Thus, emotional variables could become the focus of some future research. For example, awe has been found to play an important role in pro-environmental behaviours. Awe is a self-transcendent emotion that has been shown to diminish one's focus on oneself, which in the context of nature can help to broaden the self-concept to include nature, which increases nature connectedness and thus pro-environmental behaviour (Yang, Hu, Jing, & Nguyen, 2018). Recalling the beginnings of the

British conservation movement, which was fuelled for a love for the beauty in nature, comparable to awe, this construct promises to be an auspicious research focus in combination with nature connectedness (Brownlow, 2007).

As demonstrated in the previous paragraphs, there are a variety of promising directions for future research on pro-nature conservation behaviours. However, on the larger scale of nature conservation, psychological research on pro-nature conservation behaviours is not the only important focus. As touched upon in the literature review, wider issues around responsibility and affected populations need to be considered. Other academic fields have criticised individual action approaches for placing the responsibility for environmental action with individual people who have relatively little effect on the environment in comparison to larger power structures, such as big companies or governments (Cuomo, 2011). Since the already occurring consequences of environmental problems tend to harm poor and vulnerable populations most, such an approach could be interpreted as victim blaming (Cuomo, 2011; Patz et al., 2005). Based on discourse in pro-environmental behaviour studies and findings in this thesis regarding gender differences in engagement with pro-nature conservation behaviours, it can be assumed that wider social inequalities play a role here, too. For example, unequal distributions of responsibilities and unpaid labour as can be found between men and women also exist in engagement with pro-environmental and pro-nature conservation behaviours. Women often have to carry household and care work and they also seem to be the ones carrying workload when it comes to protecting the planet. Regardless, as demonstrated through the expert rating in chapter three, many individual actions can have a positive impact on nature conservation and should thus not be disregarded. This thesis made an effort to address accessibility of action, wider societal structures, and legislative changes through the ProCoBS subscale of Civil Actions. Nevertheless, there is further need for collaboration between a variety of academic fields, such as ecology, conservation biology, psychology, but also sociology, political sciences and even philosophy. The overarching aim here is to find effective measures to stop the dramatic biodiversity loss we are experiencing on an international scale by balancing the responsibilities and acknowledging existing power structures in current society.

8.3 Uses and Impact in Practice

While this thesis has explored pro-nature conservation behaviours as a topic of academic research, the background was always their importance in conservation practice. The rationale was built on calls from conservation organisations for a measurement scale for those behaviours (Richardson et al., 2016). The development of an item pool for the ProCoBS included grey literature from calls to action and website guides provided by conservation organisations (e.g., The Wildlife Trusts, n.d.). And most importantly, the goal of research on pro-nature conservation behaviours was always to understand them in order to effectively promote them in collaboration with conservation practitioners and policy makers. The importance of these behaviours for those stakeholders has quickly become clear through the fast pick-up of the scale by them. Not only did the National Trust include the ProCoBS in a large YouGov survey commissioned for a national report, leading to the opportunity for this thesis to include the development of a ProCoBS child version and an investigation of demographic factors, it has also been employed in another important project. The People and Nature survey is a large-scale data collection project run in collaboration between Natural England, a conservation organisation, and the UK's Department for Environment, Food, and Rural Affairs (DEFRA). This survey samples up to 25.000 adults in England over the course of a year and is used to gauge the British people's engagement with nature and inform national policy. Inclusion of the ProCoBS items in this survey is an important opportunity for impact-oriented research on pro-nature conservation behaviours. The Noticing Nature Model introduced above, for example, is based on this data (Hamlin & Richardson, 2021).

Apart from such large-scale projects with impact on policy, the ProCoBS, as well as the first findings on its predictors and relationships to important variables such as well-being, can be put into practice on smaller levels. Local conservation organisation chapters can make use of the findings on the feedback loop between specific pro-nature conservation behaviours, noticing nature and nature connectedness. This feedback loop suggests that place-based behaviours with visual results could be especially important from a psychological perspective, thus making them possibly more important than other behaviours even though those may have more ecological impact, such as Civil Actions on a societal scale (Larson et al., 2015). Encouraging behaviours such as planting wildflowers but

going beyond that and implementing time to notice the flowers when they have grown could help foster even more pro-nature conservation behaviours and moreover higher nature connectedness and thus improve well-being. These actions can be easily implemented in other activities. An example for an organisation that implemented similar actions based on research on nature connectedness and later included some of the possible advantages regarding pro-nature conservation behaviours in the communication of the programme is a project by paths for all, a Scottish walking charity. While the primary focus of the charity's work are the health and well-being benefits of walking, their recent project, "walking with nature" built on the advantages of nature contact and nature connectedness (paths for all, 2021): This included both kindness to nature and noticing nature. While the project was mainly built on the pathways to nature, it is an excellent example of how projects can employ the Noticing Nature model. One of the main kind acts for nature highlighted in the walking with nature campaign was litter picking, which happens to be one of the ProCoBS items, and can help to make the walking paths more aesthetically pleasing, thus enhancing the experience when noticing nature. The walking in nature project is just one example of how certain pro-nature conservation behaviours can be used to go beyond their ecological impact and help people to connect with nature.

A further way to capitalise on the relationship between behaviours that improve visible biodiversity as well as utilising the pathways to nature connectedness (Hamlin & Richardson, 2021; Lumber et al., 2017), could be done via social media. As the example in figure 8.1 showed, people, even within urban contexts with relatively little access to nature other than a flower box at home, can plant wildflowers and then utilise various pathways to nature connectedness, increasing nature connectedness and possibly leading to spillover to other pro-nature conservation behaviours. Figure 8.1 shows evidence of the pathway of compassion since planting wildflowers is a well-known way to provide food sources to pollinators. It uses the contact pathway in various ways as visual, olfactory, and auditory sensory impressions can be gained from watching pollinators in blooming wildflowers, and it goes beyond that by tapping into the meaning pathway through the act of filming it or taking a picture and creating a suitable headline for social media. Thus, encouraging people to engage in these actions would utilise both the pathways to nature connection and the Noticing Nature Model (Hamlin & Richardson, 2021; Lumber et al., 2017).

8.4 Conclusion

Pro-nature conservation behaviours can play an important role in the challenge humanity is facing regarding the ongoing loss of biodiversity and its likely consequences. This challenge, while regarded by experts as equally dangerous as climate change is often underrepresented in media and environmental psychology (Glaubrecht, 2021; Legagneux et al., 2018). To tackle this imbalance, this thesis set out to create a systematic research approach to pro-nature conservation behaviours. By incorporating common practices, research and theory from a variety of academic and practical fields, the concept of those behaviours was developed and examined after the validation of measurement tools. Fast pick-up of those measurement tools within practice-oriented contexts implies the high impact and promises for the future that pro-nature conservation behaviours carry. While the theoretical considerations and the research presented in this thesis can only be considered as a first glance at those behaviours, some important conclusions can be drawn from the findings:

1. There is a variety of accessible behaviours that the public can engage in to effectively support nature conservation, which should be examined and treated as a separate group of behaviours from pro-environmental behaviours
2. These behaviours can be reliably measured with the adaptable versions of the ProCoBS. This is already being done by researchers, practitioners, and policy makers, showing the potential impact of this thesis
3. Various factors play a role in how people engage in pro-nature conservation behaviours. So far, nature connectedness has been identified as a key variable with much opportunity for communications and interventions
4. There is a variety of possible directions for future research on these behaviours
5. A close collaboration with conservation practitioners is of essence for impactful results regarding pro-nature conservation behaviours

Overall, the thesis succeeded in fulfilling its aims and objectives and in the process provided useful findings for research and practice. Various open, or at least only partially

answered questions as well as some possible theories and concepts that could lead to impactful future research in the area were discovered and discussed. In the light of the importance of a change in the impact humanity has on nature, more research is needed, not only on pro-nature conservation behaviours but also on approaches that account for a more holistic view of human impact. Thus, findings from this thesis also lead to important conclusions for policy makers. With the importance of nature connectedness in relation to pro-nature conservation behaviours and well-being, it is important to make biodiverse green spaces with plenty of opportunities for engagement with nature accessible to everyone. In the past years, more and more very active and visible engagement in civil actions has been seen in political protests, such as in the Fridays for Future or the Extinction Rebellion movement. This is encouraging but it puts the ball in the court of the government, which needs to act and put conservation legislation and policy into practice.

An individualistic approach, such as pro-nature conservation behaviours, has some advantages and can go beyond ecological impact through constructs such as nature connectedness. Here, a reciprocal relationship between nature and humans can be established with people acting for nature experiencing well-being benefits. But biodiversity is a problem on a societal level and thus the pro-nature conservation behaviour approach would benefit from being supplemented with comprehensive practices acknowledging our current societal structures of power and impact.

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Appendix A: Ethics Approval Confirmations

A.1: Ethics Approval Confirmation for Scale Development, including Expert Review (Ch. 3+4)

Approval Letter: Human Sciences Research Ethics Committee

University of Derby

Date: 2nd October 2018

Dr Christopher Barnes
Deputy Chair, Human Sciences Research Ethics Committee, University of Derby

Dear Ed and Miles,

Ethics Ref No: 30-1718-MR

Thank you for submitting this revised application to the Human Sciences Research Ethics Committee.

I have now reviewed the revised documents you sent following the feedback you received on your initial application, and I am satisfied that all of the issues raised with the application have been dealt with. The application can now therefore be approved.

The following documents have now been re-reviewed:

1. Ethics application form
2. Responses to reviewer comments

If any changes to the study described in the application or supporting documentation is necessary, you must notify the committee and may be required to make a resubmission of the application.

Please note ethical approval for the study in application 30-1718-MR
is valid for a period of 5 years i.e., October 2022.

Good luck with the study.

Yours sincerely

Dr Chris Barnes

A.2.: Ethics Explanation National Trust Data (Ch. 5+6)

The data analysed in chapters 5 and 6 was provided by the National Trust and collected via YouGov. YouGov follows ethical guidelines in their data collection, abiding to guidelines by the British Polling Council and ESOMAR (https://yougov.co.uk/about/panel-methodology/).

The National Trust gave permission to use the data in this thesis and was consulted prior to any publications for further permission.

A.3: Ethics Approval Confirmation for Antecedent Study (ch.7)

Kedleston Road, Derby
DE22 1GB, UK

T: +44 (0)1332 591060
E: researchoffice@derby.ac.uk
Sponsor License No: QGN14R294

Dear Lea

ETH1920-0335

Thank you for submitting your application to the College of Life and Natural Sciences Research Ethics Committee, which has now been reviewed and considered.

The outcome of your application is:

Approved.

Please note: *this is subject to the researcher specifying the general self-efficacy scale to be used (it is possible that details were lost in the upload to Ethics Monitor, as that section in the appendix was blank) , along with confirmation that they will only proceed with data collection once all proposed scales are approved through the psychology test bank process.*

If any changes to the study described in the application are necessary, you must notify the Committee and may be required to make a resubmission of the application.

On behalf of the Committee, we wish you the best of luck with your study.

Yours sincerely

Steph Wright

Appendix B: Questionnaire given to experts for the rating (ch.3/4)

Definition

We define a pro-nature conservation behaviour as a positive action that has impact on local wildlife (rather than a positive inaction that has an indirect impact on wildlife conservation via reduction of e.g., the carbon footprint, water use, etc.)

Therefore, items that you might consider important for nature conservation, such as reducing car use or meat consumption are not present on this list. Research shows that people regard these behaviours as different from the more pro-active nature conservation behaviours.

For now, to facilitate review, the items are put under headlines depending on the category of the behaviour- these headlines will not be shown in the final questionnaire.

You will see that some items are marked as “Reverse coded”. This means that the behaviour in the item has a negative impact on nature conservation, and the item will therefore be graded in reverse to other items to reflect this.

Expertise

Before you start, please let us know what area of conservation you are an expert in and how. Are you an academic in conservation science, do you manage a reserve for a conservation organisation, etc.?

_____

At home and in Nature

Please indicate for each item whether, considering our definition of pro-nature conservation behaviours, you believe that the item belongs on an impact-based questionnaire that assesses those behaviours. (Possible responses were "Yes", "No", and "I don't know")

1. I provide food for animals
2. I provide water for animals
3. I have installed a nesting box for birds
4. I have installed a bat box
5. I pick up litter
6. I move insects rather than killing them when finding them at home
7. When walking in nature I try to avoid disturbing wildlife
8. I compost at home
9. I move small animals when finding them on a road
10. I avoid using insect repellents

Civil Action

Please indicate for each item whether, considering our definition of pro-nature conservation behaviours, you believe that the item belongs on an impact-based questionnaire that assesses those behaviours. (Response options as above)

1. I donate money to a conservation organisation
2. I volunteer with a conservation organisation in the area of fund raising
3. I volunteer with a conservation organisation in the area of land management work
4. I volunteer with a conservation organisation in the area of surveying (e.g., garden bird watch/ bio-blitz/ etc.)
5. I volunteer with a conservation organisation in another area not mentioned above
6. I participate in clean-up events
7. I hold a membership with a conservation organisation
8. I talk to other people about the importance of wildlife conservation
9. I join activist activities (e.g., demonstrations)

10. I support conservation friendly legislation (e.g., for agriculture, hunting, etc.) by voting for them when given the opportunity in local or national referendums/votes/etc.
11. I attend local council/local authority meetings about conservation issues
12. I sign petitions supporting conservation efforts
13. I get in touch with local authorities about conservation issues and solutions
14. I share posts and articles about conservation on social media
15. I vote for parties/ candidates with strong pro-conservation policies in elections
16. I go to talks/ watch documentaries about nature conservation issues or I otherwise educate myself on the topic

Gardening/ Land Management Behaviours

Gardening behaviour items will only be answered by people who indicated that they have access to a garden or are a landowner. Some of these items are feature based, others are behaviour based- this will be reflected in the answer format. All items will be specifically linked to behaviours in the garden/ in land management.

Please indicate for each item whether, considering our definition of pro-nature conservation behaviours, you believe that the item belongs on an impact-based questionnaire that assesses those behaviours. (Response options as above)

1. I maintain a wildlife friendly pond
2. I plant/ have planted a tree
3. I maintain a wild-flower area
4. I have installed features that allow small mammals to pass through my garden/ land without problems
5. I have installed a bee hotel
6. I have installed a hedgehog home
7. I have installed artificial turf (reverse coded)
8. I use paving slabs/ have otherwise exchanged green space for artificial alternatives (reverse coded)
9. I removed hedges (reverse coded)
10. I cut down pre-existing trees (reverse coded)
11. I plant pollinator friendly plants

12. I plant plants with different flowering seasons
13. I avoid using insecticides
14. I use synthetic fertilizer (reverse coded)
15. I use weed killer (reverse coded)
16. I leave log piles or other materials that can be used as a home/ shelter by animals
17. I keep my lawn neat and tidy (reverse coded)
18. I leave an undisturbed/ unmaintained area for wildlife
19. I maintain plants with berries/fruits
20. I plant native plants
21. I plant exotic plants (reverse coded)
22. I rotate the annual plants and crops I sow each year
23. I do not cut/trim my hedges during bird breeding season (March-July)

Written Feedback

Do you have any comments regarding the item list, or a specific item listed above? If you don't, you can just skip this question.

Appendix C: Scale Development Items

Please read the statements below and think about occasions when you had the opportunity to engage in these behaviours. Click the box that best describes your own behaviour. (Response options: Always, Very Frequently, Frequently, Sometimes, Occasionally, Rarely, Never)

1. I donate money to conservation organisations whenever I can afford it
2. I volunteer with a conservation organisation in habitat management work
3. I take part in wildlife surveys (e.g., garden bird watch/ bio-blitz/ etc.)
4. I volunteer with a conservation organisation in another area not mentioned above (e.g., fundraising, education, etc.)
5. I participate in organised clean-up events
6. When I see litter, I pick it up
7. I talk to other people about the importance of nature conservation
8. I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.
9. I attend local council/local authority meetings about nature conservation issues
10. I sign petitions supporting nature conservation efforts
11. I get in touch with local authorities on nature conservation issues
12. I share posts and articles about nature conservation on social media
13. I vote for parties/ candidates with strong pro-nature conservation policies in elections
14. When walking in nature, by myself or with a dog, I try to avoid disturbing wildlife

I have a garden at home/ an allotment or help look after a community/ work garden/ a garden etc. Or I am a landowner/ manager

- ○ Yes
- ○ No

The following questions were only asked if the question above was responded to with "Yes":

What kind of garden/land do you have access to? (Multiple answers possible)

A community garden

A balcony, backyard, or another small outdoor space

My own garden at home

Farmland

Other land (please specify) _____

In that garden/ land how often do you do the following? (Response options: Always, Very Frequently, Frequently, Sometimes, Occasionally, Rarely, Never)

1. I plant pollinator friendly plants
2. I plant plants with different flowering seasons
3. I avoid using insecticides
4. I use synthetic fertilizer
5. I use weed killer
6. I add log piles or other materials that can be used as a home/ shelter by wildlife
7. I leave an undisturbed/ unmaintained area for wildlife
8. I maintain plants with berries/fruits
9. I plant native plants
10. I avoid cutting/ trimming hedges during bird breeding season (March-July)
11. I provide food for wild animals such as birds

Appendix D: Supplementary materials for the scale development (Ch. 4)

D.1. Item removal via item-total correlations

Table D.1.1 Item-*Total Correlations for the non-gardening items with stepwise removal of items below the .3 threshold. For items please see Appendix B, items later removed through factor analysis highlighted in yellow in final column*

Item-Total Statistics		
Item	**Step 1**	**Step 2**
Non-gardening 1	.463	.468
Non-gardening 2	.446	.469
Non-gardening 3	.524	.527
Non-gardening 4	.412	.433
Non-gardening 5	.476	.488
Non-gardening 6	.621	.605
Non-gardening 7	.488	.474
Non-gardening 8	.687	.681
Non-gardening 9	.712	.706
Non-gardening 10	.494	.517
Non-gardening 11	.692	.677
Non-gardening 12	.594	.621
Non-gardening 13	.593	.596
Non-gardening 14	.281	

Table D.1.2 Item-*Total Correlations for the gardening items with stepwise removal of items below the .3 threshold. For items please see Appendix B, RC= Reverse Coded*

Item-Total Statistics			
Item	**Step 1**	**Step 2**	**Step 3**
Gardening 1	.637	.667	.686
Gardening 2	.614	.646	.671
Gardening 3	.489	.476	.435
Gardening 6	.628	.642	.645
Gardening 7	.517	.523	.512
Gardening 8	.596	.614	.630
Gardening 9	.698	.717	.726
Gardening 10	.610	.616	.616
Gardening 11	.555	.571	.575
Gardening 4RC	-.181		
Gardening 5RC	.261	.214	

Table D1.3. *Item-Total Correlations for all remaining items after removal through item-total together. Items marked in yellow were later removed in the factor analysis*

Item-Total Statistics	
Item	**Item-Total**
Non-gardening 1	.453
Non-gardening 2	.344
Non-gardening 3	.527
Non-gardening 4	.369
Non-gardening 5	.418
Non-gardening 6	.588
Non-gardening 7	.462
Non-gardening 8	.682
Non-gardening 9	.647

Item-Total Statistics	
Item	**Item-Total**
Non-gardening 10	.450
Non-gardening 11	.600
Non-gardening 12	.565
Non-gardening 13	.552
Gardening 1	.627
Gardening 2	.585
Gardening 3	.442
Gardening 6	.580
Gardening 7	.527
Gardening 8	.528
Gardening 9	.656
Gardening 10	.566
Gardening 11	.562

D.2 Inter-item Correlations

Inter-item correlations for final long form. For items see Appendix E

	C1	C2	C3	C4	C5	C6	C7	C8	C9	G1	G2	G3	G4	G5	G6	G7	G8	G9
C1	1.00																	
C2	.595	1.00																
C3	.475	.379	1.00															
C4	.150	.133	.232	1.00														
C5	.290	.294	.329	.570	1.00													
C6	.187	.203	.239	.766	.643	1.00												
C7	.404	.399	.579	.234	.396	.346	1.00											
C8	.177	.237	.262	.615	.548	.669	.320	1.00										
C9	.233	.268	.258	.438	.514	.511	.258	.593	1.00									
G1	.144	.178	.159	.290	.427	.319	.202	.304	.255	1.00								
G2	.178	.240	.151	.234	.341	.242	.165	.213	.214	.816	1.00							
G3	.026	-.057	.140	.315	.314	.338	.123	.294	.260	.279	.250	1.00						
G4	.200	.220	.219	.337	.337	.320	.216	.246	.325	.440	.448	.314	1.00					
G5	.045	.135	.231	.380	.354	.392	.238	.353	.377	.257	.243	.385	.477	1.00				
G6	.160	.172	.210	.202	.313	.280	.158	.227	.184	.512	.511	.268	.521	.315	1.00			
G7	.178	.207	.223	.348	.347	.327	.252	.273	.192	.762	.727	.302	.526	.315	.639	1.00		
G8	.101	.182	.145	.286	.367	.284	.227	.245	.306	.457	.438	.413	.432	.450	.378	.511	1.00	
G9	.143	.184	.226	.298	.374	.353	.197	.349	.295	.409	.400	.388	.385	.379	.442	.381	.412	1.00

Appendix E: ProCoBS for Adults (long and short form)

ProCoBS Questionnaire

The following document lays out the ProCoBs questionnaire long form and short form. Both the long and the short form may be used as one scale or two separate subscales depending on the amount of respondents with access to a garden. Development and validation paper/ citation for the Scale can be found here: https://www.mdpi.com/2071-1050/12/12/4885

Long Form

Please read the statements below and think about occasions when you had the opportunity to engage in these behaviours. Click the box that best describes your own behaviour. (Use 7 response boxes: Never, Rarely, Occasionally, Sometimes, Frequently, Very Frequently, Always)

1. I volunteer with a conservation organisation in habitat management work
2. I volunteer with a conservation organisation in another area not mentioned above (e.g., fundraising, education, etc.)
3. I participate in organised clean-up events
4. When I see litter, I pick it up
5. I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.
6. I attend local council/local authority meetings about nature conservation issues
7. I sign petitions supporting nature conservation efforts
8. I get in touch with local authorities on nature conservation issues
9. I vote for parties/ candidates with strong pro-nature conservation policies in elections

I have a garden at home/ an allotment or help look after a community/ work garden/ a garden etc. Or I am a landowner/ manager (Response options Yes / No - If yes, next questions, if no, done)

In that garden/ land how often do you do the following? (Same 7-point answer scale as above)

1. I plant pollinator friendly plants
2. I plant plants with different flowering seasons
3. I avoid using insecticides
4. I add log piles or other materials that can be used as a home/ shelter by wildlife
5. I leave an undisturbed/ unmaintained area for wildlife
6. I maintain plants with berries/fruits
7. I plant native plants
8. I avoid cutting/ trimming hedges during bird breeding season (March-July)
9. I provide food for wild animals such as birds

Short Form

Please read the statements below and think about occasions when you had the opportunity to engage in these behaviours. Click the box that best describes your own behaviour. (Use 7 response boxes: Never, Rarely, Occasionally, Sometimes, Frequently, Very Frequently, Always)

1. When I see litter, I pick it up
2. I vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.
3. I get in touch with local authorities on nature conservation issues
4. I vote for parties/ candidates with strong pro-nature conservation policies in elections

I have a garden at home/ an allotment or help look after a community/ work garden/ a garden etc. Or I am a landowner/ manager (Response options Yes / No - If yes, next questions, if no, done)

In that garden/ land how often do you do the following? (Same 7-point answer scale as above)

1. I plant pollinator friendly plants
2. I add log piles or other materials that can be used as a home/ shelter by wildlife
3. I maintain plants with berries/fruits
4. I provide food for wild animals such as birds

Appendix F: ProCoBS for Children and Adolescents

Pro-nature Conservation Behaviour Scale for Children

The Scale was developed and tested to be suitable for children and adolescents aged 8-15. Depending on the amount of children with access to a garden the scale can be evaluated as a whole or by separating into Questions 1-4 (Civil Action) and 5-8 (Gardening)

Before administering, check if the participant has access to a garden (e.g., "*Which, if any, of the following do you have?"* with response options: *"A garden at home" "A community garden I help look after (with my family, or at school, etc.)", "An allotment I help look after", "None of these")*
If the answer is "None of these" only ask questions 1-4

How often do you do the following by yourself or with someone else? (Response scale: 1- Never, 2- Rarely, 3- Occasionally, 4- Sometimes, 5- Frequently, 6- Very Frequently, 7- Always)

1. Take part in wildlife surveys (such as Garden bird watch, Bio-Blitz, etc.)
2. Pick up litter to help nature have a better home
3. Talk to other people (such as family, friends, etc.) about the importance of looking after nature and the environment
4. When walking in nature, by myself or with a dog, I try to avoid disturbing wildlife
5. Grow flowers and/ or plants that birds and insects will like
6. Make homes for nature (such as insects, hedgehogs, etc.)
7. Put food out to feed garden birds
8. Leave an area of lawn/ flowerbed to grow wild

Appendix H: Post-Hoc Tables for Results Section in Ch.6

All tables are given as produced in SPSS. Thus, some p-values are given as .000 – these values are actually <.001.

H.1: Post-Hoc Table Adults - Age and Civil Actions

Multiple Comparisons

Dependent Variable: Civil Action
Games-Howell

		Mean Difference (I-J)			95% Confidence Interval	
					Lower	
(I) Age	**(J) Age**		**Std. Error**	**Sig.**	**Bound**	**Upper Bound**
16-24	**25-39**	.24927	.14566	.321	-.1285	.6270
	40-54	.16134	.14774	.695	-.2216	.5443
	55+	.37626*	.13927	.038	.0145	.7380
25-39	**16-24**	-.24927	.14566	.321	-.6270	.1285
	40-54	-.08793	.09483	.790	-.3321	.1562
	55+	.12699	.08101	.398	-.0815	.3355
40-54	**16-24**	-.16134	.14774	.695	-.5443	.2216
	25-39	.08793	.09483	.790	-.1562	.3321
	55+	.21492	.08469	.055	-.0031	.4329
55+	**16-24**	-.37626*	.13927	.038	-.7380	-.0145
	25-39	-.12699	.08101	.398	-.3355	.0815
	40-54	-.21492	.08469	.055	-.4329	.0031

*. The mean difference is significant at the 0.05 level.

H.2: Post-Hoc Table Adults - Age and Gardening

Multiple Comparisons

Dependent Variable: Gardening
Games-Howell

		Mean Difference (I-J)			95% Confidence Interval	
(I) Age	**(J) Age**		**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
16-24	**25-39**	.14904	.20274	.883	-.3786	.6767
	40-54	-.80354*	.20415	.001	-1.3347	-.2724
	55+	-1.19467*	.19602	.000	-1.7058	-.6836
25-39	**16-24**	-.14904	.20274	.883	-.6767	.3786
	40-54	-.95258*	.11903	.000	-1.2590	-.6461
	55+	-1.34371*	.10448	.000	-1.6127	-1.0747
40-54	**16-24**	.80354*	.20415	.001	.2724	1.3347
	25-39	.95258*	.11903	.000	.6461	1.2590
	55+	-.39113*	.10719	.002	-.6671	-.1152
55+	**16-24**	1.19467*	.19602	.000	.6836	1.7058
	25-39	1.34371*	.10448	.000	1.0747	1.6127
	40-54	.39113*	.10719	.002	.1152	.6671

*. The mean difference is significant at the 0.05 level.

H.3: Post-Hoc Table Adults – Location of Residence and Civil Action

Multiple Comparisons

Dependent Variable: Civil Action
Tukey HSD

(I) Location of Residence	(J) Location of Residence	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Urban	**Town/ Fringe**	-.10968	.10797	.567	-.3630	.1436
	Rural	-.33946*	.10463	.003	-.5849	-.0940
Town/ Fringe	**Urban**	.10968	.10797	.567	-.1436	.3630
	Rural	-.22979	.14044	.231	-.5593	.0997
Rural	**Urban**	.33946*	.10463	.003	.0940	.5849
	Town/ Fringe	.22979	.14044	.231	-.0997	.5593

*. The mean difference is significant at the 0.05 level

H.4: Post-Hoc Table Adults – Location of Residence and Gardening

Multiple Comparisons

Dependent Variable: Gardening
Tukey HSD

(I) Location of Residence	(J) Location of Residence	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Urban	**Town/ Fringe**	-.51356*	.13906	.001	-.8398	-.1873
	Rural	-.89526*	.13106	.000	-1.2027	-.5878
Town/ Fringe	**Urban**	.51356*	.13906	.001	.1873	.8398
	Rural	-.38170	.17656	.078	-.7959	.0325
Rural	**Urban**	.89526*	.13106	.000	.5878	1.2027
	Town/ Fringe	.38170	.17656	.078	-.0325	.7959

*. The mean difference is significant at the 0.05 level.

H.5: Post-Hoc Table Children – Age and Civil Action

Multiple Comparisons

Dependent Variable: Civil Action
Tukey HSD

		Mean Difference			95% Confidence Interval	
					Lower	Upper
(I) Age	**(J) Age**	**(I-J)**	**Std. Error**	**Sig.**	**Bound**	**Bound**
8-9	**10-11**	-.02784	.11542	.995	-.3249	.2692
	12-13	.15517	.11646	.543	-.1446	.4549
	14-15	.41217*	.11529	.002	.1154	.7089
10-11	**8-9**	.02784	.11542	.995	-.2692	.3249
	12-13	.18301	.11569	.389	-.1148	.4808
	14-15	.44001*	.11451	.001	.1453	.7347
12-13	**8-9**	-.15517	.11646	.543	-.4549	.1446
	10-11	-.18301	.11569	.389	-.4808	.1148
	14-15	.25700	.11556	.118	-.0404	.5545
14-15	**8-9**	-.41217*	.11529	.002	-.7089	-.1154
	10-11	-.44001*	.11451	.001	-.7347	-.1453
	12-13	-.25700	.11556	.118	-.5545	.0404

*. The mean difference is significant at the 0.05 level.

H.6: Post-Hoc Table Children – Age and Garden Action

Multiple Comparisons

Dependent Variable: Garden Action
Tukey HSD

					95% Confidence Interval	
(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
8-9	**10-11**	-.17076	.15073	.669	-.5587	.2172
	12-13	.51077*	.15344	.005	.1158	.9057
	14-15	.78009*	.15213	.000	.3885	1.1717
10-11	**8-9**	.17076	.15073	.669	-.2172	.5587
	12-13	.68152*	.15425	.000	.2845	1.0786
	14-15	.95085*	.15296	.000	.5571	1.3446
12-13	**8-9**	-.51077*	.15344	.005	-.9057	-.1158
	10-11	-.68152*	.15425	.000	-1.0786	-.2845
	14-15	.26933	.15563	.308	-.1313	.6699
14-15	**8-9**	-.78009*	.15213	.000	-1.1717	-.3885
	10-11	-.95085*	.15296	.000	-1.3446	-.5571
	12-13	-.26933	.15563	.308	-.6699	.1313

*. The mean difference is significant at the 0.05 level.

H.7: Post-Hoc Table Children – Location of Residence and Garden Action

Multiple Comparisons

Dependent Variable: Garden Action
Tukey HSD

(I) Location of Residence	(J) Location of Residence	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Urban	**Town/ Fringe**	-.14807	.16913	.656	-.5451	.2490
	Rural	-.43062*	.16783	.028	-.8246	-.0366
Town/ Fringe	**Urban**	.14807	.16913	.656	-.2490	.5451
	Rural	-.28255	.22033	.405	-.7998	.2347
Rural	**Urban**	.43062*	.16783	.028	.0366	.8246
	Town/ Fringe	.28255	.22033	.405	-.2347	.7998

*. The mean difference is significant at the 0.05 level.

Appendix H: Questionnaires Developed for ch.7

H.1 Civil Action Intentions

Please read the statements below and (independently from whether you already engage in the behaviours or not) rate whether you **intend** to engage in the behaviours described in the statement (Use 7 response boxes: Never, Rarely, Occasionally, Sometimes, Frequently, Very Frequently, Always)

1. I intend to volunteer with a conservation organisation in habitat management work
2. I intend to volunteer with a conservation organisation in another area not mentioned above (e.g., fundraising, education, etc.)
3. I intend to participate in organised clean-up events
4. When I see litter, I intend to pick it up
5. I intend to vote for nature or wildlife conservation friendly legislation in local or national referendums/votes/etc.
6. I intend to attend local council/local authority meetings about nature conservation issues
7. I intend to sign petitions supporting nature conservation efforts
8. I intend to get in touch with local authorities on nature conservation issues
9. I intend to vote for parties/ candidates with strong pro-nature conservation policies in elections

H.2 Gardening intentions

In the garden/ land that you have access to which of the following behaviours do you **intend** to engage in (independent of whether you are already doing them or not)? (Use 7 response boxes: Never, Rarely, Occasionally, Sometimes, Frequently, Very Frequently, Always)

1. I intend to plant pollinator friendly plants
2. I intend to plant plants with different flowering seasons
3. I intend to avoid using insecticides
4. I intend to add log piles or other materials that can be used as a home/ shelter by wildlife
5. I intend to leave an undisturbed/ unmaintained area for wildlife
6. I intend to maintain plants with berries/fruits
7. I intend to plant native plants
8. I intend to avoid cutting/ trimming hedges during bird breeding season (March-July)
9. I intend to provide food for wild animals such as birds

H.3 Conservation self-efficacy

Please indicate how much you agree with the following statements in relation to yourself (Response options: Disagree strongly, Disagree a little, Neither agree nor disagree, Agree a little, Agree strongly)

1. I feel confident that I can help support nature conservation
2. I have the capability to take action to support nature conservation
3. Although it may cause inconvenience, I am able to change my behaviour to support nature conservation
4. I am able to do everything I can to support nature conservation

H.4 Subjective Norms

Please indicate how much you agree with each of the following statements in relation to yourself (Response options: Disagree strongly, Disagree a little, Neither agree nor disagree, Agree a little, Agree strongly)

1. My friends and family believe I should do something to support nature conservation
2. What my friends and family think I should do about nature conservation is important to me
3. My friends and family engage in behaviours to support nature conservation
4. What my friends and family do about nature conservation influences my own actions