# Can environmental volunteering organisations deliver health-related impacts? The case of The Conservation Volunteers.

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# Declaration

I, Valentine Iona Seymour have read and understood the College and Department's statements and guidelines concerning plagiarism.

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signed

Valentine Iona Seymour (06/12/2017).

# Abstract

There is an emerging body of literature exploring the potential link between connecting with the natural environment and human health. In response, there has been a gradual rise in the numbers of eco-health programmes, including environmental volunteering activities. However, despite emerging research exploring this link, it is still uncertain to what extent volunteering organisations deliver health-related impacts. This owes to an insufficient amount of evidence demonstrating causal links as well as a deeper understanding of how volunteers engage in these programmes and how volunteering organisations measure the delivery of their impacts.

To address this potential link, the thesis explores the health-related impacts delivered by environmental volunteering organisations from the perspective of The Conservation Volunteers (TCV). TCV's impact measurement tools are analysed through contextual inquiry and transaction log analytical approaches; Examining how volunteers engage in TCV programmes, is carried out through descriptive and cluster analytical approaches, implementing significance testing where possible; Finally, volunteers' perceptions of health and the impacts these have had on volunteer's health-related behaviours, are explored using ethnographic, survey, exploratory and significance testing methods.

Findings revealed that work contexts, data requirements and real-world environmental factors were found to have shaped TCV's impact measurement tool and volunteer data collected. Findings also identified differences in engagement patterns and contributor activity of volunteers who engaged in TCV's volunteering programme, Action Teams.

Overall, volunteers who engaged in TCV activities presented moderate to high levels of health-related behaviours. However, causal relationships could not be made due to the questionnaire survey design. Findings also presented similarities and differences between how volunteers' perceptions of health and measurement indicators used by TCV to measure their delivery of health-related impacts. This suggests that impact measurement tools currently used by TCV are capturing a partial picture of health-related impacts delivered.

# Impact Statement

Knowledge generated from this thesis provides several beneficial outcomes for both the volunteering and public health sectors.

Firstly, the thesis provides further understanding about the delivery of environmental volunteering programs and how volunteers engage in these programmes. Such knowledge is useful to those in the volunteering sector, to tailor their programmes to enhance the fit between their requirements and volunteers' level of engagement, and thus presumably increase participation. In addition, these findings are useful both for aiding similar observations as well as making comparative assessments with other programmes that engage in environmental activities.

Secondly, the thesis introduces the growing phenomenon of organisationally led impact measurement system in the context of the UK environmental volunteering sector, used to collect, store as well as manage volunteer data. It also presents an internally constructed impact measurement tool used to measure the health-related impacts associated with environmental volunteering. These findings not only enhance existing areas of knowledge, but also presents recommendations to other volunteering organisations wishing to develop their own impact measure tools.

Finally, these findings build on existing knowledge within the fields of health and volunteering, providing further insights into volunteers' perceptions of health. It also identifies health-related impacts generated from environmental volunteering activities from the perspective of The Conservation Volunteers. This information could be used to provide recommendations for similar environmental volunteering programmes in evaluating and developing health measurement tools, ensuring it incorporates volunteers' needs and understandings of health information.

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*This thesis was written in loving memory of Ivy Gray, who loved nature.*

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# List of Acronyms and Abbreviations

CD Contextual Design

CDA Confirmatory Data Analysis

CI Contextual Inquiry

EDA Exploratory Data Analysis

GIA General Inductive Approach

HCI Human-Computer Interaction

IS Information System

MIS Management Information System

RQ Research Question

TCV The Conservation Volunteers

TLA Transaction Log Analysis

VF Validation Framework

# Chapter One: Introduction

## 1.1 General overview and research scope

During the past four decades, researchers, health practitioners and environmentalists alike have begun to explore the potential link between connecting with the natural environment and human health (Thompson Coon *et al*., 2011). This in part stems from the emergence of the "Biophilia" hypothesis, which argues for humanity's subconscious affiliation with nature on physical, mental and social levels (Wilson, 1984). Such hypothesis is strengthened by findings which suggest a link between people's health and engaging with nature. Some examples of these include humans' preference for scenes dominated by natural elements and the health benefits associated with engaging with nature (Kaplan and Kaplan, 1989; Park *et al*., 2010).

In response to this growing awareness, there has been a gradual rise in the numbers of programmes aimed to help improve human health and the environment (Depledge, 2011). Environmental volunteering activities is an example of this, which can be described as the practice of unpaid volunteers who spend time engaging in a wide range of conservation and outdoor based activities, including habitat management and ecological restoration (Bruyere and Rappe, 2007). Existing studies in this area have started to identify the health benefits of these activities (e.g. Pillemer *et al.*, 2010; Molsher and Townsend, 2016), with some suggesting it could be used as an intervention or complementary support to existing health care services (Jenkinsen *et al*., 2013). However, further understanding is needed to explore to what extent environmental organisations deliver health-related impacts through these volunteering activities.

'Impact measurement' has become a focus of interest amongst the UK volunteering sector in an effort to recognise the increasingly important role which it plays in both society and in the economy (Rochester *et al*., 2012). It can be described as a performance evaluation of a volunteering organisation or charity and its effects, both direct and indirect, on those who engage in their activities, relevant stakeholders as well as other beneficiaries (Harlock, 2013). Its central purpose is to provide evidence to support claims made, ensuring both transparency and accountability of information data collected (Rochester *et al*., 2012). This can then be used to assist in promoting issues for public attention as well as policy related impacts (Metcalf, 2013). However, tools used by a volunteering organisation to measure their impacts can be shaped by various characteristics, including contextual factors and human perceptions (Voida

*et al*., 2011). Through understanding these characteristics this could have a potential effect on how datasets are then interpreted. This is particularly important if outcome data is to affect learning, provide information to key constituencies and enable programmes to be managed effectively as well as contribute to the volunteer sector.

## 1.2 Research questions, aim and objectives of the thesis

The thesis aims to explore some of these gaps in knowledge identified in the above section 1.1 and contribute to this field of research. More specifically, the thesis explores the characteristics which may influence an organisations' impact measurement systems and volunteer data collected, the delivery of environmental volunteering programmes (e.g. frequency), as well as the extent that volunteering organisations deliver health-related impacts through their volunteering activities. Thus, the overarching aim of this research is:

*To explore to what extent environmental volunteering organisations deliver health-related impacts.*

However, as this is a broad topic it was not feasible to address its entirety in this thesis. Instead, I have narrowed the research focus, reporting from the perspective of UK environmental charity, The Conservation Volunteers (TCV), used as a case study. Therefore, the research question of thesis is more specifically:

*To what extent do The Conservation Volunteers (TCV) deliver health-related impacts through their environmental conservation volunteering activities?*

To address this question, the thesis will also explore and attempt to answer the three following subsidiary questions (see section 3.1 for more details on the research question and the subsidiary research questions):

1) How do the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected?

2) How do volunteers engage in programmes delivered by environmental volunteering organisations?

3) How do volunteers' perceptions of health information influence volunteer data collected and our understanding of environmental volunteering organisations' delivery of health-related impacts?

To answer the above research questions, this thesis sets out to address the following three objectives, with further details described more fully in section 3.1.

1) To examine how the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected.

2) To identify how volunteers engage in programmes delivered by environmental volunteering organisations.

3) To explore how volunteers' perceptions of health information may influence volunteer data collected and our understanding of environmental volunteering organisations' delivery of health-related impacts.

## 1.3 Case study: The Conservation Volunteers

As mentioned, the overarching aim of this thesis was to explore to what extent environmental volunteering organisations deliver health-related impacts. As this was a broad topic it was therefore not feasible for me to address the aim's entirety in this thesis. In this way, I narrowed the research focus, reporting from the perspective of UK environmental charity, The Conservation Volunteers (TCV), used as a case study. Reasons for this selection are outlined in section 3.3.2.

The UK environmental volunteering charity The Conservation Volunteers (TCV), previously known as The British Trust for Conservation Volunteers until 2012, was founded in 1959. Described as one of the UK's largest conservation charities (Sibley, 2010), TCV has engaged with people from a diverse array of backgrounds and abilities, taking a hands-on approach to conservation activities (e.g. habitat management, monitoring wildlife, and ecological restoration) (Antonaci *et al*., 2014). As part of their strategic plan, TCV aims to improve outdoor greenspaces as well as the health and wellbeing of local communities (TCV, 2015). To address this aim, TCV has developed various volunteer programmes throughout the UK. These include Green Gyms®, Action Teams, as well as local community groups and are some of the sampling populations used in this thesis which are described further in section 3.3.2.

TCV began to measure the health-related impacts associated with their volunteering programmes from 1997 at a time when research began to explore whether there was an association between human health and engaging in nature-based activities (Antonaci *et al*., 2014). As such, to identify its impact there was a need for evidence base monitoring. This led to the development of a Management Information System (MIS) in 2001, an online database

initially created as a simple volunteering tracking system in Northern Ireland. Since then, the information database has evolved into a complex national volunteer project management and impact measurement tool, further supported by the organisations' dispersed project delivery network throughout the UK (Evans, 2010). Further details about TCV's impact measurement system and health-related volunteer data collected can be found in case study chapters 4 to 7.

## 1.4 Research Approach

This thesis explores those issues outlined in the section 1.1 above, using a pragmatic theoretical framework. This framework guided the research process in terms of its methodological approaches, methods, validity, scope and interpretation of research findings. The research process in this thesis comprised of three phases undertaken over a three-year period. Across each of these phases, various mixed methods were employed to address the three research objectives (see section 1.2). Further description of these approaches can be found in chapter 3.

Each phase of the research process occurred over variable timescales and are referred to in each chapter to guide the reader through the thesis process. These were shaped further by two additional factors: pragmatic inquiry as well as internal (organisational) and external (governmental and policy related) changes.

Firstly, the research was guided by an iterative process of action and reflective inquiry between project stakeholders (e.g. TCV and funders) and myself at each research phase (pragmatic inquiry). In this way, this provided an opportunity to reflect on what had been attained, forthcoming actions to achieve research aims as well as the progression of the project plan.

Secondly, throughout the research process, various internal and external changes occurred (e.g. staff turnover, governmental policies, diversity of projects and financial constraints). These had both a direct and indirect effect on the research process, including perceptions of my role and project, accessibility to data information and participants, as well as collaborative working patterns of different personnel at the organisation. However, due to the overall flexibility of the methodological approaches implemented, this enabled me to adapt to changes as they occurred.

## 1.5 Contributions to the research field

This thesis aims to make the following contributions to knowledge.

Firstly, the thesis provides further understanding of environmental volunteering organisations and their programmes. In particular, it explores if and to what extent these organisations deliver health-related impacts. In this way, it serves to build on existing areas of knowledge as well as

provide suggested recommendations that will facilitate in both research and practice in related fields.

Secondly, the thesis introduces the growing phenomenon of organisationally led impact measurement system in the context of the UK environmental volunteering sector, used to collect, store as well as manage volunteer data. It also presents an internally constructed impact measurement tool used to measure the health-related impacts associated with environmental volunteering. It therefore serves to enhance and develop further on existing areas of knowledge.

Thirdly, findings also serve to provide a deeper understanding about the delivery of and volunteers' engagement in programmes by environmental volunteering organisations. Such information is particularly important to gather further understanding about the extent to which volunteering organisations deliver health-related impacts through their volunteering activities. In addition, these findings are useful both for aiding similar observations as well as making comparative assessments with other programmes that engage in environmental activities.

Finally, these findings build on existing knowledge within the fields of health and volunteering, providing further insights into volunteers' perceptions of health. In this way, information generated could be used to provide recommendations for similar environmental volunteering programmes in evaluating and developing health measurement tools, ensuring it incorporates volunteers' needs and understandings of health information.

## 1.6 Structural Overview of the Thesis

This thesis is divided into eight chapters, including this introductory chapter: a general literature review, research framework and contextual background, four data chapters as well as discussion and conclusion. In the four data chapters these contain an introduction, results and chapter summaries, with more localised literature reviews, methods and discussion sections. These are followed by a final overall thesis discussion and conclusion chapters. The contents of the remaining chapters are outlined below.

*Chapter 2 – Literature Review*

This chapter provides a detailed background of the theoretical and empirical literature research on those subjects that are important for the scope of this thesis. In particular, it focuses on the volunteering sector, impact measurement, health and wellbeing as well as conservation and working in outdoor settings.

*Chapter 3 – Methodological framework*

This chapter describes the research framework and methodological approaches used to conduct the research in this thesis. It then provides a description of sampling regions and population used in the thesis and how they were recruitment. The chapter then summarises the data reliability and quality implications implemented as well as the ethical procedures undertaken during the research.

*Chapter 4 – TCV's management information and impact measurement system: A contextual inquiry*

This chapter provides further contextual understanding of TCV's organisational contexts, work practices, impact measurement system, and real-world environmental factors. Findings from this chapter identify how and why TCV's staff use their impact measurement system to understand what effect this may have on the volunteer data they collect. Findings also served as a valuable insight into of the nature, veracity and meaning of volunteer information data, that will be used in proceeding chapters 5, 6, and 7.

*Chapter 5 - Exploring the engagement characteristics and behaviours of TCV's environmental volunteers*

This chapter explores engagement patterns and behaviours of The Conservation Volunteer's (TCV) environmental volunteers. Findings sought to provide valuable background information for volunteer data examined to gain a deeper understanding of the delivery of these programmes. Findings also served as a foundation upon which to design proceeding research undertaken in the next chapter.

*Chapter 6 – TCV's environmental volunteers' perceptions of health*

This chapter explores the perception of TCV volunteers' health. Findings show a collective representation of TCV environmental volunteers' perception of health, examining patterns in communications used as well as attributes associated with health and their interrelationships. Findings also sought to provide background information for volunteer data about health and other associated behaviours which are explored in the next chapter.

*Chapter 7 – Exploring TCV's delivery of health-related impacts*

This chapter explores the extent to which TCV's delivers health-related impacts associated with their environmental volunteering programmes. Findings in this chapter explore volunteers' health and wellbeing, pro-environmental behaviours and social-ecological resilience. Information generated serves to assess the performance delivery of these projects, as well as provide suggested recommendations.

*Chapter 8 – Thesis discussion and conclusion*

This chapter draws together all the empirical findings and discussions in the proceeding chapters, 4 to 7. It then reviews the thesis in relation to its aims and objectives as well as the effectiveness of the research methodology. From this, it then provides a reflection of working within an organisational context as well as the organisational perspectives of the research process. Finally, it outlines the implications of the thesis in related research fields and suggests avenues for further research.

# Chapter 2: Literature Review

## 2.1 Introduction

During the last century, research has been increasingly drawn towards understanding the human-nature relationship and has revealed the many ways humans are linked with the natural environment (Thompson Coon *et al.*, 2011). Some examples of these include humans' preference for scenes dominated by natural elements and the health benefits associated with engaging with nature (Kaplan and Kaplan, 1989; Park *et al.*, 2010). Of these examples, the impacts of the human-nature relationship on people's health have grown with interest as evidence for a connection accumulates in research literature (Frumkin *et al.*, 2017). Such connection has underpinned a host of theoretical and empirical research in fields which until now have largely remained as separate entities.

In response to this growing awareness, there has been a gradual rise in the numbers of programmes aimed to help improve human health and the environment (Depledge, 2011). Environmental volunteering activities are an example of this, which can be described as the practice of unpaid volunteers, who spend time engaging in a wide range of conservation and outdoor based activities, including habitat management and ecological restoration (Bruyere and Rappe, 2007). However, as this chapter notes, that there still remains uncertainty to what extent volunteering organisations deliver health-related impacts through their volunteering activities. This owes in part to an insufficient amount of evidence demonstrating the causal directions between volunteering activities and health-related impacts as well as an insufficient understanding about the delivery of these programmes (e.g. frequency and type of activity).

In recent years, volunteer organisations have increasingly collected volunteer data in an effort to measure impacts associated with their volunteering activities, a practice known as impact measurement. This practice has also been visible amongst some environmental volunteering organisations measuring health-related impacts associated with their volunteering programmes. In concurrence, the sector has begun to also see an emergent trend of technology and online database use in the voluntary sector to support their work practices (Voida *et al.*, 2011). One example are management information systems which are progressively being used to collect, store as well as manage their information data. These impact measurement systems and the volunteer data collected are often influenced by the characteristics of volunteering organisations (Harlock, 2013). Understanding these characteristics of volunteering

organisations could provide valuable insight into of the nature, veracity and meaning of volunteer data.

The chapter is based on an interdisciplinary outlook at the intersection of the human-nature relationship and human health. It begins by describing the concepts and methodological approaches of the human-nature relationship and human health. These concepts are then converged to identify areas of overlap as well as existing research on the potential health impacts in relation to humanity's degree of relationship to nature and lifestyle choices. From this, the chapter proposes a developing conceptual model of the dimensions of human health and the natural environment as viewed from the perspective of this thesis. The model was developed and is based on the philosophical underpinnings of the thesis which are rooted in pragmatism. It is inclusive of the human-centred perspective of health, viewing animals and the wider environment within the context of their relationship to humans. It also combines theoretical concepts and methodological approaches from those research fields examined in this chapter, to facilitate a deeper understanding of the intricacies involved for improving human health.

From this, the chapter then focuses on environmental volunteering as an example of a programme recently developed aims to help improve human health and the natural environment. I then review engagement in environmental volunteering activities and health-related impacts (direct and indirect), explored through three subsections: health and pro-environmental behaviours and social-ecological resilience. In this, it identifies areas of convergence as well as gaps and limitations.

Finally, I explore the use of impact measurement and management information systems in the volunteering sector used to evaluate impacts that they deliver. In particular, I review those characteristics which can shape these systems: perceptions, contextual factors and usability. Understanding these characteristics of volunteering organisations is particularly important and could have a potential impact on how volunteer data is then interpreted.

Major parts of this chapter are published in and can be found in appendix 6:

Seymour, V. (2016) The human-nature relationship and its impact on health: A critical review. *Frontiers in Public Health*,4, 260.

## 2.2 Defining the Human-Nature Relationship

It is beyond the scope of this chapter to review the various connections at the intersect of humanity and the natural environment. Instead, I summarise key concepts and approaches from those four research fields (evolutionary biology, social economics, evolutionary psychology and environmentalism) outlined below which have paid most attention to studying this research area and have relevance to human health (section 2.3). I then summarise areas of convergence between these connections in an attempt to describe the human-nature relationship, that will serve as background to this thesis.

It is anticipated that through drawing on these different fields of knowledge, a deeper level of understanding can be brought to the growing issue of humanity's relationship with nature and its impact on health (section 2.4 and 2.5). This is because examining the human-nature relationship from a single disciplinary perspective could lead to partial findings which neglect other important sources as well as the complexities that exist between interlinkages, causal directions, processes and relations.

### 2.2.1 Evolutionary biology

Evolutionary biology is a branch of research that shortly followed Darwin's Theory of Evolution. It concerns the adaptive nature of variation in all animal and plant life, shaped by genetic architecture and developmental processes over time and space (Darwin, 1859). Since its emergence over a century ago, the field has made some significant advances in scientific knowledge, but with intense debate still remaining amongst its central questions, including the rate of evolutionary change and the nature of its transitional processes (e.g. Natural Selection) (Karrenberg, 2010). This in part owes to the research field's interdisciplinary structure, formulated on the foundations of genetics, molecular biology, phylogeny, systematics, physiology, ecology and population dynamics; integrating a diverging range of disciplines, thus producing a host of challenging endeavours (Sharov, 2014). Spanning each of these, human evolution centres on humanity's life history since the lineage split from our ancestral primates and our adaptive synergy with nature.

In the last four decades, evolutionary biology has focused much attention on the cultural-genetic interaction and how these two inherent systems interrelate in relation to lifestyle and dietary choices (Gual and Norgaard, 2010). Some of the well-known examples include humans' physiological adaptation to agricultural sustenance (Cohen and Armelagos, 1984), the gradual increase in lactose tolerance (Laland *et al*., 2010) as well as the susceptibility of allergic

diseases (e.g. asthma and hay fever) in relation to decreasing microbial exposure (Bloomfield *et al*., 2006).

This coevolutionary perspective between human adaptation and nature has been further conceptualised by Gual and Norgaard (2010) as embedding three integrated systems (biophysical, biotic and cultural). In this, culture is both constrained and promoted by the human genetics via a dynamic two-way interaction. However, bridging the gap between these research fields continues to generate much controversy, particularly as the nature of these evolutionary development processes differs widely (e.g. internal and external factors). This ongoing discussion is fuelled by various scholars from multiple disciplines. Some have argued that one cannot assume all evolutionary mechanisms can be carried over into other areas, where genomes cannot evolve as quickly to meet modern lifestyle and dietary requirements (Carrera-Bastos *et al*., 2011). Conversely, others believe that humans have not entirely escaped the mechanisms of biological evolution in response to our cultural and technological progressions (Powell, 2012).

### 2.2.2 Evolutionary psychology

Evolutionary psychology is a recently developed field of study which has grown exponentially with interest since the 1980s. It centres on the adaptation of psychological characteristics said to have evolved over time in response to social and ecological circumstances within humanity's ancestral environments (Ploeger *et al*., 2008). This reverse engineering approach to understanding the design of the human mind was first kindled by evolutionary theorist Charles Darwin in the last few pages of Origin of Species;

"*In the distant future … Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation*" (Darwin, 1859:447).

As such, evolutionary psychology is viewed by some to offer a metatheory that dissolves the traditional boundaries held in psychology (e.g. cognitive, social, personality and development). Within this all psychological theories implicitly believed by some to unify under this umbrella (Ploeger *et al*., 2008). However, the application of evolution to the study of psychology has not been without controversial debate in areas relating to cognitive adaptation, testability of hypotheses and the uniformality of human nature (Bolhuios *et al*., 2011).

During the past few decades, the field has presented numerous concepts and measures to describe human connectedness to nature. These include inclusion of nature in self (Scultz, 2001) and connectedness to nature (Mayer and Frantz, 2004). The Biophilia hypothesis

(Wilson, 1984) remains, however, the most substantially contributed to theory, and argues for the instinctive aesthetic preference for natural environments and subconscious affiliation for other living organisms. Supportive findings include humans' preference for scenes dominated by natural elements (Kaplan and Kaplan, 1989), improved cognitive functioning through connectivity with nature (Howell *et al*., 2011) as well as instinctive responses to specific natural stimuli or cues (e.g. a common phobia of snakes) (Ulrich, 1984). More recently, evidence is emerging to suggest that connectivity to nature can generate positive impacts on one's health, increasing with intensity and duration (Barton and Pretty, 2010).

The underpinning of the Biophilia hypothesis centres on humanity's source of attachment to nature beyond those on the surface particulars. Instead it reflects thousands of years of evolutionary experience closely bonding with other living organisms. Such process is mediated by the rules of prepared and counter-prepared learning which shape our cognitive and emotional apparatus, evolving by natural selection via a cultural context (Wilson, 1984). This innate value for nature is suggested to be reflected in the choices we make, experiences expressed as well as our longstanding actions to maintain our connection to nature (Depledge *et al*., 2011). For instance, environmental volunteering (section 2.6.1) sees people spending time engaging in activities with environmental implications (McDougle et al., 2011) and is one example of peoples' actions to connect with nature. Nevertheless, many have gone on to recognise the research field's need for revision and further evidentiary support through empirical analysis (Joye and van den Berg, 2011). Similarly, as other researchers have argued, these innate values should be viewed in complementary to other drivers and affinities from different sources that can also be acquired (e.g. technology and urban landscapes). This is because at the commonest level, as Orr (1993) explains, humanity can learn to love what becomes familiar, a notion also reflected in the Topophilia ("love of place") hypothesis (Tuan, 1974).

### 2.2.3 Social economics

Social economics is a metadiscipline in which economics is embedded in social, political, and cultural behaviours. It examines institutions, choice behaviour, rationality as well as values in relation to markets (Ashford, 2007). Owing to its diverse structure, the human-nature relationship has been explored in various contexts. These include the humanity's growing environmental awareness (Hay, 2005) as well as how the relationship has evolved with historical context (Glacken, 1967). Whilst the dynamics of human and nature coupled systems

has become a growing interdisciplinary field of research, past work within social economics has remained more theoretical than empirically based (Liu *et al*., 2007).

The connection between the start of industrialised societies and the dynamically evolving human-nature relationship, has been discussed by many (Buckeridge, 2009), revealing a host of economic-nature conflicts. One example includes those metaphorically outlined in the frequently cited article "The Tragedy of the Commons". In this it argues that the four laws of ecology are counter intuitive with the four laws of capitalism. Based on this perspective, the human-nature relationship is simplified to one of exchange value, where adverse costs to the environment are rarely factored into the equation (Foster, 2012). However, this is not to say that humanity's increasing specialisation and complexity in most contemporary societies are distinct from nature, but still depend on nature to exert.

Central to the tenets outlined in Tragedy of the Commons is the idea of 'gradually diminishing freedom' where a population can increasingly exceed the limits of its resources if avoidance measures are not implemented (e.g. privatisation or publicly owned property with rights of entry) (Hardin, 1998). Yet, such avoidance measures can be seen to reflect emerging arguments in the field of environmental justice, which researches the inequalities at the intersection between environmental quality, accessibility and social hierarchies. These arguments derive from the growing evidence that suggests the human-nature relationship is seemingly disproportionate to those vulnerable groups in society (e.g. lack of green spaces and poor air quality), something public health researchers believe to be a contributing factor to health inequities (Brulle and Pellow, 2006). As such, conflicts between both private and collective interests remain a challenge for future social economic development. This was explored more fully in Ostrom's (1999) research on managing a common pool of resources. Environmental volunteering activities (section 2.6.1) is one example of measures being taken to increase peoples' accessibility to green spaces, particularly those vulnerable groups in society's (see TCV strategic goals section 3.3.2). However, further research is needed to improve our current understanding of how people engage in programmes delivered by environmental volunteering organisations (see RQ2 section 1.2; Jenkinson *et al*., 2013).

### 2.2.4 Environmentalism

Environmentalism can be broadly defined as an ideology or social movement. It focuses on fundamental environmental concerns as well as associated underlying social, political and economic issues stemming from humanity's interactions affecting the natural environment

(Mulihill, 2009). In this context, the human-nature relationship has been explored through various human related activities, from natural resource extraction and environmental hazards to habitat management and restoration. Within each of these reflects a common aspect of 'power' visible in much of the literature that centres on environmental history (Radkau, 2013). Some examples include agricultural engineering, the extinction of animals through over hunting as well as the ecological collapse on Easter Island from human overexploitation of natural resources, since disproven (Hunt and Lipo, 2006; Radkau, 2013). Yet, in the last decade the field's presupposed dichotomy between humans and nature in relation to power has been critically challenged by Radkau (2013) who regards this perspective as misleading without careful examination. Instead they propose the relationship to be more closely in synchrony.

Power can be characterised as "*a person, institution, physical event or idea … because it has an impact on society. It affects what people do, think and how they live*" (Turner, 2005). Though frequently debated in other disciplines, in the context of the human-nature relationship the concept of 'power' can be exerted by both nature and humanity. In regards to nature's power against humanity, it has the ability to sustain society as well as emphasise its conditional awareness, environmental constraints and fragilities. In contrast, humanity's power against nature can take the form of institutions, artefacts, practices, procedures and techniques (Whited, 2013). In the context of this review, it focuses on nature's powers against humanity.

It has been argued that human power over nature has altered and weakened in dominance since humanity's increase in environmental awareness (Radkau, 2013). Instead, humanity's power towards nature has become one of a moral sense of protectionism or the safeguarding of the environment (Hodder and Bullock, 2005). Environmental volunteering is an example of this (see section 2.6.1). This conservative behaviour (e.g. natural defences, habitat management and ecological restoration) can be termed 'Urgent Biophilia' (Tidball, 2012), and is the conscious urge to express affinity for nature pending an environmental disaster. As Radkau (2013) suggests, with warnings of climatic change, biodiversity loss, and depletions in natural resources, this poses a threat to humanity. As such, this will eventually generate a turning point where human power is overwhelmed by the power of nature, bringing nature and power into a sustainable balance. Nonetheless, as many also highlight, humanity's responses to environmental disasters can directly impinge on an array of multi-causalities of intervening variables (e.g. resource depletion and social economics) and the complexity of outcomes (Adger *et al*., 2009).

### 2.2.5 An interdisciplinary perspective of the human-nature relationship

Through exploring the key concepts found in evolutionary biology, social economics, evolutionary psychology and environmentalism, this has enabled a broader understanding of the various ways humans are connected to the natural environment. Each should not be viewed as separate entities, but rather that they share commonalities in terms of mutual or conjoint information and active research areas where similarities can occur (see Table 2.1 below). For example, there is a clear connection between social economics, evolutionary psychology and biology in areas of health, lifestyle and biophilic nature (Tidball, 2012) as well as between social economics and the environment in regards to balancing relationships of power (Hardin, 1998; Radkau, 2013). Similarly, economic-nature conflicts can occur between disciplines evolutionary psychology and social economics in relation to people's affiliation for nature and industrial growth.

Table 2.1: A summarised overview of human-nature relationship connections between those research areas explored.

| Research field | Type of connection | Description |
|---|---|---|
| Evolutionary biology | Cultural-genetic interaction (coevolution) | The interrelationship between two or more inherent systems (e.g., biophysical, biotic and cultural). Examples used in this review related to lifestyle and dietary choices.<br><br>Overlaps identified between the following research disciplines and fields: human health, genetics, evolutionary studies, culture and social economic behaviours. |
| Evolutionary psychology | Affiliation to nature | The instinctive aesthetic preference and value for nature. Examples used in this review related to people's feelings of connectedness to nature.<br><br>Overlaps identified between the following research disciplines and fields: evolution, mental health and wellbeing social and behavioural ecology, psychology, culture and human development. |
| Social economics | Economic-nature conflicts | The values of nature are counter intuitive with those values and actions of capitalism. Examples used in this review related to natural resource management.<br><br>Overlaps identified between the following research disciplines and fields: social economics, social health factors (e.g. life style and social conditions), ecosystem accounting power relationships, conservation and resource management, affiliation to nature, and biophysical systems. |
| Environmentalism | Power relationships | Those power relationships exerted by both nature and humanity. Examples used in this review related to conservation behaviours and management of the natural environment.<br><br>Overlaps identified between the following research disciplines and fields: economic-nature conflicts, conservation management, social and cultural behaviours, social health, affiliation to nature, and biophysical systems. |

Our understanding of the human-nature relationship and its underlying mechanisms could be further understood from an interdisciplinary perspective. In essence, the human-nature relationship can be understood through the Biophilia concept of humanity's affiliation with nature as well as related concepts and measures to describe human connectedness to nature (Wilson, 1984; Mayer and Frantz, 2004). Equally, Orr's (1993) perspective that at the commonest level humans can acquire other affinities to or learn to love different elements than those of the natural world (e.g. technology and urban environments) adds to this understanding. Further, whilst humanity, and indeed nature also, has not entirely escaped change, it cannot be assumed that all have been shaped by evolutionary mechanisms (Powell, 2012). Some have been shaped by what Radkau (2013) terms as the power shift between humans and nature, which is evolving, as it has and will keep on doing. As such, the human-nature relationship goes beyond the extent to which an individual believes or feels they are part of nature. It can also be understood as, and inclusive of, our adaptive synergy with nature as well as our longstanding actions and experiences that connect us to nature (e.g. environmental volunteering; section 2.6.1). Over time, as research and scientific knowledge progresses, it is anticipated that this definition of the human-nature relationship will adapt, featuring the addition of other emerging research fields and avenues.

## 2.3 Defining health

Conceptualising 'health' has often generated complex debates across different disciplines owing to its multidimensional and dynamic nature (Huber *et al*., 2011). It is, however, beyond the scope of this chapter to review the many ways these concepts have been previously explored (Cameron *et al*., 2006; Kamberi, 2015). Instead, 'health' is viewed more generally through the lens of the World Health Organization 1948 definition, a definition widely used in health research.

The World Health Organization defined 'health' simply as the physical, social and mental wellbeing of humanity, in which 'health' was widened beyond those biomedical aspects (e.g. disease and illness) to encompass the socioeconomic and psychological domains (Cameron *et al*., 2006). This classical definition advocated health's shift towards a holistic perspective, with emphasis on more positive attributes (Saracci, 1997), and was not simply "*the mere absence of disease and infirmity*" (Huber *et al*., 2011: 1). It also reflected people's ambitious outlook after the Second World War, when health and peace were seen as inseparable (Saracci, 1997). Since then, this shift has seen a major growth, primarily in areas of positive health and psychology (Park *et al*., 2016).

In the last 30 years, WHO's definition of health has encountered much criticism. For instance, the use of the term 'completeness' when describing optimal health, has been regarded by many as impractical. Similarly, others have highlighted the need to distinguish health from happiness (Saracci, 1997) or its inability to fully reflect modern transformations in knowledge and development (e.g. technology, medicine, genomics as well as physical and social environments) (Kamberi, 2015). As such, there have been calls to reconceptualise this definition, to ensure further clarity and relevance for our adaptive societies (Huber *et al*., 2011). One example by Huber *et al* (2011) was for health to be defined instead as the "ability to adapt and to self-manage" and invite the continuation of further discussions and proposals of this definition to be characterised.

The WHO's definition of health has been broadly measured through two theoretical approaches: subjective and objective (Cameron *et al*., 2006). The subjective approach is based on individual's perceived physical, emotional and cognitive experiences or functioning. By contrast, the objective approach measures those variables which are existing and measurable external to an individual's internal experience such as living conditions or human needs that enable people to lead a good life (e.g. health markers, education, environment, occupational attainment and civic involvement). Together, these approaches provide a more comprehensive picture of a person's health status (Cameron *et al*., 2006)

Additionally, the WHO's definition of health has three main components: physical, mental and social (Cameron *et al*., 2006). Firstly, physical health is defined as a healthy organism capable of maintaining physiological fitness through protective or adaptive responses during changing circumstances (Huber *et al*., 2011). Whilst it centres on health-related behaviours and fitness (including lifestyle and dietary choices), physiological fitness is considered one of the most important health markers thought to be an integral measure of most bodily functions involved in the performance of daily physical exercise. These can be measured through various means, with examples including questionnaires, behavioural observations, motion sensors and physiological markers (e.g. heart rate) (Westerterp, 2009).

Secondly, mental health is often regarded as a broad concept to define, encapsulating both mental illness and wellbeing. It can be characterised as the positive state of wellbeing and the capacity of a person to cope with life stresses as well as contribute to community engagement activities (Huber *et al*., 2011). It has the ability to both determine as well as be determined by a host of multifaceted health and social factors being inextricably linked to overall health,

inclusive of diet, exercise and environmental conditions. As a result, there are no single definitive indicators used to capture its overall measurement. This owes in part to the breadth of methods and tends to represent hedonic (e.g. life satisfaction and happiness) and eudaimonic (e.g. virtuous activity) aspects of wellbeing, each known to be useful predictors of physical health components (Nisbet *et al*., 2009).

Thirdly, social health can be generalized as the ability to lead life with some degree of independence and participate in social activities (Huber *et al*., 2011). Indicators of the concept revolve around social relationships, social cohesion and participation in community activities. Further, such mechanisms are closely linked to improving physical and mental wellbeing as well as forming constructs which underline social capital. Owing to its complexity, its measurement focuses on strengths of primary networks or relationships (e.g. family, friends, neighbourliness and volunteering in the community) at local, neighbourhood and national levels (Ziersch *et al*., 2005).

## 2.4 Current knowledge on the human-nature relationship and human health

During the last century, research has been increasingly drawn towards understanding humans' connection to nature and have revealed the many ways humans are linked with the natural environment (e.g. Nisbet *et al*., 2009). Some examples of these include humans' preference for scenes dominated by natural elements, the sustainability of natural resources and the health benefits associated with engaging with nature (Kaplan and Kaplan, 1989; Barton and Pretty, 2010; Foster, 2012). Of these examples, the impacts of humanity's connection to nature on human health has grown with interest. This in part owes to the increasing evidence accumulating in research literature.

This section summarises existing theoretical and literature research at the intersection of the human-nature relationship (section 2.2) and human health (section 2.3), as defined this this chapter. This has been explored through three subsections: physical health, mental health and social health. It aims to identify areas of convergence as well as gaps and limitations.

### 2.4.1 Physical health

In the past 30 years research has identified that exposure to nature (e.g. visual, multisensory or by active engagement) can be effective for regulating our diurnal body rhythms to ensure physical vitality (Heerwagen, 2006). This area of research was motivated by Wilson's (1984) proposed 'Three Pillars of Biophilia' (Nature of Space, Natural Analogues and Nature in Space) where each pillar representes a type of 'nature' experience. Early empirical research in

this domain was initially carried out by Ulrich (1984) who found that those hospital patients exposed to natural scenery from a window view experienced decreased levels of pain and shorter recovery time after surgery. Following this, research in this academic field has grown exponentially and encompasses a large literature base on nature's health benefits. These include improvements in health and wellbeing relating to engagement in environmental volunteering activities (Pillemer *et al*., 2010; sections 2.6 and 2.7), undergoing 'Earthing' or physical contact with the Earth's surface regulates diurnal body rhythms (Chevalier *et al*., 2012) as well as walking activities in forest environments reducing blood pressure levels (Park *et al*., 2010).

Whilst physical health studies in the context of connecting with nature continues to grow, researchers in this field have identified further avenues of research. For example, some have suggested the need for more mixed methods research at the intersect of nature-based parameters and human health, including physiological and biochemical indicators (Ryan *et al*., 2014). Other areas of exploration include identifying what activities (e.g. environmental volunteering; section 2.6) might increase levels of physical health through the use of longitudinal datasets from which the frequency, duration and causal directions could be inferred (Pillemer *et al*., 2010; Jenkinson *et al*., 2013).

### 2.4.2 Mental health

Mental health studies in the context of connecting with nature has also generated a growing research base since the emergence of the Biophilia concept in the mid-1980s (Wilson, 1984). Much of its research within the Evolutionary Psychology discipline (section 2.4.2), examines the recuperative effects of nature on wellbeing and its beneficial properties following researcher's arguments of humanity's affiliation for nature (Grinde and Patil, 2009). Supporting research has been well documented in literature during the last few decades. These include natural sounds (Fisher, 1999), improved levels of positive mood amongst those who engage in environmental volunteering (Molsher and Townsend, 2016), as well as aesthetic preferences for nature and natural forms (Kaplan and Kaplan, 1989).

Criticisms of this research area centre on the inability to decipher causal effects and direction of such benefits and in part relates to its predominant focus on 'recuperative measure' than that of detecting its 'source' (Grinde and Patil, 2009). In light of this, reviewers remark on researchers' tendencies to focus on outcomes of wellbeing, neglecting the intervening mechanisms that sustain or inhibit wellbeing (Ryan *et al*., 2014). Similarly, further mixed-method approaches and larger sample sizes are needed in this research field (Jenkinson *et al*.,

2013; Seymour, 2016). This would enhance existing evidence gaps to enhance existing knowledge of variable interlinkages with other important sources (e.g. physical and social health aspects) as well as the diversity that exists between individuals.

### 2.4.3 Social health

In the last two decades, the relationship between people and place in the context of green spaces has received much attention in academic literature in regards to its importance for the vitality of communities and their surrounding environments (Sullivan *et al*., 2004). As studies have shown, the presence of green space can promote social cohesion and group based activities (e.g. community greening), aspects which are crucial for maintaining social ties, fostering community resilience (section 2.7), and increasing individual's wellbeing (Maas *et al*., 2009). Examples of findings include children's activities in green spaces improves social development (Louv, 2005) as well as accessibility to green spaces enhances social bonds in communities (Sullivan *et al*., 2004).

One of the main limitations within this field relates to the generally perceived idea that public green spaces are freely open to everyone in all capacities (Peters *et al*., 2010). This limitation has been as already highlighted from the emerging arguments in the field of environmental justice and economic-nature conflicts (Brulle and Pellow, 2006; section 2.2.3). As such, many researchers highlight the need to maintain awareness of other barriers which might hinder cohesion and community participation (e.g. semi- public space and social exclusion). Further, there still remains a gap between academic research and local knowledge which would otherwise lead to more effective interventions. However, without implementing participatory engagement, many studies risk misrepresenting the true social, economic and political diversity that would increase both our understanding of 'real life' problems of concern as well as bringing depth to data collected. Nonetheless, for such approach to be implemented requires sufficient time, cost and an adequate scale of resources to ensure for aspects of coordination, communication and data validation (Tulloch *et al*., 2013).

## 2.5 Towards an interdisciplinary perspective of human and ecosystem health

Since the late 19th Century, a number of descriptive models have been developed to encapsulate the dimensions of human health and the natural environment as well as their interrelationships (VanLeeuwen, 1999). These include the Environment of Health (Blum, 1974), the Social model of health (Dahlgren and Whitehead, 1991), the Mandala of Health (Hancock and Perkins, 1985), the Wheel of Fundamental Human Needs (Max-Neef, 1972),

and the Healthy Communities (Hancock, 1993). Yet, as VanLeeuwen *et al* (1999) highlight in their review, each have not fully incorporated all relevant characteristics of ecosystems (e.g. multiple species, trade-offs and feedback loops, as well as the complex interrelationships between socioeconomic and biophysical environments). Further, the Bioecological systems theory model encapsulates the biopsychological characteristics of an evolving theoretical system for scientific study of human development over time (Brofenbrenner,1995). However, the model has been suggested by some (Prout, 2005; Conn, 2014), to be static and compartmentalised in nature, emphasising instead the importance of evolving synergies between biology, culture and technology.

More recently, the concept 'One Health' has gradually evolved and increased with momentum across various disciplines (Zinsstag *et al*., 2012). It is broadly defined as the attainment of optimal health across the human-animal-environmental interfaces at local, national and global levels. It calls for a holistic and universal approach to researching health, an ideology said to be traceable to pathologist Rudolf Virchow in 1858 (Zinsstag *et al*., 2012). Yet, the concept has received criticisms regarding its prominence towards the more biological phenomena (e.g. infectious diseases) than those of a social science and spatial perspective (Wolf, 2014; Hinchliffe, 2014). Some have therefore suggested its need to adopt an interdisciplinary approach to facilitate a deeper understanding of the complexities involved (Hinchliffe, 2014).

The dimensions of human health and the natural environment, as viewed from the perspective of this thesis, are drawn from existing theoretical and empirical research reviewed in the previous subsections (2.1 to 2.5). These dimensions and the interconnections between them have been illustrated using a conceptual model (Figure 2.1). The model's purpose was to provide a simple and generalised overview of the broader research field from which the overarching thesis aim (section 3.1) originates from and is motivated by. It must be noted that research literature used to guide the development of the research questions and objectives in this thesis are reviewed in the proceeding sections of this chapter (2.6 to 2.9). This is because more detailed and narrowly focused literature was needed.

The conceptual model is based on the philosophical underpinnings of the thesis which are rooted in pragmatism (see chapter 3). It attempts to address some of the limitations identified in the above models and is inclusive of all relevant characteristics of ecosystems, their continuously evolving synergies with human health as well as a balance between the biological, social and spatial perspectives (VanLeeuwen, 1999; Prout, 2005; Conn, 2014; Wolf, 2014;

Hinchliffe, 2014). This was achieved through combining three models which collectively presents my own interpretation the dimensions of human health and the natural environment as well as the interrelationships between them. The model is therefore a modification of the following pre-existing models: the three pillars of biophilia (section 2.2; Wilson, 1984), the human-centred components of health (physical, mental and social; section 2.3) and an integrated coevolutionary perspective of human adaptation (section 2.2.1; Gual and Norgaard, 2010). It therefore aims to facilitate a deeper understanding of the complexities involved for attaining optimal human health. I will now describe the conceptual model.

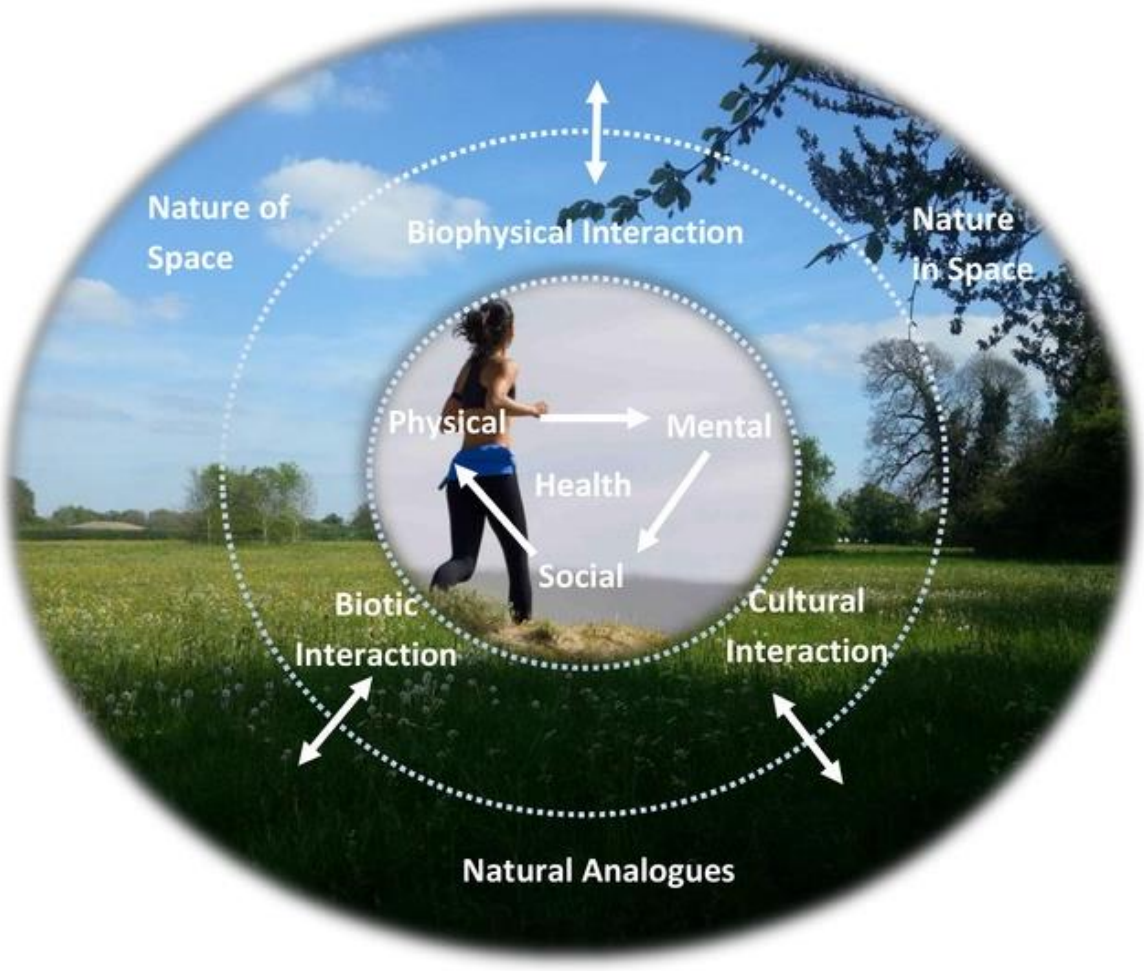


Figure 2.1: Interdisciplinary perspective of Human and Ecosystem Health (Image on the inside circle is by (Baird, 2014) with the background image, added text and embedded illustrations being my own work).

Firstly, the outer circle is representative of 'nature' that both encompasses and interconnects with the three human-centred components of health (physical, mental and social). Through this

it emphasises humanity's interrelationship with the environment through various biological, ecological, and behavioural connections. For instance, social, political and economic issues stemming from humanity's interactions affecting the natural environment (e.g. natural resources, environmental hazards, habitat management and restoration).

Secondly, the inner circle containing the three components of human health (physical, mental and social). These components are shown to be interconnected through a cohesive triangle to reflect their interdisciplinary and dynamic natures, as outlined in section 2.3. Further, this cohesive triangle acts on two levels. Firstly, as a single construct of health based on these components combined. Secondly, the underlying intervening mechanisms that sustain or inhibit health which can derive from each of these separately. Thereby, it not only focuses on the outcomes or 'recuperative measure' of health, but also the source of such outcomes and their directions (see section 2.4).

The middle circle represents the interconnected relationship between humanity and the natural environment with relevance to human health. This has been indicated by the two-way arrows and incorporates a coevolutionary perspective between human adaptation and the natural environment (section 2.2.1). In this way, the relationship is continually interconnected via a two-way physical and perceptual interactions. These are embedded within three integrated systems (biophysical, biotic and cultural), with all humanity knows of the world comes through such mediums (Gual and Norgaard, 2010). Of these three integrated systems, biotic interactions can be described as features of biological systems (e.g. genetics) which interact with other inherent systems (e.g. culture), having direct or indirect impacts on human evolution (see section 2.2.1 Evolution Biology). Cultural-genetic interactions is an example of this and explores how lifestyle choices, such as increasing exposure to nature, can impact human health. Engaging in environmental volunteering activities could be viewed as one type of activity which can increase people's exposure to nature and thus presumably their health-related impacts. As such, the human-nature relationship goes beyond the extent to which an individual believes or feels they are affiliated with nature (e.g. biophilia concept). It can also be understood as, and inclusive of, our adaptive synergy with nature as well as our longstanding actions and experiences that connect us to nature.

Based on this suggested conceptual model, methodological approaches could be employed from those research fields below which have paid most attention to studying this research area, enabling a more interdisciplinary framework. The characteristics, descriptions, implications

and practicalities of this are detailed in table 2.2 below. The advantage of this is that a multitude of knowledge from both rigorous scientific analysis as well as collaborative participatory research can be combined bringing a greater depth to data collected (Onwuegbuzie and Leech (2005). This could be achieved through using more mixed-method approaches and adopting a pragmatic outlook in research. In this way, both the true social, economic and political diversity of 'real life' as well as the optimal human health at the human-environmental interface can be identified. As such, a more multidimensional perspective of human health would be gained. Nonetheless, adopting a pragmatic outlook brings its own challenges, as explored by Onwuegbuzie and Leech (2005), with several researchers proposing frameworks that could be implemented to address these concerns (e.g. Tashakkori and Teddlie, 2006; Onwuegbuzie and Johnson, 2006; Dellinger and Leech, 2007; see section 3.4).

Table 2.2: A summarized overview of human and ecosystem health from an interdisciplinary perspective.

| | Characteristics | Description | Implications and Practicalities |
|---|---|---|---|
| Human Health<br><br>(Inner circle) | Physical, mental and social health | The three components of human health: physical, mental and social. | This acts on 2 levels: collectively and intervening mechanisms.<br><br>To identify and evaluate the sources, directions as well as outcomes of health. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include questionnaires, governmental and public datasets, behavioural observations, and physiological markers.<br><br>To enhance understanding and accounting of health capital, as well as intervening mechanisms. To use such knowledge to foster and support social health factors (e.g. healthy lifestyles, social inequalities and communities. |
| Human-nature relationship<br><br>(Middle circle) | Biophysical, biotic and cultural interaction | Describes humans' connections with the natural environment and the interrelationship between two or more inherent systems (e.g. biophysical, biotic and cultural).<br><br>These connections were explored and summarised from those four research fields which have paid most attention to studying the interface of humanity and the natural environment: evolutionary biology, evolutionary psychology, social economics and environmentalism. | This refers to a two-way relationship between human health and nature.<br><br>To identify and evaluate the sources, directions as well as outcomes of these 4 human-nature connections, using an interdisciplinary perspective. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include participatory research methods, governmental and public datasets, as well as systematic and thematic reviews. |

| | | | |
|---|---|---|---|
| Nature<br>(Outer circle) | Nature in space, nature of space and natural analogues | Describes humanity's exposure to nature and experience categories which relates to natural materials and patterns experienced in nature, both visually and non-visually. | To enhance ecosystem services accounting, to be inclusive of natural and health related capital. To integrate nature-based activities into health care systems. To design human environments, social economic systems and 'power' relationships to be more in balance with nature.<br><br>Exposure refers to those visual, multisensory or by active engagement.<br><br>To identify and evaluate the sources, directions as well as outcomes of exposure to nature. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include interviews, governmental and public datasets, and questionnaires.<br><br>To enhance understanding and accounting of natural capital, as well as intervening mechanisms. To include such knowledge in human practices (e.g. public policies) and design. |

## 2.6 Defining volunteering and environmental volunteering

In the previous subsections of this chapter, I described those concepts and methodological approaches which can be found in the human-nature relationship and human health research fields that were most relevant to the overarching research aim of this thesis. In doing so, this provided a general overview of the wider context within which the overarching research aim, questions and objectives of this thesis (section 1.2) are situated.

In this subsection, I discuss environmental volunteering as an example of a programme recently developed aims to help improve human health and the natural environment. However, before I explore existing research at the intersection of environmental volunteering and health-related impacts, I will first describe the nature of environmental volunteering in the wider context of the volunteering sector, which will serve as valuable background knowledge for proceeding chapter sections. More specifically, I provide an overview on the variability in volunteer data collected, existing impact measurement tools in the sector, the delivery of volunteering programmes as well as engagement patterns and motivations of volunteer.

The term 'volunteering' has no generally agreed upon definition, and as some suggest may depend on how one perceives the relative costs and benefits to the volunteer (Bussell and Forbes, 2002). For instance, whilst some believe an activity can be regarded as volunteering if the person receives no payment, others believe that those people choosing to work in lowly paid jobs to do good should still be classified as "quasi-volunteers" (Wilson, 2000). By contrast, Cnaan *et al* (1996) views volunteering along a continuum which ranges across four dimensions: free choice, absence of remuneration, structure and intended beneficiaries. More generally though, 'volunteering' is viewed as when a person voluntarily gives up their time to involve themselves in an unpaid activity to either provide a benefit to the environment or other(s) (NCVO, 2017).

The act of volunteering has been visible throughout human history, and can be found in ancient civilisations. One example includes the emergence of craft guilds amongst Roman society (Defourny and Develtere, 1999). Since these early examples, volunteering has been said to have flourished in the form of associations, charities, brotherhoods and guilds. From the 1970s and 1980s onwards, the UK volunteer sector shifted in line with government initiatives which promoted volunteering as a means to provide additional support to public services (Rochester *et al*., 2012). Examples include Jim Callaghan's 'National Good Neighbour', John Major's 'Make a difference', Tony Blair's 'Compact' and David Cameron's 'Big Society'. Initially,

these UK initiatives were developed during a time of economic crisis to help reduce demands on health and social services. Later, however, volunteering was promoted to encourage a more community-led civic society which was more democratic, inclusive and cohesive. As part of this, the UK government set about improving the capacity of the volunteering structure, a process which has since experienced challenges relating to the recent economic crisis (Rochester *et al*., 2012).

Just as with its definition, it is often difficult to define the context in which volunteering activities occur. The volunteering sector itself encompasses a diversity of organisations and charities, each varying in their purposes and activities (Bussell and Forbes, 2002). This diversity in the sector can often be shaped by social, cultural and environmental contextual factors as well as their own internal motivations (Rochester *et al*., 2012). Examples include corporate (or employee) volunteering at a charity of choice, volunteering in nature conservation (section 2.6.1), and being on a fundraising committee or charity trustee. Broadly, the nature of volunteering activities has been subdivided into four types (Rochester *et al*., 2012): mutual aid or self-help, where people work together to address or improve shared concerns, issues or challenges (e.g. charity-led support groups); philanthropy and service to others, which recruits volunteers to be involved a service to more than one parties (e.g. citizens advice service); participation, where people volunteer in political or decision making processes (e.g. committee work); and advocacy or campaigning, where a collective group of volunteers work towards a change of some kind (e.g. lobbyist groups). However, volunteering activities may fall under one or more of these types, with further research still needed to examine important differences amongst them (Bussell and Forbes, 2002).

Within these volunteering activities there exists different types of volunteers, each varying in their levels of engagement (see chapter 5). Until the mid-1990s, volunteers generally presented a high level of unconditional dedication over time and a strong sense of affiliation with the organisation they volunteered with. This type of volunteer has recently become termed as "classic volunteerism" (Hyde *et al*., 2016). Since then, researchers have begun to notice a gradual shift in volunteering typologies and have noted the emergence of the "episodic volunteer". This type of volunteer displays engagement patterns towards those more causal and episodic (Holmes, 2014). This shift in typologies is supported by recent studies (Reed and Selbee, 2001; Mohan and Bulloch, 2012) which show inequalities in volunteer's engagement patterns, whereby few volunteers contribute to the majority of volunteering activities, with the majority contributing the least. Suggested explanations for this shifting trend in volunteering

typologies include time availability, project types and motivations (Rochester, 2006). However, findings from these volunteering studies remain largely generalised in scope and have not yet been fully explored (e.g. urban-rural populations). Such knowledge would help to identify any variabilities in volunteers' engagement patterns to gain a deeper understanding of the delivery of volunteering programmes as well as any relating factors (e.g. level of engagement, type of volunteering project and transport mobility). This knowledge would also be considerably valuable in helping practitioners in the volunteering field in areas of project design and management, thereby ensuring an adequate level of participant engagement to sustain their volunteering practices (Holmes, 2014).

Characterising volunteer's motivations that can underline these engagement patterns and types of volunteering has a wide literature base in volunteering research. Those perspectives which have become most prominent in this research area include those psychological and sociological. From the psychological perspective, Clary and colleagues have explored volunteering motivations using a functioning approach, linking a person's motives to their behaviours (Rochester *et al*., 2012). From this, they identified six forms of motivations: altruistic values, experiences (e.g. learning from new experiences), career enhancement, social rewards, personal development or growth, and protection (e.g. escape from negative feelings). Conversely, the sociological perspective focuses on how a person views their involvement in volunteering and not the cause, placing more emphasis on the social context to explain why people volunteer (Rochester *et al*., 2012).

For the purposes of this thesis, I have focused on one type of volunteering, environmental volunteering, due to its relevance to the subject of human-nature relationship. I will now define environmental volunteering in the below section.

### 2.6.1 Defining environmental volunteering

Like other organisations and charities in the volunteering sector, environmental volunteering plays a pivotal role in civic participation and the delivery of public services for local communities (Mohan and Bulloch, 2012). In its broadest sense, it can be described as the practices of unpaid volunteers who spend time engaging in activities with environmental implications (McDougle *et al*., 2011).

There currently exists a wide variety of environmental volunteering activities that occur both indoors and outdoors (O'Brien *et al*., 2008). Examples of these include advocacy regarding environmental issues (local and national), monitoring projects (e.g. bird counts), restoration of

natural areas (e.g. conservation volunteering) and promoting pro-environmental living (e.g. efficient energy use) (Pillemer *et al*., 2010). It is, however, beyond the scope of this chapter to explore the different types of environmental volunteering activities that occur. Instead, 'environmental volunteering' is viewed through the lens of conservation volunteering due to the it's more direct engagement with the natural environment for lengthier periods of time by comparison to other environmental volunteering activities. It is also considered particularly relevant to the subjects discussed in above sections (2.2 to 2.4), human-nature relationship and human health.

Conservation volunteering can be described as the involvement of volunteers in practical conservation and outdoor-based activities, including pond weeding, dry stone walling and coppicing trees (Bruyere and Rappe, 2007). This type of volunteering is based on the premise that people can help improve and sustain the natural environment through collective and community-based efforts. It also contributes to and enables the attainment of organisations' conservation goals (Asha and Blahna, 2012). Examples include environmental volunteering or certain Non-Governmental Organisations (NGO) projects (e.g. The Conservation Volunteers).

Conservation volunteering has a long history in the UK and Ireland, with its precise emergence unknown. However, the role of the voluntary sector is generally regarded as a significant contributor to the conservation volunteering movement. Of the UK's best-known conservation organisations, some of the oldest include the Royal Society for the Protection of Birds founded in 1891, the National Trust founded in 1895 and the Wildlife Trusts founded in 1926 (Burek and Prosser, 2008). After the second world war, some have argued (Ockenden, 2007) that the launch of the environmental charity, British Trust for Conservation Volunteers (BTCV, now known as The Conservation Volunteers; see chapter 3), in 1959 saw this volunteer movement become more formalised, with the Groundworks organisation, launched during the 1980s, increasing a more community-based framework that we see today (Burek and Prosser, 2008). Since then, volunteering in nature conservation projects has become increasingly popular and owes in part to the rise in environmental awareness in recent decades (Halpenny and Caissie, 2003).

Whilst some highlight that research is still needed to gather a deeper understanding of the delivery of these programmes (Jenkinson *et al*., 2013; see chapter 5), researchers are starting to uncover reasons why people are motivated to volunteer in nature conservation projects (Russell, 2009). These include, though are not limited to, the following motivations. Firstly,

studies show that volunteers are motivated to engage in these projects owing to their love or enjoyment of the outdoors (O'Brien *et al*., 2008). Secondly, volunteers have also indicated social and cultural factors, such as social connectedness with other volunteers and making a difference to their community. Thirdly, people can be motivated to volunteer to improve their skills and employability (Russell, 2009). Yet, as O'Brien *et al* (2008) highlight, it can be hard to distinguish a clear motivation, and is instead collective and can change throughout a volunteer's lifetime.

## 2.7 Engagement in environmental volunteering activities and health-related impacts

As noted in section 2.6 above, environmental volunteering activities is one example of the gradual rise in programmes aimed to help improve human health and the environment in the last two decades (Depledge, 2011). In concurrence, studies are beginning to explore the potential impact that engaging in environmental volunteering may have on people's health. In this section, I summarise existing empirical research at the intersection of environmental volunteering and health-related impacts. This has been explored through three subsections: health (section 2.7.1) and pro-environmental behaviours and social-ecological resilience. It aims to identify areas of convergence as well as gaps and limitations.

In addition to health, this chapter also focuses on two indirectly related behaviours (explored and selected by TCV), outlined below, which could also be generated from engaging in environmental volunteering activities: pro-environmental behaviours (section 2.7.2) and social-ecological resilience (section 2.7.3). Firstly, through engaging in community-led activities (e.g. environmental volunteering), this could advocate public health benefits, both strengthening and sustaining social-ecological resilience (Tidball and Krasny, 2012). In this way, social-ecological resilience has the ability to indirectly foster and support health-related impacts. Secondly, environmental volunteering programmes could be viewed as intervening processes to help promote positive behaviour to not only ameliorate environmental problems but enhance existing ecosystem services. As such, through engaging in pro-environmental behaviours could help to improve the health of humans and non-humans alike.

It is therefore anticipated that our current understanding of the health-related impacts of environmental volunteering could be further understood if we identify the long-term trends as well as the pathways between environmental volunteering and those behaviours associated with health. This in turn would allow volunteering services to better develop programmes to further encourage these health-related behaviours. In addition, it will allow metrics of success for

volunteering services to be enhanced and thus presumably increased their health-related impacts.

### 2.7.1 Environmental volunteering and health

Volunteering has been shown to have a range of benefits for people over the course of their lives, from civic engagement and enhancing social cohesion to environmental awareness and individual health (e.g. Molsher and Townsend, 2016). Of these, research has begun to emerge over its association with improved levels of health and wellbeing. In particular, it has been suggested that engagement in environmental volunteering activities may provide additional health benefits beyond those identified in other forms of volunteering (Jenkinson *et al*., 2013). This suggested link between engagement in environmental volunteering activities and associated health benefits derives from and is strengthened by several research studies exploring the health benefits associated with people's engagement with nature in related fields (see section 2.4). Examples include cognitive functioning (Lov, 2005), wellbeing (Barton and Pretty, 2010) as well as physiological functioning (Park *et al*., 2010).

In the past decade, we have seen an emergence of studies exploring the potential health benefits associated with engagement in environmental volunteering activities. Example studies include physical health outcomes in midlife volunteers (Pillemer *et al*., 2010), volunteers' mood states (Molsher and Townsend, 2016), as well as volunteers' self-reported wellbeing (Kragh *et al*., 2016). Across each of these studies, researchers identified a slight positive relationship between environmental volunteers and the different health and wellbeing outcomes explored. It is noteworthy that whilst the two of these studies (Molsher and Townsend, 2016; Kragh *et al*., 2016) were published towards the end of writing this thesis, as some note (Bryman, 2012) it is essential as a researcher to maintain an awareness of ongoing literature in the field. In doing so, this enabled me to identify research and practical implications for my own findings within the changing context as explored below.

Quantitative methods used in these above volunteering studies were descriptive (e.g. percentage proportions and total counts) and derive from self-reported questionnaire surveys based on subsamples of UK or Australian environmental volunteering populations of different sample sizes (32, Molsher and Townsend, 2016; 417, Kragh *et al*., 2016; 6928, Pillemer *et al*., 2010). There are various strength and weaknesses to these methods used. Some strengths include the ability to generalise findings, gathering a large amount of quantifiable data and cost effectiveness. There are also few weaknesses, such as the possibility of providing invalid

answers and other response biases (Bryman, 2012). It is, however, beyond the scope of this chapter to fully evaluate the strengths and weaknesses of those self-reported survey measures used which have already been previously explored (see Lucas, 2018).

Further, whilst each of these studies lend supported evidence to the growing body of evidence in this research field, findings from these volunteering studies remain largely generalised in scope and there remains areas that warrant more research. For instance, due to the nature and practicalities of volunteering activities some have reported difficulties in collecting baseline and longitudinal datasets, particularly if the population sample are unknown before engaging in these activities (Pillemer *et al*., 2010). This can reduce the ability to make causal conclusions from findings which may otherwise provide a more comprehensive understanding of the health impacts associated with engagement in environmental volunteering activities as well as associated benefits and drawbacks emerging from these relationships (Büchs *et al*., 2012). Further, others note that there it is still uncertain to what extent volunteering organisations deliver health-related impacts through their volunteering activities. This owes in part to an insufficient understanding about the delivery of these programmes (e.g. frequency and type of activity) knowledge which would serve as valuable background information for measuring health impacts over time (Jenkinson *et al*., 2013; see chapter 5).

### 2.7.2 Pro-environmental behaviours

Pro-environmental behaviours can be defined as the adoption of behaviours which are either aimed at improving environmental quality or seeks to minimise any negative impacts of one's actions on the natural environment (Kollmuss and Agyeman, 2002). Example behaviours can include environmentally responsible travel, recycling, organic food growing, and eco-friendly shopping behaviour (Venhoeven *et al*., 2013).

Research has long identified the role of moral concerns, intrinsic motivations and external factors underlying pro-environmental behaviours (section 2.2.2). Such underlying influences have included individual value-based environmental concerns (de Groot and Steg, 2008), the influence of social norms and culturally accepted behaviours (Cialdini *et al*., 1991), goal framing and performance (Lindenberg and Steg, 2007), as well as contextual factors and other interventions (Ballantyne and Packer, 2011). Further, some argue that if pro-environmental behaviours are associated with an increase in environmental awareness, then it could be hypothesised that engagement in environmental activities might increase these behaviours (Kollmuss and Agyeman, 2002). Such an assumption is strengthened by findings which suggest

a positive link between people's pro-environmental behaviour and engagement in environmental activities, including connectedness (Nisbet *et al*., 2009), and environmental literacy (Dresner *et al*., 2014).

Within the last decade, the relationship between engaging in environmental activities (e.g. environmental volunteering; see section 2.6.1) and pro-environmental behaviours (e.g. recycling) has received increasing attention with regards to its importance for the vitality of communities and the environment (Hargreaves *et al*., 2011). More recently, the UK government and voluntary sector representatives has highlighted the potential role of volunteering organisations as an intervention for encouraging people to adopt environmentally friendly behaviours. Reasons for this include collective action and collaboration, group-based character, service delivery and advocacy, ability to connect with hard to reach communities as well as issues relating to trust both in action and communication (See Büchs *et al*., 2012).

In response to the growing awareness of volunteering's potential, studies are beginning to explore the potential impact that engaging in environmental volunteering may have on people's pro-environmental behaviours. Cooper *et al* (2015) is an example of this, and explores the differences between types of wildlife recreational activities (e.g. hunting and birdwatching) and show how these factors may impact on volunteers' pro-environmental behaviours. As such, participating in environmental volunteering and nature-based activities can be seen as equally important, increasing a person's engagement in pro-environmental behaviours and commitment through direct experience (Hartig *et al*., 2007). Yet as existing studies suggest, there is a need to examine the types of impacts over time as well as any mediating mechanisms and the relationships that may exist between them (Steward *et al*., 2009; Büchs *et al*., 2012; Cooper *et al*., 2015). In this way, an in-depth understanding of the long-term trends, relationships and pathways between environmental volunteering and pro-environmental behaviours would be gained. This in turn would allow volunteering services to better develop programmes to encourage pro-environmental behaviours, and thus presumably increase pro-environmental and other related impacts (e.g. human and environmental health).

### 2.7.3 Social-Ecological Resilience

'Resilience' is a widely used concept described generally by some as the ability of a system (e.g. social) to adapt to adversity or transform after a disturbance through retaining or changing its basic function and structure (Norris *et al*., 2008). Whilst the concept has a multiplicity of definitions (Adger, 2000), it is viewed by some as the opposite of vulnerability, whereby the

more resilient a system is, the quicker it can recover and with less change (Kelly *et al*., 2015). The concept has been studied across various fields, including social-ecological systems (Folke *et al*., 2016), disaster preparedness (Norris *et al*., 2008), business continuity (O'Sullivan *et al*., 2015) and adaptive capacities of individuals (Butler *et al*., 2007). As such, existing evaluation frameworks have been constructed or orientated towards a specific research domain and is often described in accordance to different characteristics (O'Sullivan *et al*., 2015). In the context of this chapter, I refer to social-ecological resilience.

Social-ecological resilience has been described as the capacity of social-ecological systems (e.g. biosphere and communities) to maintain its structure and functioning despite any perturbations and other stresses (Krasny *et al*., 2014; Folke *et al*., 2016). Originating from systems ecology, it draws on the assumptions of non-linear dynamics of change in complex systems, focusing on a systems ability to adapt or transform in ways that continue to support the wellbeing of human and non-humans alike (Wilkinson, 2012). The concept itself draws on two systems: social and ecological. Social systems refer to those systems integrating human dimensions, such as community, economic, societal, political and cultural. Ecological systems are those systems that integrate all living beings and their relationships, including ecosystems, humans and human actions. When integrated, social-ecological systems place emphasises on the interconnectedness between them, in which both systems shape, are shaped by and evolve together, from local to global scales (Folke *et al*., 2016).

In recent decades, there has been growing interest among policy makers and researchers surrounding the social-ecological resilience concept and how this might be used to help achieve sustainable development (Magis, 2010; Folke *at al*., 2016). Some researchers argue that resilience of social-ecological systems, whether at individual, community or societal level, could facilitate the sustainability of natural resources and ecosystem services (Adger, 2006; Barthel *et al*., 2010). This is because, a social system's ability to develop personal and collective capacity to respond to environmental change through developing new trajectories for the future and sustain themselves, could be regarded as a characteristic of sustainability (Magis, 2010; Kelly *et al*., 2015). In this way, sustainable development could be seen as a trajectory outcome of social-ecological resilience, promoting healthy and viable social systems for citizens at multiple scales (Magis, 2010). However, others note that whilst engaging in activities within a community (e.g. voluntary pro-environmental behaviours) may generate sustainable outcomes at an individual, group or community level, it is uncertain whether such activities can contribute similar sustainable outcomes at the global system-level (Anderies *et*

*al*., 2013). This perspective is supported by existing theoretical and empirical studies which suggest little overall effect on global system level sustainability. One reason for this owes to the complex relationships between sustainability, human-decision making processes and capital stakes at multiple scales (Anderies *et al*., 2013). In the context of this chapter, however, I focus on groups of people within local communities which is more relevant to the thesis' aim (section 3.1) and not an entire community, society or global system-level.

In concurrence, there has been a gradual increase in the number of studies examining the relationship between resilience and social-ecological coupled systems, including climate change, resource depletion and natural disasters (see Berkes and Jolly, 2001). Of these relationships, there has been a growth in studies exploring the potential impact that engaging in civic ecology practices has on urban communities. Examples include invasive non-native species monitoring, community tree planting and urban environmental stewardship (Tidball *et al*., 2010; Barthel *et al*., 2010; Connolly *et al*., 2014; Dolan *et al*., 2015).

Civic ecology practices can be defined as self-organised community-based efforts to conserve, monitor and create green infrastructures, such as developing community gardens and allotments (Krasny and Tidball, 2012). Such practices often reflect the local environments and cultures, forming partnerships with scientists, non-profits and government to not only work towards the sustainability of the community-driven efforts, but also be part of other large scale environmental initiatives (Krasny *et al*., 2014). Engaging in these practices has been shown to offer a range of benefits. These include strengthening ecosystem and social outcomes, such as food production and social connectivity, from individual to larger system scales (e.g. community and ecosystem), due to each scale's interactive nature and feedback loops (Barthel *et al*., 2010; Krasny *et al*., 2015; Folke *et al*., 2016). For instance, the unsustainable management of natural resources at a community-based level can have an impact on the biodiversity or nutrient cycling efficiency at interconnecting or larger system scales (Tidball and Krasny, 2007). Such outcomes have the ability to enhance ecosystem services on the ground as well as contributing to local urban resilience (Barthel *et al*., 2010).

Engaging in civic ecology activities has been suggested to embody resilient characteristics that could foster both social-ecological resilience and sustainable development outcomes (Tidball and Krasny, 2007; Kelly *et al*., 2015; Folke *et al*., 2016). Some have highlighted the following resilient characteristics in particular: skills and knowledge, self-organisation, social connection and activity (Tidball and Krasny, 2007; Krasny and Tidball, 2012; Kelly *et al*., 2015). There

are various reasons why these characteristics have been highlighted. Firstly, the role of skills and collective knowledge can create opportunities for transformation, learning new insights as well as abilities, thereby leading to ongoing and further adaptation to changes or issues which can emerge (Krasny *et al*., 2010). Secondly, self-organisation can be viewed as an adaptive governance process, which can lead to the resolution or modification of existing practices in response to a disturbance or unsustainable feedbacks (Tidball and Krasny, 2007). Thirdly, a local community group's degree of social connection can affect their ability to diffuse information, collaborate and coordinate management efforts in response to changes or disturbances that can occur (Bodin *et al*., 2006). Fourthly, the level of activity or engagement generated by local community groups can affect the overall scale and rate of change or adaptability to a disturbance (Krasny and Tidball, 2012).

Environmental volunteering activities are an example of civic ecology, who spend time engaging in a wide range of conservation and outdoor based activities, including habitat management and ecological restoration (Bruyere and Rappe, 2007). Engaging in such activities has been shown to have a range of benefits for people over the course of their lives, from civic engagement and enhancing social cohesion to environmental awareness and individual wellbeing (Putnam, 1995; Molsher and Townsend, 2016). In addition, environmental volunteering activities share those resilient characteristics (e.g. skills and knowledge) which emerge through engaging in civic ecology activities, as noted above. However, there has been limited empirical research exploring how these resilient characteristics which emerge through engaging in environmental volunteering activities may help promote or support social-ecological resilience amongst local community groups', despite the positive ecosystem and social outcomes they generate.

## 2.8 Impact measurement systems and management information systems in the volunteering sector

In this next section, I will describe the practice of impact measurement in the volunteering sector as well as the management information systems used to collect volunteer impact data, which will serve as valuable background knowledge for proceeding chapter sections.

'Volunteer impact measurement' is the performance evaluation of a volunteering organisation (section 2.6) and its effects (direct and indirect) on those who engage in their activities and other related stakeholders (Harlock, 2013). Its central purpose is to provide an evidence-base to support claims made, ensuring both transparency and accountability of information data

collected (Rochester *et al*., 2012). This can then be used to assist in promoting issues for public attention as well as policy related impacts (Metcalf, 2013).

The practice of impact measurement in the volunteering sector is not new, with the growing need to monitor the work of the voluntary sector becoming evident following the 19th Century Charity Law reform (Rochester, 2006; Harlock, 2013). After this reform, the initial focus was on measuring human 'needs', such as poverty. An example includes inquiries led by social investigators Charles Booth and Seebolm Rowntree, who correlated the effects of the labour market with the nature of poverty through scientific measure (Rochester, 2006). From these early studies, the sector's purpose for impact measurement has evolved towards providing outcome data to affect learning, provide information to key constituencies as well as contribute to the volunteer sector (Moxham, 2010).

There has been growing effort amongst the UK volunteering sector to enhance their existing impact measurement practice in recent decades (Veltri and Bronzetti, 2015). Such widespread trend towards evidence-based monitoring amongst the volunteering sector owes in part to various factors. For instance, research has recently found that meeting funder requirements is one of the most important factors shaping volunteer impact measurement in the UK volunteering sector (Ógáin *et al*., 2012). This owes in part to perceived pressures by some organisations to compete for public service delivery contracts as well as to maintain existing and attract new sources of funding (Metcalf, 2013). Additionally, there has been a shift towards outcomes-based commissioning in the public sector, where the voluntary sector is increasingly expected to demonstrate outcomes achieved in relation to their anticipated goals. One example is the Public Services (Social Value) Act 2012 which requires all those contributing to the delivery of public services (e.g. voluntary sector) to consider the wider social, environmental and economic impacts of their work practices when reporting their impacts (Veltri and Bronzetti, 2015). Other reasons for increased impact measurement practices includes project management and allocation of resources, improved practices and partnerships as well as volunteering organisations' own internal motivations to understand the impacts of their work (Moxham, 2010).

In response to this growth in impact measurement practices, the volunteering sector has also seen the emergence of new tools and evaluation methods (Ógáin *et al*., 2012). As a result, there currently exists a diversity of tools and evaluation methods which are often shaped by the diversity of values, motivations and work practices of the sector itself. For instance, a recent

study by social research co-operative 'Substance', identified over 130 different tools and evaluation methods currently used by the UK's volunteering sector (Metcalf, 2013). This in part owes to the sector's diversity of organisations and charities, each varying in their purposes and activities (see section 2.6). Additionally, factors such as budget, expertise, time availability, and organisational size can also contribute (Harlock, 2013).

Volunteering studies reviewing impact measurement practices (Metcalf, 2013; Harlock, 2013) have noted a wide range of tools and evaluation methods currently being used, both quantitative and qualitative. For instance, until recently the sector traditionally identified the monetary value of an organisation's activities and a volunteer's hours contributed (Rochester *et al*., 2012). One example is the Social Return on Investment which is a framework for measuring an organisation's social, environmental and economic financial value relative to resources invested (Harlock, 2013). By contrast, individual narratives of experiences and life histories have been gradually becoming used to explore the impacts associated with organisation's practices. With each of these methods being used, both quantitative and qualitative, there can be strengths and weakness (Arvidson, 2009). For example, whilst quantitative methods can be useful in measuring the magnitude and frequency of impacts generated, it fails to provide further contextual explanation behind these numerical values. Equally, whilst qualitative methods can provide rich explanatory data on why impacts may occur, it can also be hard to quantify and measure those added values which can emerged from using this method, i.e. community empowerment (Bryman, 2012). This suggests the need to use both quantitative and qualitative approaches in future research. Such mixed method would provide a more multidimensional perspective of a given impact being explored, identifying not only the magnitude and frequency of when an impact occurs, but to equally examine the meaning and understanding of the construct behind its occurrence (Bryman, 2012).

Alongside this growth in impact measurement practices the sector has also seen an increase use of technology and online databases to support these practices (Voida *et al*., 2011). One example are management information systems (see section 2.9 for an in-depth description) which are progressively being used amongst UK and US volunteering organisations to collect, store as well as manage their information data. Such systems refer to those management information systems (e.g. database software, spreadsheets and paper records) developed by 'end users' who use various resources or mediums that are accessible to meet their requirements (Voida *et al*., 2011).

Research at the intersect of management information systems and the volunteer sector has begun to explore the different forms of information and computer technology (ICTs) and how they are being used (Voida *et al*., 2011). Examples include fundraising (Goecks *et al*., 2008), campaigning, work and other social practices (Merkel *et al*., 2007). Across each of these studies, they reveal how the work contexts and information needs of voluntary organisations as well as stakeholder requirements have each shaped these systems (Voida *et al*., 2011). Based on these findings, it is reasonable to expect that those systems developed as impact measurement tools are equally idiosyncratic and motivated by features in volunteering staffs' work context. However, no study to the best of my knowledge has explored these systems' role in assisting with impact measurement tools.

Currently there exists three main challenges which can hinder the sector's ability to develop tools and evaluation methods used to measure their impact. First, there currently exists a varied support base available from consultancy, infrastructure and other specialist organisations in numerous fields. As such, this resulted in a trend of grey literature, conceptual confusions, fragmented evidence bases and uncoordinated support (Harlock, 2013; Veltri and Bronzetti, 2015). Second, as the sector is largely characterised by small organisations who are often faced with challenges of choosing a tool which meets their budget and time availability (Moxham, 2010). Third, the delivery and measurement impact of services can rely on both the initiatives as well as the technical skills and knowledge expertise of individual employees and volunteers (Haklay, 2010). This can result in the temporal or sporadic developments of these activities as well as the occurrence of multiple information management and evaluation tools in use (Voida *et al*., 2011).

## 2.9 Management information systems and characteristics which shape them

As mentioned in the previous section (2.8), there has been a gradual increase amongst the UK volunteering sector to measure impacts associated with their activities and collect volunteer data (Ógáin *et al*., 2012). As noted, there has been a gradual emergence of environmental volunteering organisations measuring health-related impacts associated with their volunteering activities (section 2.7). This rise has been in response to the growth in studies exploring the potential link between connecting with the natural environment and human health (Thompson Coon *et al*., 2011; sections 2.2 to 2.5). To measure these health-related impacts associated with their activities, the volunteering sector has begun to also see an emergent trend of tools and new evaluation methods which can often be influenced by the characteristics of volunteering organisations (Harlock, 2013). Understanding these characteristics of volunteering

organisations is particularly important and could have a potential impact on how volunteer data is then interpreted.

This section builds on from previous sections in this chapter and provides a description of management information systems which I touched on in the previous subsection (2.8). More specifically, this section explores those characteristics which are most relevant to the research questions and objectives in this thesis (section 1.2) and may influence the extent to which environmental volunteering organisations are able to measure health-related impacts they deliver. I have explored these characteristics outlined below through three subsections selected owing to their importance to volunteer organisations' management information and impact measurement systems: cognitive science, human factors and behavioural sciences.

A management information system (MIS) can be understood through its three components: management, information, and system. Management refers to an organisation's ability to plan, organise, control and direct its resources to achieve its intended goals. Information can be defined as processed data (e.g. raw facts and figures) which has meaning and is presented in a context. System is a set of interrelated components (e.g. data collection processes and storage facilities) which collectively work towards an organised set of goals (Al-Mamary *et al*., 2014). Together, an MIS can be described as the method of collecting, processing and storing information data to support management operations of an organisation. Examples include a financial database and volunteer impact measurement tool (see section 2.8 above). It is noteworthy that the MIS, whilst being similar, differs slightly from an information system (IS). Whilst an IS refers to people using computers to process and interpret information, an MIS is a type of IS which supports the efficiency and effectiveness of strategic management and decision-making processes in an organisation (Al-Mamary *et al*., 2014).

The emergence of the MIS can be traced back about fifty years, and its history is in part parallel to the evolution of computers. Whilst the first generation of digital computers occurred in the 1940s, the information systems were initially developed during the 1950s. These early information systems were developed and used predominantly by computer scientists and engineers owing to costs incurred to develop them (Gray, 2003). By 1965, however, more commercialised computer systems, such as mainframe computers (e.g. IBM System 360), were being produced in the form of accounting and transaction systems (e.g. spreadsheets and word processing). This was in part due to their reductions in size and cost which made it more accessible for a large company to own one and subsequently saw the start of the MIS (Gray,

2003). Owing to its success, these systems became licensed operating systems by the 1970s and 1980s being accessible amongst the non-programmer and user markets. The system went on to experience a growth in sales which coincided with the rapid rise of personal computers (Haklay and Tobón, 2002). Since then, the MIS has become used across a wide array of organisations on variable scales to support their management operations (Al-Mamary *et al*., 2014).

In addition to these technological developments, we began to see the emergence of the new research areas, surrounding Human-Computer Interactions (HCI) and usability, which rapidly grew in the 1980s in response to the growth in personal computers (Haklay and Tobón, 2002). These two research areas each play an important role in the design and development of computers systems which support people and their technological activities, yet have different purposes (Issa and Isaias, 2015). HCI is concerned with understanding how people design and use computer systems as well as those environmental aspects which surrounds it. From this information, HCI aims to meet the needs and requirements of system users to either develop or improve the systems existing design (Haklay and Tobón, 2002). Related to this, usability refers to the quality of a person's interaction with a computer system in terms of its effectiveness, performance, efficiency and satisfaction to achieve the person's goal. The quality of interaction is measured in terms of selected parameters, including time taken to perform a task or number of errors incurred (Issa and Isaias, 2015).

I will now outline those factors which can influence the development of these systems with relevance to volunteer organisations' and impact measurement systems: cognitive science, human factors and behavioural sciences.

HCI is said to be traditionally rooted in cognitive science, as well as other related disciplines (e.g. human factors engineering) and emerged during the 1960s. One of its fundamental aims was to understand a person's cognitive processes to help explained their interactions with computers and focused on a theory-based approach (Boring, 2001). A key framework put forward by Card and colleagues in the early 1980s was the information processing framework, which viewed the human mind similar to that of an information processing device (Card *et al*., 1983). The framework described the human mind to be made of three components, perception (see chapter 6), cognition and action, in which a person's internal knowledge can be an important explanatory concept for understanding their behaviour in relation to the system being explored (Hurtienne, 2009). The framework has been suggested to have shaped much of later

cognitive science in HCI, with the concepts of a person's or team's mental model (see chapter 6) being regarded as one of the tantalising ideas in this research field (Payne, 2007). To gather data relating to people's mental models a variety of elicitation tools and techniques have been developed to and used in different fields of applied research. This presents a major challenge to any discipline interested in using the construct as a means to gain insight into people's internal representations of the world. Similarly, whilst providing important insights, mental models tend to be functional rather than complete or accurate representations of reality with the inability to predict outcomes or analyse cause-effect relationships (Jones *et al*., 2011). In the context of volunteer impact measurement systems (section 2.8), how a volunteer perceives information used on an impact measurement tool to collect data has the potential to influence the data collected (Zeng and Tse, 2006). In turn, this could have a potential influence on how these datasets (e.g. health-related impacts) are then interpreted and our understanding of volunteering impacts delivered. To date, however, this remains an unexplored area that warrants further research.

Human factors is another discipline from which HCI has emerged from, and derived from problems in designing equipment during the Second World War (Harrison *et al*., 2007). The disciplines' goal focuses on optimising the human-machine fit and has been described as the practice of designing products which take account of interactions between systems and people. The discipline is pragmatic in its approach and aims to identifying design problems (Harrison *et al*., 2007). An example of this emerged during the late 1980s which saw the emergence of usability field methods, including Contextual Design (CD; see chapters 3), whose purpose was to gain further in-depth understanding of the social, cultural and organisational aspects that are relevant to a system (e.g. impact measurement system) or product (e.g. database) being explored or designed (Holtzblatt and Beyer, 2015). This qualitative method can be adapted or changed to meet the research objective, providing a more detailed understanding of an organisations' work practices that was enriched through the knowledge gained in a real-life context. It uses a small and diverse sampling population reflecting as many key characteristics relevant to the research scope were identified, thus increasing the likelihood of a heterogeneous sample (Holtzblatt and Beyer, 2015). Further, whilst the approach can be used in complimentary with other quantitative methods, findings are often grounded in the outcomes of inquiry (Löffler *et al*., 2015). In the context of volunteer organisations' management information and impact measurement systems, understanding those contextual aspects (social, cultural and organisational) that are relevant to these systems is important as they could have a

potential impact on how volunteer data is then interpreted (Harlock, 2013; Holtzblatt and Beyer, 2015). Without understanding how these impact measurement systems came into being, there is a risk of misinterpretation about what the volunteer data represents and what it informs us about the activities of volunteers. This knowledge could provide valuable insight into of the nature, veracity and meaning of volunteer data (see chapter 4). However, whilst some researchers have reviewed literature on the characteristics which may influence an organisations' impact measurement system and volunteer data collected (Harlock, 2013; Metcalf, 2013), none have to date undertaken an in-depth empirical research exploring this area.

Finally, behavioural science is a further discipline which research fields HCI and usability were built upon during the 1960s. As Jansen *et al* (2009) notes, behavioural sciences (also termed behaviourism) has traditionally focused on observing those outward behavioural aspects relating to external factors (e.g. contextual, situational or environmental) rather than those internal (e.g. thinking, feeling or knowing). However, in the context of HCI and usability, behaviourism encompasses both internal and external factors. This is because a person's outward behaviour can reflect those internal aspects in addition to other environmental factors, though not explicitly the motivations behind them (Jansen, 2009). In both HCI and usability, researchers have applied obtrusive (e.g. questionnaires and interviews) and unobtrusive (e.g. log analysis) methods in an effort to explore user's behaviour as well as to test the usability of a computer interface, depending on the research scope (Jansen *et al*., 2009). An example of this includes transaction log analysis (TLA; see chapters 3), whose purpose was to gain further in-depth understanding of how people interact with a computer system through analysing their transactions (Jansen, 2009). This unobtrusive method has no predefined tools of analysis, instead differentiating according to the type and size of information obtainable using a variety of exploratory methods. This approach can be viewed as both a strength and weakness, being flexible to meet research objectives though restricted to what data is attainable as well as the skills base of the researcher (Jansen, 2009; Yu, 2010). In the context of volunteer organisations' management information systems, understanding how staff of volunteering organisations engagement with these systems could provide an insight into its functionality and performance. As above, this knowledge could provide valuable insight into of the nature, veracity and meaning of volunteer data (see chapter 4). To my knowledge, however, this remains an unexplored area that warrants further research.

## 2.10 Summary

One of the imperatives for this chapter was to review existing theoretical and research literature on the many ways that humans are linked with the natural environment within various disciplines. Although widely discussed across the main four research fields - evolutionary psychology, environmentalism, evolutionary biology and social economics – there has been comparatively little discussion of convergence between them on defining the human-nature relationship. This chapter therefore attempts to redefine the human-nature relationship to bring further understanding of humanity's relationship with the natural environment from an interdisciplinary perspective. The chapter also highlights important complex debates both within and across these disciplines.

One of the key discussions was to explore the interrelationships between the human-nature relationship and its impact on human health. In questioning the causal relationship, this chapter addresses existing research on potential adverse and beneficial impacts in relation to humanity's degree of relationship to nature and lifestyle choices. The chapter also acknowledged current gaps and limitations of this link relative to the different types of health (physical, mental and social), as characterised by the World Health Organization in 1948. Most of these relate to research at the intersect of nature-based parameters and human health being in its relative infancy. It has also been highlighted that for a deeper sense of understanding and causal directions to be identified, requires further attention to the complexities of these aspects interlinkages, processes and relations.

The chapter also proposals a developing conceptual model of the dimensions of human health and the natural environment as viewed from the perspective of this thesis. The model was developed and is based on the philosophical underpinnings of the thesis which are rooted in pragmatism, as describe in the next chapter (chapter 3). It is based on an interdisciplinary outlook at the intersection of the human-nature relationship and human health, addressing the limitations identified in existing models. To achieve this, it combines theoretical concepts and methodological approaches from those research fields examined in this review, bringing a greater depth to data collected. In attempting this, a balance between both rigorous scientific analysis as well as collaborative participatory research will be required, adopting a pragmatic outlook. In this way, an interdisciplinary approach can facilitate a deeper understanding of the complexities involved for attaining optimal health at the human-environmental interface.

In the last two decades, there has been a gradual rise in the numbers of programmes aimed to help improve human health and the environment. The chapter explores this through the lens of

environmental volunteering activities, where studies are beginning to explore both direct (health) and indirect (pro-environmental behaviours and social-ecological resilience) health-related impacts in association with environmental volunteering activities. In particular, the chapter has reviewed the output findings (e.g. survey results) and data quality (e.g. methods used and sample sizes) of existing studies in the field. It also identified current gaps and limitations in this research area, as well as those areas which warrant further research. It is noted that there still remains uncertainty to what extent volunteering organisations deliver health-related impacts through their volunteering activities. This in part owes to an insufficient amount of evidence demonstrating the causal directions between volunteering activities and health-related impacts. Additionally, there exists an insufficient understanding about the delivery of these programmes (e.g. frequency and type of activity) knowledge which would serve as valuable background information for measuring health-related impacts over time.

Finally, the chapter explores how volunteer organisations have increasingly collected volunteer data to measure impacts associated with their volunteering activities, including those health-related. The chapter also describes management information systems used to collect volunteer impact data, which have been shown to often be influenced by the characteristics (e.g. perceptions and contextual factors) of volunteering organisations. It is suggested that understanding these characteristics of volunteering organisations is particularly important and could have a potential impact on how volunteer data is then interpreted. In this way, such knowledge could provide valuable insight into of the nature, veracity and meaning of volunteer data. Without understanding how these impact measurement systems came into being, there is a risk of misinterpretation about what the volunteer data represents and what it informs us about the activities of volunteers. However, this remains an unexplored area that warrants further research.

The general methodological framework used in this thesis is explored in the next chapter. The chapter begins by outlining the research questions and objectives to address the overall thesis aim. It then describes the theoretical underpinnings used to guide the research process. It also provides a general overview of the mixed method approach used to collect and interpret research findings, the sampling regions, sampling populations, and recruitment methods used, as well as processes used in this thesis relating to data reliability, quality, ethics and data protection. Specific and more detailed information about the methods used in this thesis are described in-depth in the case study chapters 4 to 7.

# Chapter 3: Methodological framework

The last chapter provided an overall exploration of existing empirical research on the health impacts associated with people engaging in nature-based activities. In particular, the chapter focused on those subjects that are important for the scope of this thesis: the environmental volunteering sector (section 2.6.1), and their measurement impacts systems (section 2.8) as well as delivery of health and associated impacts (section 2.7).

In this chapter, I describe the general methodological framework in which I conducted the research in this thesis, with more specific descriptions found in proceeding chapters 4 to 7. I begin by outlining the research questions and objectives to address the overall thesis aim (section 3.1). From this, I outline the pragmatic theoretical framework used to guide the research process and the different phases implemented (section 3.2.1). Specifically, I outline the mixed method approach used to collect and interpret research findings (sections 3.2.2 to 3.2.9), the sampling regions, sampling populations, and recruitment methods used (section 3.3), as well as processes used in this thesis relating to data reliability, quality, ethics and data protection (sections 3.4 and 3.5).

## 3.1 – Research questions, aim and objectives

As we have seen in the previous chapter, there is an emerging body of literature exploring the potential link between connecting with the natural environment and human health. This has resulted in a gradual rise in the numbers of programmes aimed to help improve human health and the environment, including the development of health focused programmes amongst some environmental volunteering organisations (Depledge, 2011). In response, studies have started to explore some of the benefits of engaging in environmental volunteering activities, including physical health outcomes, moods states and subjective wellbeing (e.g. Pillemer *et al*., 2010; Kragh *et al*., 2016). Much of this existing research centres on physical and mental health components with emerging literature identifying some potential social health benefits, i.e. social connectedness (Asha and Blahna, 2012). Whilst these health components can be generated in other forms of volunteering (e.g. office or charity shop based), particularly those mental and social components (e.g. subjective wellbeing, social cohesion and physical activity), environmental volunteering has been suggested to generate provide additional health benefits beyond those identified in other forms of volunteering (Barton and Pretty, 2010). This is because through engaging in environmental volunteering activities not only would this have

a direct effect on the health of both humans and non-humans but equally the functioning and integrity of ecosystem services that sustain our economic productivity (Wolch *et al*., 2014). Yet, as Jenkinson *et al* (2013) highlights, it is still uncertain to what extent volunteering organisations deliver health-related impacts through their volunteering activities. This owes in part to an insufficient amount of evidence demonstrating the causal directions between volunteering activities and health-related impacts (e.g. social-ecological resilience) as well as a deeper understanding of the delivery of these programmes (e.g. frequency, dose, type of activity).

Further, the functionality and how volunteering organisations interact with impact measurement systems has the potential to affect how volunteer data is inputted and subsequently interpreted (Voida *et al*., 2011). Understanding those characteristics which can influence or shape these systems (e.g. people's perceptions and contextual factors) can provide valuable insight into the nature, veracity and meaning of volunteer data (see section 2.9). These factors are particularly important if outcome data is to affect learning, provide information to key constituencies, enable programmes to be managed effectively and contribute to the volunteer sector (Metcalf, 2013). However, whilst some researchers have reviewed literature on the characteristics which may influence an organisations' impact measurement system and volunteer data collected (Harlock, 2013; Metcalf, 2013), none have to date undertaken an in-depth empirical research exploring this area.

The thesis therefore aims to explore some of these gaps in knowledge and contribute to this field of research. More specifically, the thesis explores the characteristics which may influence an organisations' impact measurement system, volunteer data collected, the delivery of environmental volunteering programmes (e.g. frequency), as well as the extent volunteering organisations deliver health-related impacts through their volunteering activities. Thus, the overarching aim of this research is:

*To explore to what extent environmental volunteering organisations deliver health-related impacts.*

However, as this is a broad topic it was not feasible to address its entirety in this thesis. Instead, I have narrowed the research focus, reporting from the perspective of UK environmental charity, The Conservation Volunteers (TCV), used as a case study. Therefore, the research question of the thesis is more specifically:

*To what extent do TCV deliver health-related impacts through their environmental conservation volunteering activities?*

To address the overarching aim, the thesis will also explore and attempt to answer the three following subsidiary questions (RQ):

**RQ1** *How do the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected?*

As mentioned in chapter 2, there has been a gradual increase amongst the UK volunteering sector to measure impacts associated with their activities and collect volunteer data (Ógáin *et al*., 2012). These impact measurement systems and the volunteer data collected are often influenced by the characteristics of environmental volunteering organisations (Harlock, 2013). Understanding these characteristics of environmental volunteering organisations is particularly important and could have a potential impact on how volunteer data is then interpreted. The aim of this RQ is to identify how the characteristics of environmental volunteering organisations influence their impact measurement systems and the volunteer data collected, using TCV as a case study. Without understanding how these impact measurement systems came into being, there is a risk of misinterpreting what the volunteer data represents and what it informs us about the activities of volunteers. Information gathered from this RQ provided valuable insight into of the nature, veracity and meaning of volunteer data, that I use in proceeding RQs 2 and 3.

**RQ2** *How do volunteers engage in programmes delivered by environmental volunteering organisations?*

As noted in chapter 2, whilst the study of engagement has gradually emerged in volunteering research (Mohan and Bulloch, 2012), a deeper understanding about the delivery of and volunteers' engagement in these programmes is still needed (Jenkinson *et al*., 2013). This information is particularly important to gather further understanding about the extent to which volunteering organisations deliver health-related impacts through their volunteering activities. The goal of this research question was to examine the engagement characteristics and behaviours of environmental volunteers, using TCV as a case study. Findings identified served as a foundation upon which to design proceeding research undertaken to address RQ3 below. Additionally, findings also sought to provide valuable background information for volunteer

data examined to address RQ3 to gain a deeper understanding of the delivery of these programmes.

**RQ3** *How do volunteers' perceptions of health information influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts?*

Research has shown there to be differences in how members of public perceive health (Zeng and Tse, 2006), which are influenced by various internal and external factors (Jones *et al*., 2011). Further, a person's perception of information used on an impact measurement tool to collect data has the potential to influence the data collected, which in turn could have a potential influence on how these datasets are then interpreted. It is therefore reasonable to expect that volunteers' perception of health information may influence volunteer data collected by impact measurement tools, and in turn, our understanding of environmental volunteering organisations' delivery of health-related impacts. The purpose of this RQ is to explore how volunteers' perceptions of health information may influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts, using TCV as a case study.

To answer the above research questions, this thesis sets out to address the following three objectives:

**Objective 1** *To examine how the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected.*

To address RQ1, my first objective is to examine how the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected, using TCV as a case study. To achieve this objective, I will first gather further contextual understanding of environmental volunteering organisations' work contexts, practices, impact measurement systems, and real-world environmental factors. Additionally, I will explore staff's level of engagement with supporting infrastructures as a way to understand the functionality of an existing system and the information data collected. Information gathered

provided valuable insight into of the nature, veracity and meaning of volunteer data, that I use in proceeding objectives 2 and 3.

**Objective 2** *To identify how volunteers* engage *in programmes delivered by environmental volunteering organisations.*

To address RQ2, my second objective was to identify how volunteers engage in programmes delivered by environmental volunteering organisations. To achieve this objective, I explored the engagement characteristics, contributor activity and behavioural profiles of environmental volunteers, using TCV as a case study. Findings identified served as a foundation upon which to design and make logistical decisions for proceeding research undertaken to address Objective 3 below. Additionally, findings also sought to provide valuable background information for volunteer data about health and other associated behaviours examined to address Objective 3.

**Objective 3** *To explore how volunteers' perceptions of health information may influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts.*

Finally, to address RQ3, my third objective is to explore how volunteers' perceptions of health information may influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts, using TCV as a case study. To achieve this objective, I build a collective representation of volunteers' perceptions of health, examining patterns in communications used as well as attributes associated with health and their interrelationships. Further, I explore volunteer data about health and other associated behaviours collected, using an impact measurement tool.

## 3.2 - Methodological approaches, methods and theoretical framework

### 3.2.1 – Overview

The philosophical underpinnings of the thesis are rooted in pragmatism. In the next proceeding sections, I will describe the theoretical framework of the thesis, and how it has guided the research process in terms of its methodological approaches, methods, validity, scope and interpretation of research findings.

Pragmatism has been widely defined as a philosophical approach in which our understandings and ideas of the world are grounded in the consequences or outcomes of experimental inquiry (often termed the pragmatic 'maxim' or 'principle'). It advocates the integration of mixed philosophies and methods that are best placed to meet the research question. In this way, pragmatism sees no distinctions between qualitative and quantitative perspectives. Instead, research methodologies are seen as mere tools to assist in our inquiries to understand the world (Onwuegbuzie and Leech, 2005).

Researchers have noted the various strengths of pragmatism as a philosophical approach, with some of these described here. One strength is that it enables researchers to be flexible when selecting methods to address their research goals, needs and skills base (Onwuegbuzie and Leech, 2005). The approach also allows researchers to use qualitative and quantitative methods in complementary thereby providing an in-depth view of a research study (Creswell and Clark, 2007). Such mixed method would allow for a multilevel of perspectives (Bryman, 2012), identifying not only the magnitude and frequency at which something occurs (quantitative), but to equally examine the meaning and understanding of the construct behind its occurrence (qualitative). A mixed method can also be used to assist in increasing reliability and credibility of research findings interpreted from multiple perspectives (Onwuegbuzie and Leech, 2005).

By contrast, researchers have also indicated the weaknesses of pragmatism as a philosophical approach, some of which are outlined here. Whilst a mixed method provides a wider perspective of findings, it can come at the cost of increased research effort, time and resources used by researchers (Onwuegbuzie and Leech, 2005). Further, as knowledge of the world is viewed as emergent through interaction, it is temporally stable and situated within context it derived from. Therefore, knowledge is viewed as never fully finalised and instead changing over time. In this way, some highlight the need for researchers to note how they are working within temporal time frames and what is beyond the scope of a project for future research (Dalsgaard, 2014). Moreover, others comment that pragmatic research can promote incremental change and may thus receive less attention than other applied research (e.g. quantitative) which tend to produce more immediate and practical results (Johnson and Onwuegbuzie, 2004).

The pragmatism philosophy stems from an American movement in the second half of the nineteenth century, founded by its early contributors Charles Sanders Peirce, William James, John Dewey and George Herbert Mead (Östman, 2005). It was developed firstly by Peirce and

mediated two opposing philosophies of the time: interpretivism (knowledge derives from sensory experience and observation; inductive reasoning) and scientific realism (knowledge derives from reason or evidentiary based; deductive reasoning). By the early to mid-twentieth century, pragmatism briefly went into decline before re-emerging in the late 1970s with various contemporary works (Dalsgaard, 2014). Since then, the philosophical position of pragmatism has been applied to various fields of research (e.g. information systems and design), and has led some to suggest it has evolved into different streams (Gava and Stern, 2016). In the context of this thesis, as it explores the extent to which environmental organisations deliver health-related impacts through their specially developed volunteering programmes, pragmatism is viewed through the lens of design.

Pragmatism has been widely used as a conceptual scaffold for practices in the design field (Dalsgaard, 2014). Within these, Dewey's pragmatist philosophy is generally accepted as a theory of design which focuses on creative action, exploration and development as well as combining scientific, reflective and interpretative methods (Östman, 2005). As Dalsgaard (2014) explains, this owes in part to the areas of convergence between both design thinking and pragmatism. Firstly, understandings and ideas of the world are derived from practical exploration through an iterative experimental process of action and reflection (sometimes referred to as the theory-practice relationship). Secondly, knowledge of the world is viewed as emergent through interaction, being temporally stable and situated within context. Finally, the exploratory method or instrument (e.g. language or analytics) is dual in nature, used to both frame our understanding of an inquiry and to transform it.

Pragmatism was adopted as the theoretical framework of this thesis for three reasons. Firstly, the thesis encompasses different research fields (e.g. health, environmental science and volunteering) to address the research aim which is placed central to the research process, being goal orientated. In this way, pragmatism was adopted due to its integration of mixed method approach, adopting those techniques that are best placed to meet the research question. Secondly, the thesis uses an inquiry process to understand the various factors that shape environmental volunteering organisations' impact performance which could have a potential effect on how datasets are then interpreted. Thirdly, due to its overall flexibility, the research process could be adapted according to logistical aspects, being pragmatic in nature: researcher's skills base, project scope, organisational needs, time and resource availability as well as where it is situated in the research process.

When approaching the research questions (outlined in section 3.1) from a pragmatic view point, knowledge is emergent by method of inquiry and practical exploration, being exploratory in nature and situated within context. To achieve this, I used various mixed method approaches used for inquiry and data exploration (sections 3.2.2 to 3.2.9). I will now provide an overview of the research process.

The research process in this thesis comprised of four phases undertaken over a three-year period. Each of these four phases of the research practices correspond with case study chapters 4 to 7 (see Table 3.1 for a description). Across each of these phases, various mixed methods (described in proceeding subsections) were employed to address research questions and objectives. This was guided by an iterative process that was aided by reflective inquiry based on evaluation of data information collected, as illustrated in Figure 3.1. The process started by identifying a research problem, before developing related objectives and methods to address these objectives. From findings observed in each of the four phases, these helped shape the objective and methods used for the next phase, until it was felt the research process had addressed the overarching thesis aim.

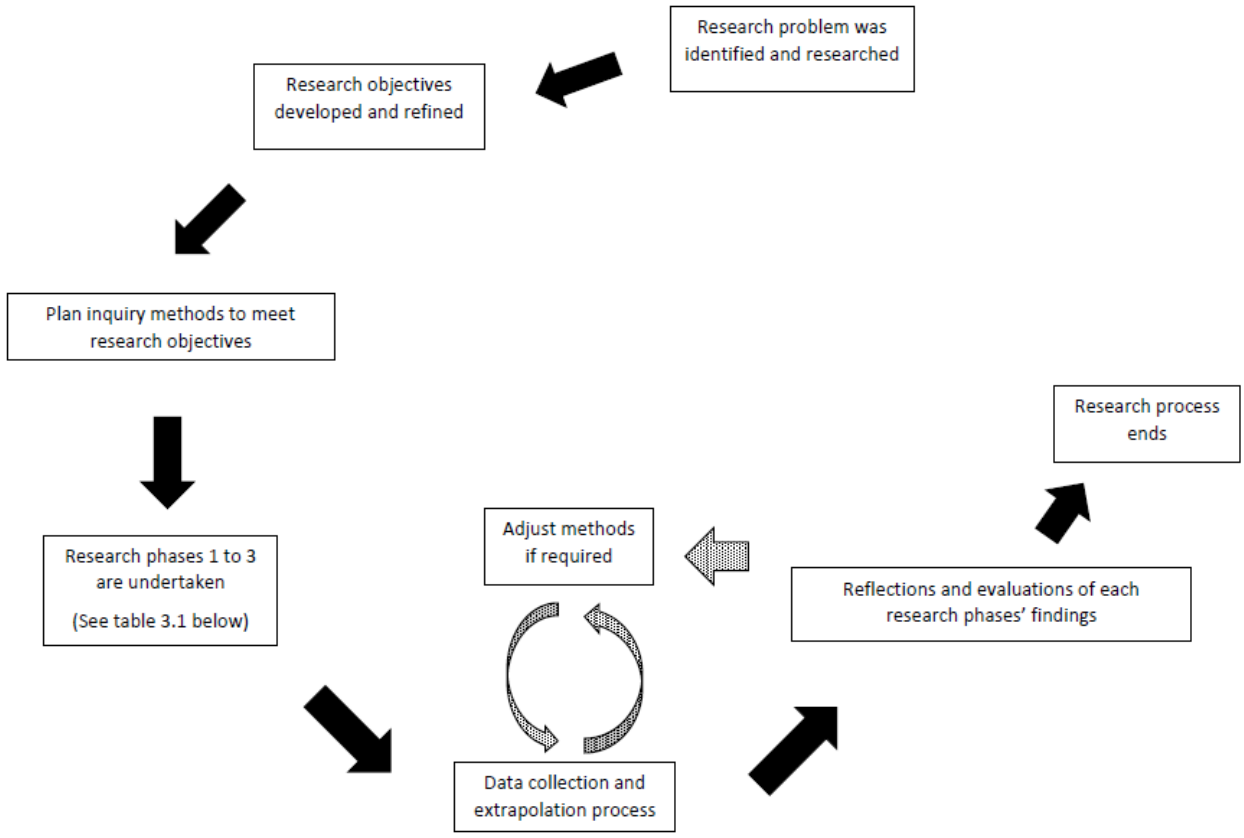

Figure 3.1: The research process applied in this thesis (Black arrows indicate main research process with grey arrows indicating adjustments to this).

The research process was further enhanced through conducting quarterly meetings with stakeholders (e.g. TCV and funders) which provided an opportunity to reflect on what had been attained, forthcoming actions to achieve research aims as well as the progression of the project plan. As part of this, written reports, presentations and active discussions were undertaken.

Such diversity in research methods offered both a richer insight and complementary views each phase of experimental inquiry. These have been summarised in Table 3.1 and are explained in further detail in proceeding sections 3.3.2 to 3.2.9 as well as the four data chapters, 4 to 7.

Table 3.1: Summary of research questions, phases, descriptions, data collection and analytical methods used.

| Research Questions | Research Phase | Description | Data collection methods | Data analysis methods |
|---|---|---|---|---|
| **1 -** How do the characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected? | **1** – Chapter 4 | Provides a contextual background about TCV and their work practices. | Contextual inquiry (semi-structured interviews and observation studies) | General inductive analytical approach |
| | | | TCV staffs' server usage log data extrapolated from MIS database | Transaction Log Analysis/ Exploratory data analysis |
| **2 -** How do volunteers engage in programmes delivered by environmental volunteering organisations? | **2** – Chapter 5 | Explores engagement patterns of TCV's environmental volunteers. | Volunteer data extrapolated from TCV's MIS database | Exploratory and confirmatory data analysis |
| **3 -** How do volunteers' perceptions of health information influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts? | **3** – Chapter 6 | Explore TCV volunteers' tacit knowledge of the term 'health', related factors and activities. | Focus group interview | General inductive analytical approach |
| | | | | Content analysis |
| | | | | Exploratory data analysis |
| | **3** – Chapter 7 | Explores the extent to which TCV's programs deliver health-related impacts on those who engage in their volunteering activities. | E-mail questionnaire survey | Exploratory and confirmatory data analysis |
| | | | Focus group interviews | General inductive analytical approach |
| | | | Structured interviews | |

### 3.2.2 – Contextual inquiry

Contextual inquiry (CI) can be described as a field method to gain further in-depth understanding of the social, cultural and organisational aspects that are relevant to a system (e.g. impact measurement system) or product (e.g. database) being explored. CI forms the initial three steps of the wider methodological framework, Contextual Design (CD), from which it derives. CD is the full design process (six steps), developed in 1988 by the Digital

Equipment Corporation. CD has been adapted from the fields of psychology, anthropology and sociology and provides suggested design recommendations for future developments of a system or product (Holtzblatt and Beyer, 2015).

The purpose and suitability of using CI in this research as a methodological approach was fourfold. Firstly, it was identified as a suitable methodological approach to gain further in-depth contextual understanding of TCVs' existing work contexts, practices, impact measurement systems, and real-world environmental factors, thereby addressing Objective 1 (chapter 4). The full design process of CD was therefore not required as my research objective was not to undertake a full design process, but to instead conduct an inquiry. As Holtzblatt and Beyer (2015) state, one strength of CD is that the steps it uses are flexible and can be adapted or changed to meet the research objective. Secondly, the purpose of CI is pragmatic in focus, in which our understandings and ideas of work practices are grounded in the outcomes of inquiry (Löffler *et al.*, 2015). Thirdly, CI provided a more detailed understanding of an organisations' work practices that was enriched through the knowledge gained in a real-life context. This is a further strength of the approach and is particularly useful when researchers are less familiar with or experienced in the work practices of an organisation. Fourthly, the methodological approach is also pragmatic in the sense that it can be adapted according to the project scope, organisational needs, time and resource availability as well as where it is situated in the research process (Holtzblatt and Beyer, 2015).

I will now describe a general overview of CI, with further information on the methods I used found in chapter 4.

The objective of CI is to incorporate a person's tacit knowledge to understanding the design and functionality of an existing system. Tacit knowledge is knowledge which is often shaped by our individual experiences, interactions, and real-world environmental factors, and may not always be articulated. CI emerged at a time when traditional methods in design research were felt by some to inadequately address peoples' requirements until the later stages of the design process, with the process instead being driven by the designer or researcher (Holtzblatt and Beyer, 2015). As Ghasemifard *et al* (2015) explains, how efficient the interface is between a person and a system being used has direct impacts on the system's overall usability and other related elements (e.g. data collected and evaluated). This subsequently led to the introduction of field methods in design research, including CI, which implement the involvement of people

and the system they use in the early stages of the design process, which strengthens this approach.

Whilst this methodology has since evolved both during its initial development as well as more recently, this thesis presents what has been termed the 'classical' form of CI (Holtzblatt and Beyer, 2015). CI uses qualitative ethnographic field methods – one-to-one interviews (section 3.2.3) and field observations (section 3.2.4) – to reveal people's tacit knowledge, their working practices in an organisation as well as other relevant real-world environmental factors (Löffler *et al*., 2015). These ethnographic field methods derive from its origins in anthropology and aim to provide a richer understanding of the social, cultural and organisational aspects that are relevant to the system being explored (Grbich, 2013). In CI, these ethnographic field methods are structured on four main principles. Firstly, to understand the social and cultural context in which a system is developed, shaped and used. Secondly, to form a partnership with the people who use the system during the design process through equal dialogue. Thirdly, to collectively interpret these peoples' knowledge and experience throughout the inquiry. Fourthly, to focus the inquiry and dialogues with these people towards meaningful topics which relate to the inquiries' research scope (Holtzblatt and Beyer, 2015). It is noteworthy that whilst the CI approach does not use quantitative methods to characterise and directly measure peoples' interactions with a system, as Holtzblatt and Beyer (2015) state, the approach can be used in addition with quantitative methods (e.g. section 3.2.9 - Transaction Log Analysis), thereby strengthening the approach.

Information data gathered is then explored and consolidated with two or more researchers as part of an interpretation session, using a general inductive analytical approach as outlined in section 3.2.7 below. From this, a series of diagrammatic work models are then developed which present a generalised representation of the key perspectives of an organisations' work contexts, practices, systems, and real-world environmental factors (Löffler *et al*., 2015). Holtzblatt and Beyer (2015) recommend using some or all of their following five diagrammatic work models that are most relevant to the research scope of the inquiry being undertaken: flow model, which presents the communications and coordination between people in an organisation in relation their work practices; sequence model, that illustrates the steps people take in an organisation to achieve a common goal(s); artefact model, which shows a detailed view of the system(s) in an organisation and how it is used; physical model, that presents the physical work environment of an organisation and how it is used to support work practices; and the cultural model, which

shows the culture, policies and procedures in an organisation and how this reflects in an organisations' overall expectations and deliverables.

In chapter 4, this diagrammatic approach was applied as follows. Interview transcripts and observation field notes were converted into an affinity diagram, used to collate and cluster notes into groupings of similarities and dissimilarities (Holtzblatt and Beyer, 2015). The affinity diagram was created using a general inductive approach (section 3.2.7). Notes from the affinity diagram were consolidated into two diagrammatic work models: sequence model, that illustrates the steps necessary to achieve a common goal(s); and artefact model, which shows a detailed view of the TCV's impact measurement system and how it is used (Holtzblatt and Beyer, 2015). Each model is a generalised representation of the key perspectives of the work environment and its operations, synthesized into a single coherent diagram. Whilst Holtzblatt and Beyer (2015) mention two further models, physical (physical work environment and how it is used to support work practices), flow (the communications and coordination between colleagues in relation to work practices), and cultural (the culture, policies and procedures in an organisation and how this reflects in its overall expectations and deliverables), they suggest using only those models relevant to the research scope. These three models were excluded due to their degree of overlap in subject matter already identified in the two models above and irrelevance to the research scope. For a final validity check, the three models were clarified in a one-to-one discussion with most (n= 9) TCV staff and was used to ensure credibility and confirmability of findings (Bryman, 2012). One-to-one discussions occurred a few days after staff participated in the interview and observational sessions. Models were found to be fully representational of findings from interviews and observation sessions, with no changes noted.

### 3.2.3 Interviews

Interviews are a data collection method in qualitative research and has been described as a "conversation with purpose" that is both collaborative and exploratory (Richards, 2009: 183). The method is similar to observation studies (section 3.2.4) in that they come under the umbrella of ethnographic research (Patton, 2002). Moreover, the method is generally regarded as suitable for gathering people's perceptions and experiences on a given issue, and widely used amongst social scientists (Richards, 2009). Whilst some have noted the method does not yield the breadth of information as do questionnaires (section 3.2.6) or identify people's intrinsic behaviours as exposed by observation studies (section 3.2.4), interviews do provide the researchers with an understanding of the world through the perspective of participants

involved and can be used in addition with other methods to strengthen data collected (Bryman, 2012). Another strength of the method is its ability to implement different approaches to meet researcher's objectives. This enables researchers to explore and validate people's experiences and views (Richards, 2009), with two types of interviews (structured and semi-structured) used in the thesis outlined below.

*Structured interviews*

Structured interviews are where a researcher requires specific information with little variation in data collected and is used often for quantitative surveys, which complements a positivist focus (Bryman, 2012). The method works where each participant is asked identical questions using the same wording and order of sequence (Richards, 2009). In this thesis, the interview method was used to collect data by those TCV staff working on specific funded projects and analysed by myself (chapter 7). This interview method presents the following strengths and weakness. Firstly, the method attempts to enhance standardisation between volunteer's responses, to ensure consistency and ease of coding (Doody and Noonan, 2013). In addition, it also limits the researcher's subjectivity and bias whereby the format and topics of the interview are pre-defined (Richards, 2009). However, a few weaknesses were observed. Firstly, due to the method's structured nature, it has been suggested to leave limited room for elaboration or further probing (Bryman, 2012). Secondly, as many of the questions were open-ended, this could leave interviews open to context effects. Nonetheless, such method enables participants to provide more in-depth responses to questions and reduces researcher bias (Patton, 2002). The method was selected by TCV to collect volunteer data which met their research objectives. A further in-depth description of how this interview method was applied in chapter 7 can be found below.

26 one-to-one structured interviews were conducted by TCV staff for a half an hour duration (n=13 hours) from June 2013 to April 2014, in association with the Change! Tool questionnaire survey. Interviews were held in TCV staff's office workplace environments, both in the office and in outdoor greenspaces, due to time and resource availability. Information explaining the nature, purpose and general format of the interviews was provided to volunteers before the interview, ensuring they understood their involvement in the research and answering any questions they had (Bryman, 2012).

The structured interviews consisted of 14 open ended questions associated with the Green Impacts project, which were presented to volunteers in a logical and consistent sequence to

collect similar types of data from all volunteers (Grbich, 2013). 6 interview questions were initiated from the survey and based on pro-environmental behaviours, with a further 8 based on areas of interest to those TCV relating to volunteering experiences and subjective wellbeing. Interview questions covered the following 4 areas: reflections of volunteering experience, the impact of volunteering on volunteers' subjective wellbeing and pro-environmental behaviours as well as on those around them. Interview questions developed were discussed between TCV members of staff with good knowledge and experience of conducting similar interviews at TCV, to enhance face validity (Patton, 2002). All interviews were audio-recorded and transcribed. To ensure validity of information gathered, all content recorded was clarified with volunteers and their identities were protected using pseudonyms (Patton, 2002).

*Semi-structured interviews*

Semi-structured interviews are situated somewhere in-between a structured (see above) and unstructured interview, gathering relevant information for inquiry (Richards, 2009). An unstructured interview is the opposite of a structured interview, where questions are unplanned and unfolds like a conversation, even if it has a purpose and focus (Bryman, 2012). With a semi-structured interview, the researcher often identifies questions or themes on an area of focus with relevance to the research objective which complements a pragmatic focus. Interviews can often use probing techniques to encourage further elaboration or explanation to follow up on interesting or unexpected avenues that emerge, shown to increase the richness and strengthens the depth of responses. Moreover, some report the use of probing increases the likelihood of obtaining difficult to compare answers thereby weakening data reliability (Doody and Noonan, 2013). However, when used in chapter 4 as the purpose was to ensure that as many key characteristics relevant to the research scope were identified, this method was therefore suitable and increased the breadth of findings obtained (Holtzblatt and Beyer, 2015). I will now explain in detail how this method was applied in chapters 4 and 7.

I will first provide details of how the method was applied in chapter 4.

15 one-to-one semi-structured interviews were conducted for an hour duration (n=15 hours) from September 2013 to January 2014. Interviews were held in TCV staff workplace environment, both in the office and in outdoor greenspaces, in order to form a relaxed working partnership (Holtzblatt and Beyer, 2015). The interviews consisted of 10 open ended questions, which were presented to staff in a logical and consistent sequence to collect similar types of data from all staff (Grbich, 2013). Interview questions were based on a previously determined

focus identified from reviewing surrounding literature (section 4.1.1) and covered the following 5 areas:

- Roles and responsibilities of TCV staff

- Communication and coordination

- Types and objectives of volunteer information data collected

- Processes and artefacts used to collect volunteer data

- Internal and external influences affecting their work context

Interview questions were discussed with a PhD student with in-depth knowledge and experience of conducting contextual inquiries in organisational settings (Patton, 2002). Questions were also piloted with 5 participants of mixed backgrounds (e.g. computer science university students, a social geography lecturer and members of an environmental organisation). Feedback enabled me to strengthen questions, ensuring they were clear, neutral and sensitive in nature, making alterations where required (Bryman, 2012). Plans were also made in case any difficulties emerged, including phrasing of complex questions or prompts, reserved staff members and discussions of sensitive topics (Doody and Noonan, 2013).

A probing technique was used throughout to encourage elaboration or explanation, using 8 focused follow-up questions (e.g. “Can you tell me more about that?”). The technique has been shown to increase the richness and depth of responses (Doody and Noonan, 2013), and was used to learn more about staff’s working goals, task expectations and assumptions behind their behavior. The technique also allowed flexibility to focus on promising avenues of conversation that might not have otherwise been in the list of questions (Bryman, 2012).

All interviews were audio-recorded and transcribed. To ensure validity of information gathered, all content recorded was clarified with staff and their identities were protected using pseudonyms (Patton, 2002). Additionally, the audio-recorder was switched off for 5 minutes in 2 interviews when instructed to by staff. This was due to the sensitive nature of information and not used for interview, with the wishes and trust of staff remaining paramount (Grbich, 2013).

The information data gathered using these above methods was explored using a general inductive analytical approach as outlined in section 3.2.7 below.

Structured interviews were also conducted in chapter as part of the resilience project as evaluated in chapter 7 with details on how this was conducted being as follows. Following directly on from the focus group interviews, a further 6 one-to-one interviews were conducted by the TCV project officer who led the project with external stakeholders and lasted for an hour duration each (n=6 hours). The reason for undertaking one-to-one rather than focus group interviews was because only one person who represented either a project partner, non-governmental organisation or local government officials would engage directly with the local community groups.

The questions and format of the one-to-one interviews were exactly the same as the focus group interviews with local community groups, being semi-structured (Bryman, 2012). Semi-structured interviews are situated somewhere in-between a structured (planned questions) and unstructured interview (unplanned questions and unfolds like a conversation) where the researcher often identifies questions or themes on an area of focus with relevance to the research aim (Richards, 2009). This approach ensured similar types of data were collected (Grbich, 2013). The only difference between these two sets of interviews were the response focuses, with local community groups measuring themselves, whilst external stakeholders were measuring a local community group based on their own reflections. Reasons for this was to provide an external view of each groups' measure of resilience, thereby enhancing validity and reliability of findings (Bryman, 2012).

All interviews were audio-recorded and transcribed. To ensure validity of information gathered, all content recorded was clarified with volunteers and their identities were protected using pseudonyms (Patton, 2002).

### 3.2.4 Observation studies

Observation studies (sometimes termed 'participant observations') is a qualitative research method and has been described by some as the systematic description of events, behaviours and artefacts that occur in people's natural environments (Grbich, 2013). The method's historical origins are somewhat unclear, with some indicating its use in ancient times, whilst others suggest its emergence in the late nineteenth and early twentieth centuries when anthropologists were exploring non-western cultures (Baker, 2006). The method gradually became a principal research approach used in ethnographic studies by anthropologists, before entering the field of sociology and is used in other research fields (Kawulich, 2005).

The method's purpose is to understand another cultural setting or way of life from the perspectives of participants as well as their tacit knowledge (section 3.2.2), with relevance to the researcher's objective (Patton, 2002). This is achieved through active observation, informal conversations with participants, as well as writing detailed field notes (Grbich, 2013). In addition, researchers have indicated the need for having an open, non-judgmental attitude as well as a great interest in learning about others and their culture (Kawulich, 2005). Further, the researcher undertaking observational studies often does so through various roles, including complete observer, observer as participant, participant as observer and complete participant (Baker, 2006). In the context of this thesis, the role I undertook was a form of observer as participant, in which as part of the contextual inquiry approach (section 3.2.2) I developed a co-interpretation partnership with TCV staff. This was to gain a comprehensive understanding of TCV's existing work practices, organisational contexts, impact measurement system and supporting infrastructures. One strength of this partnership approach, is that it enabled staff to validate observations instantly, stimulate their reflectivity as well as reducing any biases in interpretations (Holtzblatt and Beyer, 2015).

It is noteworthy that the method's application in CI has been criticized by some (Hughes *et al*., 1993) who feel that researchers do not allow enough time to fully engage in participant observation to collect an enough data to be evaluated. However, it is suggested that to obtain an in-depth amount of data, can be dependent on the researcher's skills as well as the degree of focus they implement during observation (Holtzblatt and Beyer, 2015). More generally, others feel there is an insufficient amount of time to write a complete set of in-depth field notes and is seen as a weakness of this method (Kawulich, 2005). To reduce this, the method can be enhanced using other addition methods, such as interviews, thereby validating and triangulating participant's subjective reporting (Baker, 2006).

An observation study approach was used in thesis for the following three reasons. Firstly, this qualitative inquiry was particularly useful to gather a comprehensive understanding of TCV's existing work practices, organisational contexts, impact measurement system and supporting infrastructures, thereby meeting Objective 1. This enabled me to gain additional tacit or implicit knowledge (section 3.2.2), which may not always be articulated (Holtzblatt and Beyer, 2015). Secondly, the method was used to complement semi-structured interviews (section 3.2.3) to validate staff responses (Löffler *et al*., 2015). Thirdly, it could be adapted to the researcher's project scope, as well as the time availability of TCV staff and was pragmatic in approach.

Information data gathered are then explored and consolidated with two or more researchers as part of an interpretation session, using a general inductive analytical approach as outlined in section 3.2.7 below. From this, a series of diagrammatic work models are then developed which present a generalised representation of the key perspectives of an organisations' work contexts, practices, systems, and real-world environmental factors (Löffler *et al*., 2015).

I will now provide further explanation as to how this method was applied in chapter 4 below.

Observation sessions were conducted with TCV staff members for a duration of 8 hours each (n=120 hours). Observation sessions were used to complement semi-structured interviews, in order to validate staff responses (Cowie, 2009) as well as to gain additional tacit or implicit knowledge, which may not always be articulated (Löffler *et al*., 2015).

Observation sessions occurred in staff's working environments, both in the office and in outdoor settings whilst they worked with volunteer groups. In these sessions, it was important as part of the contextual inquiry approach to create a co-interpretation partnership (section 3.2.4). This was used to gain a comprehensive understanding of TCV's existing work practices, organisational contexts, impact measurement system and supporting infrastructures. Through this partnership approach, it enabled staff to validate observations instantly, stimulate their reflectivity as well as reducing any biases in interpretations (Leicht *et al*., 2010; Holtzblatt and Beyer, 2015).

Co-interpretation partnerships were maintained throughout observations, where staff were asked to explain and comment on aspects relating to their work and use of the MIS. This inductive elicitation method enabled the context of actions and diagnostic decision-making processes to be articulated and clarified with staff members. In addition, this method helped to uncover unarticulated elements of the work context as well as identify social interactions between TCV staff (Holtzblatt and Beyer, 2015), either in the office environment or through other forms of communication (e.g. telephone or email).

Detailed field notes were taken throughout observation sessions using thick description method, which focused on staff's working environments, their communications (in person or via email) and interactions that occurred (Grbich, 2013). Fieldnotes were recorded by hand in a notebook across three columns: time and date, fieldnotes, and analytical comments about field notes (Cowie, 2009). This enabled a rich in-depth amount of data, providing an 'audit trail' of what happened, when and why, thereby strengthening the truthfulness and transparency of the results (Patton, 2002).

### 3.2.5 Focus groups

Focus groups are a type of interview used in qualitative research and differs from those interviews in section 3.2.3 which asks participants to respond to questions in a one-to-one setting (Bryman, 2012). Instead, focus groups can be described as a series of planned group discussions, with a strong emphasis on group interactions involving people in collaborative discussions on an area of interest to the researcher (George, 2013). The method is generally attributed to the sociologist Robert Merton who used it to explore the effects of mass communication on members of public after the second world war, and later became more prominent in academic research during the 1980s. Since then the method has been used in many fields, including health (Krueger and Casey, 2014).

Focus groups are often used for multiple purposes and in various contexts. These include to explore perceptions, experiences and knowledge (George, 2013). In the context of the thesis, the focus was to explore volunteer's perceptions of health. Moreover, the method uses various interactive methods, such as open-ended questions, card sorting activities, exchanging anecdotes and commenting on each other's' comments, to explore and clarify participant's views. Such a method is viewed as a strength and is an approach you are less able to do in a one-to-one interview setting and has been shown to generate more critical comments than interviews (George, 2013). In this way, it reveals the different perspectives of the group simultaneously as well as highlighting the group's vocabulary, cultural values and group norms (Krueger and Casey, 2014).

However, despite the method's strengths, some researchers have indicated few notable challenges due to its group working dynamic. Firstly, some suggest the method's ability to compromise participant's confidentiality and silence those less talkative in the group (an occurrence known as 'groupthink') limiting the variability in perspectives of the group (Krueger and Casey, 2014). Strategies were used in this thesis to reduce this effect was to moderate the interactive balance of the discussions, encouraging those quieter members to join in as well as highlighting issues of maintaining confidentiality to the group about any information that is discussed. Similarly, others raise concerns over the method's reliability and generalisability of findings (Onwuegbuzie and Leech, 2005). Whilst concerns over the method's reliability can be minimised through using the same questions and planned group discussions to increase consistency in data, making generalisations from findings can be more difficult due to the nature of the method (George, 2013).

My reasons for using focus groups as a method were as follows. Firstly, it is an effective way to elicit and explore volunteers' tacit knowledge to understand their perception of health. Such knowledge would provide further insight when interpreting volunteer data that was used for further analysis in chapter 7 (addressing Objective 3), and in turn, our understanding of environmental volunteering organisations' delivery of health-related impacts. Secondly, the method uses a knowledge exploration process which can be described as pragmatic, where knowledge emerges through discussions and reflections which are grounded in the outcomes of inquiry. Thirdly, it could be adapted to TCV's work practices and volunteering programmes as well as the time and resource availability as well as where it is situated in the research process. The information data gathered was then explored in chapters 6 and 7, using a general inductive and content analytical approaches as outlined in sections 3.2.7 and 3.2.8 below. From this, a series of diagrammatic models relevant to the research scope are developed based on data gathered to describe and visualise themes or categories identified. I will now explain how the focus group method was applied in chapters 6 and 7 below.

First, I will provide details on the focus group method applied in Chapter 6.

Data was collected through 5 focus group discussions for an hour duration (n = 5 hours) in December 2015, and were separated into three main parts: icebreakers, group discussions and card sorting activity. These three methods were used as tools to elicit participants' tacit knowledge and explore their perceptions on health and wellbeing to meet the chapter's aim. Focus groups were held in outdoor settings (e.g. woodlands and beside urban lakes) during the lunchtime breaks of each volunteering group, to form a relaxed working partnership. This was due to the time and resource availability of both TCV project officers and volunteers. Information explaining the nature, purpose and general format of the focus group discussions was provided to staff and volunteers before the discussions were undertaken, ensuring they understood their involvement in the research and answering any questions they had (Bryman, 2012). All focus group discussions were audio-recorded and transcribed. To ensure validity of information gathered, all content recorded was clarified with volunteers and their identities were protected using pseudonyms (Patton, 2002).

Ice breaker sessions were used at the start of the focus group discussions. In these sessions, TCV volunteers were asked to say their name and a little bit about themselves as a way of introduction. This was used as a pre-intervention strategy to engage TCV volunteers in understanding the objectives of the study, as well as allowing me to become acquainted with

them and increasing group interpersonal interactions (Kilanowski, 2012). During the transcribing of this session, volunteers' identities were protected using pseudonyms (Patton, 2002), with data collected not being used in the main data analysis. This was because the session was used purely as only a pre-intervention strategy and did not relate to the chapter's overall aim.

The focus group discussion came directly after the ice breaker session and consisted of one open ended question ("*how would you define the term health?*"). An opened ended question was selected to initiate the focus group discussion about defining health as well as enabling volunteers to provide rich and in-depth responses (Patton, 2002). From this question, volunteers were asked to define health in their own words to gather and explore their perceptions on health. Volunteers were asked to think for a few minutes before engaging in a group discussion, recording their answers onto post-it notes, an interactive method shown to help facilitate discussions, draw out central ideas and encourage those reluctant participants (Peterson and Barron, 2007).

The open-ended question was discussed with a research fellow with in-depth knowledge and experience of conducting interviews and focus group discussions centred around people's perceptions, to enhance face validity (Patton, 2002). Feedback enabled me to strengthen the question, ensuring it was clear, neutral and sensitive in nature, making alterations where required (Bryman, 2012). Plans were also made in case any difficulties emerged, including prompts, reserved volunteers and discussions of sensitive topics (Doody and Noonan, 2013).

A probing technique was used throughout to encourage elaboration or explanation, using 5 focused follow-up questions (e.g. "Can you tell me more about that?"). The technique has been shown to increase the richness and depth of responses (Doody and Noonan, 2013), and was used to learn more about volunteers' knowledge, understanding and assumptions about the term health. The technique also allowed flexibility to focus on promising avenues of conversation that might not have otherwise been in the list of questions (Bryman, 2012).

The card sorting session came after the focus group discussions, and asked volunteers to describe what they saw on the card before ranking them in order of importance based on a group decision. This method of organising cards into ranks is an effective way of directly eliciting information about how people subjectively perceive those attributes that make up a subject in terms of their importance (Petrie *et al*., 2011). The method also enabled the order of ranked cards chosen by each group to be validated with volunteers for a final validity check,

with no changes noted (Jones *et al*., 2011). This session came after the focus group discussion so not to influence or bias volunteers' responses about their perceptions of health.

The session used a closed card sorting approach in which volunteer' were asked to rank predetermined information categories presented on a card, rather than an open card sorting where information categories are selected by participants and are unknown. Closed card sorting was selected to understand volunteers' perceptions of known health attributes and their level of importance to the volunteers based on their perceptions of health (Wood and Wood, 2008). From this, comparisons can be made been volunteers' health perceptions identified in the proceeding focus group discussions and how they might differ from known health attributes.

Information on the cards were based on the Measures of National Well-being framework, developed by the Office of National Statistics UK in 2014, and used to measure the UK's national wellbeing (See www.ons.gov.uk/well-being). The framework was selected for two reasons. Firstly, it was consistent with the definition of health used in this thesis, where health in the context of this thesis is viewed more generally as the physical, social, and mental well-being of humanity (Fleuret and Atkinson, 2007). Secondly, as the framework was based on a public consultation, incorporating the perspectives of the UK public members on how they perceive health, it could be used to compare volunteers' views with those of the public, and whether being involved in environmental volunteering activities alters volunteers' health perceptions with regards to the environmental factors (see the framework's domains below).

The framework itself comprised of 10 objective and subjective measurement domains: personal wellbeing, health, relationships, what we do, where we live, natural environment, personal finance, economy, governance, and education and skills. Volunteers were provided with a set of cards with the names and a brief description of the 10 domains written on them, one domain per card. Volunteers were then asked to discuss each of the cards, before ranking them in order of their perceived importance, based on a group decision. '1' was regarded as the most important, and '10' being the least. This approach enabled more in-depth information about the 10 attributes associated with health and their interrelationships to be identified. The session also allowed for comparisons to be made between volunteer groups on how they value and weight attributes associated with health (Nudelman and Shiloh, 2015).

I will now outline the focus group method used in Chapter 7.

The Resilience project implemented a focus group interview research design to assess the impacts of engaging environmental volunteering activities on the resilience of local community

groups. 13 focus group interviews were conducted for an hour duration (n=13 hours) with local community groups from 2011 to 2014. These were conducted by the TCV project officer who led the project and myself, both having in-depth knowledge and experience of using this method. Focus group interviews were held at community centres, booked conference rooms and offices used by local community groups and external stakeholders, due to time and resource availability of participants.

Four open ended questions were selected to initiate the focus group discussion (see appendix 5). The four open ended questions aimed to explore the four themes central to the Resilience Framework as outlined in the previous section. Each question was first discussed and then measured using a 5-point Likert scale with a total score of 20. Volunteers were asked to think for a few minutes before engaging in a group discussion, recording their answers onto post-it notes, an interactive method shown to help facilitate discussions, draw out central ideas and encourage those reluctant participants (Peterson and Barron, 2007).

Interview questions developed were discussed between TCV members of staff with a good level of knowledge on social-ecological resilience and experience of conducting similar interviews at TCV, to enhance face validity (Patton, 2002). Plans were also made in case any difficulties emerged, including phrasing of complex questions or prompts and any reserved members of the local community groups interviewed (Doody and Noonan, 2013).

A probing technique was used throughout to encourage elaboration or explanation, using 5 focused follow-up questions (e.g. “Can you tell me more about that?”). The technique has been shown to increase the richness and depth of responses (Doody and Noonan, 2013). The technique also allowed flexibility to focus on promising avenues of conversation that might not have otherwise been in the list of questions (Bryman, 2012).

### 3.2.6 E-mail questionnaire surveys

E-mail questionnaire surveys are a type of quantitative research method, used to gather information from a target sampling population. This method shares many similarities with other types of surveys yet uses an online mode (e.g. embedded in an email or link to a survey URL) of data collection (Fan and Yan, 2009). These surveys consist of a series of questions and other prompts, which can be structured and formatted to meet a research objective (van Gelder *et al*., 2010). Since their emergence in the 1980s, e-mail questionnaire surveys have gradually become widely used in survey research in various disciplines (Evans and Mathur, 2005).

Researchers have indicated various strengths and weaknesses with the method of data collection. In general, e-mail questionnaire surveys are regarded as a cost-effective approach which can reach audiences over a wide geographical distribution (Evans and Mathur, 2005). Yet as some note, challenges have been identified in relation to declining response rates which can create non-response biases. Reasons for this include perception as junk mail, time availability, as well as no direct internet access at participant's home (Fan and Yan, 2009). To reduce these challenges, some suggest the use of follow-up reminders to increase response rates, as well as the use of more personalised e-mail surveys (van Gelder *et al*., 2010). A further strength of this survey method is the ease of data entry and analysis for researchers, with all survey information inputted by participants and all stored in a database for further analysis. Nonetheless, as a few studies highlight, there can be difficulties of incomplete or limited data collected (Evans and Mathur, 2005). This can relate to various factors, including length or format of survey, and participant's lack of experience or expertise in using online surveys (Fan and Yan, 2009).

In this thesis, e-mail questionnaire surveys were selected and implemented by TCV, with volunteer data collected evaluated by myself in chapter 7 to examine the organisation's delivery of health impacts (Objective 3). There were three reasons why TCV selected this method. Firstly, as mentioned the method was a cost-effective way to collect volunteer data over a large geographical scale. Secondly, the method provided an ease of data entry, storing all volunteer responses onto the MIS. In this way, this effectively limited the amount of work undertaken by staff, reduced potential effects of interviewer biases and ensured volunteers voluntarily consented to being involved. Thirdly, this mode of survey was based on pragmatic considerations, so it could be easily created and adapted to TCV's work practices and volunteering programmes due to its overall flexibility.

The information data was gathered using two approaches depending on the types of questions, whether open (e.g. questions beginning with 'why') or closed (e.g. multiple-choice question). Firstly, open response questions were explored using a general inductive analytical approach as outlined in section 3.2.7 below. Secondly, closed response questions were analysed using exploratory data analysis as outlined below in section 3.2.9. I will now provide further details regarding the e-mail questionnaire surveys used in chapter 7 below.

1450 e-mail questionnaire surveys were completed by TCV volunteers from April 2011 to April 2014. Of these surveys, 274 were collected as part of the Green Exercise project and 1176

were collected as part of the Change! Tool project. The process in which volunteer data is collected as part of these two surveys is described in further detail in chapter 4 (section 4.3.4). Surveys were administered at variable intervals of approximately one, three and six months after starting volunteering sessions. This was due to the nature and practicalities of volunteering activities, where there can be difficulty for surveys to be completed before volunteering sessions begin, particularly if the population sample are unknown before engaging in these activities. It is therefore assumed that a person's baseline is established early on at the start of volunteering.

### 3.2.7 – General inductive approach

A general inductive approach (GIA) is a qualitative analytical method. GIA uses a generalised inductive coding technique whereby the researcher identifies key themes or categories and the linkages between these that emerged from the raw textual data (e.g. interview transcripts) being analysed. These key themes, categories and their linkages which are then condensed into a summary of findings (Thomas, 2006).

The GIA approach was regarded as a suitable method to be used in this thesis for several reasons. GIA uses a pragmatic approach and has no specific underlying philosophical assumptions which may otherwise help guide and interpret research findings (Grbich, 2013). Whilst this approach could be viewed as a weakness, unlike other qualitative analytical approaches which are associated with specific approaches or philosophical traditions (e.g. Grounded Theory), GIA's strength is that findings are not obscured or reframed by these underlying philosophies (Thomas, 2006). Further, whilst GIA does share similarities to Grounded Theory; an inductive analytical approach which generates a theory from textual data (See Grbich, 2013); GIA differs in its general coding process and outcomes which aims to describe important themes or categories relevant to the research objectives that are then developed into a model or theory. As Thomas (2006) states, the strength of this approach is that it is particularly helpful for those, like myself, who are unfamiliar with the more tradition qualitative procedures, due to its simple and nontechnical means of undertaking qualitative analysis. This method is described more fully in chapters 4, 6 and 7.

In the context of this thesis, the method was used to explore information data gathered from interviews, observations, focus groups and e-mail questionnaire surveys (sections 3.2.3 to 3.2.6), with details on how it was applied to each case study chapter (4 to 7) found below.

In chapter 4, this inductive analytical approach was conducted by myself and a fellow PhD student, each with in-depth knowledge of management information systems and organisation science, to reduce any researcher bias (Grbich, 2013). Intercoder reliability was measured using a simple proportion agreement method due to the large-scale variations in coding, and exploratory nature of the study (Campbell et al., 2013). From this, reported intercoder agreement scores of 85% percent was identified which is deemed acceptable (Kurasaki, 2000; Campbell *et al*., 2013).

In chapter 6, this inductive analytical approach was conducted by two coders (myself and a fellow PhD student) each having extensive knowledge of health and human perceptions. This thereby reduced researcher bias as well as increasing credibility, value and validity of findings (Patton, 2002). Intercoder reliability was measured using a simple proportion agreement method due to the large-scale variations in coding, and exploratory nature of the study (Campbell et al., 2013). From this, reported intercoder agreement scores of 89% percent were identified which is deemed acceptable (Kurasaki, 2000; Campbell et al., 2013). This was achieved using a codebook and interrater agreement between coders on coding categories and level granularity (Campbell *et al*., 2013). The codebook contained the following aspects: code type, basic definition of code, a full description of code, granularity of code, guidelines of when and when not to use it as well as examples. Using this approach, it facilitated a systematic approach, thereby increasing consistency in coding, intercoder reliability as well as training and support to all coders (Campbell *et al*., 2013). From this, a conceptual map of volunteers' perceptions of the term 'health' was developed to describe and provide a visual map of themes or categories identified.

In chapter 7, the general inductive approach was conducted by myself and the TCV project officer who oversaw volunteer data collected. Each coder was selected due to their in-depth knowledge of health, pro-environmental behaviours and social-ecological resilience, to reduce any researcher bias (Grbich, 2013). Intercoder reliability was measured using a simple proportion agreement method due to the large-scale variations in coding, and exploratory nature of the study (Campbell *et al*., 2013). From this, reported intercoder agreement scores of 81% percent was identified which is deemed acceptable (Kurasaki, 2000; Campbell *et al.*, 2013). This was achieved using a mutual codebook and interrater agreement between coders on coding categories and level granularity (Campbell *et al*., 2013). The codebook contained the following aspects: code type, basic definition of code, a full description of code, granularity of code, and guidelines of when and when not to use it as well as examples. Using this

approach, it facilitated a systematic approach, thereby increasing consistency in coding, intercoder reliability as well as training and support to all coders (Campbell *et al*., 2013).

### 3.2.8 Content analysis

Content analysis is a method of analysing an array of written (e.g. textual data), visual or verbal forms of communication (Stemler, 2015). The method has been suggested to date back to eighteenth century Scandinavia to examine hymns and has recently become more widely used in health studies (Hsieh and Shannon, 2005). The method uses various approaches which are determined by the research objective being explored complementing a pragmatic approach and can be qualitative or quantitative as well as inductive or deductive (Elo and Kyngäs, 2007). In the context of this thesis, I will focus here on the quantitative and inductive approaches.

The quantitative approach is defined as a systematic and objective way of describing and quantifying phenomena enhancing our understanding of textual data (Elo and Kyngäs, 2007). The approach is said to be a quantitative analysis of qualitative data, and codes textual data into categories before implementing statistical analysis (Hsieh and Shannon, 2005). This approach can be applied through various methods (e.g. frequency counts) to explore trends and patterns of words, as well as their underlying relationships to understand their usage rather than to than to infer their meaning (Grbich, 2013). As such, this approach was regarded as a suitable approach to build a collective representation of volunteers' perception of health, examining patterns in communications used as well as attributes associated with health and their interrelationships (Objective 3).

Further, an inductive approach to content analysis is where categories derive from the text through open coding and creating categories, going from specific categories to those general (Elo and Kyngäs, 2007). Such approach can be particularly useful where there is unknown, limited amount or fragmented knowledge on a subject area of interest (Stemler, 2015). Moreover, though some have criticised this analytical approach for being too simplistic, the method was chosen due to its overall flexibility in meeting the research objective. In this way, the method could be adapted to meet the researcher's skills base, project scope, as well as information data obtainable, and is thereby viewed as a strength of this approach (Elo and Kyngäs, 2007).

From categories identified, an Exploratory Data Analysis method (section 3.2.9) relevant to the research scope was then applied, with further details on how this method was applied in chapter 6 found below.

Focus group transcribed data was also analysed through a quantitative Content Analysis approach to characterise and measure patterns in volunteers' words, expressions and communications used to describe health (Hsieh and Shannon, 2005). This approach was used to provide further insight in relation to volunteers' meaning and interpretation of the term 'health'. It also analysed general descriptions used and comparisons of words used across the volunteer groups (Grbich, 2013).

Words used by volunteers across each of the focus group discussions to describe health was analysed using an exploratory analytical approach. Exploratory data analysis is an inductive analytical approach to data exploration with no fixed set of procedures. This analytical approach was implemented to reveal and visually represent the underlying features of the dataset, using both graphical (e.g. bar charts) and non-graphical (e.g. descriptive) summaries (Jebb *et al*., 2016). It was implemented as follows. Firstly, the total number of words used by volunteers to describe health as well as the percentage proportion of words used relative to the total number of words across all the volunteer groups was calculated. Secondly, the total frequency of the most reoccurring words used was calculated to identify which words are commonly or more widely used and how this may differ between the volunteer groups. Thirdly, the average counts per word and the standard deviations between them was calculated to assess how often words are used as well as their variability in usage between the volunteer groups. These three areas of analysis were used to examine not only the diversity of vocabulary and terminology used by volunteers across the five groups, but also how frequently they were used. By exploring the diversity and frequency of words, it is said to be a useful indicator of those concepts or attributes which are most important to people (Grbich, 2013). Through understanding those health concepts or attributes which are most used by volunteers, it therefore provides an insight into the general meaning these words and how widespread they are used amongst the volunteering groups.

### 3.2.9 – Exploratory and confirmatory data analysis

Exploratory Data Analysis (abbreviated to EDA), is a broadly defined methodology and owes in part to its changing nature as new methods emerge (Yu, 2010). Though techniques existed previously, the term itself, EDA, was introduced in a book by Tukey and colleagues (1977). It is described as a flexible inductive analytical approach to analysing data, using both graphical (e.g. visual representations) and non-graphical (e.g. descriptive summaries and cluster analysis) techniques with no fixed set of procedures (Jebb *et al*., 2016). As such, the approach is context specific and is driven by the object of analysis which complements a pragmatic focus and is

reliant on the skills base of the researcher (Yu, 2010). Further, the approach serves for two interlinked purposes. Firstly, to develop a comprehensive understanding of the underlying structures in the dataset, which is a strength to this approach. Secondly, to generate further hypotheses for statistical testing (deductive data analysis) as well as identify alternative or additional avenues of analysis and is a further strength of this approach (Constello, 2009). In the context of this thesis, I refer to those inductive analytical approaches for general data analysis, as well as those approaches used to explore people's patterns of interaction or engagement.

In contrast, Confirmatory Data Analysis (CDA) has been defined as a deductive analytical approach and uses traditional statistical tools to understand the underlying distributions of and to test a hypothesis in a dataset (Dytham, 2011). CDA complements a positivist philosophical focus, which tests and provides evidence to suggest if a hypothesis is true or false and is viewed as a strength of this approach. This analytical approach first emerged in the eighteenth Century, with most modern approaches developed during the early to mid-20$^{th}$ Century, and is an analytical approach used widely across most scientific research disciplines (Fielding, 2007). The method differs from EDA in that it requires a preconceived hypothesis or assumption previously to the evaluation of a dataset and must meet a set of assumptions before statistical tools can be implemented (Dytham, 2011). In this way, to generate further hypotheses for researchers to undertake statistical testing, a comprehensive understanding of the underlying structures in the dataset is first required. In the context of this thesis, I refer to those deductive analytical approaches to identify differences and relationships between datasets as well as for general data analysis.

The purpose and suitability of using both EDA and CDA in this thesis was threefold. Firstly, as Tukey (1980) and others have commented, there is the need for implementing both EDA and CDA analytical approaches in data analysis to gain an in-depth understanding of datasets. This is because whilst EDA provides a comprehensive understanding of the underlying structures in the dataset which can aid researcher's in developing a hypothesis and selecting statistical tools, CDA can provide evidence that a hypothesis is true or false using these statistical tools (Constello, 2009). In this way, data analysis incorporates the strengths of each analytical approach, thereby reducing each of their weakness. Secondly, EDA is useful where existing knowledge maybe unknown, limited or fragmented. It is also useful where the size and scale of datasets may not meet the assumptions of or are more difficult to be evaluated using CDA (Yu, 2010). Thirdly, both approaches could be adapted to the researcher's skills base, project scope, time availability as well as data obtainable (Jebb *et al*., 2016).

I will now outline the types of EDA and CDA used in this thesis, using TCV's volunteer data, and how they each contribute to the aim and objectives of the thesis: transaction log analysis, engagement characteristics and profiles as well as general data analysis.

*Transaction log analysis*

Transaction log analysis (TLA), is an unobtrusive method used to explore electronically recorded interactions (log files) between a computerised system and the users of that system (Jansen, 2009). The method emerged during the mid-to-late 1960s to evaluate the performance and usage of early online data retrieval systems (Peters, 1993). Since then it has become widely used in Human-Computer Interaction research to observe user behaviours or system performance derived from people's usage patterns (Jansen, 2009). Such usage patterns (e.g. type, context, time duration and frequency of activity) largely differentiate according to what data is obtainable or required and are evaluated using a variety of EDA methods. The applicability of this approach can be viewed as both a strength and weakness, being flexible to meet research objectives though restricted to what data is attainable (Jansen, 2009).

In chapter 4, the approach was used to characterise TCV staffs' usage patterns to gain contextual understanding of their work practices, program management, and volunteer data collected, thereby addressing Objective 1. The approach was based on 12 TCV staff consented to participate between January and September 2014 and conducted as follows. Staff server usage logs were first extrapolated from TCV's MIS for the period September 2013 to September 2014, to account for any seasonal patterns relating to their conservation activities. Due to the nature and scale of the dataset extrapolated, staff usage logs were monthly summarised to ensure consistency. Each staff had a total of server usage logs (144 in total). It included the following data items: type of information accessed or uploaded (volunteer, volunteer project, volunteer programme and TCV site information details), TCV staff login unique identifying number, action performed (when a form is 'added' or 'edited' onto MIS) and timestamp (date and time). Server usage logs were then examined using an exploratory data analytical approach, again due to the nature and scale of the dataset extrapolated. EDA is an inductive analytical approach to data exploration with no fixed set of procedures (Jebb *et al*., 2016) and was used to reveal and visually represent the underlying features of the dataset (Yu, 2010), using both graphical (e.g. bar charts) and non-graphical (e.g. descriptive) summaries.

EDA was implemented as follows. Firstly, the total number and percentage of activities across the different job roles and types of activity on each of the four forms accessed (e.g. forms added and edited) was compared. Secondly, differences in annual activity between the two regions was evaluated. Thirdly, comparisons between staff members were assessed both between the total number of days' activity occurred on forms accessed as well as between total numbers of forms accessed. These three areas of analysis were used to examine relationships and differences in relation to TCV staff's MIS activity usage between the two regions.

*Engagement characteristics and behavioural profiles*

In chapter 5, EDA techniques were applied to explore engagement characteristics and behavioural profiles. Engagement characteristics and behavioural profiles refer to distinct engagement patterns exhibited by a person(s) which collectively can be used as a baseline to construct a profile of a person's behaviour. In the last 10 years, there has been an increase in the use of computerised databases and online platforms by conservation volunteering programmes, archiving electronic records of volunteer's activities (e.g. tasks and hours contributed). Using these sources of information, researchers have begun to evaluate volunteer's activity records to identify engagement patterns and behavioural profiles that can be derived (Neis and Zipf, 2012; Ponciano and Brasileiro, 2014). In particular, the thesis implements and expands on these analytical methods, using various EDA approaches. It is noteworthy, that whilst one weakness of this method is that it fails to understand the underlying mechanisms and contextual information, as Jansen (2009) suggests, it can be used in addition with qualitative methods (e.g. section 3.2.2 - Contextual Inquiry), thereby strengthening the approach. In the context of this study, the approach was used to gain further understanding about volunteers and their engagement in programmes delivered by environmental volunteering organisations. In this way, it addresses Objective 2, and was used to inform us about the activities of volunteers in TCV and the underlying mechanisms of behaviours exhibited. A more detailed description of how engagement characteristics and profiling methods were used in chapter 5 are explained below.

Engagement characteristics and contributor activity of volunteers was identified and assessed as follows. Firstly, exploratory data analysis, both graphical (Bar graphs) and non-graphical (Descriptive tables, ratio proportions and percentages), was used to reveal the underlying features of the dataset in relation to the following: volunteer numbers, net annual changes in volunteering numbers, length of time volunteering, number of volunteering sessions attended,

number of days in-between sessions, proportion of "One-Session" to "Multi-Session" types of volunteers, volunteer motivations, as well as their individual contributions to overall volunteering activities. This analytical approach was used due to the nature and scale of the dataset and enabled a comprehensive understanding of its underlying structures in the datasets (Constello, 2009). In addition, this approach was used to generate further hypotheses for statistical testing outlined below and identify alternative or additional avenues of analytical exploration (Jeb *et al.*, 2016).

Volunteer engagement profiles were identified using engagement metrics and clustering algorithms described by Ponciano and Brasileiro (2014), which analysed engagement patterns of those who participated in online citizen science projects. Online citizen science projects (e.g. Snapshot Serengeti, Galaxy Zoo, Wikipedia) are those whereby participants volunteer their cognitive abilities and classify information or images to help scientists and researchers solve research problems (Ponciano and Brasileiro, 2014). Reasons for using this analytical method owed to a number of similarities shared between both online citizen science and TCV projects. Firstly, information about volunteers and their activities is collected as they engage in each of these projects. Secondly, each of these projects includes volunteers who attended only one volunteer session. Finally, as the MIS contained similar type of volunteer data as that used in Ponciano and Brasileiro (2014)'s study, this presented scope for the applicability of these methods to explore TCV volunteers' engagement patterns and behavioural profiles.

Unlike Ponciano and Brasileiro's (2014) analysis, the current study includes volunteers who attended only one volunteer session. This was to ensure a full-scale assessment of all volunteer profiles that are encountered and 'engage' in volunteering activities could be made and understood (Rochester, 2006). Such type of volunteer meets the criteria set out by Cnaan *et al* (1996) based on 200 volunteer definitions.

Three of the four engagement characteristics defined by Ponciano and Brasileiro (2014) were used: Activity Ratio, Relative Activity Duration and Variation in Periodicity. Such characteristics are particularly useful for understanding a volunteer's level of productivity, attendance frequencies and length of time spent volunteering in order to evaluate their degree of engagement. Whilst Ponciano and Brasileiro (2014) also include 'daily devoted time' as the fourth metric to analyse the average number of hours a person volunteers over the total time they are linked to the volunteering project, as TCV did not record this data I was unable to include this metric. Activity Ratio is the number of days a volunteer was active divided by the total days they are linked to the volunteering project, i.e. all of the days between the first and last days of engaging in volunteering activities. A volunteer was considered to be active if they

attended at least one session. Relative Activity Duration is the ratio between the numbers of days a volunteer was active divided by the overall study observation period in days. Finally, Variation in Periodicity is the average number of days elapsed between two sequential active days of an individual divided by the total average of days elapsed between active days of all individuals. Engagement metrics were then normalised to span 0 to 1 using the following normalisation scaling formula where *x* is the engagement metric and *i* is the volunteer:

$$X_{i=\frac{x_i - x_{min}}{x_{max} - x_{min}}}$$

In addition to the three engagement characteristics outlined above, distances travelled by volunteers was included in the engagement profiling method. This was calculated using ArcGIS. Volunteer's place of residence and TCV sites were first geocoded using Code-Point® Open dataset and ESRI's World Street base map data. As 2,896 (27.9%) of volunteer postcodes for their places of residence were either missing or incorrect, the analysis was based on a total of 7,475 volunteers for the three regions, Greater London (4887), Greater Manchester (624) and Yorkshire (1964). Using OS Master Map® Integrated Transport Network Layer dataset (Version 09/2015), the shortest distance (in miles) between each volunteer's places of residence and TCV volunteering sites was calculated (Zhu *et al.*, 2013), approximating the distance travelled by volunteers using the shortest route between locations inclusive of roads (Nicoară and Haidu, 2014). This ensured a higher degree of accuracy than the Euclidean (straight line) distance, taking account for actual street network structures (e.g. bridges, rivers and road networks) that can affect volunteer's distances travelled and time investment (Nicoară and Haidu, 2014). This is particularly important in London, where a short distance across the river can be translated to a much longer travel time on the road, due to the limited number of bridges.

Following this, I identified behavioural profiles of volunteers who exhibited similar engagement characteristics using a clustering analytical approach (Ponciano and Brasileiro, 2014). This inductive analytical inquiry is a commonly used technique for classifying information data into categories or groups that share similar characteristics and is used where no previous knowledge of these categories or groupings are known. Firstly, the hierarchical cluster analysis using the R package 'cluster' (Maechler *et al.*, 2015) was applied. This was to understand the grouping of volunteers using Ward's Minimum Variance method to estimate the observed similarities and dissimilarities between volunteer's engagement metrics. Drawing on this, the within group sum of squares by the number of clusters for each dataset region was then plotted to identify the significant number of grouped clusters. Both the hierarchical cluster

analysis and within group sum of squares were selected as suitable techniques for identifying the significant number of grouped clusters in large datasets as there was no previous knowledge of these categories or groupings known (Fielding, 2007). K-Means clustering approach was then applied to partition data points into the *k* number of groupings selected, which sorted data values according to the nearest mean at each cluster's centre. K-means clustering was used due to there being a known number of grouped clusters (identified above), as well as its ability to be used with large datasets. This increased the generalisability of findings, and the method's overall efficiency in terms of its computational costs (Wagstaff *et al*., 2001). An Averaged Silhouette Width was then used to validate the numbers of clusters selected and evaluate each cluster's degree of tightness and separation (Hennig, 2015). This owed to the method's compatibility to be calculated with Euclidean distance, and as no previous knowledge of these groupings was known. Those scores equal to or larger than 0.51 were used as a reference to indicate sufficient partitioning (Rousseeuw, 1987). In addition, a Spearman's rank correlation coefficients were used to observe whether relationships could be identified between each of the engagement metrics that would further explain volunteer engagement profiles. This non-parametric test was identified as a suitable method as the dataset was not normally distributed and therefore violated the assumptions of a Pearson correlation coefficient (Fielding, 2007).

*General data analysis*

General data analysis refers to those more commonly used inductive analytical approaches (graphical and non-graphical) which form the basis of EDA, as outlined above, to uncover patterns and structures of datasets. These include scatter plots, bar charts, measures of central tendency and data distributions (Jebb *et al*., 2016). In the context of this study, the approach was used to explore volunteers' perceptions of health and wellbeing in order to assess the extent to which TCVs' environmental volunteering programs deliver these related impacts, addressing Objective 3.

In chapter 7, this was applied as follows. All questionnaire survey datasets were evaluated and summarised using an exploratory data analytical approach, due to the nature and scale of the survey data. Both graphical (bar graphs) and non-graphical (descriptive tables) methods were used. Those analytical approaches applied differentiated according to what volunteer data was collected by TCV and are evaluated using a variety of exploratory methods. As such, this approach was flexible to meet research objectives though restricted to what data is attainable (Jansen, 2009). Datasets were analysed using exploratory analytical approach as follows:

volunteers' total scores, individual survey question scores, number and proportion of volunteer responses to SWEMWBS scores in the Green Exercise survey, total number of days active per Green Exercise survey, percentage change in volunteers' pro-environmental scores for the Change! Tool survey, differences between Green Gym® and Action Team volunteers' individual pro-environmental behaviour scores for the Change! Tool survey, as well as differences between local community group and external stakeholders' individual resilient characteristic scores. General descriptions of each survey's total scores, individual question scores, and differences between repeated questionnaire surveys completed were calculated (except the Resilience questionnaire survey), measuring their central tendency (mean and medium) and spread (upper and lower quartiles, standard deviations and range). This was done for those volunteers that completed the baseline and later follow-up surveys only, excluding non-respondents. In this way, the degree and types of health-related impacts associated with engaging in TCV's environmental volunteering activities could be identified and further examined to assess for variable differences (Dytham, 2011).

*Confirmatory data analysis*

Various forms of CDA approaches are used in this thesis to identify differences and relationships between datasets as well as for general data exploration. These include Pearson correlations to test relational associations, and analysis of variance to assess differences between survey scores (Fielding, 2007). In this context of this thesis, the approach was used to examine the motivations and engagement characteristics of TCV volunteers and their health-related impacts. A detailed description of how it was applied in chapters 5 and 7 are found below.

In chapter 5, confirmatory data analysis was used to assess relationships, interactions and differences between geographical regions, year of analysis as well as TCV sites. This was carried out using a series of a 2-Way ANOVA (with replication) statistical tests on the following data information (Dytham, 2011); volunteer numbers and number of volunteering sessions (also referred to as activities). A 2-Way ANOVA (with replication) was selected due to the purpose of the analysis, with the dataset meeting the assumptions of this test, including homogeneity (internal consistency and reliability), as identified from the exploratory data analysis above.

In chapter 7, the following confirmatory data analytical approaches were used. Differences in baseline scores between respondents and those non-respondents to the later rounds of the survey for both the Green Exercise and Change! Tool surveys were calculated to assess the overall representativeness of longitudinal dataset. The Resilience survey dataset was excluded from this analysis as the majority of volunteers and external stakeholders responded to the survey, and it was not a longitudinal dataset. As no differences in baseline scores between respondent and those non-respondents to the later rounds of the survey are observed, this suggests these longitudinal datasets (Green Exercise and Change! Tool surveys) can be thought of as representative of the overall sample (Bryman, 2012).

I then calculated within- and between-person variations of volunteers' total scores for both the Green Exercise (both SWEMWBS scores and total days active) and Change! Tool surveys. Within- and between-person variations were calculated to understand further the variability and differences between volunteers' changes in scores over time. This is because people tend to differ from one another in self-reported scores and these differences are not otherwise identified using a total overall variance and datasets can be misinterpreted (Costa *et al*., 2008). Again, the Resilience survey dataset was excluded from this analysis due to the size and characteristics of the dataset. To calculate within- and between-person variations, I first estimated both within- and between-person variation coefficient, using a one-way ANOVA. One-way ANOVA was also used to identify differences in scores between the first and later rounds of the surveys, for those volunteers that completed all surveys only, excluding non-respondents. All datasets met the assumptions of the one-way ANOVA and were normally distributed. Further, power analysis for One-way ANOVA with 3 groups (the three waves of questionnaire surveys) was conducted to determine a sufficient sample size using an alpha of 0.05, a power of 0.80 and a very large effect size (F = 0.8). The desired sample size is 35 and above, therefore the total sample size of 39, with 13 per group, was sufficient (Fielding, 2007). From the information obtained by one-way ANOVA (within-person squared mean - $SM_w$; and between-person squared mean - $SM_b$), I could then estimate between-person variance ($S^2_b$) and within-person variance ($S^2_w$), using the following three calculations as outlined by Slater *et al* (2004: 602) and *Costa et al* (2008: 542):

$$S^2_w = SM_w \quad (1)$$

$$S^2_w + kS^2_b = SM_b \quad (2)$$

$$S^2_b = (SM_b - S^2_w)/k \quad (3)$$

In the second calculation, k represents the estimation number per individual volunteer, which differed between the two surveys (Green Exercise and Change! Tool surveys). Using $S^2_b$ and $S^2_w$ estimates, I could then estimate the coefficient of variation (CV %) and variance ratio (λ), steps 4 to 6, to measure the amount of variability and spread of the datasets relative to the mean, as follows (Costa *et al*., 2008: 542):

$$CV_w = (S_w/\alpha) \times 100 \quad (4)$$

$$CV_b = (S_b/\alpha) \times 100 \quad (5)$$

$$\lambda = S^2_w / S^2_b \quad (6)$$

In the third and fourth calculations, α represents the sample mean.

From this, a series of confirmatory analytical approaches were used as 'exploratory statistics', being exploratory in their goals when evaluating the datasets (Behrens, 1997). Like exploratory analytical approaches, confirmatory analytical approaches which were applied differentiated according to what volunteer data was collected by and was flexible to meet research objectives though restricted to what data is attainable (Jansen, 2009). Firstly, relationships between each of the survey rounds (a representative of time) and volunteers' overall scores for the Green Exercise (SWEMWBS scores and days active) and Change! Tool surveys were analysed with a Pearson's Correlation Coefficient test (Dytham, 2011). As no relationship between these variables in the Green Exercise survey could be identified a simple linear regression, used to measure and predict relationships between variables, was therefore not conducted (Dytham, 2011). Conversely, whilst a relationship between each of the survey rounds (a representative of time) and volunteers' overall scores for the Change! Tool surveys was identified, it was a very weak correlation (2%), suggesting either a very weak relationship or it had arisen by chance. Using a scatterplot analysis to visually assess whether a relationship was observable, it revealed that the very weak relationship was not linear or monotonic in structure. This suggests that there is was no significant relationship, and the length of time volunteers engage in TCV activities is a relatively small predictive factor. Therefore, a regression model was not used (Field, 2007).

Additionally, no statistical analysis was conducted to compare the differences between Change! Tool scores between TCV's two volunteering programmes, Green Gyms® and Action Teams, due to the significant differences in samples sizes (Green Gyms® n = 598; Action Teams n = 354).

Though the sample sizes to conduct all analyses above were relatively small, the tests were regarded as feasible, having a very large effect size of 0.8 and above (calculated as the size of the difference between the two-variable means), thereby minimizing the effects of Type I or II errors (See Cohen, 1988 and De Winter, 2013). However, it is noteworthy that due to the small sample sizes no further in-depth statistical analysis could be undertaken (e.g. MANOVA statistical tests for Green Exercise and Change! Tool surveys) as they were considered as being sensitive to the small number of cases (Dytham, 2011).

Finally, it is noteworthy that due to the small sample size in datasets collected as part of the Resilience project no in-depth statistical analysis could be undertaken. This is because statistical inference tests were considered as being sensitive to the small number of cases (Dytham, 2011).

## 3.3 – Sampling regions, sampling populations, recruitment methods and data sources

This section summarises the sampling regions, sampling populations and recruitment methods used in the thesis research, with further details of each of these found in chapters 4 to 7 that follow. In each of these following chapters, a case study design is used. This type of design method is described as the intensive study of a single case rather than an entire population or sample (Crowe *et al*., 2011). Its purpose is to gather an in-depth and multifaceted exploration of an issue, event or phenomenon of interest in their real life setting which is representative of an entire population or sample being explored (Gerring, 2011).

Case study design originated in clinical medicine and has been used widely in various disciplines, particularly the social sciences, education, business, law, and health (Crowe *et al*., 2011). As a result, this design method has been applied in a variety of different ways and has evolved to be a pragmatic (Harrison *et al*., 2017).

A case study approach was used in this thesis for the following reasons. Firstly, the approach enabled me to gather in-depth and detailed information to answer the research questions and objectives (section 3.2) with the aim of 'generalising' where possible (Crowe *et al*., 2011). This was because it was not feasible to address the broadness of each research question and relating objective in their entirety. As Gerring (2011) highlights, this is one strength to using this approach. Secondly, the approach captures contextual information relating to those more explanatory 'how', 'what', and 'why' questions where knowledge emerges through discussions and reflections as well as exploration of data. As knowledge was grounded in the outcomes of

inquiry this can be described as a pragmatic approach to data extrapolation, and therefore met the philosophical underpinnings of the thesis Crowe *et al*., 2011). Thirdly, it could be adapted to the research scope of the thesis, as well as the time availability of TCV staff and was pragmatic in approach. Fourthly, the approach allowed me the flexibility to gather data using a variety of methods due to its suitability to be used with both qualitative and quantitative theoretical frameworks concurrently. This approach enabled me to triangulate research findings, producing stronger inferences of data (Singh *et al*., 2015). This is because findings could be viewed through a bi-focal lens (i.e. both quantitative and qualitative data), combining both macro and micro-levels of data being explored. As others note, this is a further strength of using this method (Thurmond, 2001; Onwuegbuzie and Leech, 2005).

### 3.3.1 – Sampling regions

In this subsection, I outline the sampling regions used across each of the case study chapters in this thesis and my reasons for their selections.

Firstly, chapter 4 sampling regions began in Greater London where there was most job role diversity, before spreading into the South East following recruitment methods used (section 4.2.1). It is noteworthy that all TCV regional offices present few differences in organisational structures across regions. Reasons for selecting these two regions was due to their adequate sample size, shared similar employee positions, as well as accessible in travelling distance. Further, findings observed serve to provide in-depth understanding about the characteristic which shape volunteer data in the Greater London region, which will be used for chapters 5, 6, and 7 below.

In chapter 5, I selected the following three sampling regions in which to explore TCV volunteer's motivations and engagement patterns: Greater London, Greater Manchester and Yorkshire. My reasons for this selection was to identify any influences of population density distributions in rural to urban areas, differences in mobility potential (e.g. public transport services), as well as cross-examination between relatively similar urban regions. Though the South East was included in the previous chapter (chapter 4), it did not feature in this chapter due to an insufficient size and scale of the volunteering dataset. Moreover, findings from this chapter were important for allocating and designing focus group sessions used in the next chapter (chapter 6), as well as serving as background knowledge to findings identified in chapter 7 which both focus on the Greater London region.

In chapter 6, I selected the Greater London region to conduct my focus group interviews with TCV volunteers. My reason for this was due to adequate sample size, and distance travelled as well as time and resource availability. Further, as chapters 4 and 5 also focused on the Greater London region, this provided information upon which to design focus group sessions to ensure a sufficient sampling population size. It was also able to implement in-depth contextual knowledge gathered from chapter 4 about staff and volunteers' working practices and existing impact measurement systems which were relevant to findings gathered.

Finally, in chapter 7 the sampling region focused on the Greater London region for various reasons. Firstly, as the volunteer data collected by TCV to measure health-related impacts were predominantly collected in Greater London, it was therefore important to analyse those datasets where there was a consistent overlap. Whilst one funded research project was piloted by TCV in three further locations, two projects only occurred in Greater London. As such, a more comprehensive evaluation of health-related impacts in the Greater London region could be conducted. Moreover, datasets could be explored with relevance to the three previous chapters as essential background knowledge relating to the characteristics which influence volunteer data collected (chapter 4, 5 and 6). In this way, this enabled me to gather a comprehensive understanding of TCV's delivery of health-related impacts.

### 3.3.2 – Sampling populations

As mentioned in section 3.1.1, the overarching aim of this thesis was to explore to what extent environmental volunteering organisations deliver health impacts. As this was a broad topic it was therefore not feasible for me to address the aim's entirety in this thesis. In this way, I narrowed the research focus, reporting from the perspective of UK environmental charity, The Conservation Volunteers (TCV), used as a case study. Reasons for this selection was threefold. Firstly, TCV shares goals with many other environmental volunteering organisations across the UK, with each of these projects engaging members of the public in activities that help contribute to the conservation and restoration of natural environments (Bruyere and Rappe 2007). In this way, findings observed in this thesis can be applicable to other similar environmental volunteering. Secondly, the organisation already had a longitudinal health-related impact measurement system in place which could be readily evaluated, which at the start of the research was not known in other similar environmental volunteering organisations in the UK. Thirdly, I was fortunate to have volunteered under various roles (e.g. weekend warden) for TCV from April 2009 to June 2013, thus having a good level of first-hand

knowledge and understanding of the charity's environmental volunteering programme as well as a good working relationship with staff.

TCV, previously known as The British Trust for Conservation Volunteers until 2012, was founded in 1959. Described as one of the UK's largest conservation charities (Sibley, 2010; King and Associates, 2011), TCV has engaged with people from a diverse array of backgrounds and abilities, taking a hands-on approach to conservation activities. Such activities include habitat management, monitoring wildlife, and ecological restoration (Antonaci *et al*., 2014).

Throughout the duration of this thesis, TCV has been working towards six strategic goals (Figure 3.2) aimed at improving outdoor greenspaces and the lives of local communities in response to existing financial challenges in UK public service delivery. To achieve these goals, TCV have designed their volunteering projects to encourage engagement on a personal and community level to help improve the quality of people's neighbourhoods, social cohesion, prosperity and health (TCV, 2015).

**Strategic Goals:**

1) Work together with people and communities to transform their health, prospects and outdoor places for the long-term

2) Be a resistant organisation

3) Be a great place to work

4) Have customers who love us

6) Be better known and supported for the value we deliver

Figure 3.2: TCV strategic goals 2013 to 2015.

As part of their strategic plan, the conservation charity has developed various volunteer programmes throughout the UK, including Green Gyms®, Action Teams, and local community groups. To manage these, the charity operates on two workforce levels: operational and managerial, working closely with external stakeholders.

TCV began to measure the health-related impacts associated with their volunteering programmes from 1997 at a time when research began to explore whether there was an association between human health and engaging in nature-based activities (Antonaci *et al*., 2014). As such, to identify its impact there was a need for evidence base monitoring.

In 2001, TCV developed a Management Information System (MIS), an online database initially created as a simple volunteering tracking system in Northern Ireland (King and Associates, 2011). Since then, the information database has evolved into a complex national volunteer project management and impact measurement tool, further supported by the organisations' dispersed project delivery network throughout the UK. The database acts as a full featured system to record every action of volunteers in a similar fashion to a utility company. It contains a large and highly detailed dataset, storing 222,605 volunteer records undertaking 241,990 conservation tasks over 12 spatial geographical regions. Moreover, the database also contains self-reported surveys, interview responses and workshop discussions (King and Associates, 2011). The information in the system is collected by TCV staff using both paper and online forms to record volunteer's information (e.g. socio-demographics, TCV sites, regions and projects attended) as well as their activities (e.g. number of days and conservation tasks contributed) usually after the activity ended.

When addressing the research questions and objectives (section 3.1.1), the following sections below outline sampling populations used in this thesis by both myself as well as TCV as part of their impact measurement systems.

*TCV staff*

TCV staff are paid employees who work at operational and managerial levels. At an operational level, these includes site managers and project officers that manage those at the voluntary level, organise the running of volunteer programmes as well as the import and export of volunteer and related project information data. At managerial level these include Area mangers, Directors, Executives, and Chief Executive Officers whose roles are to manage all the charity's operations and resources, to foster partnerships with stakeholders and funders, to disseminate TCV achievements from volunteer and related project information data, to develop and implement strategic plans as well as responsible for its overall leadership direction (Evans, 2010).

This sampling population was used by myself in chapter 4 and was used as follows.

15 TCV staff members were identified based on their regular use and interaction with the MIS database. The four main job roles identified (community project officers, green gym project officers, green impacts project officers and area managers) covered a range of workplace environments, volunteer projects implemented, employee positions and their associated tasks. This ensured that as many key characteristics relevant to the research scope were identified, thus increasing the likelihood of a heterogeneous sample (Holtzblatt and Beyer, 2015).

Staff were recruited from a wide geographical spread, working in 7 offices (6 staff members were from the same office) throughout Greater London (n=7) and the South East of England (n=8) regions: Rotherhithe (London), Haringey (London), Twickenham (London), Croydon (London), Ashford (Kent), Reading (Berkshire) and Hastings (East Sussex). Sampling began in Greater London where there was most job role diversity, before spreading into the South East. Each of these two regions had adequate sample size, shared similar employee positions, and were accessible in travelling distance. It is noteworthy that TCV regional offices have similar organisational structures across regions.

*Action Teams*

Action Teams are a TCV volunteering programme aimed at managing and conserving a wide range of natural habitats throughout the UK. The programme holds weekly sessions throughout the year and engages volunteers in a variety of conservation projects. Projects include habitat management, creation, restoration and maintenance as well as creating new nature gardens for local communities and schools. The programme was established in 1959 when the charity was initially set up to engage volunteers in practical conservation work. Volunteers that attend these programmes do so on their own initiative.

This sampling population was used by myself and TCV in chapters 5, 6, and 7. My reason for using Action Teams as a sampling population in chapter 5 owed to not only the large scale and volume of volunteer records on the MIS, but unlike Green Gyms, these volunteering programme sessions are flexible with volunteers attending as and when they can commit their time, therefore being more representative of most environmental volunteer populations. Moreover, I used volunteers from Actions Teams in chapter 6 as the programme did not focus on health aspects which may have influenced findings and would not therefore be fully representable of the views made by environmental volunteer populations. Chapter 6 was based on 22 environmental volunteers from TCV, working across 5 sites within the Greater London region (UK): Stave Hill Ecology Park, Lavender Pond, Greenwich Peninsula Ecology Park,

Haringey and Croydon. I continued to recruit participants through working with TCV gatekeepers and using a snowballing approach (see section 3.3.3), until it was felt that data saturation had been reached (Grbich, 2013). The study had no specifications in relation to sampling populations, including as many voluntarily consenting participants as possible without coercion. This ensured that the study was inclusive of a representational cross-section of those involved in TCV's Action Teams (Bryman, 2012) and were representative of short and long-term volunteer typologies (section 5.3.3).

Finally, in chapter 7 TCV used Action Teams as part of their questionnaire surveys to measure impacts associated with their volunteering programmes.

*Green Gyms®*

Green Gyms® are a TCV volunteering programme that focuses on improving the health and wellbeing of volunteers through engaging in practical work sessions within green spaces to promote biodiversity and organic food growing (e.g. planting trees, sowing meadows and establishing wildlife ponds). It includes warm up and cool down sessions in preparation for a range of light to vigorous activities to suit all abilities. The programme was established in 1997 in collaboration with Dr William Bird, a general practitioner and Strategic Health Advisor to Natural England, who promotes exercise in natural environments. It has been endorsed by the Department of Health to have proven impacts on the volunteers' health and wellbeing as well as on their community spaces. Volunteers that attend these programmes do so either on their own initiative or following advice by their GP. Volunteers that attended the Green Gyms® programmes were selected by TCV as a sampling population due to the programmes' focus on improving volunteers' health and to measure any associated impacts. It is noteworthy that the engagement characteristics of Green Gyms® volunteers was not included in chapter 5, whilst their health-related findings feature in chapter 7. One reason related to the large scale and size of the dataset. Secondly, these volunteering programme sessions were not flexible with volunteers not being fully representable of most environmental volunteer populations who attend as and when they can commit their time. Instead, these programmes follow a set timetable, having one session per week with volunteers often (though not always) attending following advice by their GP for a given length or period. Some details about volunteers' engagement longevity have been noted in other research by Hine *et al* (2008). Further information about this volunteering group can be found in chapter 7.

*Local community groups*

In this thesis, local community groups refer to those volunteers who engage in local environmental volunteering activities in association with but independent from TCV. These groups varied in the number of volunteering sessions held throughout the year and engage volunteers from their local community in a variety of conservation projects. Projects include habitat management, creation, restoration and maintenance as well as creating new nature gardens for local communities and schools. They were each established in the last 10 years and initiated by their founding members for their own individual purposes. In chapter 7, 13 local community groups made up of 70 volunteers between them were selected by TCV as representatives of the environmental volunteering population as well as due to distances travelled, time and resource availability of TCV staff. It is noteworthy that the engagement characteristics of Green Gyms® volunteers was not included in chapter 5, whilst their health-related findings feature in chapter 7. This is because volunteer data to conduct analysis in this chapter was not available or collected by TCV.

*External stakeholders*

In chapter 7, 6 external stakeholders refer to those who worked outside or in partnership with but were not a direct member of the local community groups (see above). Stakeholders include members of local authorities and businesses as well as non-governmental organisations and other environmental volunteering groups. This sampling population was selected by TCV to provide an external view of each local community groups' self-report data collected as well as due to distances travelled, time and resource availability of TCV staff. More details are outlined in chapter 7.

### 3.3.3 – Recruitment methods

In this section, I describe the methods used to recruit participants to be involved in the thesis research. Outlined below are those methods used by both myself as well as TCV as part of their impact measurement systems.

*Gatekeeper*

Gatekeeper recruitment method is where a person or institution who allows a researcher access to a sampling population or field setting whom the researcher wishes to involve in their research (Bryman, 2012). The method is used in various areas of research in recent decades, including health and social science fields. The method works where those regarded as "gatekeepers" (e.g. organisation directors), serve as intermediaries between researchers and participants

(McFadyen and Rankin, 2016). The method was used in chapters 4, 6 and 7 in addition to snowballing (see subsection below), as a starting point for recruiting sample populations.

The gatekeeper recruitment method was selected for the following reasons. Firstly, whilst I had knowledge of TCV prior to the start of the thesis research, the gatekeeper approach was implemented as the sampling populations were largely unknown to me and I did not have access to a full list of the population to be able to contact them. This is regarded as one of the method's strengths when sample populations, such as these, can be hard to reach (Bryman, 2012). Secondly, these gatekeepers were effective in diffusing knowledge about my research over a wide geographical area, as well as to foster both collaboration and trust between myself and participants (e.g. volunteers and staff) as well as monitoring any unanticipated issues that may arise (e.g. participant concerns) (Rattani and Johns, 2017).

One main challenge which some researchers highlight is gaining accessibility to a sampling population, relating to various reasons (e.g. organisation protocols or sensitivity of research issues). To limit this affect, I worked in close collaboration with gatekeepers throughout the research process, ensuring that I fully understood and adhered to the values and practices of TCV (McFadyen and Rankin, 2016). This was further strengthened through my pre-existing working relationships with gatekeepers prior to the thesis research. Moreover, this non-probability method does not give all individuals in the population an equal chance of being selected, the sampling population may not be truly representative, thus reducing validity of finding and increasing potential biases (Bryman, 2012).

I will now explain in detail how this method was applied in each of the following case study chapters.

In chapter 4, this recruitment method was applied as follows. TCV staff were first recruited through 3 TCV gatekeepers in managerial roles, collectively having connections to 30 staff members, 6 of whom responded. These gatekeepers were effective in diffusing knowledge of the research to staff dispersed over a wide geographical area, fostering both collaboration and trust between myself and staff who participated (Rattani and Johns, 2017).

*Snowballing*

Snowballing recruitment which targets a subset of a sample population who are most relevant to the research question (Bryman, 2012). This recruitment method has become a standard technique in qualitative research and was developed to study social networks as well as those

hard to reach hidden populations (Heckathorn, 2011). The method works by first recruiting a small pool of initial participants that meet the eligibility criteria of the study, and then these initial participants recruit further participants who also meet the criteria within their social networks and the sample subsequently expands (Bryman, 2012). The recruitment method was applied in chapters 4, 6 and 7 of this thesis and was used in addition to gatekeeper recruitment, described above.

Snowballing was selected as a recruitment method for the following reasons. Firstly, as mentioned the sampling population were largely unknown to me and viewed by some researchers being a good recruitment method when sample populations can be hard to reach (Heckathorn, 2011). Secondly, snowballing was viewed as an effective method to gain trust with participants and was particularly useful in chapter 4 due to the sensitive nature of information data collected (Grbich, 2013). In addition, it enabled me to gather a sample which met the eligibility criteria for each chapter in a reasonable time period which was cost-effective (Bryman, 2012).

However, a few weaknesses have been identified with this non-probability sampling technique. Firstly, similar to the gatekeeper approach, the snowballing method did not give all individuals in the population an equal chance of being selected, the sampling population may not be truly representative, thus reducing validity of finding and increasing potential biases. As the sampling population size was unknown this therefore effected my ability to make statistical inferences using confirmatory data analysis (section 3.2.9). Descriptive statistics was therefore implemented to describe the sampling population before confirmatory data could be applied (Bryman, 2012). Secondly, the recruitment method may contain unknown biases (e.g. how representative is the sample of the population) being of a size and direction that was unknown (Heckathorn, 2011). To reduce this effect, the initial sample were selected through previous contacts in a target area known to the gatekeepers as well as representing a diverse sample, where possible, to enhance the spread of data information collected (Bryman, 2012).

I will now explain in detail how this method was applied in each of the following case study chapters.

In chapter 4, 7 TCV staff based in different projects were recruited through snowballing method, out of a potential 15. This strengthened validity since I was studying the organisational structure of TCV in a population unknown to myself (Heckathorn, 2011). Recruitment continued until data saturation had been reached, and no new insights or recurring themes could

be identified (Grbich, 2013). Although there is some debate in literature regarding sample size and saturation point (see Mason, 2010), staff numbers in this chapter were consistent with recommendations for conducting contextual inquiries (Beyer and Holtzblatt, 2015).

*Email Recruitment Strategy*

Email recruitment is where researchers use email communication to recruit potential participants from a known sample population relevant to the researcher's study objective and has gradually become more widely used in research (Bryman, 2012). Researchers tend to use email templates that can comprise of the following information: the purpose of the research, the research method, anticipated outcomes of the research, the identity of the funders, the purpose or uses of data collected, potential benefits and harmful consequences of the research that might affect participants, issues relating to data storage and security as well as participants' degree of anonymity and confidentiality. Further, researchers usually send a follow-up email which has been shown to increase response rates (Fan and Yan, 2009).

This recruitment method was used by TCV staff to recruit volunteers to participate in their questionnaire surveys, volunteer data which is evaluated in chapter 7. TCV selected this recruitment method for the following reasons. Firstly, the method was viewed as a cost-effective way to recruit volunteers over a large geographical scale (Evans and Mathur, 2005). Secondly, this self-selection method ensured volunteers voluntarily consented to being involved (Bryman, 2012).

Yet, as some researchers highlight (Fan and Yan, 2009), the method has been shown to have a potentially low response rate, as shown in chapter 7. Further, whilst having access to computers is becoming more widespread in the UK population, and would suggest an improvement in response rates (Evans and Mathur, 2005), it is noteworthy that a small proportion of those volunteers who attend TCV volunteering sessions do not have accessibility to a computer at home and could create a nonresponse bias. Finally, as the method used was based on a self-selection non-probability sampling technique, where volunteers selected themselves whether they wanted to be included in the survey. The sampling population may not therefore be truly representative, thus reducing validity of finding and increasing potential biases (Bryman, 2012).

3.3.4 – Data sources

In this thesis a wide range of TCV volunteer data was used in chapters 5 and 7 and were extrapolated from TCV's MIS database. Further details regarding these data sources are provided below.

*Chapter 5*

In chapter 5, volunteer data is based on data received from volunteers when they initially join TCV and complete a registration and welfare paper form. The following volunteer data items collected with the registration and welfare paper form were used for this chapter's analysis: volunteer identification, region identification, site identification, total active days, start and end dates of volunteering as well as postcodes of volunteer's places of residence and TCV sites that they attended. Due to the scale and volume of volunteer records, the study was based on all registered weekday and weekend volunteers registered from January 2010 to December 2013. The analysis served to provide a comparison between all UK (17, 075) and selected volunteering regions (Greater London (6690), Greater Manchester (810) and Yorkshire (2871). This was to identify any influences of population density distributions in rural to urban areas, differences in mobility potential (e.g. public transport services), as well as cross-examination between relatively similar urban regions.

*Chapter 7*

Volunteer data used in chapter 7 was extrapolated from TCV's MIS database, explored further in chapter 4, selecting those datasets relevant to the chapter's research aim. Also in chapter 4, I identified small but appreciable inconsistencies in data collected. As these were non-systematic biases, there could be no systematic error in measurements or estimates. Further, the Greater London region was the focal region for various reasons which are described more fully in section 3.3.1.

TCV volunteer data collected in this chapter presented a large attrition rate between surveys and is consistent with participatory patterns of TCV volunteers identified in chapter 5 where 94% of TCV volunteers only attend one session. It is therefore possible that those non-respondents in later survey rounds are under-represented in findings. Data sources used were based on the following questionnaire surveys: Green Exercise, Change! Tool and Resilience projects.

The Green Exercise is a self-reported questionnaire that comprises of two parts: single-item physical activity measure and short version Warwick Edinburgh Mental Well Being Score (SWEMWBS). The first part, single-item physical activity measure, was created by Milton et

al (2011) and is used to detect changes daily physical activity over time. The second part is based on the short version Warwick Edinburgh Mental Well Being Score (SWEMWBS) and was developed collaboratively by NHS Health Scotland, University of Warwick and University of Edinburgh in 2007. The second part of the survey comprises of 7 positively worded statements (e.g. I've been feeling good about myself) to measure a person's level mental wellbeing which are rated using a 5-point Likert scale (See Stewart-Brown et al., 2009).

Green Exercise was piloted by TCV at those Green Gyms® programmes in Greater London which were representative of both short and long-term volunteer engagement profile types (see chapter 5). A total of 204 volunteers completed the first survey, 54 completed the second follow up survey, and 16 completed the third follow up survey – a response rate of 26.6% and 7.8%, respectively. The survey was carried out between April 2012 to April 2014 and was used to measure changes in volunteers' wellbeing and daily physical activity over time. Further details about the sampling population, recruitment methods and reasons for their selection can be found in chapter 3 (sections 3.3.2 and 3.3.3). The following data items were used for this study's analysis: volunteer unique identifying number, region identification, site identification, total active days, start and end dates of volunteering as well as overall health scores and answers to individual questions.

The Change! Tool self-completion questionnaire survey (See appendix 3), was initially developed by the World Wildlife Fund (WWF) and CAG Consulting (See www.community-engagement.co.uk). The survey is based on the Transtheoretical Model developed by Prochaska and DiClements (1986), which incorporates the stages, processes and decisions central to the behavioural change cycle (Norcross *et al*., 2011). The survey uses a longitudinal design to assess the impacts of environmental volunteering on respondent's behaviours over time. The Change! Tool uses a set of questions to measure a person's self-reported pro-environmental behaviours, using a 5-point Likert scale with a total score of 40. Indicators used in this study focused on the following eight sustainable lifestyle choices: pro-environmental travel, waste management, food growing, community involvement, local decision making, sustainable energy use, awareness of local wildlife (termed here as 'Your Area') and pro-environmental shopping behaviour.

The Change! Tool survey was implemented by TCV from April 2011 to April 2014 and was used to assess the impacts of environmental volunteering on respondent's behaviours over time. The study sample comprised of 952 volunteers who completed the baseline survey, 161

completed the first follow up survey, and 63 completed the second follow up survey – a response rate of 13.8% and 5.4% respectively. Respondents in this study were recruited from two volunteering programmes led by TCV based in the Greater London (UK): Green Gyms® (See Green Exercise questionnaire survey) and Action Teams. Each of these volunteer programmes were representative of both short and long-term volunteer engagement profile types (see chapter 5). A detailed description of these two sampling populations, recruitment methods and reasons for their selection can be found in sections 3.3.2 and 3.3.3. Further, the questionnaire was complemented by a series of structured interviews (n=26) from to June 2013 to April 2014 conducted by TCV staff with those volunteers who voluntarily consented (see appendix 4).

## 3.4 - Data reliability and quality

As the philosophical underpinnings of the thesis are rooted in pragmatism, incorporating various mixed research methods, I will now briefly comment on how I will ensure the validity, reliability, trustworthiness, defensibility and quality of my research and that others may learn from conclusions drawn.

In recent decades, the subject of validity evaluation within mixed research methods has been discussed, with few suggested frameworks being developed (e.g. Tashakkori and Teddlie, 2006; Onwuegbuzie and Johnson, 2006; Creswell and Clark, 2007). Though each of these frameworks have attempted to combine the validity perspectives of qualitative and quantitative, there is this tendency to focus on the inferences and integration aspects of these two perspectives than on validity itself. Similarly, some have highlighted the complexity of these frameworks as well as their adoption of new words to the already large abundance of words used to described validity in both qualitative and quantitative research (Dellinger and Leech, 2007). As such, this could be viewed as a weakness as it can be somewhat confusing for research students or those from either a qualitative or quantitative discipline, like myself, who are using a mixed method approach for the first time. It was for these reasons that in this thesis I used Dellinger and Leech (2007)'s Validation Framework, which I will now describe.

Dellinger and Leech (2007)'s Validation Framework (VF, See Figure 3.3 below), incorporates elements from quantitative, qualitative and mixed method research. One strength of the VF is its use as a guidance, not as a checklist, of validity types and extends from Messick (1995)'s construct validity, which they define as:

"The *overall evaluation judgement of the extent to which empirical evidence and/ or theoretical rationale support the adequacy and appropriateness of interpretations and actions on the basis of data generated through any means*" (Dellinger and Leech, 2007:316).

The VF incorporates terminology and criteria from traditions of both quantitative and qualitative research, as well as five elements from mixed methods (Leech *et al*., 2010): foundation element (researcher's prior knowledge and experience), construct validation of the three method types (quantitative, qualitative and mixed), inferential consistency (integration of the three method types), the utilisation/historical element and consequential element (evaluate study outcomes and their applicability for future research).

The purpose and suitability of using VF as a validity approach was two-fold. Firstly, construct validation uses a pragmatic and open process, continuously integrating relevant available information, whether quantitative or qualitative (Leech *et al*., 2010). Secondly, through using existing terminology and criteria from traditions of both quantitative and qualitative research, though somewhat simplistic, it allows for comparisons can be made with other empirical findings, thereby strengthening the framework's usage (Dellinger and Leech, 2007).

The quality of quantitative methods was evaluated to ensure both validity and reliability of findings. In particular, methods were assessed for their degree of accuracy, generalisability (internal and external validity) as well as consistency (reliability) (Dellinger and Leech, 2007). These were attained through large samples sizes, measure internal consistency, study description (e.g. participants, situation, time and intervention), descriptive analysis, analysis of secondary datasets as well as regional and office comparisons.

The term 'validity' is viewed by some to be contentious in qualitative research, with no agreed set of criteria (Northcote, 2012). Instead there exists multiple quality measures including true value, credibility, dependability, trustworthiness, generalisability, legitimacy and authenticity (Dellinger and Leech, 2007). This owes to differences in epistemologies, ontologies and methodologies to those quantitative methods (Guba and Lincoln, 1985). In this way, quality measures in this study are evaluated using those relevant to the type of research method undertaken and is a further strength of the VF due to its overall flexibility to be adapted to the research study at hand. These were attained through gaining multiple perspectives (data triangulation), multiple coders (analyst triangulation), interviewee transcript review (member checking), thick description (audit trail), as well as stakeholder, peer and supervisory feedback (peer review).

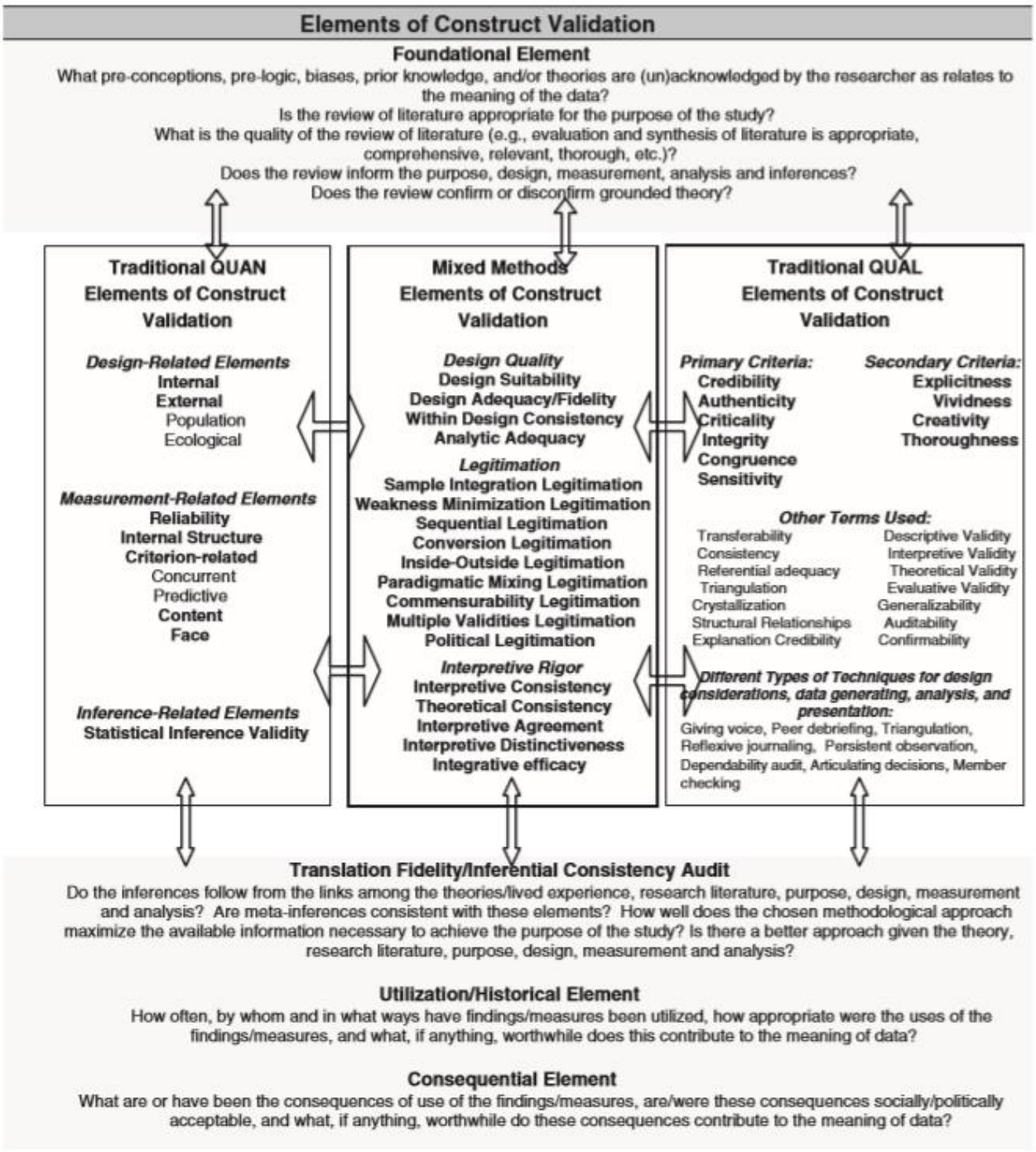


Figure 3.3: Dellinger and Leech's Validation Framework (2007: 322).

Finally, the quality of mixed methods is evaluated against Dellinger and Leech (2007)'s five validity elements: foundation element, construct validation of the three method types (quantitative, qualitative and mixed), inferential consistency, the utilization/historical element and consequential element. These were obtained through various means, including comparisons to existing findings in literature, examine the uses of data, provide historic

overview of study, as well as evaluate outcomes of findings. This is reviewed and discussed more fully in Chapter 8.

Further in-depth descriptions of data reliability and quality are outlined in each of the data chapters from, 4 to 7.

## 3.5 – Research ethics and data protection

Throughout the research, I adhered to all requirements stated in the UCL Ethics Committee Research Ethics guidelines. Ethical procedures and considerations varied between each of the different phases of research conducted which are outlined here.

For part of the first phase of the research (chapter 4), I did not require ethical approval. This was because it was classed as a 'service evaluation' of TCV's Management Information System (MIS) database, which was already in use. For this, I contacted potential participants suggested to me by those who worked within TCV. To ensure trust with those taking part, voluntary informed consent was required from each individual participant prior to gathering data for both CI (section 3.2.2) and TLA (section 3.2.5) methods. As part of this, I communicated clearly as well as provided information sheets which comprised of the following: the purpose of the research, the research method, anticipated outcomes of the research, the identity of the funders, the purpose or uses of data collected, potential benefits and harmful consequences of the research that might affect participants, issues relating to data storage and security as well as participants' degree of anonymity and confidentiality. Attached to the information sheet was a written consent form for each participant to sign once they had read, understood and agreed to be involved in the research, enabling them adequate time to ask any questions they may have. In addition, interview and observation sessions were conducted within their place of work, an environment with which they were familiar and allowed them to withdraw from the study at any time.

As part of the second and third phases of the research (chapters 5 and 7), the volunteer data that was analysed in this thesis was derived from an identical copy of TCV's MIS database system, provided by TCV in April 2014. All data relating to volunteer's personal, sensitive or identifying information (including name, gender, ethnicity and economic activity) were removed before I obtained the copy of the database, following a signed data sharing agreement with TCV. As the dataset was both confidential and anonymous, where no individual could be linked to or identified from their data information, ethical approval was not therefore required. This also included volunteers' postcodes in chapter 5, which were only used for measuring an

approximate distance travelled that they travelled to the TCV site that they attended. They did not contain, nor were they linked to a unique household address. As Royal Mail (2011) states, there is an average of 15 properties or more that can be linked to any UK postcode, thereby making it difficult to identify a single property from a postcode. I also took care to only use those areas in those regions analysed where there were no properties which were isolated, using no data which contained small numbers of volunteers in a small regional area. In doing so, this minimized the risk of identifying volunteers and thereby being unable to identify an individual volunteers' property (see Information Commissioner's Office, 2012). In addition, all data information output relating to distances travelled by volunteers were generalised, presenting no geographical maps or data information which would identify any volunteer.

Finally, as part of the second phase of the research (chapter 7), workshop sessions received ethical approval from the Chair of the university's Research Ethics Committee (Approval Reference: 6537/003, February 2015). This was because as part of the sessions participants were asked to discuss of the definition of 'health', though not explicitly an individual's or group's own 'health' thereby meeting the criteria of minimal risk. Further, it did not include any of the following: vulnerable groups, deception, intrusive interventions as well as personal or sensitive information. I ensured and was content that participant's consent indicated their understanding of the workshop sessions' purpose and how it was conducted, using a similar process to that described for the first phase of the research (e.g. information sheet and consent forms).

All data collected as part of the thesis research was made confidential and anonymised, before being stored in compliance with the Data Protection Act (1998) and UCL's data protection guidelines. Research progress summaries and reports were made available to the participants, funders and partners involved with any results published in academic publications or conferences credited to everyone who contributed to the research. At the completion of the research project, all data will be destroyed securely.

## 3.6 - Summary

To summarise, this chapter introduces and describes the theoretical framework of the thesis, and how the pragmatic approach has guided the research process in terms of its methodologies, methods, validity, scope and interpretation of research findings. It then described the sampling regions and populations used in this thesis and how they were recruited by TCV and myself.

Finally, it detailed the data reliability and quality implications implemented as well as the ethical procedures undertaken during the research.

Overall, the thesis serves as a case study, in which I worked collaboratively with an organisation (TCV) towards a conceptualised impact measurement framework to strengthen and progress existing research on the effect that engaging in environmental volunteering activities has on an individual's wellbeing. Further, the analysis will address research objectives posed at the beginning of this chapter.

An in-depth contextual understanding of TCV's characteristics that influence their impact measurement systems and volunteer data collected is explored in the next chapter. In the next chapter, I gather further contextual understanding of TCV's work contexts, practices, impact measurement systems, and real-world environmental factors. I also explore staff's level of engagement with supporting infrastructures to understand the functionality of an existing system and the information data collected. Information gathered provided valuable insight into of the nature, veracity and meaning of volunteer data, that I use in proceeding chapter 5 and 7.

# Chapter 4: TCV's management information and impact measurement system: A contextual inquiry

## 4.1 Introduction

The volunteering sector encompasses a diversity of organisations and charities, each varying in their purposes and activities (Rochester, 2006). This diversity in the sector is often shaped by social, cultural and environmental contextual factors. These factors can include their work practices to achieve a common goal (e.g. communication), the physical working environment as well as their cultures, policies and project deliverables (Holtzblatt and Beyer, 2015).

Research has recently found that some volunteering organisations have internally created their own information system databases used as both a project management and data collection tool to support their activities (Voida *et al*., 2015). These have been termed by others as 'homebrewed' database systems. These databases have been shown to be reflected and shaped by the diversity of values, motivations and work practices of the organisation itself (Voida *et al*., 2011). Moreover, researchers reviewing related literature have noted that those databases used by volunteering organisations as data collection tools to measure their project deliverables, could also be shaped by contextual factors (Harlock, 2013; Metcalf, 2013). In the context of this chapter, contextual factors can be defined as those characteristics unique to a volunteer organisation (e.g. internal and external policies and working behaviours). However, this remains an emerging area in volunteering research, with no empirical studies to date characterising the nature of impact measurement tools internally developed by volunteering organisations. Understanding contextual factors is particularly important and could have a potential impact on the nature, veracity and meaning volunteer datasets collected. Without understanding how this information came into being, there is a risk of misinterpretation about what the information represents and what it informs us about the activities of volunteers.

Using information about an organisation's work practices, physical and cultural environment, researchers have begun to understand the context in which a system (e.g. online database or tool) is developed, shaped and used. One example is Contextual Inquiry, a method which gathers a detailed understanding of an organisations' work context and supporting systems in a real-life context (Holtzblatt and Beyer, 2015). Identifying an organisations' contextual characteristics which can shape a system is achieved through using qualitative ethnographic field methods, one-to-one interviews and field observations (Löffler *et al*., 2015).

The aim of this chapter was to gain further contextual understanding of TCV's organisational contexts, work practices, impact measurement system, and real-world environmental factors. Additionally, the chapter also aims to explore TCV staff's level of engagement with supporting infrastructures and its interrelationship with volunteer data collected. This aim has been achieved using a mixed method approach, described in chapter 3. In this way, it sought to provide valuable insight into of the nature, veracity and meaning of volunteer data, used in the following chapters 5 and 7.

The chapter begins by reviewing the existing theoretical and research literature on management information and impact measurement systems in voluntary sector as well as related work and methodological approaches within these areas. From this, it outlines mixed methods, Contextual Inquiry and Transaction Log Analysis methods used in this study. The methodological approach and findings are then discussed.

### 4.1.1 Characteristics which can shape volunteer impact measurement systems

As noted, Contextual Inquiry can be described as a field method to gain further in-depth understanding of the social, cultural and organisational characteristics that are relevant to a system (e.g. impact measurement system) or product (e.g. database) being explored (sections 3.2.2 and 4.1). In this chapter, I focused on those characteristics which can shape an organisation's work practices, physical and cultural environment to understand the context in which a system (e.g. online database or tool) is developed, shaped and used. These characteristics were as follows: roles and responsibilities of staff, communication and coordination, types and objectives of volunteer information data collected, processes and artefacts used to collect volunteer data, as well as internal and external influences affecting an organisation's work context. These characteristics were selected owing to their importance to volunteering organisations and volunteer impact measurement systems. I will outline each of the characteristics below and their relevance to volunteering organisations and their impact measurement systems.

The roles, responsibilities, tasks of and coordination between organisation staff in relation to their work practices. Studies exploring systems (e.g. online databases) used by an organisation often examine their work practices (Holtzblatt and Beyer, 2015). In doing so, it provides a more detailed understanding about the design and functionality of an existing system. Such knowledge can be important in identifying how efficient the interface is between a person and a system being used which can impact other related elements (e.g. data collected and evaluated)

(Ghasemifard *et al*., 2015). Further, this can also be important for understanding variations in the types of volunteer and related data collected (e.g. spatial scale).

The types and objectives of volunteer information data collected. In the last decade, several researchers in the field have reviewed the variable types of volunteer data being collected in the volunteer sector, each varying in response to different objectives (Metcalf, 2013; Harlock, 2013). This owes in part to the sector's diversity of organisations and charities, each varying in their purposes and activities (see sections 2.6 and 2.8). Identifying the types and objectives of volunteer data collected is important from an analytical perspective, to gather an understanding of the underlying structures as well as the validity of the information in the datasets (Constello, 2009; Bryman, 2012).

Processes and artefacts used by volunteer organisations to collect volunteer data. There currently exists a diversity of tools and evaluation methods which are often shaped by the diversity of values, motivations and work practices of the sector itself (Metcalf, 2013). This owes in part to the sector's diversity of organisations and charities, each varying in their purposes and activities. Additionally, factors such as budget, expertise, time availability, and organisational size can also contribute (Harlock, 2013). Understanding processes and artefacts used by volunteer organisations to collect volunteer data can help identify the consistency, internal reliability and quality of volunteer data (Bryman, 2012; McConville, 2017).

Internal and external influences are those which may shape the types of volunteering programmes managed and associated data collected (e.g. internal policies and funders). Research has recently found that meeting funder requirements is one of the most important factors shaping volunteer impact measurement in the UK volunteering sector (Ógáin *et al*., 2012). One suggested reason for this owes to perceived pressures by some organisations to compete for public service delivery contracts as well as to maintain existing and attract new sources of funding (Metcalf, 2013). Other reasons include governmental policies, project management and allocation of resources, improved practices and partnerships as well as volunteering organisations' own internal motivations to understand the impacts of their work (Harlock, 2013). Identifying these internal and external influences as well as how they might shape volunteer data collected is important when interpreting the data's overall meaning (e.g. regional differences and generalisations).

### 4.1.2 Related work and methodological approaches

Research at the intersect of information technology and the volunteer sector has been quite limited, with broad samples existing across disciplines (Voida *et al*., 2015). These volunteering studies focused on homebrewed information management systems amongst US volunteering organisations using three types of qualitative methods: questionnaire surveys, persona diaries and semi-structured interviews. The studies explored the different forms of information and computer technology (ICTs) within the sector (Voida *et al*., 2011) as well as their role in assisting fundraising (Goecks *et al*., 2008), campaigning, work and other social practices (Merkel *et al*., 2007). Across each of these studies, they reveal how work contexts, information needs and stakeholder requirements have shaped their information management systems. Yet, whilst these findings provide useful insights into general work practices and supporting technological infrastructure, to my knowledge no research to date has explored its interrelationship with volunteer impact measurement data through both qualitative and quantitative dimensions. Understanding such factors is particularly important and could have a potential impact on how datasets are then interpreted.

Conversely, studies in usability research have used field methods to gain further in-depth contextual understanding of the social, cultural and organisational aspects that are relevant to a system (e.g. database or work practices) or product being explored. Contextual Inquiry is an example of this (section 3.2.2) and uses a qualitative ethnographic approach to gather people's implicit knowledge on work practices and real-world environmental factors to identify as well as understand the functionality of an existing system (Holtzblatt and Beyer, 2015). Some existing studies in this area include Fouskas *et al* (2002) and Kim *et al* (2011). In each of these studies they explore the work practices of organisations, supporting infrastructures as well as the physical and cultural environment.

Finally, research in usability research often explore people's engagement with a system to understand the user-system-information interactions (Jansen, 2009). Transaction Log Analysis is an example of this (section 3.2.9) and often examines the electronically recorded log of people's activities using descriptive quantitative analytical approaches (Jansen, 2009). Existing studies in this area include Jones *et al* (2000), and Avery and Tracy (2014). Across each of these studies, they reveal how these quantitative analytical approaches can be used to identify people's engagement characteristics and behavioural patterns with digital library system databases. Whilst the descriptive approaches in these studies have been used to explore information systems specifically, providing similar information data is accessible, there is

scope for the applicability of these methods in other relating or nearby fields wishing to explore people's engagement with an information system.

To summarise, this section has reviewed related work which surrounds the interrelationships between people's work practices and supporting infrastructures. It has identified that though there is research at the intersect of information technology and the volunteer sector, none have explored these interrelationships with volunteer data, which is central to the aim of this chapter. As mentioned, understanding this interrelationship is particularly important to provide valuable insight into of the nature, veracity and meaning of volunteer information data and could have a potential impact on how volunteer datasets are then interpreted.

In addition, this section highlights the use of Contextual Inquiry to gain understanding of the social, cultural and organisational aspects that are relevant to work practices being explored. As the purpose of this chapter was to gather a contextual understanding of TCV's organisational contexts, work practices, impact measurement systems, and real-world environmental, Contextual Inquiry was identified as a suitable methodological approach. Similarly, this section suggests there to be scope for the use of Transaction Log Analysis to be applied in other relating or nearby fields wishing to explore people's engagement with an information system. As this chapter aims to explore TCV staff's interactions with supporting infrastructures to understand the functionality of their existing volunteer impact measurement system and related data collected, transaction log analysis methodological approach was used.

## 4.2 Method summary

A mixed method approach was conducted from September 2013 to September 2014, using the following techniques: Contextual Inquiry (one-to-one semi-structured interviews and observation sessions) and Transaction Log Analysis. These triangulating techniques were based on ethnographic, inductive and exploratory methods, examining information data from emerging themes. This methodological approach was to characterise, validate and enhance my understanding of TCV staffs' use of the MIS in relation to their roles and work practices. Details regarding methods used in this chapter can be found in chapter 3 sections 3.2.2 to 3.4.

## 4.3 Results

Presented below are the findings from the Transaction Log Analysis, one-to-one interview and observation sessions as well as the two work models that emerged from the Contextual Inquiry. These findings were used to understanding TCV's existing organisational contexts, impact measurement system and supporting infrastructures.

### 4.3.1 Transaction Log Analysis

Transaction Log Analysis (TLA) was conducted to explore how TCV staff engage with their online database (the MIS) as well as the type of volunteer information data that is currently being collected. In particular, I was able to unobtrusively observe how staff engagement differed to gain a comprehensive view of participant's work patterns over time in response to their different roles, responsibilities and associated tasks. These observations were made for the period September 2013 to September 2014 to identify if any seasonal changes that could occur, owing to the type of work some TCV staff engage in (e.g. woodland management).

Based on data observations, Community and Green Gym project officers were found to contribute the most activity and number of days on the MIS database than both the Green Impacts Project Officer and Area Manager (Table 4.1). This suggests that these two roles require more use of the MIS to carry out and support their daily tasks and responsibilities.

Table 4.1: Total and percentage of contributing activity on TCV's MIS database by job role.

| Job Roles | Activity | | Days | |
|---|---|---|---|---|
| | Total | % | Total | % |
| Community Project Officers | 2374 | 64.2 | 398 | 55 |
| Green Gym Project Officers | 1138 | 30.8 | 310 | 42.8 |
| Green Impacts Project Officer | 3 | 0.1 | 3 | 0.4 |
| Area Manager | 83 | 2.2 | 16 | 2.2 |

The total number of days' activity as well as the total amount of activity that occurred between staff was assessed (Figure 4.1), revealing noticeable differences between both staff and regions. This suggests variability between regions, staff roles and activities which again relates to their daily tasks and responsibilities which the MIS supports.

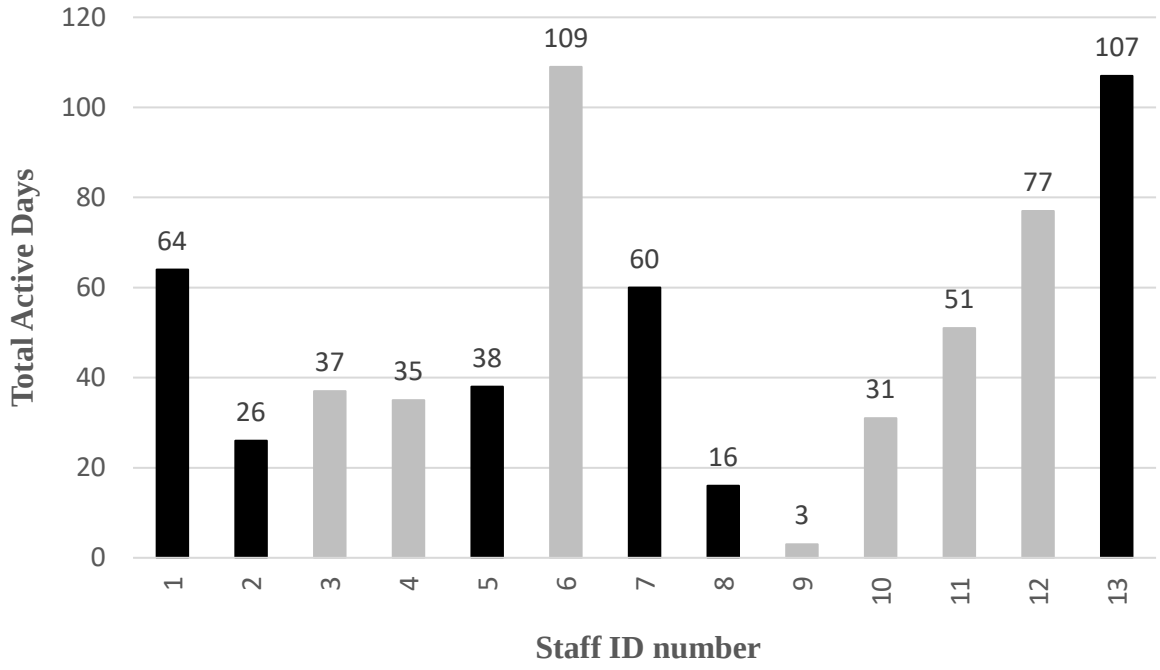


Figure 4.1: Staffs' total active days in Greater London (Grey columns) and the South East (Black columns).

Comparisons between the total number of days' activity occurred and the total amount of activities undertaken by participants per month presented a weak positive relationship (Figure 4.2) whereby some participants undertook high levels of activity in a short number of days and vice versa. Such trends were not role specific, but individual to each participant. This suggests that there a few members of staff who's work pattern requires them to carry out a larger amount of activity on the MIS in fewer days than others who spend more days on the MIS.

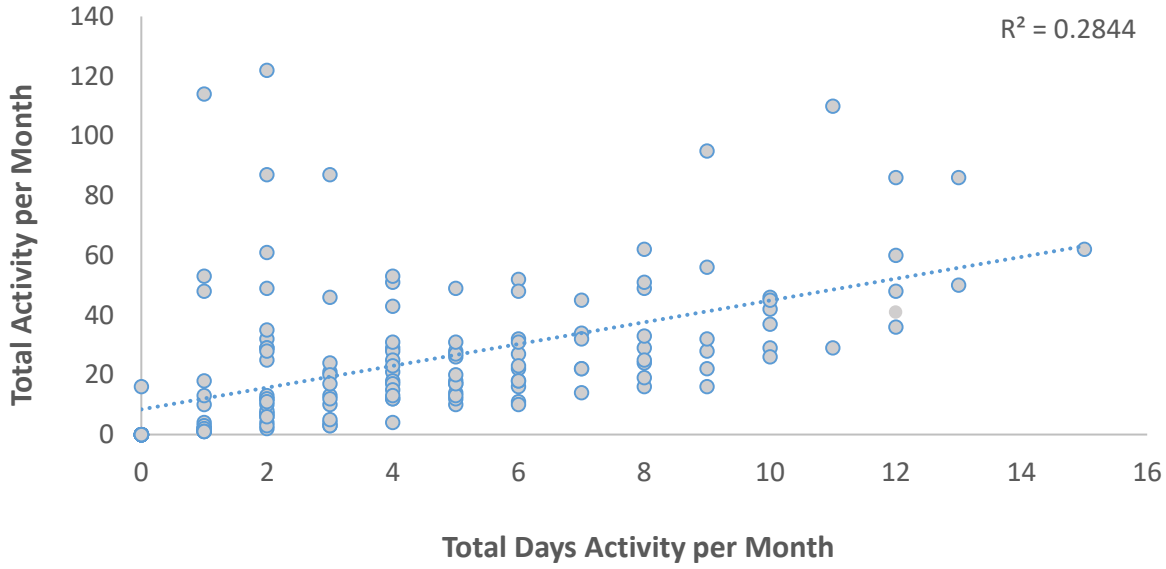


Figure 4.2: Total days' activity and total activity of staff per month.

Large variability was also found between the types of forms accessed on which activity occurred, with task forms having the highest frequency, followed by volunteer, site and group, respectively. This suggests that TCV staff spend large amount of activity relating to volunteering tasks which are undertaken by certain volunteer groups over fewer sites. Further, staff in the South East completed an increased number of volunteer, site and group forms, with those in Greater London presenting a higher proportion of task forms. This suggests that staff in the south East could experience higher turnover of volunteers in comparison to those in Greater London who invest most time in volunteering activities. Further exploration on staff's activities revealed only slight differences between the two types of activities recorded, add (1947) or edit (1753), on forms accessed where staff are updating existing information on the MIS after data is added.

Table 4.2: Total and percentage of contributing activity on TCV's MIS database by form type.

| Form Types | Greater London | | South East | |
|---|---|---|---|---|
| | Total | % | Total | % |
| Task | 1018 | 58.2 | 949 | 46.9 |
| Volunteer | 646 | 36.9 | 865 | 42.8 |
| Site | 78 | 4.5 | 163 | 8.1 |
| Group | 7 | 0.4 | 46 | 2.3 |

Finally, there were variable trends throughout the year. Firstly, similar trends were observable in total days' activity throughout the year across regions, being higher overall in Greater London. In general, activity peaks in spring, summer and autumn months when conservation activity tends to increase with the seasons. Secondly, there were fluctuations in total amount of activity from month to month between the two regions with stark differences between April to July 2014 (Figure 4.3). This suggests differences in volunteering activities undertaken between the two regions. Thirdly, oscillating trends were visible across each of the forms accessed throughout the year, differentiating between each region. Again, this suggests differences in volunteering activities undertaken between the two regions.

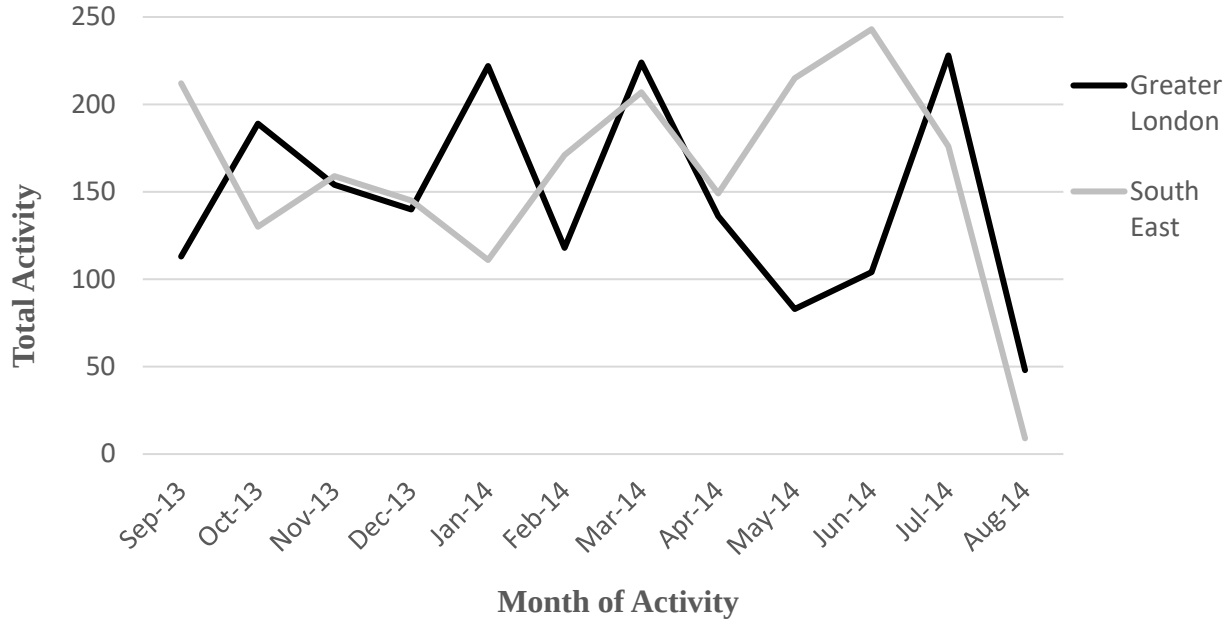


Figure 4.3: Participant's total monthly activity throughout the observation period.

It is noteworthy that all participants presented at decline in level of activity from July to August.

In summary, there were clear distinctions between staff usage of the MIS, with operational staff contributing the most activity. There were variable trends between the amount of activity and number of days staff were active on the MIS which were not role specific. Staff varied in their total activities between the types of forms accessed and with only slight differences in the types of activities recorded (e.g. add or edit) on forms accessed. Finally, there were also variable trends in days active, amount of monthly activity and forms accessed throughout the year.

### 4.3.2 One-to-one semi-structured interviews

A total of 15 one-to-one semi-structured interviews were conducted from September 2013 to January 2014. This was to gain further in-depth contextual understanding of TCV's organisational context, impact measurement systems and supporting infrastructures. Interviews explored the following areas of focus: roles and responsibilities, communication and coordination, types and objectives of volunteer information data collected, processes and artefacts used to collect volunteer information data, as well as internal and external influences affecting staff's work context. This was to understand and identify differences and similarities between TCV staff. Each of these focus areas are described below.

Interviews revealed the job roles and associated responsibilities of staff, identifying four main roles: community project officers, green gym project officers, green impacts project officers and area managers. Of these roles identified, managerial staff (area managers; n=3) each presented differences in their work-related activities and were largely office based, with few exceptions (e.g. meetings with funders or staff). For instance, whilst one manager oversaw all staff operations and activities that occurred in the South East, another led all London TCV projects associated with collecting and analysing volunteer data. In addition, all managerial staff reported a broadness in the responsibilities associated with their roles, including generating financial reports, reviewing staff progress and collaborating with relevant stakeholders or funders. By contrast, interviews with operational staff (project officers; n=9) revealed shared common goals or worked in collaboration to support TCV's activities. Operational staff highlighted how they spent a large proportion of their time engaging directly with volunteers in outdoor practical conservation activities than those managerial. As one member of staff stated:

"*My duties include leading groups of volunteers in conservation work, doing education sessions, carrying out the habitat maintenance management, site risk assessments, working with the community, carrying out project management as well as running environmental workshops*".

Mixed findings were observed in staff's communication and coordination of work-related tasks to support TCV activities. Overall, all staff spoke about how they used multiple channels to communicate with other staff and volunteers. Those mentioned included forms of social media (e.g. Facebook), one-to-one communication, emails, telephone calls and group meetings. Of these communication channels, most staff (n=10) reported that they predominantly engaged in one-to-one communication or used the telephone as their main form of communication. Yet, few staff (n=2) noted that they tended to use other forms of communication, with one member of staff stating:

"*I tend to use either email, or* [mobile] *text more to communicate with others as often I do not have a high level of* [mobile] *signal due to the remote working environment*".

In addition, staff's communication topics were largely consistent and centred around project management, volunteer data collection and supporting infrastructures (e.g. IT support staff, MIS, equipment). Yet, there were few notable differences owing to variabilities between regional offices and types of volunteer programmes. For instance, some staff (n=3) indicated

the use of a "vehicle booking system" to manage the daily use of the office's communal car or minibus to help support offsite volunteering activities (e.g. transporting equipment). Similarly, staff differed in how they coordinated and managed their responsibilities to support TCV's activities, with some (n=4) coordinating work activities at a regional scale, whilst most (n=8) operated at a more localised level (e.g. local authority). As one staff member noted:

"*I manage all health walks that occur in both Kent and Sussex. It can get quite busy. For example, one day I'll be in Ashford and the next in Hastings*".

Interviews also revealed that whilst all staff engaged in collecting volunteer and related data, there were variable differences between managerial and operational staff. Managerial staff tended to collect information related to volunteer data (e.g. financial or funding information) and less forms of volunteer data itself, with those operational instead collecting variable forms of volunteer data (e.g. volunteer's personal data and volunteering projects undertaken). Further, few differences were identified in the types of volunteer data collected by operational staff between regional offices and the types of volunteering programmes (e.g. Green Gyms®) staff engaged in. For instance, one operational staff member commented that they only required the collection of basic volunteer data for project management and reporting to funders:

*"I produce basic stats like numbers of volunteers from the MIS for the local council who only want raw data of volunteers, they don't want anything else. I also find this useful for planning future volunteering days".*

Conversely, other operational staff collected volunteer data specifically aimed towards a funded project they were contracted to. For example, almost half of staff (n=6) recorded 'BAGELS' impact measurements, a term to describe those data fields used to measure environmental outputs (e.g. number of trees planted). Similarly, other staff (n=5) collected volunteers' responses to questionnaire surveys (e.g. Green Exercise survey) on selected volunteering projects.

In general, all staff used similar processes and artefacts to collect volunteer and related data. As one member of staff stated:

"*All volunteer data,* [volunteering] *site data, like site surveys and risk assessments, and* [volunteering] *project data, we collect using these paper forms. And then that information we just then transfer it onto the MIS in the new volunteer data screen*".

The functionality and requirements of these data collection processes were internally developed and motivated by features in staff's work context, including diversity of information needs. In addition, few staff (n=2) identified additional forms of data collection tools and information systems used as part of their role, with one staff member noting:

"*Then there's also the Academy. It's almost like another information system or website that TCV developed. So, a lot of the stuff that use to be on the bulletin board is now on the Academy. The Academy is like a forum board. It contains an awful lot of procedure stuff*".

Similarly, one staff reported that they had created their own information system to support their working activities:

*"I have started to make my own database … Like my own contacts and potential volunteers".*

Finally, a variety of internal and external influences affecting TCV's organisational context, impact measurement systems and supporting infrastructures were identified. Staff identified two main internal influences. Firstly, training was highlighted by some members of staff (n=3) as an internal influence in relation to learning and update their existing skills on the MIS. Reasons for staff highlighting training as an internal influence related to issues of usability, the general functioning of the MIS and its appearance. Yet, such issues were not shared by the majority of staff (n=9), due to existing skills and experience in using information systems, with one commenting:

"*It's the little things that the MIS does that make's the whole job easier. So, now I am accustomed to the system, and I think that is the key, it's the more you do it the easier it gets*".

Secondly, just over half of staff (n=8) noted a limited amount of communication in relation to any changes that occur on the MIS. Such changes include alterations in the MIS's structure and appearance, location of reference resources (e.g. practical conservation field guides or risk assessment forms) and adage of new data fields to data collection tools. Further, almost half of staff (n=7) identified external stakeholders and funders as the main external influence shaping the types of volunteering programmes managed and associated data collected. As one staff member said:

*"I run the Kent Heritage Trees Project which is a 5-year Lottery Funded project which the aim is to, among other things, map as many old and important heritage trees in Kent as possible. So, inputting site data, data about the different educational sessions that I run, how many*

*children, what kind of activities. Yeah so we can work towards knowing how many school visits and how many educational sessions I've run over the year for the project".*

To summarise, interviews revealed differences in job roles and associated responsibilities between operational (e.g. project officers) and managerial (e.g. area manager) staff. Few differences were observed in staffs' work-related communications owing to variabilities between regional offices and types of volunteer programmes. Staff also differed in how they coordinated and managed their responsibilities to support TCV's activities, operating at different geographical scales. Further, all staff used similar processes and artefacts to collect volunteer data, with few additional forms of data collection tools and information systems identified. Finally, issues regarding internal training and communication as well as the requirements of funders were identified as the main potential influences affecting TCV's organisational context, impact measurement systems and supporting infrastructures.

### 4.3.3 Observation sessions

A total of 15 TCV staff were observed in their working environments in addition to the one-to-one semi-structured interviews. These sessions observed the following areas of focus: roles and responsibilities, communication and coordination, types and objectives of volunteer information data collected, processes and artefacts used to collect volunteer information data, as well as internal and external influences affecting staff's work context. Observation sessions were used in complimentary to semi-structured interviews to validate staff responses as well as to uncover unarticulated elements of the work context and identify social interactions between TCV staff. This was to understand and identify differences and similarities between TCV staff. Observation notes are outlined below.

Observation sessions revealed mixed findings between TCV's regional offices in relation to staff's styles of working. Of the 7 offices observed, 5 offices had between 2 to 8 staff at any given time, with 2 offices having a single member of staff. In response, there were noticeable differences in communication and coordination of work between these two types of working environments and are provided in Table 4.3. For instance, in those shared office spaces they engaged in more one-to-one communication about work-related issues, including finding resources on the MIS and collaboration on managing volunteering events. By contrast, whilst those staff who worked alone encountered the same working issues, they tended to communicate with those staff in other offices either by telephone or email. These findings helped to identify how staff coordinated their tasks and suggests that some staff work

collaboratively across sites to undertake volunteering tasks whilst others work collaboratively on a single site.

Table 4.3: TCV staff's working patterns.

| TCV staff role | Task description | Description |
|---|---|---|
| Area managers | Organise a regional team meeting. | Area manager contacts staff at other regional offices by email and telephone to organise a team meeting. |
| Community project officers | Undertake volunteering event day. | Lone staff member telephones nearby TCV office to make arrangements to borrow equipment for a volunteering event at the weekend. |
| Green gym project officers | Undertake Green Gym tasks with volunteers. | A group of 2 to 3 Green Gym project officers collectively manage a 6-hour Green Gym session in local park with volunteers. Coordination of work is done through one-to-one communication. |
| | Locating the organisation's internal policies. | One staff member asks others in their shared office space where to find conservation task handbooks on the MIS. |
| Green impacts project officers | Review volunteer programme deliverables. | Green impact project officer reviewed the output data of the Change! Tool questionnaire survey with area manager and funders through a group-led meeting in the TCV office. |

Further, differences were found between staff in association with their roles and responsibilities (Table 4.4). For example, managerial staff spent a large proportion of their time undertaking work-related activities in the office, with few notable exceptions, such as visiting external stakeholders, and conducting staff progress reviews in other offices. Conversely, operational staff spent more of their time (5 to 6 hours) engaging directly with volunteers in outdoor practical conservation activities than those managerial, and less time (1 to 2 hours) in the office either inputting volunteer data into the MIS or organising future volunteering activities.

Table 4.4: Example of TCV staff roles and responsibilities.

| TCV staff role | Activity example | Description |
|---|---|---|
| Area managers | To conduct staff reviews. | Area managers travelled to different staff offices to undertake staff reviews at selected intervals. This included evaluating staff's deliverables and outputs. |
| | To review the deliverables of funded projects with project officers and funders. | Area managers review project deliverables for funded projects (e.g. Green Gyms) at selected intervals with operational staff and funders. Discussions are based on output data generated, using volunteer data collected by the MIS. |
| Community project officers | To collect registration and personal details of new volunteers who have joined. | Project officers collect registration and personal details of new volunteers using a paper registration form, before uploading details onto the MIS. |
| Green gym project officers | To undertake Green Gym tasks with volunteers. | Green Gym project officers undertake Green Gym task for 6 hours on a selected day. This includes 2 coffees breaks and a lunch break. Tasks include those intensive (e.g. coppicing trees) and those less intensive (e.g. replanting pots) conservation activities. |
| | To send out and follow up questionnaire surveys with volunteers. | Project officer checks list of volunteers on the MIS to see when volunteers have completed their last questionnaire survey. If a volunteer needs to |

| | | |
|---|---|---|
| | | complete a survey, the project officer sends them an email with a web link to the online survey. |
| Green impacts project officers | To collect volunteer data as part of a funded research project. | Green impact project officers collect volunteer's responses to the Change! Tool questionnaire survey, which analyses volunteer's pro-environmental change over time in association with TCV volunteering activities. Volunteer output data is visible on the MIS. Volunteer data is exported into Excel spreadsheets for further analysis. |
| | To analyse volunteer data and report back to area manager and funders on deliverables. | To review the output data of the Change! Tool questionnaire survey on the MIS, which is downloaded onto an Excel spreadsheet. Data is analysed in Excel, before composing a quarterly report to present to area manager and funders. |

Sessions also presented variabilities in the types of volunteer data collected by staff with examples of these differences found in Table 4.5. In general, managerial staff collected data associated with performances of staff, deliverables of volunteer programmes, and financial accounting notes. By contrast, operational staff collected information about volunteers, volunteering programmes, volunteering sites, and volunteers' responses to questionnaire surveys on selected projects.

Table 4.5: Volunteer and related data collected and used by TCV staff.

| Staff role | Activity description | Example |
|---|---|---|
| Area managers | To review volunteer programme deliverables. | Reviewed Action Team project data on the MIS with staff member. All information required to conduct tasks were assessed in line with the organisation's policies and whether the number of tasks and volunteers met with area manager's targets. |
| | To review all financial transactions. | Reviewed budget data on the MIS for all Green Gym tasks undertaken. |
| Community project officers | Collect registration and personal details of volunteers. | Collected TCV volunteer details of those who wish to take part in the Action Team project using a paper registration form. Volunteer details were then uploaded onto the MIS. |
| | Planning logistics for conservation task. | Planned a pond weeding task and organised what equipment was required, uploading data onto the MIS. |
| Green gym project officers | Collect volunteer data as part of a funded project. | Green Exercise survey link is sent to volunteers by email. Volunteer's survey response data submitted is then stored on the MIS. |
| Green impacts project officers | Collect volunteer data as part of a funded project. | Conducted Resilience focus group interviews with local community volunteers associated with TCV in the Greater London region. Transcript data of volunteer responses to interview were then uploaded onto the MIS. |

Finally, similarities and differences were identified in the physical items used to support the activities of staff and volunteers, as illustrated in Table 4.6. In general, all staff collected volunteer and associated data using paper forms, before manually inputting and storing the data on the MIS. As noted in 4.3.2, few staff encountered issues in relation to the usability, general functioning and appearance of the MIS. In addition, staff also used the MIS for other activities, including managing their diaries, looking up details of staff and volunteers as well as answering and receiving emails. There were also few differences in physical items used by staff to collect volunteer data or store related procedural and guideline information, such as additional individually or TCV created information systems.

Table 4.6: Example of tools used to support the activities of TCV staff and volunteers.

| Staff role | Activity description | Tool(s) used |
|---|---|---|
| Area managers | Research organisation's internal policies. | TCV policy guides are downloaded from the Academy, an online resource website created by TCV for managerial staff. |
| | Evaluate deliverables of a funded project, based on volunteer's responses to questionnaire surveys. | Volunteer output data is visible on the MIS. Volunteer data is exported into Excel spreadsheets for further analysis. |
| Community project officers | Researching information for carrying out a conservation task, such as dry-stone walling. | Conservation task handbooks on the MIS. |
| Green gym project officers | Collect site and risk assessment details for a conservation task. | Record site and risk assessment details onto a paper form for conservation task. This information is then uploaded onto and stored on the MIS. |
| Green impacts project officers | Collect registration and personal information of new volunteers. | Paper registration form was used to collect data from volunteers, before data is uploaded onto the MIS.<br>The MIS is used to create an online questionnaire survey. Survey web link is sent to volunteers by |

| | | |
|---|---|---|
| | Collect volunteer responses to questionnaire surveys. | email. Volunteer's survey response data submitted is then stored on the MIS. |

In summary, observation sessions revealed noticeable differences in communication and coordination, with staff in shared office spaces engaging in more one-to-one communication about work-related issues than lone workers. Differences were also found between staff in association with their roles, responsibilities and volunteer data collected. In general, operational staff collected the majority of volunteer data, with managerial staff collecting information related to volunteer data. Finally, all staff used a similar process to collect and store volunteer data, with additional information systems being used in addition.

### 4.3.4 Work models

Based on collated findings from the one-to-one semi-structured interviews and observation session two diagrammatic work models were developed, sequence and artefact, which were most relevant to the chapters' research aim. The use of diagrammatic work models is recommended by Holtzblatt and Beyer (2015) as part of the Contextual Inquiry method. Their purpose is to provide a simple and descriptive illustration of the work practices, and supporting artefacts used by TCV staff synthesized into a single coherent diagram. These two models are described below.

#### *Sequence Model*

A *sequence model* was used to describe the generic steps and actions undertaken by TCV staff, to gain a generic overview of TCV's work practices, volunteering programmes, impact measurement systems and supporting infrastructures (Figure 4.3). The model consists of the following elements: rectangular boxes containing visual images with bold text to illustrate steps and actions in the sequence model, arrows and step numbers to show the direction of sequence, as well as italic text next to arrows to describe steps and actions that occur in the sequence.

The initial steps and actions of the sequence model centre on TCV's work practices associated with managing volunteering programmes and supporting infrastructures. Firstly, operational staff organise conservation activities for the volunteering programmes that they manage by conducting volunteering site surveys, risk assessments, and detailing project logistical requirements (Step 1). After the conservation activities have occurred, operational staff identify which existing volunteers contributed to these activities, adding the details of any new

volunteers that joined in with the activities (Step 2). All project management and volunteer data collected in steps 1 to 2 by TCV staff were done using papers forms and then manually input and upload this data onto the MIS (Step 3).

The next steps and actions of the sequence model show TCV's volunteer impact measurements and supporting infrastructures associated with their volunteering programmes. Volunteer impact measurements are collected in two ways. Firstly, from the volunteer data stored on the MIS identified in steps 1 to 3. Secondly, those volunteer impact measurements specifically aimed towards a funded volunteering project (e.g. Green Gyms®) with a set research objective (e.g. health and wellbeing). Volunteers' responses to questionnaire surveys are collected at variable intervals after the starting volunteering sessions by operational staff. Questionnaire surveys are first created by staff using the MIS (Step 4), and are then sent to volunteers at variable intervals in the form of a web link through e-mail (Step 5). All data inputted by volunteers are then stored on the MIS (Step 6). Both types of volunteer impact measurements collected can then be exported and used by operational staff to report back to managerial staff, funders and stakeholders to review volunteering project deliverables (Step 7).

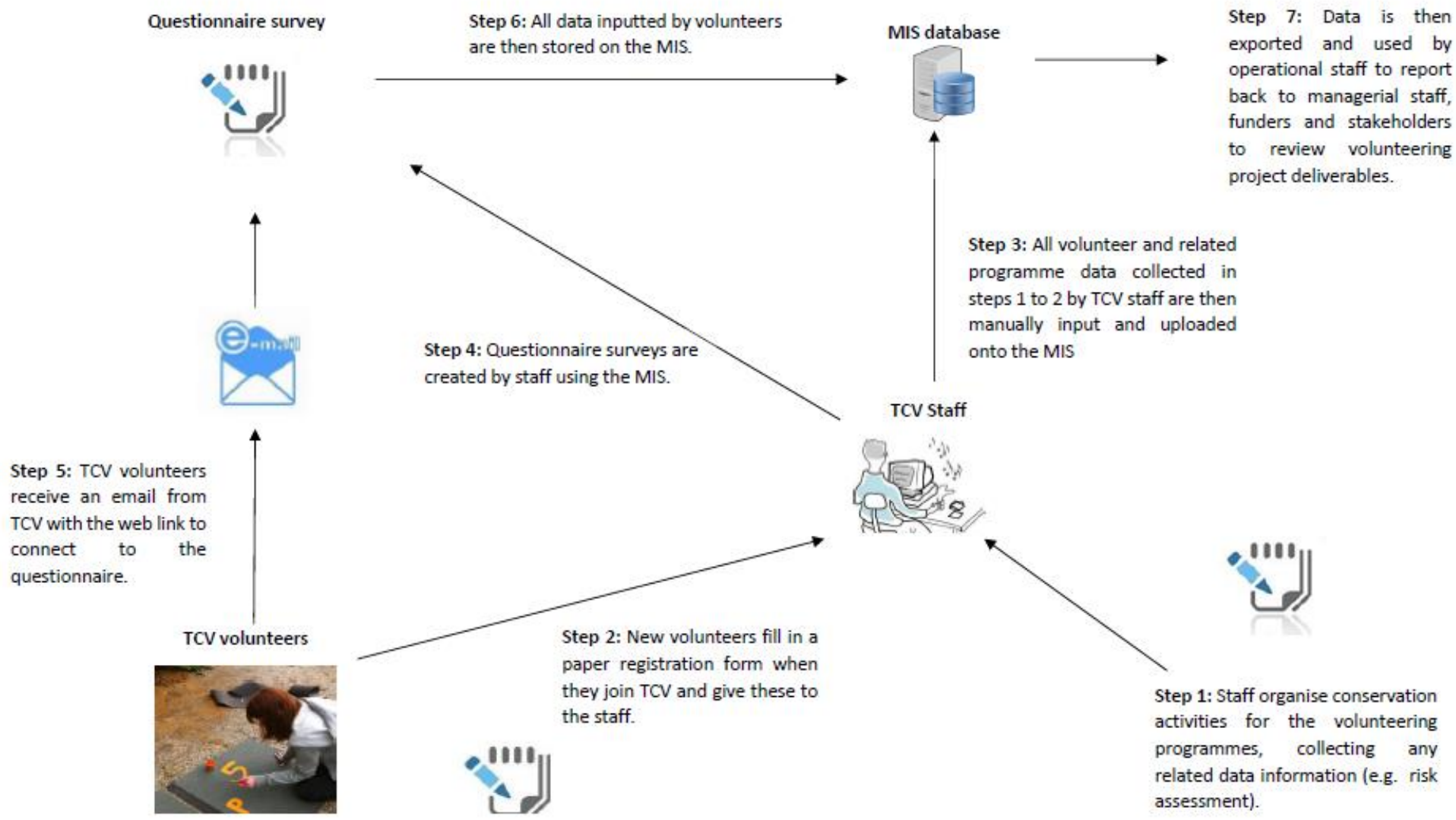


Figure 4.4: Sequence model showing on TCV's work practices, impact measurement systems and supporting infrastructures.

### *Artefact Model*

The *artefact model* identifies those physical items and supporting infrastructures used by staff to facilitate TCV's work practices, volunteering programmes and impact measurement systems. The model is based on collated findings from the one-to-one semi-structured interviews and observation session and consists of the following elements: paper forms, online forms, online questionnaire surveys and evaluation tools. Each of these elements is described below, providing an example.

When volunteers initially join TCV and engage in outdoor practical conservation activities, operational staff will ask the new volunteers to fill in a registration and welfare paper form. Once these forms have been completed, volunteers are asked to return them to the operational staff who will then manually input and store the information volunteers have provided on the MIS. As appendix 1 shows, the form requires volunteers to provide the following information: personal information, emergency contact information, health and welfare details, photograph permissions, data protection agreement, socio-demographic status (e.g. gender), previous volunteering activity (either for TCV or another organisation) as well as where they heard about the TCV programme. All information provided is then transferred directly onto the MIS by TCV staff, with each volunteer identified by their unique identification number, geographical region, site location and conservation tasks undertaken. From the volunteers' information collected, this can be used by operational staff for project management and reporting to managerial staff, funders and stakeholders basic volunteer data (e.g. numbers of volunteers).

All staff, whether managerial or operational, collect volunteer and associated data using both paper forms, before being manually inputting and stored onto the MIS. An example of this is illustrated in Figure 4.5 and is a screenshot of a data collection form on the MIS which was observed during one of the observation sessions. The form shown is called a 'project report', which collections information about a conservation activity (top left), the numbers and types of volunteers who contributed to the conservation activity (top right), and 'BAGELS' impact measurements (bottom) for those operational staff who record these measurements. Once information is inputted, staff are then able to submit the form, storing information onto the MIS.

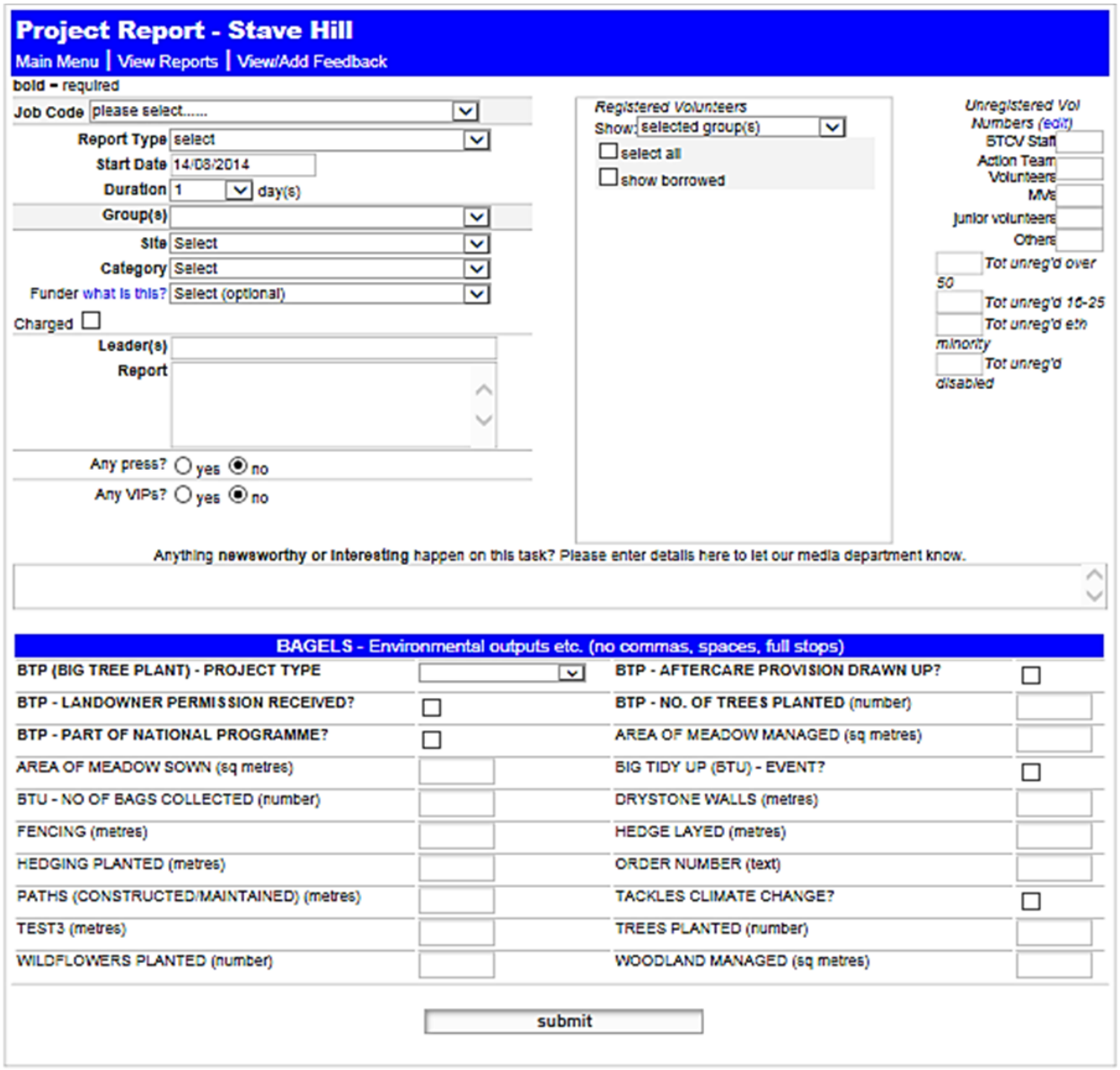


Figure 4.5: Screenshot of project report form on TCV's MIS.

Finally, as identified the MIS also functions as an impact measurement tool collecting volunteers' responses to specifically designed questionnaire surveys by TCV staff as part of funded volunteering projects with a set research objective. The process in which the volunteer impact measurement data is collected and stored is again described in the sequence model in the above section. An example of this is the Green Exercise questionnaire survey (see section 3.3.4 and appendix 2), a self-reported questionnaire used in selected Green Gyms® programmes. Figure 4.6 presents a screenshot of the first part of the survey as it appears to a volunteer online. In addition, Figure 4.7 shows how staff use the MIS to evaluate the Green Exercise survey data collected from volunteers, using two forms of descriptive summaries: bar charts and summary tables. It is these descriptive summaries which operational staff use to

report back to managerial staff, funders and stakeholders to review volunteering project deliverables.

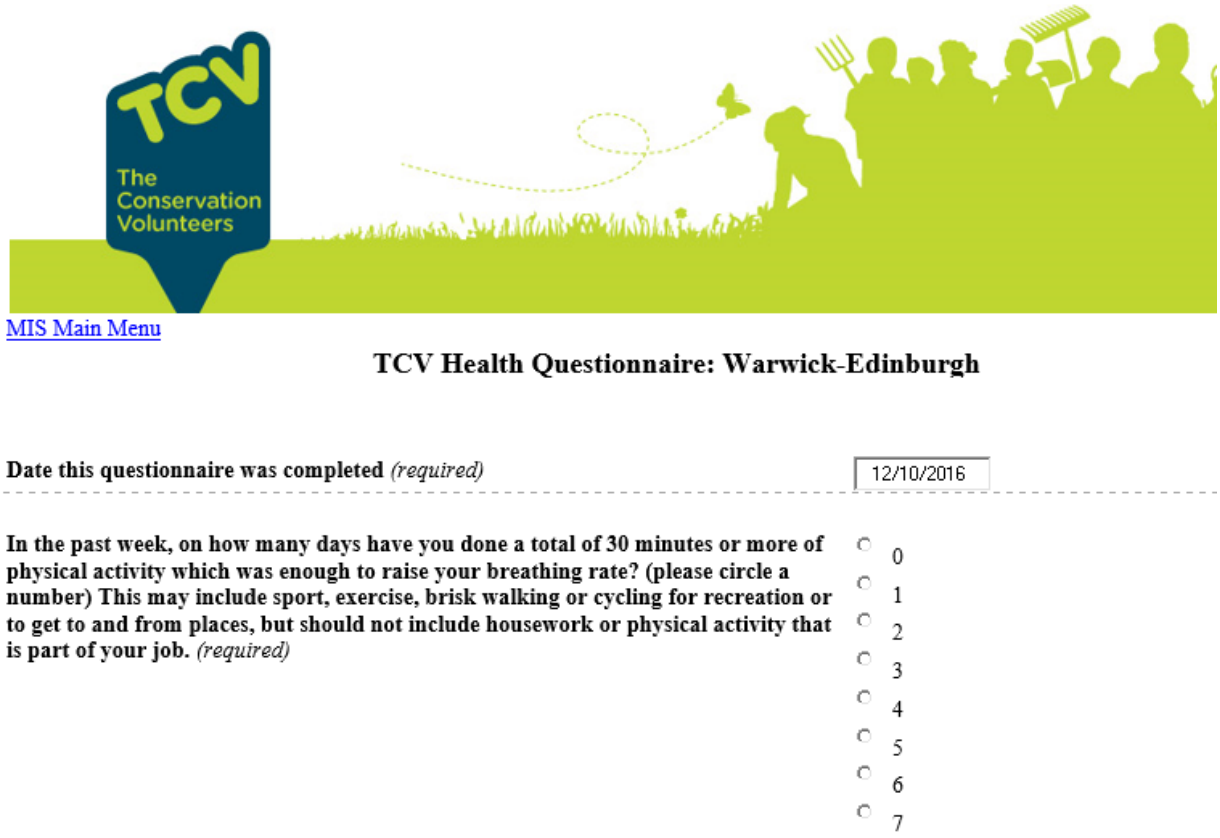


Figure 4.6: Screenshot of the Green Exercise questionnaire survey on TCV's MIS.

| | |
|---|---|
| Improved score from survey 1 to 2 | 44.48% (125 out of 281) |
| Improved score from survey 1 to 3 | 51.83% (85 out of 164) |
| Improved score from survey 1 to 4 | 53.00% (53 out of 100) |
| Improved score from survey 1 to 5 | 42.86% (27 out of 63) |
| Improved score from survey 1 to 6 | 50.00% (1 out of 2) |

| | |
|---|---|
| Survey 1 average score | 25.81 |
| Survey 2 average score | 25.73 |
| Survey 3 average score | 26.34 |
| Survey 4 average score | 26.93 |
| Survey 5 average score | 26.11 |
| Survey 6 average score | 31.50 |

| BANDINGS | EXCELLENT | GOOD | AVERAGE | BELOW AVG | POOR |
|---|---|---|---|---|---|
| Survey 1 | 27.52% | 20.04% | 16.45% | 17.45% | 18.54% |
| Survey 2 | 25.98% | 19.22% | 17.79% | 18.51% | 18.51% |
| Survey 3 | 28.66% | 23.17% | 18.29% | 14.02% | 15.85% |
| Survey 4 | 33.00% | 30.00% | 13.00% | 10.00% | 14.00% |
| Survey 5 | 20.63% | 26.98% | 23.81% | 11.11% | 17.46% |
| Survey 6 | 50.00% | 50.00% | 0.00% | 0.00% | 0.00% |

Figure 4.7: Screenshot of descriptive summaries for Green Exercise questionnaire survey data outputs on TCV's MIS.

## 4.4 Discussion

Overall, this chapter gathered a contextual understanding of TCV's organisational contexts, work practices, impact measurement systems, and real-world environmental factors. Additionally, the chapter explores TCV staff's interactions with supporting infrastructures to understand the functionality of their existing volunteer impact measurement system and related data collected. From this, it enabled me to identify how work contexts, data requirements, supporting infrastructures (e.g. the MIS) and real-world environmental factors have shaped TCV's volunteer impact measurement system and related data collected (Voida *et al*., 2011). This is because there is a risk of misinterpretation about what the information represents and what it informs us about the activities of volunteers. I achieved this using a mixed method approach, to observe and discuss with staff about their work practices as well as to characterise their interactive behaviours with TCV's MIS. This chapter therefore provides valuable insight into of the nature, veracity and meaning of volunteer data, which are reviewed below, and will be used in proceeding chapters 5 and 7 for further analysis.

Findings in this chapter presented various similarities and differences in the roles, responsibilities and associated tasks of TCV staff. The following four main roles were identified, each presenting differences in tasks they engaged in: community project officers, green gym project officers, green impacts project officers and area managers. Of these, managerial staff spent a large proportion of their time undertaking work-related activities in the office, with few notable exceptions (e.g. visiting external stakeholders or funders), spending a large proportion of their time on the MIS database inputting external stakeholder and funding related information. By contrast, operational staff (e.g. Community and Green Gym Project Officers) spent more time engaging directly with volunteers in outdoor practical conservation activities than those managerial, and less time undertaking work-related activities in the office. As a result, volunteer data collected centred primarily on adding new volunteers as well as volunteering tasks, groups and sites. Yet, operational staffs' interactive engagement in the MIS differed, whereby some staff undertook high levels of activity in a short number of days and vice versa, a trend which was not role specific, but individual. This observation was identified in staffs' transaction logs. Factors which might explain these trends include job specifications, seasonal variations in volunteering activities and time availability (Voida *et al*., 2011). Similarly, operational staff differed in how they coordinated and managed their responsibilities to support TCV's activities, with some coordinating work activities at a regional scale, whilst most operated at a more localised level (e.g. local authority). This was identified in both the one-to-one interview and observational sessions. Such variability in staff roles and management of related responsibilities was reflected in the types and scale of volunteer data collected as well as data collection efforts, reviewed below.

Findings presented variations in the types of volunteer and related data collected with these emulating the variations in TCV staffs' roles, responsibilities and tasks they undertook. Firstly, there were variable differences between managerial and operational staff, with those managerial tending to collect more information related to volunteer data (e.g. financial or funding information) and less forms of volunteer data, with those operational instead collecting a large proportion of volunteer data (e.g. volunteers' personal data). This was also reflected in staffs' use of the MIS explored using transaction log analysis. One benefit to having the same members of operational staff undertaking collecting volunteer data using the same process is that it increases the level of consistency and internal reliability of data collected (Bryman, 2012). Secondly, few differences were found in the types of volunteer data collected by operational staff between regional offices and the types of volunteering programmes (e.g.

Green Gyms®) staff engaged in. For instance, some operational staff noted that they only required the collection of basic volunteer data for project management and reporting to funders. Similar findings have been noted by others in volunteering research (Ógáin *et al*., 2012; Harlock, 2013) which found there to by a plethora of measurement tools used by volunteering organisations owing to the diversity of needs and internal motivations when measuring impacts. Possible effects of this includes increased heterogeneity and variabilities between volunteer datasets (e.g. questionnaire surveys) which need to be considered when interpreting data outputs.

Similarities and differences were also identified in the physical items used to support the activities of all TCV staff, therefore having indirect impacts on the quality of volunteer data collected, as explained below. For example, all staff collected volunteer and associated data using paper forms, before manually inputting and storing the data on the MIS. These physical items used to collect and store volunteer data were idiosyncratic, motivated by features in people's work context, including diversity and fluidity of information needs. Similar internally created information systems, termed homebrewed systems, have also been identified amongst US volunteering organisations to assist with their work-related activities (Merkel *et al*., 2007; Goecks *et al*., 2008; Voida *et al*., 2011). As such, this consistency in data collection processes will minimise any inconsistencies and other anomalies in the data, thereby improving the data quality (Bryman, 2012; McConville, 2017). Moreover, there were also few differences in physical items used by operational staff to collect volunteer data or store related procedural and guideline information, such as additional information systems created by TCV (e.g. the Academy). Reasons for these differences in physical items related to additional data requirements as well as an add-on feature to TCV's MIS to meet staff requirements. However, none of these physical items were found to significantly affect the quality of volunteer and associated data stored on the MIS, used in proceeding chapters 5 and 7 for further analysis. This was because these were non-systematic biases, there could be no systematic error in measurements or estimates in volunteer data analysed.

Staff highlighted two internal influences affecting TCV's organisational context, impact measurement systems and supporting infrastructures which had the potential to impact the veracity and nature of volunteer data collected: training and communication. Firstly, training was highlighted by few staff as an internal influence and related to issues of usability, the general functioning of the MIS and its appearance. Yet, such issues were not shared by most staff who possessed existing skills and experiences in using information systems. A similar

finding was also identified by Voida *et al* (2011) who interviewed staff from a wide range of volunteering organisations in the US who regularly used homebrewed databases. In this way, there would be small but appreciable inconsistencies in volunteer data collected by TCV. Yet, as these were non-systematic biases, there could be no systematic error in measurements or estimates in volunteer data analysed.

Following on from above, staff also noted a limited amount of communication regarding changes that occurred on the MIS. These changes included alterations in the MIS's structure and appearance, location of reference resources (e.g. practical conservation field guides) and adage of new data fields to data collection tools. Such changes have the potential to affect how volunteer data is inputted on the MIS and subsequently interpreted, increasing the likelihood of heterogeneity and variability between datasets. This finding highlights the inextricable link between the communication and the implementation of organisational changes (Elving, 2005), and its potential impact on volunteer data. In addition, findings in this chapter found differences in communication and collaborative networks between staff across offices, regions and volunteering projects. For instance, there were those operational staff who worked in the same office or region and collaborated on work-related activities to support volunteering projects. Such variability in communication and collaborative networks between staff could also impact the nature and veracity of volunteer data in relation to standardisation of data collected.

Finally, external stakeholders and funders were identified by some staff as the main external influence shaping the types of volunteering data collected. For instance, almost half of operational staff were found to develop volunteer programmes (e.g. Green Gyms®) and collect associated data specifically aimed towards a funded project with a set research objective, i.e. measuring volunteers' health and wellbeing. Similar evidence was shown in a survey by Ógáin *et al* (2012) which found that meeting funder requirements is one of the most important factors shaping volunteer impact measurement in the UK volunteering sector. One suggested reason for funders being an important influential factor owes to perceived pressures by some volunteering organisations to maintain existing and attract new sources of funding (Metcalf, 2013). Further, there was variability in how geographically spread some funded projects were operated, whether at a national, regional or localised level (e.g. Green Impacts project in Greater London). It is therefore noteworthy that the nature of volunteer data collected in association with these funded projects will reflect these geographical distributions, knowledge which is important when interpreting the data's overall meaning (e.g. regional differences and

generalisations). As such, the true nature and scale of how TCV's activities impact volunteers is not fully known, creating instead a partial picture of volunteering impacts.

### 4.4.1 Study limitations

This section presents two main limitations relevant to the analysis that was presented here. Further general limitations of the thesis methodological approach can be found in chapter 8.

Firstly, findings were based on two neighbouring regions, Greater London and South East of England, increasing susceptibility that organisational practices are similar and cannot therefore be generalised. As such, this may have reduced the ability to detect differences relating to factors, such as direct interaction between staff across regions.

Secondly, server usage logs extrapolated for transaction log analysis did not included staffs' individual session lengths or navigation paths on the MIS. Therefore, staffs' interactive behaviours with the MIS could not be fully interpreted. Such information would have been particularly useful to provide further context about how staff use the MIS and its interrelationship with volunteer data collected, including what type of volunteer data on each form is edited.

## 4.5 Summary

The chapter identified how and why TCV's staff use their impact measurement system to understand what effect this may have on overall nature, veracity and meaning of the volunteer data they collect. In particular, it gathered a contextual understanding of TCV's organisational contexts, staff's interactions with supporting infrastructures, work practices, impact measurement systems, and real-world environmental factors. This was demonstrated through implementing additional forms of qualitative and quantitative methodological approaches.

Findings from this chapter served as a valuable insight into of the nature, veracity and meaning of volunteer information data, that will be used in proceeding chapters 5, 6, and 7 for further analysis. It presented similarities and differences in the roles, responsibilities and associated tasks of TCV staff. Staff also differed in how they coordinated and managed their responsibilities to support TCV's activities at different geographical scales and was reflected in the types and scale of volunteer data collected as well as data collection efforts. Similarities and differences were also identified in the physical items used to support the activities of staff in collecting volunteer and related data (e.g. MIS online database). Moreover, staff highlighted internal (training and communication) and external (stakeholders and funders) influences

affecting TCV's organisational context, impact measurement systems and supporting infrastructures. Such changes could have the potential to affect how volunteer data is inputted and subsequently interpreted, increasing the likelihood of heterogeneity and variability between datasets.

Finally, two main limitations relevant to the analysis that was presented here. Firstly, findings were case specific to two neighbouring regions, Greater London and South East of England. As such, this may have reduced the ability to detect differences relating to factors, such as direct interaction between participants. Secondly, server usage logs extrapolated for transaction log analysis did not included staffs' session lengths or navigation paths on the MIS. Such information would have been particularly useful to provide further context to how staffs' use the MIS and its interrelationship with volunteer data collected, including what type of volunteer data is edited.

The next chapter explores the engagement characteristics and behaviours of TCV's volunteers, using volunteer data collected by TCV. The chapter begins by reviewing the existing theoretical and research literature on volunteer engagement and motivation as well as related studies within these disciplinary areas. It then outlines methods used in the chapter to analyse and interpret research findings which are then discussed.

# Chapter 5: Exploring the engagement characteristics and behaviours of TCV's environmental volunteers

## 5.1 Introduction

In the last decade, the study of engagement has gradually emerged in volunteering research literature (Reed and Selbee, 2001; Mohan and Bulloch, 2012). However, findings from these volunteering studies remain largely generalised in scope and have not yet been fully explored. Such knowledge would help to identify any variabilities in volunteers' engagement patterns to gain a deeper understanding of the delivery of volunteering programmes as well as any relating factors (e.g. level of engagement, type of volunteering project and transport mobility).

The last 10 years have seen an increase in the use of computerised databases and online platforms by volunteering organisations (section 2.8). These databases are used to manage volunteers' activities which all occur offline. Information about volunteers (e.g. volunteering sites, regions, and projects attended) and their associated activities (e.g. number of days and tasks contributed) are collected by the project's staff and stored in an online database. Volunteer data collected is often used by project staff to report back to project funders to review volunteering project deliverables (section 4.3).

Using information collected about volunteers (e.g. identification codes) and their associated activities (e.g. tasks undertaken), researchers have begun to evaluate the activities of volunteers to identify participatory patterns in online and ICT dependent citizen science projects. Online and ICT-dependent citizen science projects are where volunteers typically collect data as part of a scientific enquiry (e.g. number of species identified) in partnership with scientists, using smartphones or an online system (Haklay, 2013). In these studies, identifying volunteers' engagement characteristics and behavioural patterns has been achieved using both exploratory (graphic and non-graphic descriptive data summaries) and confirmatory (traditional statistical tools of inference, significance, and confidence) analytical techniques. Such knowledge has been valuable in assisting practitioners in citizen science fields in their understanding, recruitment, and retention of individuals who engage in their activities. With this in mind, there is scope for the applicability of these methods in other relating or nearby fields (e.g. volunteering) wishing to explore volunteer engagement if similar information data is accessible.

The purpose of this chapter was to characterise TCV volunteer's behaviours and their degree of engagement to a project or programme. This knowledge was used as essential background information, which enabled me to gain further understanding about TCV volunteers and their engagement in programmes delivered by TCV. This was achieved through applying and building on those existing quantitative approaches used to characterise the nature of volunteer engagement in online and ICT dependent citizen science projects. This was because TCV share some similarities with online and ICT dependent citizen science projects in relation to the types of volunteer information data they collect (e.g. number of tasks completed). Thus, there was scope for the applicability of these methods to explore TCV volunteers' engagement.

The method combines descriptive and exploratory data analytical approaches (section 3.2.9) to explore the engagement characteristics, contributor activity and behavioural profiles of TCV volunteers. As we will see, findings from this chapter served as a foundation upon which to organise focus group interviews that follow in chapter 6 (thereby addressing research objective 3). Findings also sought to provide valuable background information for findings identified in chapter 7 to gain a deeper understanding of the delivery of these programmes as well as provide suggested recommendations for their ongoing future delivery (chapter 8). This information is particularly important to gather further understanding about the extent to which volunteering organisations deliver health-related impacts through their volunteering activities (Jenkinson *et al*., 2013).

The chapter begins by reviewing the existing theoretical and research literature on volunteer engagement and motivation as well as related studies within these disciplinary areas. From this, it outlines exploratory quantitative methods I used in this study. The methodological approach and findings are then discussed.

Major parts of this chapter are published in and can be found in appendix 7:

Seymour, V. and Haklay, M. (2017) Exploring engagement characteristics and behaviours of environmental volunteers. *Citizen Science: Theory and Practice*, 2 (1), 5.

Minor parts of this chapter are published in:

Boakes, E., Gliozzo, G., **Seymour, V**., Harvey, M., Smith, C., Roy, D. and Haklay, M. (2016) Patterns of contribution to citizen science biodiversity projects increase understanding of volunteers' recording behaviours. *Scientific Reports*, 6, doi:10.1038/srep33051.

### 5.1.1 Volunteer engagement and its underlying characteristics

In the last decade, the study of engagement has gradually emerged in volunteering research literature. The subject of engagement itself has been studied widely across other disciplines and includes user, work, and student engagement (Lehmann *et al*., 2012).

The term "engagement" has no generally agreed upon definition or conceptual framework. Instead, it is broadly defined and oriented towards the research field which is being studied. For instance, in studies on user engagement, the term has been defined loosely as "a process and product of interaction" in which its degree of intensity can alter with time depending on a host of factors, including attention, aesthetics, challenges, feedback and motivation (O'Brien and Toms, 2008). By contrast, work engagement centres on an employee's cognitive connection to their work and is said to be persistent in the event of challenges encountered. Within each of these study fields, there are two types of engagement: attentional (intensity or degree of involvement and duration expenditure) and emotional (perception, motivation, cognitive and experience) (Lehmann *et al*., 2012). In this study, I focus on attentional engagement, referred to here as the interaction or behaviour presented by a volunteer in relation to the project they engage with. It is these behaviours that can be used to understand a volunteers' level of engagement as well as describe what type of volunteer they are, whether classic or episodic (see section 2.6 for further explanation on these types of volunteers). Yet, it remains an area of limited yet valuable research amongst the volunteering sector with regards to volunteer recruitment and project management (see section 2.6.1; Reed and Selbee, 2001; Mohan and Bulloch, 2012).

Often used in user engagement research for website design, attentional engagement can be derived from a person's engagement characteristics (e.g. click-through rates, page views, and time spent on a web site). These can be measured through a series of metrics (e.g. length, frequency and geographical location of activity), with those characteristics being evaluated according to what information is obtainable or required. Similar to user engagement research, researchers have begun to evaluate the attentional engagement of volunteers who engage in online and ICT dependent citizen science projects, using information collected about volunteers (e.g. identification codes and tasks contributed) via computerised databases and online platforms (Ponciano and Brasileiro, 2014). As identified, a similar type of data about volunteers' attentional engagement is also being collected by some volunteering projects (e.g. The Conservation Volunteers), which has the potential to be used to characterise the nature of volunteer engagement within the volunteering sector.

In this chapter, the following engagement characteristics were used and are reviewed in more detail; longevity, frequency and distance travelled. These characteristics were selected owing to their importance for making logistical decisions to organise workshop sessions in the next chapter (chapter 6) as well as provide valuable background information for findings identified in chapter 7.

Longevity is the length of time a person continues to be involved in volunteering activities. Research has long shown much variation in the length of time that a person commits to engaging in volunteering activities relating to a number of internal and external factors, including intrinsic motivation, time availability, and type of volunteer project (Holmes, 2014; Dunn *et al*., 2016). Understanding volunteers' longevity behaviours was important for managing focus group interviews that follow in chapter 6 in relation to adequacy of recruitment and retention as well as the allocation of resources (e.g. equipment and training) (Chu *et al*., 2012). Further, this knowledge also serves as valuable background information for when I explore volunteer data collected by TCV on the health impacts and related behaviours associated with their volunteering programmes in the Greater London region (chapter 7). In this way, I would be able to assess the performance delivery of these programmes. Additionally, this knowledge would provide suggested recommendations for their ongoing future delivery (chapter 8), taking into account the size of the volunteer population that TCV reaches as well as the proportion of time volunteers spend engaging in these volunteering activities.

Frequency refers to the regularity of a person's involvement in volunteering activities. This is a commonly used method in online user engagement research which measures a person's level of involvement in an activity. It is usually regarded that the higher a person's level of involvement in an activity, the more engaged they are (Lehmann *et al.*, 2012). Such information was useful for the planning of my workshop sessions in relation to the number and frequency of sessions required (e.g. weekly or monthly) as well as length of time allocated (e.g. single event or ongoing project). Similarly, these findings provided further understanding about those volunteers included in the analysis conducted in chapter 7, who predominantly attend multiple volunteering sessions. In particular, this knowledge describes volunteers' level of engagement in TCV's environmental volunteering activities, a factor which has the potential to influence the scale and degree of health-related impacts that are delivered.

Finally, distance travelled is the distance a person travels to a volunteering site as part of a volunteering project, from either their place of residence (e.g. home or residential address). As TCV's environmental volunteering projects are organised group sessions that occur in set locations which required volunteers to travel. These sessions occur for an entire day, with volunteers often travelling from their place of residency. However, to date no studies in volunteering research have looked into patterns of distances travelled. Instead they have identified the importance of distances travelled to a person's willingness to engage in environmental volunteering activities (Pope, 2005; O'Brien *et al.*, 2008; Tulloch and, Szabo 2012), with issues relating to insufficient public transport, car accessibility and reimbursement of transport costs, acting as potential barriers (Pope, 2005; Tulloch and Szabo, 2012). Nonetheless, such knowledge was valuable for selecting locations to hold workshop sessions (chapter 6), choosing those sites which maximised volunteer numbers and were within a commutable distance for volunteers to attend. Through knowing how far volunteers travel to a site assisted me when allocating financial resources (e.g. travel reimbursement) as well as when organising travel arrangements (e.g. minibus or car sharing) for those travelling from further distances. This knowledge also aided my understanding about volunteers' level of commitment in attending those programmes evaluated in chapter 7, as well as the potential distance at which TCV's health-related impacts may be delivered in Greater London.

### 5.1.2 Related work and existing gaps in knowledge

Characterising volunteer's motivations that can underline their engagement has a wide literature base in volunteering research (section 2.6), examining both qualitative (e.g. questionnaire surveys) and quantitative dimensions (e.g. measurement indexes). There are many areas that this research has touched on, including motivations to volunteer (Clary and Snyder, 1999), individual trait-based characteristics of those who choose to volunteer (Davis Smith *et al*., 2005) and task or activity preferences (Willems and Walk, 2013). Across each of these studies, they reveal how factors of personality characteristics, team affiliation, social enjoyment, types of volunteering projects, current life situations and personal motivations can predict a person's initial and ongoing involvement in volunteering activities. As these studies show, whilst these findings provide useful insights into motivations for volunteering, more research is needed which focuses on project management and adaptability to levels of volunteer retention in order to help strengthen their practices.

Studies in volunteering research which have focused on the engagement behaviours of volunteers include exploring the total amounts of charitable giving, volunteering and

participation in civic engagement (Reed and Selbee, 2001; Mohan and Bulloch, 2012). Quantitative methods used in each of these volunteering studies were descriptive (e.g. percentage proportions and total counts) and derived from governmental surveys based on subsamples of the national population. In each of these studies they found that few volunteers contributed the majority of volunteering activities. Further, Mohan and Bulloch (2012)'s study which explored the socio-demographic backgrounds of those highly contributing volunteers, found that they were most largely from prosperous, middle-aged and highly educated sections of the UK population. However, findings from these volunteering studies remain largely generalised in scope and have not yet fully explored the different types of volunteer engagement characteristics or volunteering projects. For instance, due to environmental volunteering projects increased involves in practical conservation and outdoor based activities (e.g. dry-stone walling) for lengthier periods of time, engagement characteristics may therefore differ to other volunteering projects (Bruyere and Rappe, 2007). Nor have they fully cross-examined these patterns amongst urban-rural population density distributions. Such knowledge would help to identify any variabilities in volunteers' engagement patterns as well as any relating factors (e.g. level of engagement, type of volunteering project and transport mobility).

Finally, as mentioned research on engagement behaviours of volunteers has gradually emerged to identify participatory patterns in online and ICT dependent citizen science projects (e.g. Zooniverse, SETI@home and The Milky Way Project). Existing studies in this area include analysing the contributing activity of volunteers (Neis and Zipf, 2012), understanding volunteers' recording behaviours in species monitoring (Boakes *et al*., 2016), characterising volunteer engagement (Tulloch and Szabo, 2012), and volunteer engagement profiling (Ponciano and Brasileiro, 2014). The studies use various quantitative analytical approaches (e.g. descriptive statistics and cluster analytical approaches) to evaluate the activity logs of volunteers who engage in online and ICT dependent citizen science projects. Across each of these studies, they reveal how these analytical approaches can be used to identify volunteers' contributing behaviours and engagement patterns in these projects. For instance, Ponciano and Brasileiro (2014) used a clustering analytical approach to identified engagement profiles of volunteers, grouping volunteers according to similarities and dissimilarities between their engagement characteristics. This inductive analytical inquiry is a commonly used technique for classifying information data into categories or groups which share similar characteristics. This analytical method is used where no previous knowledge of these categories or groupings are known. Whilst the analytical approaches in these studies have been used to explore citizen

science projects specifically, providing similar information data is accessible there is scope for the applicability of these methods in other relating or nearby fields (e.g. volunteering) wishing to explore volunteer engagement.

## 5.2 Method summary

Descriptive and cluster analytical approaches, implementing significance testing where possible, to examine the engagement characteristics and profiles of those involved in TCV's volunteering activities. Data analysis, consisted on two main parts: firstly, engagement characteristics and contributor activity and secondly, volunteer engagement profiles. All statistical analysis was performed using R Version 3.1.1 (R Core Team) and all spatial analysis was conducted using ArcGIS (Version 10.1). Further in-depth details of the methods used in this chapter are found in sections 3.2 to 3.4.

## 5.3 Results

This section explores and summarises the engagement characteristics and profiles of environmental volunteers who engage in The Conservation Volunteers' (TCV) Action Team projects.

### 5.3.1 Volunteer characteristics: Total volunteer numbers and retention

The total numbers and retention levels of TCV volunteers from January 2010 to December 2013 were calculated. First, the total number of volunteers from each of the three geographical regions varied widely. Greater London presented the highest overall volunteer population (2539 to 724) by comparison to Greater Manchester (237 to 178) and Yorkshire (907 to 592). From this, the percentage of each region's volunteering population size relative to the TCV's overall volunteering population (6989 to 3693) was calculated as follows; Greater London (19.6 - 36.3%), Greater Manchester (2.7 – 4.8%) and Yorkshire (10.8-16%). Further, there were no stable trends in volunteering numbers across sites, instead being quite variable. Similarly, there were no differences in volunteering numbers between months throughout the year.

Volunteers' yearly retention levels differed across each region presenting no clear trends. In general, volunteering numbers increased from 2010 to 2012, with decreases occurring across all regions between 2012 and 2013. The Greater London region accounted for most of these yearly changes in volunteering numbers, having the highest retention levels. By comparison, Greater Manchester and Yorkshire have lower retention levels.

In summary, there were no clear trends in volunteer numbers across all three regions, both yearly and between individual volunteering sties. Greater London exhibited the highest

volunteer population and retention levels, compared to the other two regions. Further, seasonal variability shows no bearing on volunteer numbers, with the volunteering site having more of an impact.

### 5.3.2 Volunteer characteristics: Longevity, frequency and distance travelled

I calculated the total length of time that volunteers were actively engaged (longevity) in volunteering activities as well as the number of volunteering sessions they attended (frequency) for each region. The total length of time that volunteers were actively engaged varied from 1 day to up to 3 years. I also observed differences in the number of sessions volunteers attended and the amount of time that lapsed between these sessions. Overall, findings showed similar trends in longevity and frequency characteristics across all geographic regions (See Figures 5.1 and 5.2), with a higher number of volunteers engaging in one volunteering session.

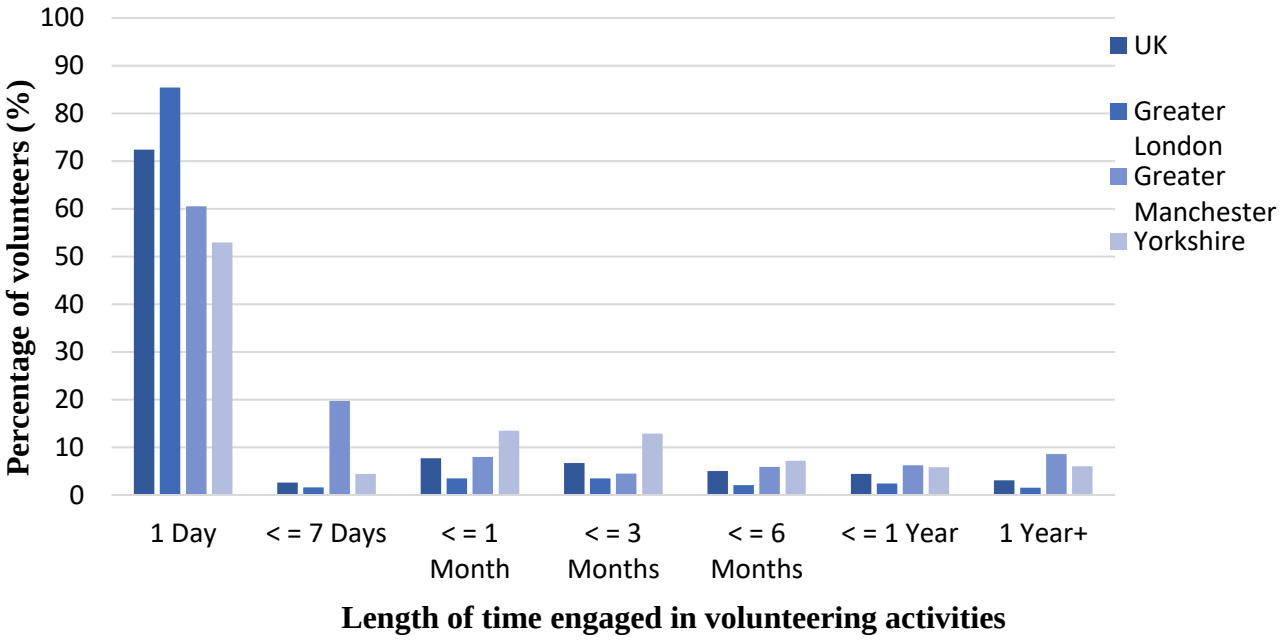


Figure 5.1: Total percentage of TCV volunteers' length of time volunteering.

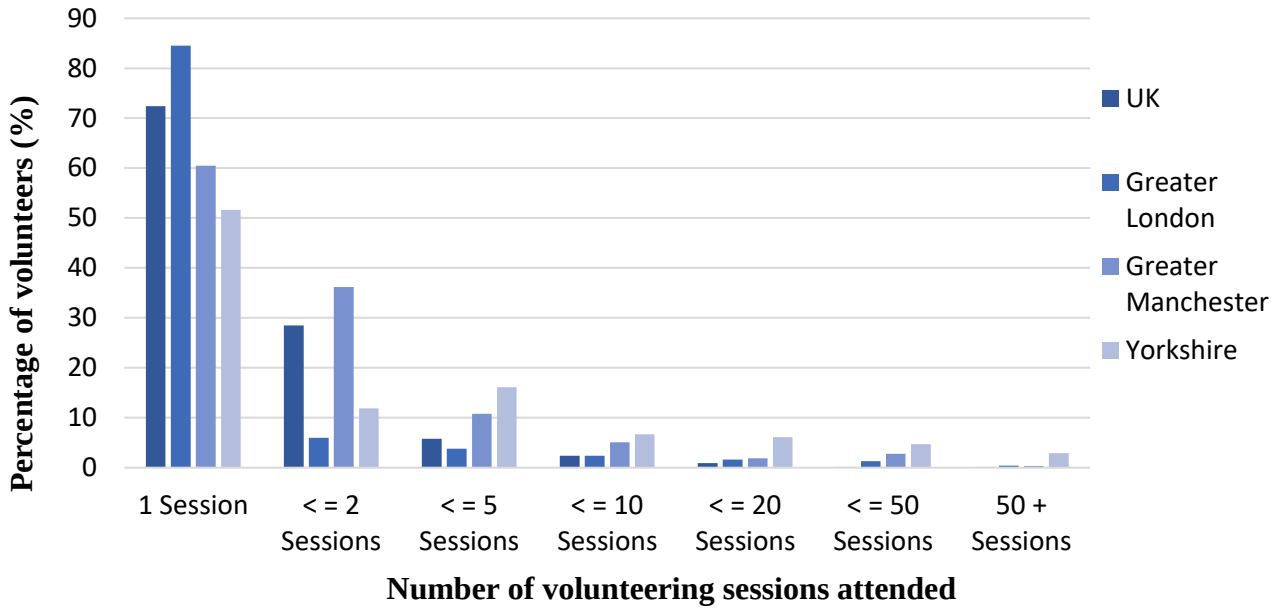


Figure 5.2: Total percentage of TCV volunteers' attending volunteering sessions.

Ratio proportions of "One-Session" to "Multi-Session" volunteers varied. The overall value for the UK was 18:7 which differed to Greater London (5:1), Greater Manchester (3:2), and Yorkshire (1:1). Overall, participatory patterns across all regions revealed that a small percentage of "Multi-Session" volunteers contributed the most to volunteering activities, with a larger proportion of "One-Session" volunteers contributing the least. For instance, of the 207,671 total volunteering activities for all UK regions (Table 5.1), 89.1% were conducted by "Multi-Session" volunteers, who make up 27.6% of the total volunteers. This participatory pattern of "Multi-Session" volunteers is similar across each in the regions: Greater London 11.1% of volunteers contributed 95.6% activity, while in Greater Manchester 39.5% contributed 80.4% of activity, and in Yorkshire 33% contributed 96.7% of activity.

Table 5.1: Annual volunteering activities for each geographic area.

| Regions | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|
| Greater London | 3372 | 5467 | 5160 | 7386 |
| Greater Manchester | 1552 | 1282 | 1610 | 1920 |
| Yorkshire | 4332 | 4190 | 7073 | 7053 |
| Total UK Activities | 43187 | 49734 | 56420 | 58330 |

Findings showed that the numbers of volunteers decreased with increasing distances travelled. These trends were replicable between both ‘One-Session' and ‘Multi-Session' volunteers, with the majority living within a 20-mile distance of the TCV site they attended. Overall estimated distances travelled by volunteers for each region were as follows: Greater London about 32 miles, Greater Manchester about 36.5 miles, and Yorkshire about 42.3 miles. Findings also showed that in the two urban regions most volunteers (Greater London 80%, Greater Manchester 85.6%) lived within a 5 to 20-mile distance from the TCV site they attended. By contrast, most volunteers (62%) in Yorkshire lived within close proximity of up to 5 miles from the TCV sites they attended. These findings were consistent whether a volunteer attended one or multiple sessions, as illustrated in Table 5.2.

Table 5.2: Volunteer travelling distances in percentage across the three geographical regions for each volunteer type.

| Sessions | Regions | Distance Travelled (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | < = 1 Mile | < = 5 Miles | < = 10 Miles | < = 20 Miles | < = 30 Miles | 30+ Miles |
| One- | Greater London | 3.3 | 28.4 | 29.4 | 30.9 | 7 | 0.9 |
| Session | Greater Manchester | 2.3 | 27.8 | 39.7 | 20.7 | 7.9 | 1.6 |
| | Yorkshire | 8.2 | 52.9 | 19.7 | 13.6 | 4.5 | 1.6 |
| Multi- | Greater London | 9.9 | 61.5 | 20 | 6.2 | 1.9 | 0.3 |
| Session | Greater Manchester | 1.2 | 24.1 | 50.6 | 20.7 | 4.1 | 1.2 |
| | Yorkshire | 14.8 | 53.8 | 14.9 | 9.4 | 5.7 | 1.2 |

To summarise, similar trends were observed in longevity and frequency characteristics across all geographic regions, with a large proportion of volunteers engaging in one volunteering session. Additionally, participatory patterns across all regions revealed that a small percentage of volunteers contributed the most to volunteering activities, with a larger proportion contributing the least. Finally, most volunteers lived within a commutable distance of the TCV site they attended, with few travelling from further distances.

### 5.3.3 Volunteer engagement profiles

Engagement metrics cluster into three distinguishable groupings termed as One-Session, Short-Term, and Long-Term. These were shown to be the number that best optimised the trade-offs between the number of groups and the within group sum of squares. This was validated in Averaged Silhouette widths with scores above 0.51 indicating sufficient partitioning (Greater London 0.58; Greater Manchester 0.55; Yorkshire 0.57). Table 5.3 shows the general descriptives of the three regions' engagement metrics subdivided into profile types as defined by Ponciano and Brasileiro (2014).

Table 5.3: General descriptives for each of the engagement characteristics (Activity Ratio [AR], Relative Activity Duration [RAD], Variation in Periodicity [VP] and Distance Travelled in miles [Distance]) compared across each region.

| | Greater London | | | | Greater Manchester | | | | Yorkshire | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AR | RAD | VP | Distance | AR | RAD | VP | Distance | AR | RAD | VP | Distance |
| Mean | 0.8 | 0.02 | 0.6 | 8.7 | 0.63 | 0.04 | 0.9 | 6.1 | 0.7 | 0.07 | 1 | 8.8 |
| Medium | 1 | 0.05 | 0.8 | 3.3 | 1 | < 0.01 | 0.05 | 7 | 1 | < 0.01 | 0.09 | 3.5 |
| 1st Quartile | 0.04 | 0.01 | 0.4 | 1.9 | 0.14 | < 0.01 | 0.05 | 4.7 | 0.13 | < 0.01 | 0.09 | 1.8 |
| 3rd Quartile | 1 | 0.02 | 2 | 8.9 | 1 | 0.03 | 0.3 | 11.2 | 1 | 0.03 | 0.7 | 6.6 |
| SD | 0.3 | 0.09 | 2.7 | 6.7 | 0.4 | 0.1 | 3.1 | 7.2 | 0.4 | 0.2 | 2.7 | 6.6 |
| Range | 1 | 1 | 34 | 32 | 1 | 1 | 41 | 42.3 | 1 | 1 | 19.4 | 36.5 |

In general, the average number of day's volunteers were active relative to the total time they volunteered (Activity Ratio), were moderate to high across all regions as indicated in means and medians, with a large proportion of volunteers being highly active as shown in the 3rd quartiles. The length of time volunteers actively engaged in environmental volunteering activities during the study observation period (Relative Activity Duration) tended to be longer in Greater Manchester, with a higher proportion volunteering for a short duration. Further, the number of days elapsed between each volunteering session (Variation in Periodicity) shows a slight variability between regions, with those in Yorkshire presenting the highest range suggesting attendance to be less frequent than those in urban regions. In addition, the mean average distance travelled is relatively similar across each region with most volunteers living within a proximity of up to 10 miles to the TCV sites they attend, presenting similar to trends identified in section 5.3.2.

Table 5.4: Mean centroids for each of the engagement characteristics (Activity Ratio [AR], Relative Activity Duration [RAD], Variation in Periodicity [VP] and Distance Travelled in miles [Distance]) compared across each region and subdivided by profile type.

| Profile Type | Regions | Engagement Characteristics | | | |
|---|---|---|---|---|---|
| | | AR | RAD | VP | Distance |
| One-Session | Greater London | 0.97 | 0.01 | 0.8 | 4.6 |
| | Greater Manchester | 1 | < 0.01 | 0.4 | 3.5 |
| | Yorkshire | 0.88 | 0.02 | 0.7 | 2.4 |
| Short-Term | Greater London | 0.9 | 0.02 | 0.4 | 8.9 |
| | Greater Manchester | 0.88 | 0.5 | 1 | 11.6 |
| | Yorkshire | 0.78 | 0.04 | 0.9 | 6.2 |
| Long-Term | Greater London | 0.8 | 0.03 | 0.6 | 28.3 |
| | Greater Manchester | 0.68 | 0.77 | 1.1 | 30.1 |
| | Yorkshire | 0.61 | 0.05 | 1.8 | 35.9 |

Volunteer's engagement profiles, as shown in table 5.4 above, are outlined below.

**One-Session volunteer***:* Those classified as 'One-Session' have the highest amount of activity ratio as expected, tending to be actively engaged mostly for one session as indicated by a low relative activity duration, travel the least distance and the lowest variation in periodicity.

**Short-Term volunteer**: Those that have been classified as 'Short-Term' volunteers tend to have a profile type mid-way between the two other profiles.

**Long-Term volunteer**: Those classified as 'Long-Term' tend to be active over longer periods of up to ~3 years as, with a small comparative decrease in degree of active engagement, a slight increase in the days elapsed between sessions (Variation in Periodicity) and travelling the furthest distance.

On closer examination, regions differed in engagement characteristics. In general, activity ratios were relatively similar in Greater London and Manchester, with volunteers being active for shorter periods than those in Yorkshire, with marked differences in periodicity and distances travelled. This suggests that each of the profile types have a variable range with noticeable distinctions between those more urbanised regions to those semi-urban and rural. Further, there is a noticeable gradient in engagement metrics across each engagement profile. This is supported by a series of Spearman's rank correlation coefficient (as data presented a non-normal distribution) where a statistical significance was observed between each of the four engagement metrics ($p < 0.001$).

Numbers and percentages of volunteers classified in each engagement profile grouping are shown in figures 5.3 and 5.4. Those in the One-Session profile make up the largest group of volunteers with numbers gradually declining towards the other end of the spectrum, those exhibiting a Long-Term profile type, and is a pattern present across all regions.

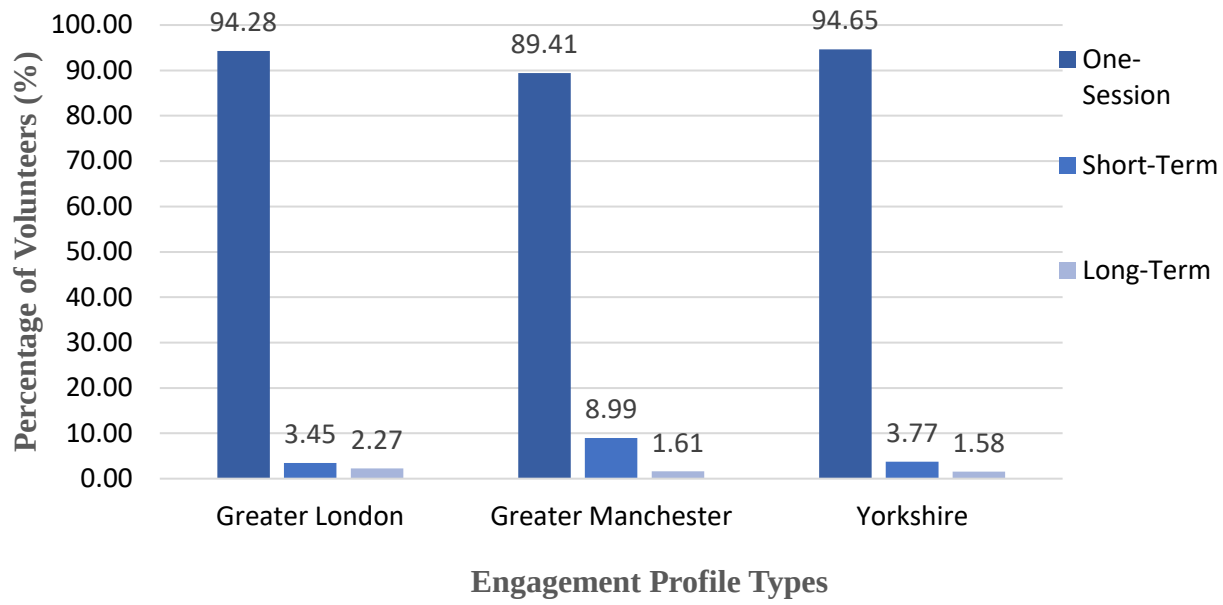


Figure 5.3: Proportion of volunteers which contribute to each engagement profile type across regions.

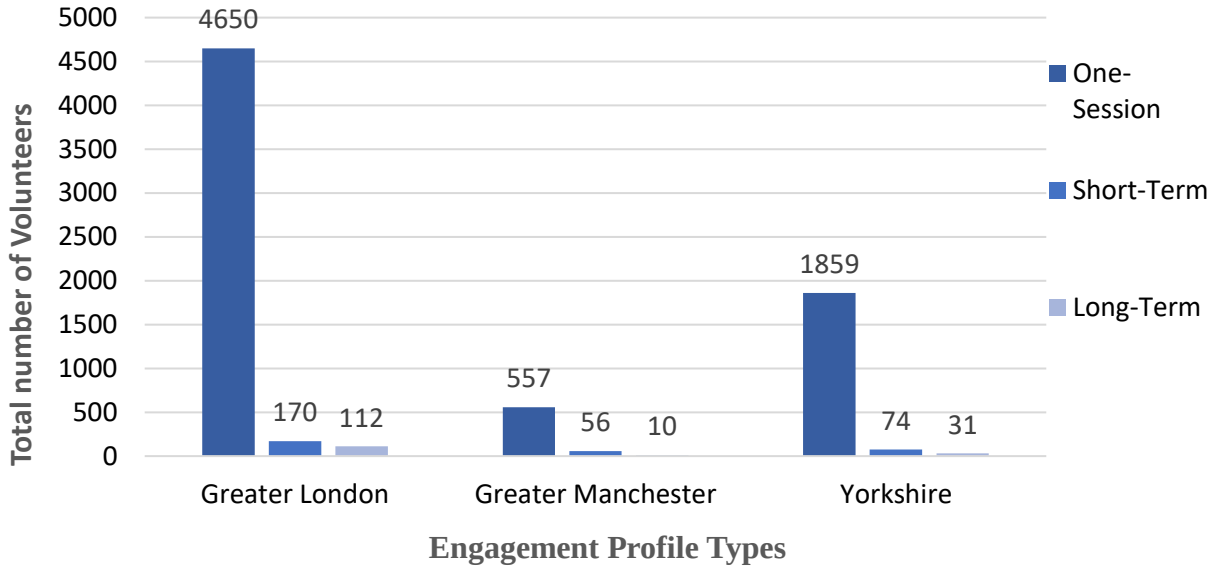


Figure 5.4: Total numbers of volunteers which contribute to each engagement profile type across regions.

In summary, there were clear distinctions between those more urbanised regions to those semi-urban and rural, with those volunteers from urban regions (e.g. Greater London) being actively engaged in volunteering activities for longer periods than those semi-urban and rural. Further, I identified three types of volunteer engagement profiles which are similar in scale across all regions: 'One-Session', 'Short-Term' and 'Long-Term'. Volunteer engagement profiles presented a distinct gradient in their engagement characteristics, with 'One-Session' and 'Long-Term' being on opposite ends of the spectrum.

## 5.4 Discussion

Overall, this chapter characterised TCV volunteer's behaviours and their degree of engagement to a project or programme. This knowledge was used as essential background information, which enabled me to gain further understanding about TCV volunteers and their engagement in programmes delivered by TCV. I achieved this using a combination of descriptive and exploratory data analytical approaches (section 3.2.9) to explore the engagement characteristics, contributor activity and behavioural profiles of The Conservation Volunteer's (TCV) environmental volunteers. In this way, findings served as a foundation upon which to organise workshop sessions as outlined in the next chapter (chapter 6). Further, findings also sought to provide valuable background information for findings identified in chapter 7 as well as provide suggested recommendations for their ongoing future delivery (chapter 8).

Findings presented differences in net annual volunteer numbers and longevity behaviours between the three UK regions examined. Of these, Greater London exhibited both a higher volunteer population as well as those engaging in volunteering activities over a longer duration. Several factors might explain this trend, including population density, social factors, as well as project organisation (Ryan *et al*., 2001; Asah and Blahna, 2013). Yet, the exact potential effects of seasonal variability remain unknown. By understanding volunteers' numbers and longevity behaviours, this strengthened the logistical decisions I made in organising resources required (e.g. equipment), the number of sessions to undertake as well as estimate volunteer sample sizes for organising the workshop sessions in chapter 6. Such knowledge also serves as valuable background information for when I explore volunteer data collected by TCV on the health impacts and related behaviours associated with their volunteering programmes in the Greater London region (chapter 7). In this way, I would be able to assess the performance delivery of these programmes. Additionally, provided suggested recommendations for their ongoing future delivery (chapter 8), taking into account the size of the volunteer population that TCV reaches as well as the proportion of time volunteers spend engaging in these volunteering activities.

In relation to the ratio proportions of 'One-Session' and 'Multi-Session' volunteers and their associated contributions to volunteering activities, a common trend was identified across all regions in which few volunteers contributed the most to volunteering activities and many volunteers contributing the least. This demonstrates that 'civic core' is also happening in environmental volunteering. As noted, similar findings have also been identified in existing research on charitable giving, volunteering and participation in civic associations (Reed and Selbee, 2001; Mohan and Bulloch, 2012). As such, this suggests that civic core is not only

present in national civic associations, but also extends into TCV's environmental volunteering projects, albeit variation in ratio proportions. Such information was useful for the planning of my workshop sessions in relation to the number and frequency of sessions required (e.g. weekly or monthly) as well as length of time allocated (e.g. single event or ongoing project). Similarly, these findings provided further understanding about those volunteers included in the analysis conducted in chapter 7, who predominantly attend multiple volunteering sessions. In particular, this knowledge describes volunteers' level of engagement in TCV's environmental volunteering activities, a factor which has the potential to influence the scale and degree of health-related impacts that are delivered.

As noted, to date there has been little research on the impacts of distance travelled on environmental volunteering projects (Pope, 2005; O'Brien *et al*., 2008). My findings showed that the majority of volunteers lived within a 20-mile distance of TCV sites, with fewer travelling from further distances. These trends were replicable between both 'One-session' and 'Multi-Session' volunteers, with slight noticeable differences between regions. Similarly, as expected the proportion of volunteers decreased with increasing distance travelled, with those in Yorkshire travelling further than those in the other two regions. Possible explanation includes the improved mobility potential in large urban areas such as public transport services (Pope, 2005). In addition, vehicle ownership, financial resources, the lower number of volunteering opportunities in areas with a lower population density can influence the distance travelled (O'Brien *et al.*, 2008; Tulloch and Szabo, 2012). Such knowledge was valuable for when I selected locations to hold workshop sessions, and suggested the need to choose those sites which maximised volunteer numbers and was within a commutable distance for volunteers to attend. Through knowing how far volunteers travel to a site assisted me when allocating financial resources (e.g. travel reimbursement) as well as when organising travel arrangements (e.g. minibus or car sharing) for those travelling from further distances. Further, such knowledge aided my understanding about volunteers' level of commitment in attending those programmes evaluated in chapter 7, as well as the potential distance at which TCV's health-related impacts may be delivered in Greater London.

Volunteer engagement profiles were identified using a clustering analytical approach, grouping volunteers according to similarities and dissimilarities between their engagement characteristics. This approach indicated there to be three main profile types of similar scale across all three regions; 'One-Session', 'Short-Term' and 'Long-Term'. This suggests there to

be a general consistency in profile types with no marked regional variation, and are similar to those identified in related studies. I will now summarise these profiles more fully below.

Firstly, 'One-Session' volunteer accounting for the largest proportion of the volunteer numbers, travelling the least distance and committing the shortest amount of time. Findings concur with similar studies in existing volunteering projects (e.g. Reed and Selbee, 2001; Mohan and Bulloch, 2012; Hyde *et al*., 2016), providing further evidence on the emerging shift in engagement patterns towards those more causal and episodic (section 2.6). Suggested explanations for this trend include time availability and motivations (Clary and Snyder, 1999; Davis Smith, 2005; Rochester, 2006).

Secondly, those classified as 'Short-Term' have a profile type mid-way between those 'One-Session' and 'Long-Term'. This transition was also identified by Cnaan and Amrofell (1994) who suggested there to be no distinctions between volunteer typologies (e.g. one-off versus ongoing volunteer typologies). Instead they proposed a gradient or continuum of typologies, with those classified episodic and causal being placed at the lower end of the spectrum committing the least amount of time. Very few studies (Rochester, 2006) have described this profile type, placing more emphasis on those episodic or long-term. In this way, it can only be assumed that the 'Short-Term' volunteer is a combination or overlap of the proceeding profiles by variable degrees, with further research still required.

Thirdly, those classified as 'Long-Term' volunteers represented the smallest proportion, travelling the furthest distance and committed the longest amount of time to the organisation. These volunteers presented engagement characteristics that closely resemble those which have been described as the 'classic' typology, who have a high level of unconditional dedication and a strong sense of affiliation with the organisation they volunteer with (section 2.6; Holmes, 2014).

Finally, through understanding volunteers' engagement profiles this enabled me to tailor my workshop sessions (chapter 6) to enhance the fit between my requirements (e.g. length and number of sessions) and volunteers' level of engagement, and thus presumably increase participation. Further, a knowledge of how and in what ways volunteers engage in TCV's environmental volunteering programmes not only helped me to understand the potential ways volunteers' engagement behaviours may contribute to the overall outcomes of health-related impacts TCV delivers (chapter 7), but increased my understanding of how these programmes are important to volunteers.

### 5.4.1 Study limitations

This section presents three main limitations relevant to the analysis that was presented here. Further general limitations of the thesis methodological approach can be found in chapter 8.

Firstly, the study is limited to the use of a quantitative approach and fails to understand the underlining mechanisms and contextual information. Reasons for this related to inconsistency between volunteer records on TCV's MIS database (as was discussed in the previous chapter) and current volunteers as well as time and resource availability. As such, the use of mixed quantitative and qualitative approaches may have provided a more in-depth understanding of volunteer engagement.

Secondly, figures for volunteer's distances travelled to their volunteering site were only estimated, based on the shortest distance path calculations. This was because information on the mode of transport a volunteer has travelled is not collected by TCV. Such collection of this information would ensure a more accurate assessment of volunteer's travelling distance, yet was beyond the scope of this study. In this way, caution must be taken when interpreting these findings.

Thirdly, it must also be noted that the number of hours a volunteer dedicates to a single volunteering session remains unknown and is not record by TCV. It is therefore uncertain whether volunteering hours are variable between volunteers, with the findings instead representing the number of volunteering sessions attended irrespective of hours. Based on my own experience working as a volunteer at TCV, I am aware that volunteers can often differ in the numbers of hours they commit to a volunteering session. Findings therefore do not truly compare volunteers in terms of their overall contributions to TCV sessions with one-off volunteers being as equally valuable as those who volunteer for a lengthier period. This is because a one-off volunteer who engages in a volunteering session for 8 hours may be as valuable as a volunteer who engages in volunteering sessions over a 4-month period for 30 minutes each session. It is therefore recommended that future research includes the numbers of hours a volunteer has engaged in a volunteering session to present the true value of their contribution.

## 5.5 Summary

The chapter uses quantitative analytical techniques (See chapter 3) to explore the motivations, engagement characteristics, contributor activity and behavioural profiles of The Conservation Volunteer's (TCV) environmental volunteers. Findings served as a foundation upon which to

organise workshop sessions as outlined in the next chapter (chapter 6) as well as providing further understanding into how volunteers' engagement behaviours may contribute to the overall outcomes of health-related impacts TCV delivers (chapter 7). Findings also aided the development of future impact measurement tools both for TCV and other volunteering organisations, discussed further in chapter 8.

Three types of volunteer engagement profiles were identified which are similar in scale across all regions, namely the 'One-Session', 'Short-Term' and 'Long-Term' volunteer. Further, participatory patterns across all regions revealed that a small percentage of volunteers contributed the most to volunteering activities, with a larger proportion contributing the least. Findings also showed that the numbers of volunteers decreased with increasing distances travelled. These trends were replicable between both 'One-Session' and 'Multi-Session' volunteers, with the majority living within a 20-mile distance of the TCV site they attended.

The chapter identified two main limitations. Due to its quantitative approach, it fails to understand the underlining mechanisms and contextual information which may have provided a more in-depth understanding of volunteer engagement. It is recommended that future research should implement additional forms of qualitative methods to explore contextual information (e.g. motivations) associated with volunteers' engagement patterns. Further, the distances travelled by volunteers to their volunteering site were based on estimated calculations and need to be interpreted with caution. In addition, the study opens up further questions about whether the profile types are attributable to other volunteer organisations, an area that warrants research beyond the scope of this thesis.

Finally, information generated can be valuable in assisting practitioners in the volunteering field in their understanding, recruitment, and retention of individuals who engage in their activities. For instance, findings can help practitioners decide where to place advertisements to recruit new volunteers based on where most existing volunteers are located and travel from in the area (e.g. distance travelled). This could also help them to increase long-term sustainability and design of their programmes and bring them in alignment with volunteer's engagement typologies and overall participatory patterns.

The next chapter explores TCV volunteers' perceptions of health, knowledge which provided valuable insight into the meaning behind volunteer' health-related data analysed in chapter 7. The chapter begins by reviewing the existing theoretical and research literature on human perceptions, before describing related studies and methodological approaches used. It then

outlines methods used in the chapter to collect and interpret research findings which are then discussed.

# Chapter 6: Understanding TCV volunteers' perceptions of health

## 6.1 Introduction

Health perception relates to how the concept of 'health' is subjectively viewed, understood and interpreted (Mechanic, 2005). Just as with other concepts we are exposed to, a person's perception of health can be shaped by their individual experiences, interactions and understandings (Jones *et al*., 2011). For instance, researchers have highlighted the role of media communication in framing the publics' understanding of health-related issues, i.e. lifestyle behaviours and dietary choices (Mechanic, 2005; Carducci *et al*., 2011). Similarly, others report how a person's individual experiences can also help shape their health perceptions, such as engaging in behaviour change interventions (e.g. health promotion programme) which aim to raise awareness of health-related issues (Puhl *et al*., 2012).

Research has also shown how perceptions of health can differ between members of public and health care professionals. Examples in existing studies include exploring consumer health vocabulary and language (Zeng and Tse, 2006), health literacy (Sørensen *et al*., 2015), behaviour change (Nudelman and Shiloh, 2015) as well as perceptions of health priorities (Brodie *et al*., 2007). Across each of these studies, they reveal how the publics' perceptions of health can translate into their conceptual understandings, terminology used, and priorities given to health-related attributes. They also suggest that a person's perception of health has the potential to influence how they interpret health-related information found in resources as well as interactive tools used for health promotion (Zeng and Tse, 2006).

Based on these studies, it is reasonable to expect that a person's perception of health might also influence how they perceive other health-related documents. One example is a questionnaire survey, a widely used method to measure peoples' self-reported health (Grbich, 2013). How a person interprets concepts and terminology used in a questionnaire survey has the potential to influence data collected and thus presumably on how these datasets are then interpreted, presenting instead a partial picture of reality. Understanding such factors is particularly important and could have a potential impact on how datasets are then interpreted.

This relationship between health perception and data collection could also extend into other sectors who measure health-related impacts associated with their activities. Environmental volunteering organisations (e.g. TCV) are an example of this and have gradually begun to explore the relationship between environmental volunteers and their health based on self-

reported surveys (e.g. Pillemer *et al*., 2010; Kragh *et al*., 2016; Molsher and Townsend, 2016). However, to my knowledge no studies to date have explored the relationship between volunteers' health perception and volunteer data collected. This is particularly important if outcome data is to affect learning, enable volunteer programmes to be managed effectively and contribute to related sectors.

Using information about a person's existing knowledge and how this can have an influence on our perceptions, researchers have begun to explore the uptake of new knowledge as we build on what we already know (Bernstein, 2010). An example of this are mental models, a concept used to describe a person's cognitive representation of their external reality. Mental models are constructed from our individual life experiences, perceptions and understandings of the world around us. Identifying a person's mental model which helps shapes their perceptions can be achieved using various elicitation methods, including focus group interviews (Jones *et al*., 2011).

This chapter explores TCV volunteers' perceptions of health, knowledge which provided valuable insight into the meaning behind volunteer' health-related data analysed in the next chapter. Volunteers' health perceptions were gathered through exploring characteristics which help form their mental models (section 2.9). Using this knowledge, I will then be able to gather a fuller picture of TCV's health-related impacts delivered. This was achieved through implementing a mixed method approach, using focus group interviews, content analysis and a general inductive approach. These combined methods were based on inductive and exploratory methods, examining information data from emerging themes. Further in-depth details of the methods used in this chapter are found in sections 3.2.5 to 3.2.8.

Throughout this chapter, volunteers' perceptions are viewed in comparison to a widely accepted definition of health and used as a benchmark. This enabled any gaps in knowledge and misconceptions to be easily identified. In the context of this thesis, 'health' is viewed through the lens of the World Health Organization 1948 definition, as the physical, social, and mental well-being of humanity. A detailed description of this definition has been outlined previously in chapter 2. This definition was selected owing to its broad and generalised scope, being widely employed by health experts. As explained in section 2.3, conceptualising "health" has often generated complex debates across different disciplines owing to its multidimensional and dynamic nature (Huber *et al*., 2011). It is, however, beyond the scope of this thesis to review the many ways these concepts have been previously explored.

The chapter begins by reviewing the existing theoretical and research literature on human perceptions and mental models, as well as related studies and methodological approaches.

From this, it outlines mixed methods used in this chapter. The methodological approach and findings are then discussed.

### 6.1.1 Human perception and mental models

Human perception refers to the way in which a concept or piece of information is viewed, understood and interpreted. Humans tend to perceive concepts or information through two processes (Bernstein, 2010). Firstly, sensory perception is where human's process information generated from their immediate environments and are based on responses to their senses, including sight, smell and taste. The second type of process relates to a person's existing knowledge and how this can have an influence on our perceptions and the uptake of new knowledge as we build on what we already know (Bernstein, 2010). In the context of this chapter, I refer to the second of these two perception processes which was most relevant to the research aim and can be further described using the mental model concept.

Mental models can be defined as a person's cognitive representation of their external reality and are constructed from our individual life experiences, perceptions and understandings of the world around us. They have been studied widely in cognitive science and psychology (Jones *et al*., 2011).

The mental model concept has been broadly defined and oriented towards the research field that is being studied. For instance, risk communication uses the mental model approach to develop forms of public communication on issues surrounding risks, such as disposal of nuclear waste (Skarlatidou *et al*., 2012). By contrast, team learning uses mental models to gather an insight into the social processes that underlie knowledge sharing in teams (van den Bossche *et al*., 2011). Within each of these study fields, there are two types of mental models used and described (Jones *et al*., 2011): individual (a single person's mental model) and shared (a collective mental model amongst a group of people).

In the context of this chapter, I focus on shared mental models which are more relevant to the chapter's aim. This is because it is beyond the scope of this chapter to review the many ways these two types of mental models have been previously explored (e.g. van den Bossche *et al*., 2011).

Shared mental models have been described in various ways by different researchers and relates to the context in which they are used (see van den Bossche *et al*., 2011). For example, in psychology research shared mental models are used to understanding how teams of people interact and function (e.g. decision-making and learning processes) and are derived from a

group's discussion on a concept or subject being explored (Mathieu, 2000). Conversely, Klimoski and Mohammed (1994) refer to this model as a collective representation of knowledge shared by a group about a concept or subject being explored, with emphasis placed on it being a group-level phenomenon.

In the context of this chapter, shared mental models are viewed through a similar lens to Klimoski and Mohammed (1994), exploring people's perceptions in a group based setting, and not the actual group processes themselves. One reason for this owes to the nature of methods used in this chapter, which implemented focus group interviews. Unlike individual mental models which use research methods at an individual's level (e.g. one-to-one interviews), shared mental models tend to use group-based methods (e.g. focus group interviews) with a strong emphasis on group interactions and collaborative discussions on an area of interest to the researcher (van den Bossche *et al*., 2011; George, 2013). In this way, findings generated from group based methods are used to construct a collective representation of perceptions shared at a group-level. A shared mental model was also used due to its ability to reveal the different perspectives of the group simultaneously as well as highlighting the group's vocabulary, cultural values and group norms (Krueger and Casey, 2014). In doing so, the approach has been suggested to generate more critical and varied comments than those at an individual level (George, 2013).

In this chapter, shared mental models are described using the following characteristics: concepts, terminology, and structure. These characteristics were selected owing to their importance in understanding environmental volunteers' perceptions of health and their relevance for interpreting volunteer data used in the next chapter, thereby meeting with the chapter's aim. Each of these characteristics are described below.

A concept is an idea or understanding of an object or subject of interest. In mental models, concepts can be used to form a representation of people's understanding of a given issue (Jones *et al*., 2011). Identifying concepts can also be useful in identifying people's gaps or misconceptions in knowledge, which could influence how data collected is then interpreted.

Terminology refers to the language or vocabulary used in relation to a phenomenon, subject domain or system. Studies exploring people's mental models often examine terminology used by participants on concepts of interest (Carley and Palmquist, 1992). In doing so, it provides valuable insight into not only the types of terminology spoken by people, but also how terminology is defined and its overall usage. Such information can be important for data

analysis, particularly when interpreting peoples' responses to research intervention methods (e.g. questionnaire surveys) to gather a fuller picture of the findings observed.

Structure refers to the structural organisation of any given phenomenon, subject domain or system. A person's structural organisation of a mental model can be thought of as a network of concepts and relations. Research suggests that how we structurally organise concepts can depict what is important to us within that phenomenon (Jones *et al*., 2011). This information can be useful when evaluating people's impact measurement data to identify the true level of impact, which may not always be articulated.

### 6.1.2 Related work and methodological approaches

Characterising peoples' conceptual understanding of health has a wide literature base in health literacy research. Previous research has touched on many areas including health promotion for people with disabilities (Patrick, 1997), and health literacy for cancer caregivers (Yuen *et al*., 2016). These studies use various conceptual mapping methods to help characterise and explore how people perceive health, forming a representation of people's internal mental models. Using this method, these studies' findings have helped to make improvements to patient healthcare services (e.g. information resources) through building on people's pre-existing conceptual understanding of health (Zeng and Tse, 2006). Based on this premise, the chapter uses this method to explore volunteers' conceptual understanding of health. In doing so, it may provide further insight into the meaning behind a persons' health data collected, knowledge which might not otherwise be known and can distort our overall findings observed. This is particularly important if outcome data is to effect learning, enable programmes to be managed effectively and contribute to related sectors.

Studies in health literacy research have widely explored patterns in the terminology, expressions and communications used by the public to describe health topics. These include online users of consumer health websites, patient-clinician dialogue, and social media communication (Zeng and Tse, 2006; Puhl *et al*., 2012). Patterns in terminology have been examined using various exploratory methods and can give us an insight into people's mental models and perceptions. Quantitative content analysis is an example of this and is an inductive numerical method used to explore text data through descriptive statistics (Hsieh and Shannon, 2005). This inductive method has been shown to be useful in providing further insight in relation to the meaning and interpretation of the health terminology used by the public. For instance, by measuring the diversity and frequency of words used, it is said to be a useful indicator of those concepts or attributes which are most important to people (Grbich, 2013).

Existing studies in health literacy which use this method, include health messages in the mass media (Manganello and Blake, 2010), and health-care related posts on twitter feeds (Hamad *et al*., 2016). Whilst the analytical approaches in these studies have been used to explore patterns in terminology used by the public specifically, there is scope for these methods to be applied in other related or nearby fields (e.g. volunteering) who wish to explore peoples' patterns in terminology used.

Research on priority setting has been widely researched in the field of health care services, policy and tools development. Existing studies in this area include framework domains behaviour change interventions (Cane *et al*., 2012), public involvement in health care priority setting (Martin *et al*., 2002). These studies use various analytical approaches to evaluate the priorities given to health topics and related attributes or domains. An example of this are card sorting methods, which asks people to rank a set of cards in order of how they perceive each cards importance or relationship to another (Petrie *et al*., 2011). For instance, Cane *et al* (2012) used the card sorting method amongst health professionals in behaviour change to validate of theoretical domains framework with health professionals for use in behaviour change and implementation research. The method has been shown to be an effective way of directly eliciting information about how people subjectively perceive those attributes that make up a subject or concept in terms of their importance. As such, this card sorting method is particularly useful in providing insights to understand people's mental models and perceptions about a given topic being explored (Capra, 2005). Such knowledge would help to understand volunteers' perceptions of known health attributes and their level of importance to the volunteers based on their perceptions of health.

## 6.2 Method summary

A mixed method approach was conducted from December 2015 to June 2016, using focus group discussions separated into three main parts: icebreakers, group discussions and card sorting activity. Data collected was analysed using qualitative and quantitative analytical methods: general inductive approach and quantitative content analysis, respectively. These combined methods were based on inductive and exploratory methods, examining information data from emerging themes. Further in-depth details of the methods used in this chapter are found in sections 3.2 to 3.4.

## 6.3 Results

This section explores volunteers' perceptions of health, including concepts used, word frequencies and usage. Direct quotations from transcripts illustrate selected themes and serve to contextualise participants' responses. Pseudonyms were used to protect the identity of respondents.

### 6.3.1 Conceptual map of the term 'health'

In general, volunteer groups were largely similar in how they perceived the term 'health', with few differences. Those main and subsidiary concepts used by volunteers are illustrated in figure 6.1. As the figure shows, the term 'health' has been subdivided into three main concepts used by volunteers to describe how they perceived the term 'health'. These main concepts are then further divided into subsidiary concepts which are used to describe those main concepts. I will now outline each of the main and relating subsidiary concepts described by volunteers below. Please note that figure 6.1 is a representation of volunteers' shared mental models and therefore not reflective of conventional health models, with differences to be expected.

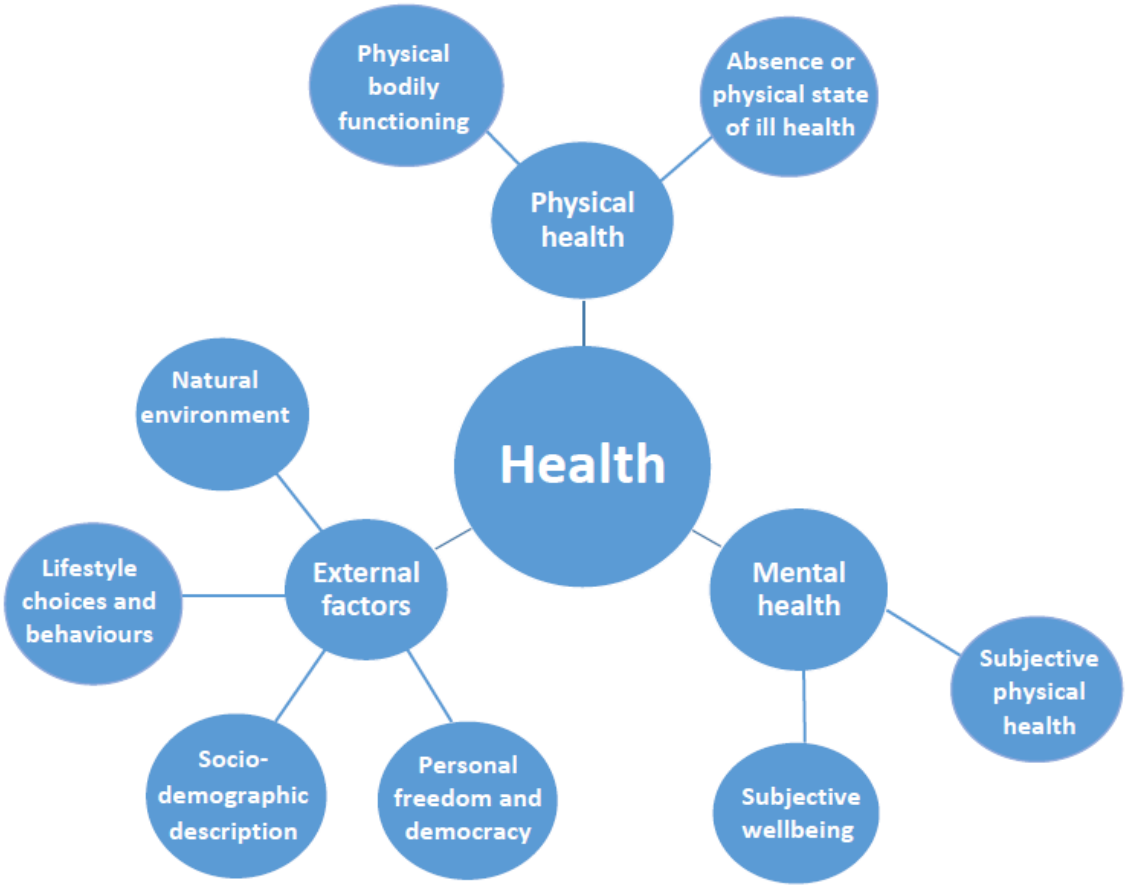


Figure 6.1: TCV volunteers' conceptual model of health.

The concept ‘physical health’ was expressed by all volunteer groups as one main concept of health and described further using two subsidiary concepts. Firstly, volunteers defined physical health in relation to a person’s physical bodily functioning. Examples provided by volunteers were relatively consistent, making references to both general and specific bodily functions (e.g. cardiology and mobility) as well as overall energy and vitality. As Harry from TCV Croydon volunteer group said:

“*Physical health. So, feeling fit and energetic, you know, being able to walk upstairs without getting out of breath. Increasing your cardio through activities like sport*”.

Further, physical bodily functioning was perceived by Jenny from TCV Greenwich Peninsula Ecology Park volunteer group to also relate to our multitude of senses:

“*I put maintenance of five senses. So, I put hearing, touch, taste, sight, and smell*”.

Secondly, almost all volunteers viewed physical health as the absence or physical state of ill health. Their responses ranged from minor ailments of colds and flus, to those more serious chronic diseases, such as cancer or heart disease. For example, Peter from Stave Hill Ecology Park volunteer group noted:

“*I see it as the absence of disease. So, not suffering minor ailments. For example, colds or coughs. Also, those more long-term illnesses like cancer, diabetes, heart disease and strokes*”.

Mental health was also identified as another main concept used to describe health, with volunteers presenting slight differences in their responses. For some volunteers, mental health was perceived as how a person feels internally in relation to their ‘physical’ health (e.g. subjective physical health), such as a sense of having energy, vitality, stamina, and alertness as well as the presence and degree of feeling pain. For instance, Audrey from TCV Harringey volunteer group stated:

“*Normal bodily and mind functioning for me. So, subjective. So, when I notice when I am unwell or in pain, because I can’t do things as well as I normally can. So, some kind of falling away from some normal functioning*”.

Other volunteers related it to subjective wellbeing and how a person feels internally with regards to their ‘mental’ health. Examples of this included a person’s emotions or mood (e.g.

happiness, positivity, stress, safe and freedom), an illness (e.g. depression) as well as their mental functioning (e.g. ability to solve problems). Of these examples, it is noteworthy that volunteers perceived each of them across a broad spectrum, from positive to negative descriptions, and as Joel from TCV Lavender Ponds volunteer group said:

"*For me, wellbeing can be our moods. Like feeling happy or stressed*".

Further, Sophie from Stave Hill Ecology Park volunteer group noted interrelationships between the two subsidiary concepts of mental health:

*"I have put down happy, alert, positive and active. Because I find that when I am at peak physical health, I am bouncier. So, more alert. Brain works faster. More positive so I can solve problems better. Therefore, I am genuinely happier all round and feel physically healthier".*

A final main concept noted by volunteers was 'external factors', which are those factors that they perceived to have an impact on our health, both directly and indirectly. These were subdivided into four subsidiary concepts in order of how frequent they were mentioned by volunteers. Firstly, the natural environment, described by volunteers as the outdoor physical environment in which people live, visit, work and come into contact with on a daily basis. Examples used by volunteers tended to be similar, and focused on the quality of the air, water or soils as well as the presence of environmental pollution (e.g. car fumes, and sewage waste). For instance, as Sue from TCV Croydon volunteer group commented:

"*I would say the environment effects health. Like breathing in London. So, air pollution from cars and aeroplanes. Also, the water in the Thames is not great in comparison to other areas, with things like rubbish and sewage being found in some areas*".

Secondly, a person's lifestyle choices and behaviours. All volunteers perceived this as a person's set of attitudes, habits and behavioural choices. Again, volunteers perceived each of them across a broad spectrum, from positive to negative descriptions. Examples of this include diet and nutrition (e.g. food or drink consumption) as well as exercise and activity (e.g. physical sports). As Becky from TCV Harringey volunteer group said:

"*I'd say that lack of exercise or sedentary lifestyles can have a bad impact on your health. I think there needs to be a balance in order to stay healthy. Sometimes you have to go out like*

*going out with friends. Like watch a movie or play something like sport or go to a bar or something. But don't like to overdo it. So, like a work life balance*".

Thirdly, socio-demographic descriptions. This refers to the social factors which can be used to describe people in a population, which can affect a person's health. This concept was used by some volunteers, with examples used including a person's age, sex, ethnicity and level of deprivation. As Lisa from TCV Greenwich Peninsula Ecology Park volunteer group from one volunteer noted:

*"I think health for me is being as strong as reasonable you know. Taking into account of age and circumstances and that sort of thing as our health changes as you age".*

Lastly, few volunteers perceived personal freedom as a further external factor contributing to the concept of health. They described this as a person's ability to be free in the decisions and activities they do. An example of this expressed by Hamish from TCV Lavender Ponds volunteer group focused on democracy:

"*The ability to think and do to as they please because that kind of thing we take that for granted I think … And democracy because you have more variety of information about choices that you make. Like mental health is a thing that's more important. It proceeds all physical health. So, if you have the ability to express who you are it's like a cornerstone of democracy. Then I feel then that's going to get you going forward with living. It's about how well you enjoy life".*

Peter from TCV Stave Hill Ecology Park volunteer group viewed democracy in relation to governance:

"*Personally, governance is largely beyond my control. I try not to put too much of my happiness there*".

### 6.3.2 Card sorting session

This section summarises how volunteers ranked the 10 health measures from the National Well-being framework. Those of high importance were ranked as 1 and those of low importance as 10. Overall, there were variable differences in how each of the groups perceived the 10 domains in order of importance (See table 6.1 below). For the purpose of describing importance levels, I have loosely subdivided the ranked numbers into three groupings of importance: high (1-3), moderate (4-6) and low (7-10). As the number '10' could not be easily subdivided into three equally weighted groupings, one of the groups included 4 ranks, whilst two groups included 3 ranks. Those grouped as having a low level of importance contained 4

ranks from 7 to 10. My reason for including 7 in this group and not 'moderate' was because volunteers classed those ranked from 7 to 10 as being of lower importance. The three ranked groups are therefore reflective of volunteers' perceived groupings.

Table 6.1: TCV volunteers' card ranking scores of the 10 domains in order of importance: high (dark blue), moderate (mid-colour blue) and low (light blue).

| **Domain** | **Volunteer Group** | | | | | **Mean Rank** |
|---|---|---|---|---|---|---|
| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | |
| Personal Wellbeing | **6** | **1** | **1** | **1** | **1** | **2** |
| Health | **3** | **3** | **2** | **2** | **2** | **2.4** |
| Relationships | **5** | **2** | **3** | **3** | **3** | **3** |
| Education and skills | **4** | **4** | **4** | **5** | **5** | **4.4** |
| What you do | **8** | **5** | **5** | **4** | **3** | **5** |
| Natural Environment | **1** | **6** | **7** | **7** | **4** | **5** |
| Where you live | **7** | **7** | **8** | **6** | **4** | **6.4** |
| Personal Finance | **5** | **8** | **6** | **8** | **6** | **6.6** |
| Economy | **3** | **9** | **9** | **9** | **7** | **7.4** |
| Governance | **2** | **10** | **10** | **10** | **8** | **8** |

Most volunteer groups shared similarities in those domains they perceived as highly important, namely 'personal wellbeing', 'health', and 'relationships', the former of which was regarded as the most important. Reasons for those selected owed to the domains' direct impacts on a person's health and wellbeing as well as their interrelationships (e.g. personal wellbeing and social connectedness).

For instance, as Bryan from TCV Croydon volunteer group noted:

*Surely personal wellbeing encompasses the whole thing. I think that if you have personal wellbeing then the others are a constitute of it. I mean personally I think it's doing something worthwhile. Like a sense of purpose or fulfilment, because if what you do is worthwhile then you can put up with a lot of other things. That can enable you to enjoy life or help solve problems or which might otherwise seem utterly dreadful. But again, I feel it's a sense of purpose. Also to me I'd personally view personal relationships as fairly closely entwinned with that one* [personal wellbeing and health] *as one of the most meaningful ways you interact with people can be through shared projects and goals.*

By comparison, one volunteer group differentiated, with only 'health' viewed as highly important, including 'governance' and 'economy' into this category. As Joel from TCV Lavender Ponds volunteer group explained:

*"To be healthy I get you need to have resources. I guess you need money to buy healthy food. Or to play sport you need to buy resources likes shoes or something".*

There were mixed responses in those domains perceived as moderately important. Of these, 'education and skills', scored as 4 or 5, was selected by all volunteer groups. This related personal development, links to job prospects and personal finances, as well as accessibility. As Sophie from TCV Stave Hill Ecology Park volunteer group noted:

"*I do think you have to have a foundation of education and skills. Otherwise you can't develop. However, I would not rate it as high but somewhere in the middle. And it's not just having access to formal education. I think being able to develop and to learn from each other. So, like if you have a problem with a computer or you don't know something to ask something to help?"*

In addition, most volunteer groups also selected 'personal finance', with Marion from TCV Harringey volunteer group commenting:

*"I would say this one* [personal finance] *is a tricky one for me. How I manage my money is important. But how much I've got is not important. So, it's on two levels. I'm not too fussed about having a lot of money. But I am fussed about having enough money. And so how much money I've got is important and isn't. But how I manage it is important. To make sure I use if effectively. And I am financially secure".*

Volunteer groups also viewed ‘where you lived’, ‘what we do’, ‘natural environment’, and ‘personal relationships’ as moderately important, having both direct and indirect associations with a person’s health and wellbeing. For instance, Lisa from TCV Greenwich Peninsula Ecology Park volunteer group highlighted:

*“Where you live doesn’t necessarily determine your health and wellbeing. Whether you are in London or Liverpool or wherever you can still be happy. So, it doesn’t matter the physical location of where you live it’s the community that you live within or it is the environment in which you find yourself. Like, the place I am happiest on earth is this place in France. So, I would say where you live is only important when it’s a long way away from where you work for example. As opposed to your general happiness. And the weekends and the wherever else so”.*

Mike from TCV Lavender Ponds volunteer group noted:

“*Where we live? I guess it doesn’t really matter where I live. I mean I don’t know how much it will affect my health. I don’t know. But I mean in London’s there’s like smoke and pollution which impact your health. But personally, it doesn’t matter where you live. And as longs I’m like personally well then I’m like I’ll be okay*”.

Lastly, there were also variable responses between volunteer groups on those domains they felt to be of lower importance to a person’s health. The majority ranked ‘economy’ and ‘governance’ as the lowest of the domains. In part, this related to the indirectness or secondary nature of these domains in their ability to directly impact a person’s health and wellbeing as well as what some volunteers described as their limited sense of control over these domains. For example, Nancy from TCV Croydon volunteer group said:

*“I mean there’s a sense in which governance and economy are important. But personally, they are largely beyond my control”.*

Barry from TCV Harringey volunteer group stated:

“*From my point of view governance is pretty irrelevant. And what they actually do has very little effect on me personally. Things like what is the income tax allowance. Yeah, that affects me. But aside from that an awful lot doesn’t immediately. Yes, it effects the country. Yes, the society. But the things that actually affect me directly are not much at all”.*

### 6.3.3 Word frequency and usage

The total number of words used by volunteers to describe their perception of health was calculated (Table 6.2). A total of 73 words were used by volunteers to describe health, with an equal number used to describe both physical and mental aspects. From this, the percentage proportions of each volunteer groups' abundance of words used relative to the total abundance was then calculated as follows: group 1 (37%), group 2 (37%), group 3 (34.2%), group 4 (43.8%), and group 5 (42.5). In general, the total number of words used by each group varied, ranging from 25 to 32, with Group 4 using the most words. This was also reflected in the total frequency of words used, of which group 3 presented the least. Average counts per word ranged across groups (1.6 to 2.8), as reflected in standard deviations (SD).

Table 6.2: General descriptive details of words used by the TCV volunteer groups.

| Group | Total words used | Total word count | % of total words used | Av. counts per word | Std. Dev |
|---|---|---|---|---|---|
| 1 | 27 | 62 | 37 | 2.2 | 1.3 |
| 2 | 27 | 78 | 37 | 2.8 | 2.7 |
| 3 | 25 | 41 | 34.2 | 1.6 | 1.1 |
| 4 | 32 | 80 | 43.8 | 2.5 | 2.7 |
| 5 | 31 | 78 | 42.5 | 2.4 | 2.4 |

Frequency analysis of prominent words used by TCV volunteers is presented in table 6.3 below. 'Happiness' was the highest recurring word used by volunteers to describe their concept/perception of health (n=29), followed by 'mental health' (n=23), 'wellbeing' (n=23) and 'physical health' (n=20), suggesting those terms to describe attributes of mental health were used slightly more than those physical health attributes. However, as Figure 6.2 shows, there was variation in recurring words and their frequency between volunteer groups. For instance, Group 2 used 'happiness', 'wellbeing' and 'diet' the most to describe health, yet did not use the words 'energy' or 'socialise'. In contrast, Group 4 tended to use 'mental' and 'physical' health more often than all words used, with Group 1 remaining consistent throughout.

Table: 6.3: Most frequently recurring words used by the volunteers.

| Words | No. of citations |
|---|---|
| Happiness | 29 |
| Mental health | 23 |
| Wellbeing | 23 |
| Physical health | 20 |
| Diet | 14 |
| Fitness | 14 |
| Socialise | 12 |
| Exercise | 9 |
| Energy | 8 |
| Work-life balance | 8 |

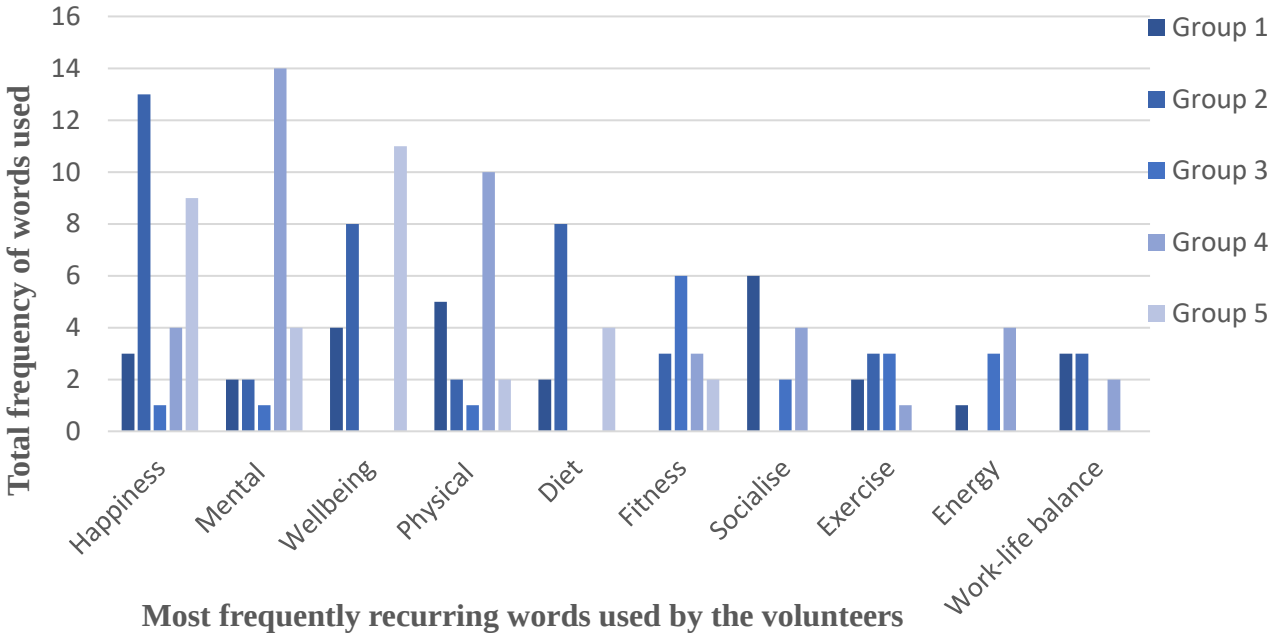


Figure 6.2: Most frequently recurring words used by the volunteer groups.

## 6.4 Discussion

Overall, this chapter explored TCV volunteers' perceptions of health which were viewed in comparison to the World Health Organization 1948 definition of health (section 2.3), a widely accepted definition. In particular, volunteers' health perceptions were gathered through exploring those characteristics (concepts, terminology and structure) which help form mental models which help shape human perceptions (Jones *et al*., 2011). In this way, this chapter provided valuable insight into the meaning behind volunteer' health-related data analysed and will be used in the next chapter for further analysis. This is particularly important if outcome data is to affect learning, enable volunteer programmes to be managed effectively and contribute to related sectors. Further, these findings attempt to progress existing research (Sørensen *et al*., 2015; Nudelman and Shiloh, 2015; Brodie *et al*., 2007), providing further evidence on how some populations of the general public perceive health by comparison to health care professionals or established conceptual models used in health literature. I achieved this through implementing a mixed method approach, using focus group interviews, quantitative content analysis and a general inductive approach. These combined methods were based on inductive and exploratory methods, examining information data from emerging themes. I will now review those characteristics used to explore TCV volunteers' shared mental model of health outlined in section 6.1.1: concepts, terminology and structure.

To my knowledge, no studies to date have explored the relationship between volunteers' health perception and volunteer data collected. As mentioned, this is particularly important if outcome data is to effect learning, enable programmes to be managed effectively and contribute to related sectors. This study therefore provides insight in this area of research and aimed to explore volunteers' meaning and interpretation of health. In general, volunteer groups were relatively similar in how they defined the term health, and suggests that they share a similar conceptual understanding of the term (Jones *et al*., 2011). For instance, all volunteer groups described health using physical and mental concepts (e.g. wellbeing). It is also noteworthy that volunteer group's overall conceptual model (Figure 1) closely resembles that of the World Health Organization 1948 definition, as the physical, social, and mental well-being of humanity (Fleuret and Atkinson, 2007). For example, volunteers noted that health was the "*absence of disease or illness*", a phrase directly used in the World Health Organization's definition. Some explanations for this selection include improved health literacy, promotion, and education (Patrick, 1997; Zeng and Tse, 2006; Yuen *et al*., 2016). This suggests that in some ways volunteers' shared mental models may not entirely differ from those of health care professionals or conceptual models used in health literature. As such, this would enable rather

than foster their ability to effectively interpret health-related documents, such as questionnaires, having a limited impact on health data collected and interpreted.

Conversely, there were few differences in concepts used by volunteers to describe health identified. Firstly, volunteers defined the term health using concepts often regarded as external factors (e.g. socio-demographic description, lifestyle choices and behaviours) rather than a description of health itself (e.g. wellbeing). One example was "*personal freedom and democracy*", in which one volunteer linked it to a person's overall wellness, life satisfaction and mental health, whilst another volunteer placed it at a distance and separated it from a person's happiness. A similar finding was observed in the key areas selected to measure the UK's national wellbeing, which was based on a consultation with both the public and health professionals, and includes the concept of "governance" (section 6.2). In both of the examples, volunteers seem to be referring to the concepts of "control" and "autonomy", terms which are growing in recognition in public health literature (Marmot, 2004; Whitehead *et al*., 2016). These concepts are viewed as potentially important social factors in determining access to resources crucial in maintaining a person's health, wellbeing and longevity. Secondly, volunteers described mental health as "*subjective physical health*" and referred to a person's subjective view of their physical health (e.g. presence or absence of pain). In health literature, such concept tends to be used instead to describe a self-reported measure of physical health, rather than a direct definition of health. One reason for these differences in concepts used by volunteers to describe health may relate to their mental model (sections 2.9 and 6.2), which tend to be constructed from our life experiences, perceptions and understandings of the world around us (Jones *et al*., 2011). These findings suggest there to be small but appreciable misconceptions in volunteers' perceptions of terms used to describe health, and could have a potential influence on how TCV volunteers' health data are then interpreted in the next chapter (chapter 7).

Volunteers presented variations in terminology used, word frequency and their usage. Firstly, volunteers' terminology and phrases used to describe concepts of health tended to combine general descriptive language (e.g. mind and body) and technical terminology (e.g. lung capacity and cardiovascular disease). These findings resonate with similar studies in health literacy (Zeng and Tse, 2006; Zeng-Treitler *et al*., 2008) and is a trend which may be attributed to a few factors, including personal experiences and medical encounters, as well as contextual, societal and cultural associations. Further, it suggests volunteers' collective conceptual representation of health occurs at multiple levels (e.g. lexical, semantic and explanatory)

relating to various internal and external factors, viewing health as a multidimensional and dynamic nature. Secondly, there was much variation in frequency of prominent words between groups, with those terms describing attributes of mental health (e.g. happiness) being used slightly more than those physical health attributes. Findings provide further evidence on the health language and literacy used by those of non-health professions (e.g. Zeng and Tse, 2006; Sørensen *et al*., 2015) and could be viewed as a useful indicator of those words which are most important to volunteers (Grbich, 2013). Suggested explanations for this trend include increased awareness, public acceptance as well as mental health literacy (Schomerus *et al*., 2012). Overall, these findings provide us with an initial interpretation of the health terminology used by volunteers as well as an insight into their shared mental model and collective perceptions of health more generally (Carley and Palmquist, 1992).

Similarities and differences were observed in how each of the volunteer groups perceived attributes associated with health in terms of their degree of importance. Firstly, results showed 'individual wellbeing', 'health' and 'relationships' were viewed by most groups as highly important attributes contributing to our overall health, and owed to the domains' direct impacts on a person's health (e.g. personal wellbeing and social connectedness). However, one group instead viewed external factors 'natural environment', 'governance' and 'economy' as highly important attributes contributing to our overall health. Suggested reasons for this difference may relate to individual perception or differences in cultural issues (Zeng and Tse, 2006; Yuen *et al*., 2016). For instance, two of the participants in this volunteer group were from the U.S.A where issues such as affordability of healthcare have been widely discussed in governmental politics in recent years and may therefore have had an impact on their perceptions of health care systems (Barr, 2016). Secondly, 'what we do', 'where we live', 'personal finance' and 'education and skills' were generally perceived by volunteer groups as moderately important, being viewed by what many in the health sector term as determinants of health (both directly and indirectly). Similar findings have also been identified in other studies (e.g. Nudelman and Shiloh, 2015). Thirdly, national 'economy' and 'governances' were ranked by most volunteer groups as lowly important. Suggested reasons for this trend include value priorities as well as other contextual factors, including sociodemographic background and individual experiences (Brodie *et al*., 2007). Such knowledge helps us to understand volunteers' perceptions of known health attributes and how they structurally organise these attributes in order of importance, thus providing an insight into volunteers' collective shared mental model of health (Ozesmi and Ozesmi, 2004; Jones *et al*., 2011). These findings serve as important background knowledge

when evaluating volunteers' health-related data in the next chapter (chapter 7) to identify TCV's true level of health-related impacts delivered.

Through exploring these three characteristics which help form shared mental models, concepts, terminology and structure, this has enabled me to gather an understanding of how volunteers perceive health (Jones *et al*., 2011). In general, volunteers' collective conceptual representation and structural organisation of health concepts occurs at multiple levels, with some concepts being more significant than others. This is supported by frequency findings and card sorting activities which revealed those attributes of health which appear to be most important to volunteers. For example, both in the card sorting activity and frequency analysis, attributes referring to a person's mental wellbeing (e.g. happiness and individual wellbeing) were found to be more significant than others, such as external factors (e.g. natural environment). Based on these collective findings, concepts relating to mental health were more significant, followed by main concepts physical health and external factors, respectively. Similarly, within each of these main concepts, some subsidiary concepts are equally found to play more significance than others (e.g. sociodemographic status and democracy). Moreover, this multidimensional perspective of health is also reflected in terminology used by volunteers, being both generalised and specialised. Overall, when compared to the World Health Organization's definition of health, volunteers' shared mental model is largely similar, with small differences relating to either misconceptions and variable life experiences. As these differences (e.g. subjective physical health) pose no significant effect on how volunteers perceive health, these will not influence how volunteer data collected by TCV is then interpreted in the next chapter. In this way, I will then be able to gather a fuller picture of TCV's health-related impacts delivered.

### 6.4.1 Study limitations and future research

There are two main limitations of this study. Firstly, whilst findings observed were case specific to TCV, similar more generalised findings on health perceptions have been identified in existing health literacy research (Patrick, 1997; Zeng and Tse, 2006). This suggests that these findings could be extendable. In this way, study findings are harder to generalise to the larger population of environmental volunteers. It is therefore recommended that further work on a much larger scale is needed to explore the whether these findings are more widespread to provide a more in-depth understanding of environmental volunteers' meaning and interpretation of health.

Secondly, due to the nature of workshop discussions it is uncertain whether data generated might be subject to group effects (positive and negative), particularly as volunteers were already known to each other, and had engaged in the Action Team programme for a short or long-term duration (see chapter 5 for short and long-term volunteer typologies). Reasons for this include dominant group members, peer pressure and other group dynamics and may be responsible for incomplete or biased information processing. With this in mind, future research exploring environmental volunteers' perceptions of health need to identify potential influences of group effects by both measuring separate individual and group effects as well as through implementing additional methods (e.g. one-to-one interviews with participants).

## 6.5 Summary

This chapter explored TCV volunteers' perceptions of health and were gathered through exploring characteristics which help form mental models which help shape human perceptions. This was demonstrated through implementing a mixed method approach, using focus group interviews, content analysis and a general inductive approach.

Findings from this chapter provided valuable insight into the meaning behind volunteer' health-related data analysed and will be used in the next chapter for further analysis. In general, volunteer groups were relatively similar in how they defined the term health, with their overall conceptual model closely resembles that of the World Health Organization 1948 definition. Whilst small differences were identified (e.g. subjective physical health), these pose no significant effect on how volunteers perceive health, these will not influence how volunteer data collected by TCV is then interpreted in the next chapter. In this way, I will then be able to gather a fuller picture of TCV's health-related impacts delivered.

There are two main limitations of this chapter. Firstly, findings observed were case specific to TCV, being findings are harder to generalise to the larger population of environmental volunteers. Secondly, due to the nature of workshop discussions, it is uncertain whether data generated might be subject to group effects, such as dominant group members, peer pressure and other group dynamics. The chapter also identifies areas that warrant more research. For instance, it is recommended that further work on a much larger scale is needed to explore the whether these findings are more widespread to provide a more in-depth understanding of environmental volunteers' meaning and interpretation of health. Similarly, the chapter opens questions about the need to identify potential influences of group effects by both measuring

separate individual and group effects as well as through implementing additional methods (e.g. one-to-one interviews with participants) in future research.

The next chapter explores to what extent TCV delivers health-related impacts based on volunteer data collected. The chapter begins by providing a general overview of the existing research literature on the health and related impacts associated with environmental volunteering, before describing related studies and methodological approaches used. It then outlines methods used in the chapter to collect and interpret research findings which are then discussed.

# Chapter 7: Exploring TCV's delivery of health-related impacts

## 7.1 Introduction

In the last decade, the relationship between engaging in environmental activities and health has received increasing attention with regards to its importance for the vitality of communities and the environment (Hargreaves *et al*., 2011). More recently, researchers have highlighted the potential role of volunteering activities in supporting existing health care services, encouraging people to adopt healthier lifestyles and related behaviours (Jenkinson *et al*., 2013). Reasons for this include collective action and collaboration, service delivery and advocacy, ability to connect with hard to reach communities as well as issues relating to trust both in action and communication (Büchs *et al*., 2012). However, further understanding is needed to explore to what extent environmental volunteering organisations deliver health-related impacts through their activities (see section 2.7).

In light of these general discussions, as well as taking account of volunteers' perceptions of health as identified in the previous chapter, the purpose of this chapter was to explore to what extent TCV delivers health-related impacts. In this way, information generated serves to assess the performance delivery of TCV's volunteering programmes, as well as provide suggested recommendations, which I discuss further in chapter 8. This is particularly important if outcome data is to affect learning, enable programmes to be managed effectively and contribute to the voluntary sector. This has been achieved using a mixed method approach and addresses research objective 3.

The chapter begins by providing a general overview of the existing theoretical and research literature on the health impacts and related behaviours associated with environmental volunteering. From this, it outlines performance delivery and impact measurement in the volunteering sector. The methodological approach and findings are then discussed.

Major parts of this chapter are published in and can be found in appendix 8:

**Seymour, V.**, King, M. and Antonaci, R. (2018) Understanding the impact of volunteering on pro-environmental behavioural change. Voluntary Sector Review, doi.org/10.1332/204080518X15155917206307

### 7.1.1 - Environmental Volunteering, health impacts and related behaviours

During the past four decades, researchers, health practitioners and environmentalists alike have begun to explore the potential link between connecting with the natural environment and human health (Thompson Coon *et al*., 2011). Existing theoretical and empirical research in this area is explored in-depth in chapter 2 (see section 2.4).

In response to this growing awareness between health and nature, there has been a gradual rise in the numbers of programmes aimed to help improve human health and the environment. Environmental volunteering activities is an example of this (section 2.6.1) and has been suggested to provide additional health benefits beyond those identified in other forms of volunteering (Depledge, 2011). Examples of existing studies in this research area include physical health and wellbeing outcomes in midlife volunteers (Pillemer *et al*., 2010), volunteering as a potential public health intervention (Jenkinson *et al*., 2013), improved levels of positive mood (Molsher and Townsend, 2016), as well as volunteers' self-reported wellbeing (Kragh *et al*., 2016). Engagement in these activities has been suggested by some to encourage people to adopt health-related behaviours and could be used as an intervention to support existing health care services. However, it is still uncertain to what extent volunteering organisations deliver health-related impacts through their volunteering activities (Jenkinsen *et al*., 2013). This owes in part to an insufficient amount of evidence demonstrating the causal directions between volunteering activities and health-related impacts (see section 2.7.1 for further discussions).

This chapter therefore aims to contribute to this field of research and it explores TCV's delivery of health-related impacts through their volunteering activities. More specifically, it examines two characteristics of health outlined below, physical and mental wellbeing. These were selected by TCV as part of their questionnaire survey owing to their importance to the overall health as well as their relevance to volunteers who engaged in environmental volunteering activities.

Firstly, the performance of daily physical exercise as an estimate measure of their physical health. Physiological fitness is often considered one of the most important health markers thought to be an integral measure of most bodily functions involved in the performance of daily physical exercise (Westerterp, 2009). It is widely established that regular exercise has major impacts on physical health. Additionally, studies in the past 30 years have also identified that exposure to nature by active engagement is equally effective for regulating our diurnal body rhythms to ensure physical vitality (Heerwagen, 2009). Understanding volunteer's amount of

daily physical exercise is important to identify whether engaging in environmental volunteering activities has an impact on a person's physical health and thus measure the volunteering organisation's delivery of physical health-related impacts.

Secondly, mental wellbeing in this thesis has been broadly described as the positive state of wellbeing and the capacity of a person to cope with life stresses as well as contribute to community engagement activities (Huber *et al*., 2011). In general, it tends to represent hedonic (e.g. life satisfaction and happiness) and eudaimonic (e.g. virtuous activity) aspects of wellbeing (Tennant *et al*., 2007). It has the ability to both determine as well as be determined by a host of multifaceted health and social factors being inextricably linked to overall health and environmental conditions. There also exists a number of studies examining the recuperative effects of nature on human wellbeing (Grinde and Patil, 2009). As above, understanding volunteer's wellbeing is important to identify whether engaging in environmental volunteering activities has an impact on a person's mental wellbeing and thus measure the volunteering organisation's delivery of mental health-related impacts.

In addition, this chapter also focuses on two indirectly related behaviours, social-ecological resilience and pro-environmental behaviours, which are described in the below sections. Our current understanding of the health-related impacts of environmental volunteering could be further understood if we identify the long-term trends as well as the pathways between environmental volunteering and those behaviours associated with health. This in turn would allow volunteering services to better develop programmes to further encourage these health-related behaviours. It would also allow metrics of success for volunteering services to be enhanced and thus presumably increase their health-related impacts. Therefore, this current chapter aims to explore this gap in knowledge as well as related behaviours affecting environmental volunteers' health-related impacts.

*Social-Ecological Resilience*

Social-ecological resilience has been described as the capacity of social-ecological systems (e.g. biosphere and communities) to maintain their structure and functioning despite any perturbations and other stresses (Krasny *et al*., 2014; Folke *et al*., 2016). It can be both promoted by as well as used to strengthen the health and wellbeing of humans and non-humans alike. This can be promoted and sustained through various contributing factors, including social infrastructure, organisational competence, regular activities, as well as their ability to share and learn information. In this way, through engaging in community led activities (e.g.

environmental volunteering), could lead to self-organisation and adaptive learning, attributes which could be seen as a facet of a social-ecological resilience as well as having the potential to foster sustainable development (Barthel *et al*., 2010; Tidball and Krasny, 2012; Kelly *et al*., 2015). This has the ability to indirectly foster and support health-related impacts. Further in-depth descriptions about the social-ecological resilience, and those characteristics (e.g. skills and knowledge) which could promote or sustain social-ecological resilience which were explored by TCV in the context of environmental volunteering, have been reviewed in section 2.7.3.

In this chapter, it focuses on how those resilient characteristics which emerge through engaging in environmental volunteering activities, a form of civic ecology practice, may help to promote or support social-ecological resilience at group level. In particular, it focuses on the following four characteristics: activity, self-organisation, connections, and skills and knowledge. These four characteristics were also highlighted by other researchers (e.g. Tidball and Krasny, 2007; Krasny and Tidball, 2012; Kelly *et al*., 2015; Folke *et al*., 2016) and selected by TCV to explore owing to their potential to promote social-ecological resilience as well as the sustainable functioning of local community groups who engage in environmental volunteering activities.

Firstly, the level of activity or interaction within a community group (e.g. meetings, local events and group activities). Studies have shown, engagement and communication can be critical in facilitating resilience to construct social support, create a sense of belongingness, achieve goals and develop relationships (O'Sullivan *et al*., 2015). In general, the higher a group's level of involvement in activities, the more engaged they are considered to be. As such, through understanding local community groups' interacting activities and engagement behaviours can be considered an important aspect for development of social-ecological resilience in relation to their ongoing and future sustainability.

Secondly, the ability of a group to self-organise in relation to its objectives, resources and strategic management. Research has shown that a system that can evolve, has the ability to survive or adapt to change by changing itself (Steiner and Markantoni, 2014). In this way, a group that is effective in self-organising has the resources in place to deliver its aims and have plans in place to gain new resources, as they are needed. This could also enable groups to implement plans to increase their degree of long-term management and self-sufficiency, such as in areas of decision making, retention and recruitment, as well as financial resources.

Thirdly, the skills and knowledge that a person(s) possess in a group. Such skills required for local environmental work can be transferable from other situations, be they technical or interpersonal skills. These attributes can be viewed as tools for building social-ecological resilience, creating flexibility in problem solving, self-efficiency and empowerment leading to action and advocacy (Tidball and Krasny, 2007). In this way, groups who understand their skill base and recognise its local value are well placed to share the skills with the wider community and learn from others. In doing so this can lead to adaptive learning, a characteristic which can also help to encourage resilience (Folke *et al*., 2016). Further, this characteristic can be helpful to local community groups, enabling them to tailor future programmes to enhance the fit between volunteers' contributing attributes as well as the group's sustainable functioning (Magis, 2010).

Fourthly, the social connections or networks people have acquired. This can be used to develop a sense of social cohesion, belonging, and as well as contributing to the connectedness of the community (O'Sullivan *et al*., 2015). This characteristic is important due to its potential ability to help foster engagement and related benefits, whereby the wider and more diverse a group's social network, this thus enhances their ability to share and learn information. As such, groups who widen and diversify their social networks have the ability to promote resilient outcomes, enhancing their ability to integrate more effectively into their locality, encouraging adaptive learning, receiving feedback on local issues, aspirations and opportunities (Tidball and Krasny, 2007).

*Pro-environmental behaviours*

Pro-environmental behaviours are the adoption of behaviours aimed at improving environmental quality. These behaviours include environmentally responsible travel, recycling, organic food growing, community involvement and decision making, eco-smart energy use, awareness of local wildlife and eco-friendly shopping behaviour (Venhoeven *et al*., 2013). Population growth in urbanized areas are expected to impact future accessibility to and overall loss of natural spaces. Not only would this have a direct detrimental effect on the health of both humans and non-humans, but equally the functioning and integrity of ecosystem services that sustain our economic productivity. Thereby, costs of sustaining our human-engineered components of social-ecological systems could rise, having an indirect impact on our economic growth and associated pathways connecting to health (Wolch *et al*., 2014; Clark *et al*., 2014). With this in mind, environmental volunteering programmes could be viewed as

intervening processes to help promote positive behaviour to not only ameliorate environmental problems, but enhance existing ecosystem services. As such, through engaging in pro-environmental behaviours could help to improve the wellbeing of humans and non-humans alike. Descriptions about the pro-environmental behaviours, and those characteristics used by TCV to measure it in the context of environmental volunteering, have been discussed more fully in section 2.7.2.

In this chapter, the following characteristics used to measure pro-environmental behaviours are described below: pro-environmental travel, waste management, food growing, community involvement, local decision making, sustainable energy use, awareness of local wildlife (termed here as 'Your Area') and pro-environmental shopping behaviour. These eight characteristics were selected by TCV as part of their questionnaire survey owing to their importance to the pro-environmental behaviours and their relevance to volunteers who engaged in environmental volunteering activities. Owing to the similarities between characteristics, I have classed the characteristics into two groupings: pro-environmental lifestyle behaviours and civic engagement activities.

Firstly, pro-environmental lifestyle behaviours in the context of this chapter refer to those behaviours which most people are able to engage in (e.g. recycling). Recent studies suggest a positive link between people's pro-environmental behaviour and engagement in environmental activities (e.g. Cooper *et al*., 2015). Participating in environmental volunteering and nature-based activities could also be seen as equally important, increasing a person's engagement in pro-environmental behaviours and commitment through direct experience. Of the eight characteristics outlined above, the following six I have classed as pro-environmental lifestyle behaviours: pro-environmental travel, waste management, food growing, sustainable energy use, awareness of local wildlife (termed here as 'Your Area') and pro-environmental shopping behaviour.

Secondly, civic engagement activities refer the involvement of a person who wishes to make a difference in the civic life of their community through both political and non-political process, such as environmental volunteering activities. Those characteristics classed as civic engagement activities are similar to some of those identified in the social-ecological resilience section above: community involvement and local decision making. It can be assumed that a person's involvement in civic engagement activities can be critical in facilitating a sustainable and pro-environmental community to construct support and achieve relevant goals (O'Sullivan

*et al*., 2015). As such, through understanding volunteer's civic engagement activities can be considered important to the ongoing and future environmental sustainability of their community, aspects which indirectly effect human health (Tidball and Krasny, 2007).

### 7.1.2 - Related work and methodological approaches

As noted, studies in volunteering research have begun to focus on the health and wellbeing outcomes of volunteers, providing further evidence on the outcomes associated with environmental volunteering programmes (Pillemer *et al*., 2010; Molsher and Townsend, 2016; Kragh *et al*., 2016). In each of these studies, researchers used a mixed method approach in the form of questionnaire surveys to collect volunteer data. Yet, findings from these studies tended to be based on either one aspect of health or aging populations and lacked deeper understanding of the delivery of these programmes, including frequency and type of activity (Jenkinson *et al*., 2013). The chapter explores TCV's longitudinal volunteer data on physical health and mental wellbeing collected from a wide demographic spectrum in relation to their environmental volunteering programme, Green Gyms®, specifically orientated towards a health focus. Such knowledge would help to identify changes over time, different types of health aspects (e.g. physical and mental health) as well as any relating factors (e.g. level of engagement) in order to explore to what extent TCV delivers health-related impacts across the demographic spectrum.

Characterising people's level of pro-environmental behaviours and nature connectedness has a wide literature base in environmental education and psychology research, examining both qualitative (e.g. questionnaires) and quantitative dimensions (e.g. measurement indexes). Previous research has touched on many areas including measuring people's environmental concern and connectedness to the environment (Mayer and Frantz, 2009; Nisbet *et al*., 2009), examining the differences between hunting and birdwatching wildlife recreational activities (Cooper *et al*., 2015), as well as the use of educational workshops to increase people's awareness and education in pro-environmental behaviours (Ballantyne and Packer, 2011). These studies have revealed how each of these factors may impact on volunteers' pro-environmental behaviours increasing their awareness and education in related issues. However, researchers have highlighted methodological challenges associated with measuring pro-environmental outcomes owing to the inability to ascertain the reason for a change in behaviour. This can make it difficult to know the extent to which change derives from an individual cause or intervention (Steward *et al.*, 2009). As such, more in-depth and longitudinal research is needed to distinguish long and short term affects, to understand people's

experiences as well as other external influences (Büch *et al*., 2012). In response, this chapter pays particular attention to two key variables, level of engagement (e.g. time duration and sessions attended) and type of environmental volunteering programme, using in-depth interviews to understand volunteers' experiences and self-reported questionnaire surveys to measure volunteers' changes in behaviours over time.

In concurrence, there has been a gradual increase in the number of studies examining the relationship between resilience and the natural environment, including climate change, resource depletion and natural disasters (Berkes and Jolly, 2001). Of these relationships, emerging studies have focused on 'community greening' activities in urban regions, defined as community-based efforts to create green spaces in cities, such as community gardens and allotments (Tidball and Krasny, 2007). These studies use various mixed method approaches (e.g. interviews) to evaluate the benefits associated with engaging in greenspaces and has been shown to offer a range of benefits, including human, natural and social capital (Tidball and Krasny, 2007). These studies reveal how a highly functioning greenspace managed by local community groups would build additional forms of capital (e.g. self-organisation and adaptive learning) which could be seen as a facet of a social-ecologically resilient community as well as having the potential to foster sustainable development (Tidball and Krasny, 2007; Kelly *et al*., 2015). Whilst there has been limited research in this area from the perspective of environmental volunteering activities, outcomes from nearby studies suggests that these findings could be extendable and that there is scope for methods to be applied from other related or nearby fields. To address this, this chapter uses a mixed method approach (e.g. focus group interviews) to reveal whether engaging in environmental volunteering activities has an impact on peoples' self-reported social-ecological resilience.

## 7.2 Method summary

A mixed method analytical approach was implemented from October 2014 to March 2015, using several quantitative and qualitative methods. These combined methods were used to analyse volunteer data collected by TCV. Data collected as part of this chapter was conducted by TCV staff using three different types of techniques in relation to their research objectives: e-mail questionnaire surveys, one-to-one interviews and focus group interviews. This volunteer data was extrapolated from the TCV MIS. Data analysis was conducted using a mixed method approach, which consisted of two main parts: firstly, exploratory and confirmatory data analysis of questionnaire survey datasets (Quantitative analysis), and secondly, general

inductive analysis of resilience transcript summaries (Qualitative analysis). Quantitative analysis was performed using R Version 3.1.1 (R Core Team) and qualitative analysis was conducted using Atlas.ti (Version 8). All methods and data sources used in this chapter can be found in sections 3.2 to 3.3.4.

## 7.3 Results

This section explores and summarises the wellbeing, pro-environmental behaviours and social-ecological resilience profiles of The Conservation Volunteers' (TCV) environmental volunteers.

### 7.3.1 – Green Exercise project: Survey Responses

General descriptive statistics of volunteer's responses to the TCV's Green Exercise questionnaire surveys from April 2012 to April 2014 can be found in table 7.1. SWEMWBS scores between each of the three surveys were relatively comparable. Scores presented an average to good level of wellbeing as indicated in means and mediums, with scores ranging from 22.6 to 23.6 out of a total score of 35. Such trend was also identified in days physically active which had a mean and medium of 3 or more days a week.

Variability between average scores was relatively small, as shown by standard deviations (SD) and quartiles. On closer examination, within- (CVw; SWEMWBS scores 12.3 to 18.6%, days active 25.5 to 27.3 %) and between-volunteer coefficients of variation ($CV_b$; SWEMWBS scores 12.01 to 17.8%, days active 22.3 to 25.6%), as well as variance ratios (ʎ; SWEMWBS scores 0.77 to 0.79, days active 1.09 to 1.13) present differences in variability that were relatively consistent throughout each of the three rounds of survey. This suggests there to be small variability between volunteers' self-reported wellbeing while there exists larger variability between days they were active. Further, the range between lowest to highest SWEMWBS scores is wider in the first and second surveys, with those in the third survey being narrower. Not only is this reflective of sample sizes for each survey but also suggests that those which engage longer in TCV's environmental volunteering activities rate themselves more similarly. Overall, there was no observable change or relationship in SWEMWBS scores and days active throughout all surveys. Additionally, table 7.1 also shows there to be no differences in baseline scores between long-term volunteers who responded to all three survey rounds and one-off volunteers who only responded to one round of surveys. As such, by using only those long-term volunteers' responses to all three rounds of surveys, these longitudinal datasets can be thought of as representative of the overall sample.

Table 7.1: Descriptive summary of TCV volunteer's SWEMWBS scores and days active, including one-off and long-term volunteers as indicated.

| Survey No. | Health measure | Descriptive Summary | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mean | Medium | 1st Quartile | 3rd Quartile | SD | Range |
| 1 (One-off volunteers only) | SWEMWBS score | 23.9 | 23.5 | 20.1 | 26.3 | 4.4 | 22 |
| | No. of days active | 3.6 | 3 | 2.2 | 5.3 | 2.3 | 7 |
| 1 (excluding one-off volunteers) | SWEMWBS score | 23.6 | 23.2 | 20.7 | 26 | 4.2 | 19.2 |
| | No. of days active | 3.6 | 3 | 2 | 5 | 2 | 7 |
| 2 | SWEMWBS score | 22.6 | 21.5 | 19.2 | 25 | 4.3 | 18.1 |
| | No. of days active | 3.7 | 4 | 3 | 4.75 | 1.7 | 7 |
| 3 | SWEMWBS score | 23.1 | 21.54 | 19.62 | 26.52 | 4.4 | 17.02 |
| | No. of days active | 4.1 | 4 | 3 | 5 | 1.7 | 7 |

In addition, no differences were observed between volunteers' total SWEMWBS scores (One-way ANOVA, F (1,38) = 0.0, p = 0.99) or days actives (One-way ANOVA, F (1,38) = 0.26, p = 0.77) between all three rounds of survey. Similarly, no relationships between volunteers' total SWEMWBS scores (Pearson Correlation Coefficient *R* (1,38) = 0.01, p = 0.96) or days actives (Pearson Correlation Coefficient *R* (1,38) = 0.68, p = 0.68). This suggest there to be no significant differences or relationships in volunteers' overall scores over time.

Volunteer's sub-types of wellbeing and physical activity were compared in relation to differences between survey scores or days active across each survey (see Figures 7.1 and 7.2). Overall, findings showed small but appreciable trends in each wellbeing type across the geographic region. Of these, statements 1 – "*feeling optimistic about the future*", 5 - "*I've been thinking clearly*" - and 7 - "*I've been able to make up my own mind about things*" - account for

the largest contribution to the wellbeing scores in the first round of the questionnaire survey. By the third round of the questionnaire survey, statements 2 – "*feeling useful*", and 6 – "*feeling closer to people*", accounted for the largest contribution (30% collectively overall, each 15.1%) to the wellbeing scores. Further, it is noteworthy that the majority of responses made by volunteers were either 'all of the time', 'often' or 'some of the time', with a very small number selecting either 'rarely' or 'none of the time'. Similarly, few volunteers responded that they were active for 0 days, with most reporting between 1 to 7 days throughout each of the surveys.

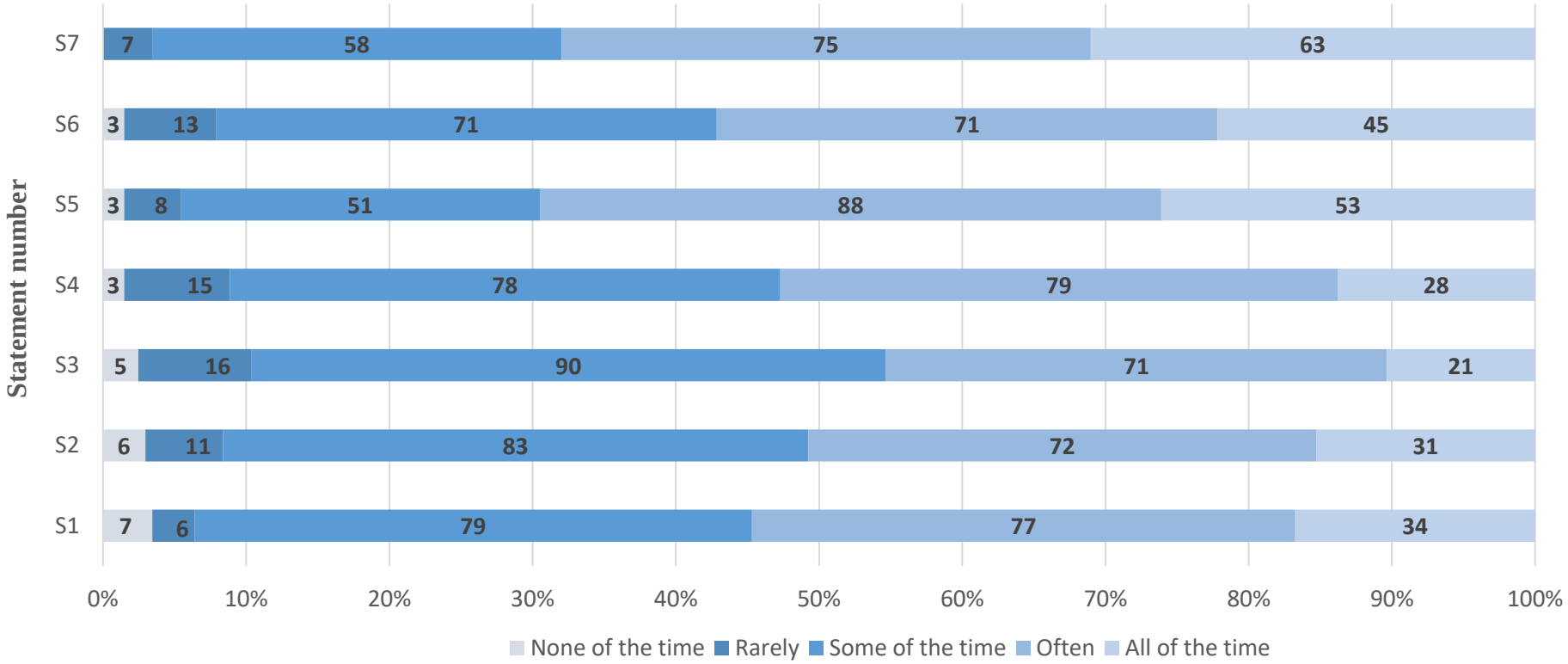


Figure 7.1: Numbers and proportions of volunteer response per SWEMWBS statement in survey 1 (S1-7).

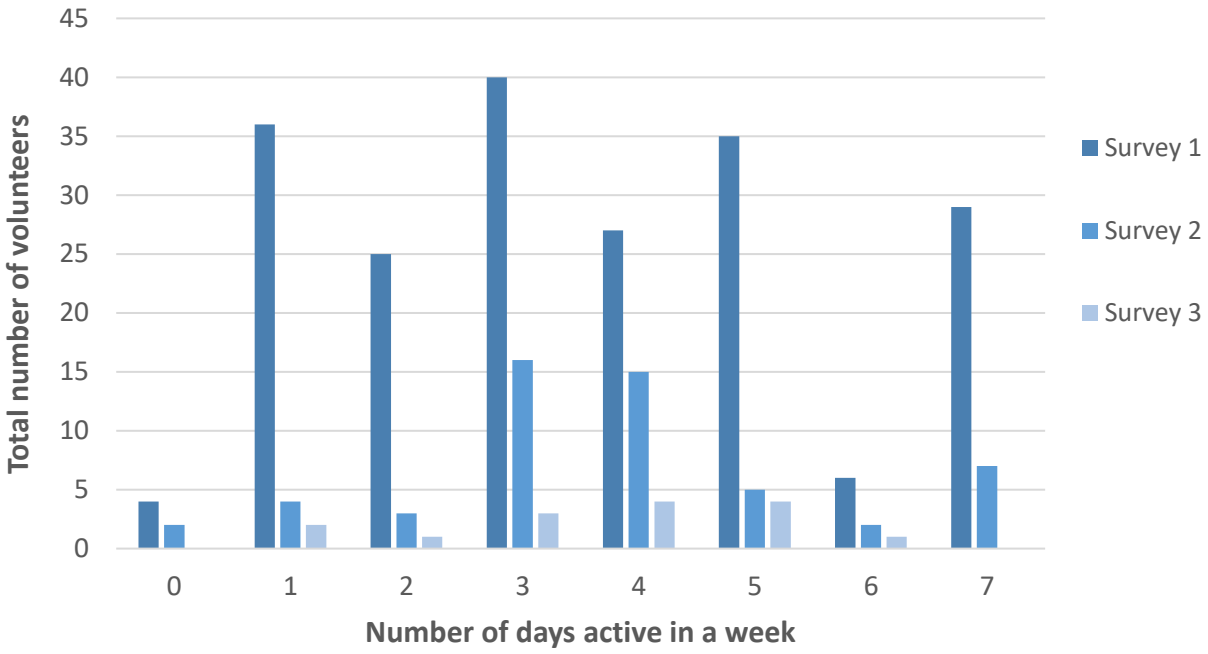


Figure 7.2: Total number of TCV volunteers per response to days active in Greater London.

### 7.3.2 - Change! Tool project: Survey Responses

General descriptive statistics of volunteers' responses to the Change! Tool questionnaire surveys can be found in table 7.2. Overall, average self-reported pro-environmental behaviour scores presented a slight positive increase from those identified in first and proceeding surveys as indicated in means and medians. Variability between average scores was relatively small, as shown by standard deviations (SD) and quartiles. Within- ($CV_w$ 3.8 to 4.3 %) and between-volunteer coefficients of variation ($CV_b$ 3.5 to 3.8%), as well as variance ratios (ʎ 1.01 to 1.03) and indicates that the level of variability in datasets, whilst low, was relatively similar throughout each of the three rounds of survey. Most volunteers displaying moderate levels of pro-environmental behaviours, with scores ranging from 19.4 to 22.7 out of a total score of 40. Further, the range between lowest to highest scores is wider in the first and second surveys, with those in the third survey being narrower. Not only is this reflective of sample sizes for each survey, but also suggests that those which engage longer in TCV's environmental volunteering activities rate themselves more similarly (see description for long-term volunteers in chapter 5).

Table 7.2: General descriptive statistics of TCV volunteers' total scores for each of the Change! Tool questionnaire surveys.

| | First Survey (*N*=1165) | Second Survey (*N*=161) | Third Survey (*N*=63) |
|---|---|---|---|
| Mean | 19.4 | 20.7 | 22.7 |
| Median | 20 | 20 | 23 |
| 1st Quartile | 15 | 17 | 18 |
| 3rd Quartile | 24 | 25 | 28 |
| SD | 7.1 | 7.3 | 6.3 |
| Range | 38 | 38 | 27 |

In general, volunteers presented a slight increase across most of the pro-environmental behaviours (except waste management), with those showing the greatest areas of change being travel and taking part in local decision-making activities (Figure 7.3). Waste management included the amount of weekly waste that has been recycled as well as water and energy usage in the home. Travel included the mode of transport used on a regular basis as well as holiday travel. Taking part in local decision-making activities included council meetings, being involved in local resident or neighbourhood meetings. Further statistical analysis also showed differences were observed between volunteers' total Change! Tool scores (One-way ANOVA, $F(1,152) = 2.09$, $p = 0.028$) between all three rounds of survey, each representing a different time periods (i.e. 1, 3 and 6 month intervals). This suggests there to be a change in volunteers' overall scores over time, with a slight increase in total mean scores across each of the three waves of questionnaire surveys.

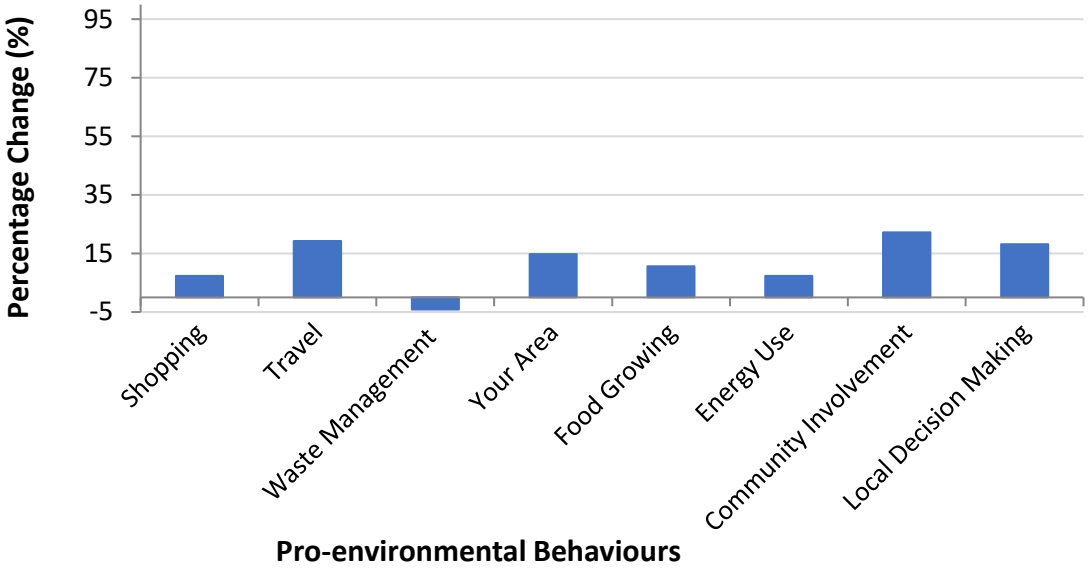


Figure 7.3: Percentage change in volunteers' mean scores for pro-environmental behaviours measured from first to third surveys.

In addition, a slight positive relationship between volunteers' total Change! Tool scores (Pearson Correlation Coefficient $R$ (1,152) = 0.161, p = 0.047) and the length of time volunteers engaged in environmental volunteering activities. Whilst a relationship between each of the survey rounds (a representative of time) and volunteers' overall scores for the Change! Tool surveys was identified, it was a very weak correlation (2%), suggesting either a very weak relationship or it had arisen by chance. Using a scatterplot analysis to visually assess whether a relationship was observable, it revealed that the very weak relationship was not linear or monotonic in structure. This suggests that there is was no significant relationship, and the length of time volunteers engage in TCV activities is a relatively small predictive factor.

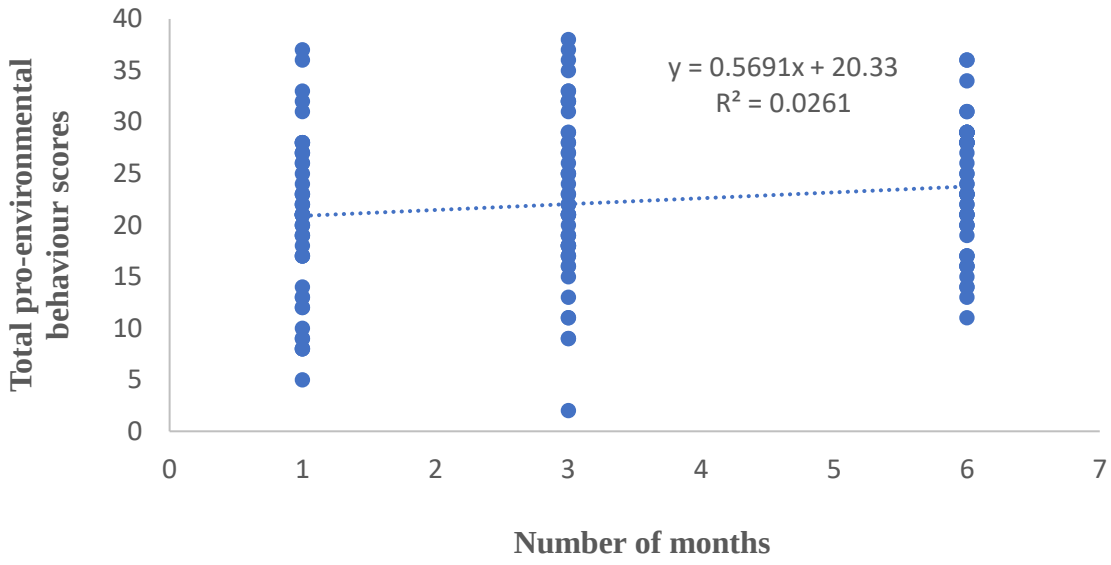


Figure 7.4: Total pro-environmental behaviours scores based on the length of time volunteers engaged in environmental volunteering activities.

Finally, differences were also observed between the two programmes – Green Gyms and Action Teams – with the former presenting greater impact than the latter whose baseline surveys show a much higher level of awareness for environmental issues (Figure 7.6). For instance, those volunteers who engage in the Green Gyms programme present greater impact across six of the eight pro-environmental behavioural changes (with little or no significant changes for pro-environmental behaviours shopping behaviour and waste management). By contrast, those volunteers who attend the Action Teams programme show a reduced level of impact across most of the pro-environmental behaviours, except food growing and travel which present small but appreciable positive impacts.

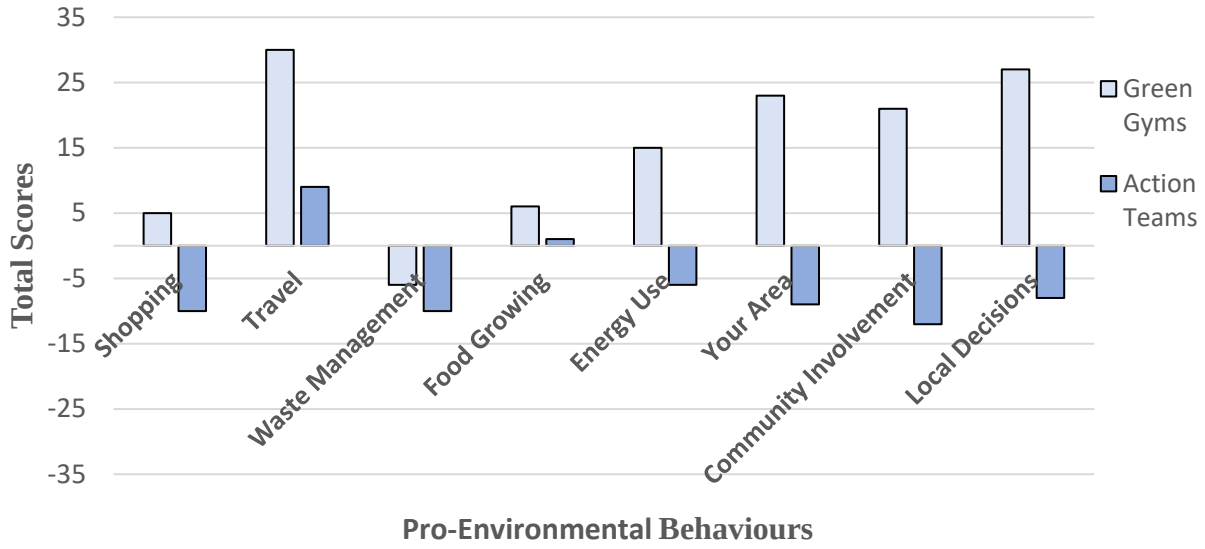


Figure 7.5: Change scores total in volunteers' pro-environmental behaviours between volunteering programmes.

### 7.3.3 - Change! Tool project: One-to-one interview responses

Of those volunteers interviewed (n=26), over half (n = 15) reported a change in their pro-environmental behaviours since volunteering with TCV. Others (n=11) observed no significant change due to already being pro-environmentally conscious and exhibiting such behaviours. This was also evident from findings observed in the Change! Tool survey, with participants adopting six of the eight key pro-environmental behavioural changes that were explored: travel, food growing, local decisions, energy, wildlife in your area and community. Of those who reported a change, when asked what the main trigger for this change was almost all attributed this to the knowledge and enthusiasm expressed by TCV staff and leaders as well as to their first-hand experience engaging in environmental volunteering activities. As one noted:

*"The leaders were very helpful. The learning usually comes hand in hand with volunteering, but I have taken greater interest in environmental issues. The volunteering experience has kept me informed on the environmental changes I could*

*make and has also made me more aware. I have also started to learn more about sustainability".*

Further, of those participants who noted that they felt empowered to continue with their pro-environmental behavioural changes adopted, over half (n=16) had a stated how their experience had a positive impact on others, particularly family, friends, and co-workers, who then went on to also implemented such changes. As such, pro-environmental changes in response to engaging in environmental volunteering activities had a positive cascading effect beyond those who initially participated.

Finally, in discussing the potential effects of environmental volunteering on participant's health, almost all reported a positive impact (n=20), with only a relatively small number (n=6) observing no significant effect often relating to a pre-existing healthy lifestyle. Specifically, participants identified noticeable improvements, physically, mentally and socially, which included general fitness, mental wellbeing, self-fulfilment, interpersonal relations, motivation and self-confidence as well as increased levels of awareness for maintaining healthier lifestyles and behaviours. This was evident across participants' responses, regardless of the length of time they had contributed to volunteering (e.g. days, months or years), with one participant stating:

*"I am feeling fitter, healthier, and this experience has increased my self-esteem".*

In general, such positive impacts were frequently associated with TCV's environmental activities, including leadership training, helping the local community and conserving the surrounding environment as well as actively engaging and interacting with a diverse group of people. One volunteer commented:

"*I was good to be able to interact with the different people from different backgrounds. And it was interesting to see how I coped with the different tasks and different tools*".

In this way, findings indicated an overall positive relationship between engagement in environmental volunteering activities and a person's physical, mental and social health.

### 7.3.4 – Resilience project: Group and one-to-one interview scores

General descriptive summaries of the local community groups' (n=13 groups) responses to the Resilience focus group questions can be found in table 7.3. In general, each community groups' average scores across each of the characteristics were moderate to high. Of the four characteristics explored, the groups' mean and medium scores for level of activity was shown to be slightly higher than those presented in other three characteristics (self-organising, connections as well as skills and knowledge) which were relatively similar. This suggests that they tended to be highly engaged in their group led activities (e.g. meetings, local events and group activities), whilst presenting a balance in their degree of social connectedness, contributing skills base and ability to self-manage. Variability between groups' mean scores differed across the four characteristics, as shown by standard deviations (SD) and quartiles, with more variability observed in levels of activity and self-organisation, than connections and skills and knowledge. This is also reflected in the range between lowest to highest scores, which is wider in the activity and self-organising indicators, with those for connections as well as skills and knowledge being narrower. This suggests that the groups tended to rate their levels of connections, skills and knowledge more similarly, yet differ in their regularity of activity and degree of self-organisation.

Table 7.3: General descriptive statistics of participant' scores for each of the four characteristics which can promote social-ecological resilience.

| | Activity | Self-organising | Connections | Skills and Knowledge |
|---|---|---|---|---|
| Mean | 4.23 | 3.31 | 3.77 | 3.77 |
| Median | 5 | 4 | 4 | 4 |
| 1st Quartile | 3.5 | 2 | 3 | 3 |
| 3rd Quartile | 5 | 4.5 | 4.5 | 4.5 |
| SD | 1.36 | 1.44 | 0.83 | 0.83 |
| Range | 4 | 4 | 2 | 2 |

Moreover, the average scores reported by stakeholders (n=6) as they provided an external assessment of each groups' characteristics were also moderate to high. In addition, external stakeholders tended to rate groups with similar scores for each of the four characteristics, as indicated in means and medians (Table 7.4), and are slightly higher overall than those scores reported by the local community groups. In this way, the four characteristics are shown as equally balanced across each of the groups. Further, variability between these average characteristic scores was quite low, as shown by standard deviations (SD) and quartiles. In addition, the range between lowest to highest scores tends to be narrow across each of the indicators. Not only might this reflect the small numbers of local stakeholders who completed the survey (n=6), but also shows that they tended assess the local groups' characteristics more similarly.

Table 7.4: General descriptive statistics of stakeholders' scores for each of the four characteristics.

| | Activity | Self-organising | Connections | Skills and Knowledge |
|---|---|---|---|---|
| Mean | 4.2 | 4.3 | 4.2 | 4.5 |
| Median | 4 | 4 | 4 | 5 |
| 1st Quartile | 4 | 4 | 3.7 | 3.7 |
| 3rd Quartile | 4.25 | 5 | 5 | 5 |
| SD | 0.41 | 0.5 | 0.75 | 0.84 |
| Range | 1 | 1 | 2 | 2 |

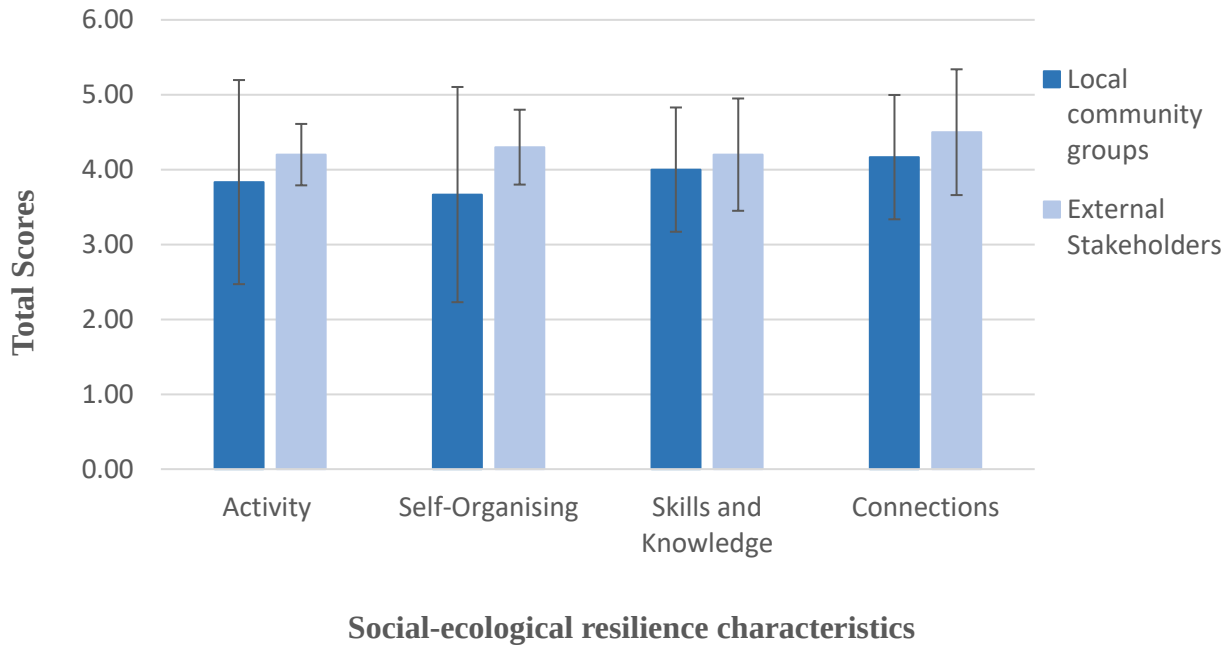


Figure 7.6: Comparisons of local community group and external stakeholder social-ecological resilience characteristic score means and standard deviations (±SD).

Conversely, small but appreciable differences in perceived characteristics were found between characteristic scores (see Figure 7.7), where scores by external stakeholders were slightly higher (except activity) throughout than those self-reported scores by local community groups. This suggests that the local community groups perceived their characteristics as similar to that of external stakeholders.

In summary community groups presented a high level of activity by comparison to other characteristics. There were similarities in how groups rated their levels of connections, skills and knowledge. There were also variable trends in groups' regularity of activity and degree of self-organisation. Finally, small but appreciable differences were identified in characteristic scores between community groups and external stakeholders.

### 7.3.5 –Resilience project: Group and one-to-one interview responses

Overall, most local community groups who engaged in focus group interviews (n=11), reported a moderate to high level of activities. Activities included holding committee or community 'meetings', 'frequent email correspondence' and 'local events', as well

as undertaking regular local conservation and community activities (e.g. guided wildlife walks and community gardening). However, differences were identified in the amount of activities each group engaged in. Reasons for these differences in activity levels related to a number of factors, such as issues surrounding landownership, financial resources, seasonal variability and ability to self-organise. For example, most groups (n=11) reported that they engaged in regular amounts of activities on a weekly or fortnightly basis, with one participant commenting:

"*We carry out various activities every Tuesday and Friday as well as the first and third Sundays of every month. Our activities centre on conservation, environmental education, and sustainable agricultural techniques due to them recognising that children are future guardians of the environment. A lot of activities take place at the ecology centre, including, pond dipping, talks on sustainable living, star gazing, tree identification, and habitat creation for badgers, bats and foxes. We also organise Green Fairs in which organisations can come and demonstrate different skills or sell locally made, organic products*".

By contrast, few groups (n=2) noted having a low amount of activities. For instance, one participant stated:

"*We meet once every three to four months to have discussions. However, as four members are family or close friends, they sometimes talk about the green 'off the record' in-between this time. We work on the garden on a seasonal basis, but need to do more activities in the year*".

All external stakeholders that engaged in one-to-one interviews (n=6), perceived local community groups as having a moderate to high level of activities. Examples of this included '*frequent email correspondence*' as well as ongoing progress in undertaking regular local conservation and community activities. One stakeholder highlighted:

"*There is a need for further activities to enhance group intercommunications*".

Further, there was variability in group's ability to self-organise in relation to acquiring resources, decision making processes, as well as strategic aims for the future of the group and its activities. For instance, some groups have a future management plan in

place which is supported through a regular funding source or self-sufficiency (e.g. membership fees). As one participant reported:

"*[We] receive our income from various sources, the biggest being from fee-based education work that they do with schools in the borough and the contracts they receive to deliver environmental projects and training … Projects are also funded by the lottery and other charitable trusts*".

By contrast, others have no set aims or objectives relating to various reasons, such as no formalised decision-making processes, permissions for use of land, and lack of regular and consistent members:

"*It's hard to imagine the future … There is no secure or regular funding in place or funding applications. [We] do not have plans in place to recruit new members because there is no membership*".

Further, stakeholders rated local groups' ability to self-organise as moderate to high level. For instance, it was noted that one group had produced "*well organised open event days"* noting:

*"[They are] a very well organised group, with up to date risk assessments and insurance, tool maintenance is excellent, weekly workdays are well organised and planned"*.

Reasons for this owed to groups' effective ability to demonstrate overall self-sufficiency (both financially and volunteer retention), sustain commitment, and delivery of project outputs. Conversely, some stakeholders scored groups' quite low and as one noted:

"*The group need to incorporate a management plan for the future in terms of its activities and volunteer recruitment to ensure its long-term sustainability*".

All groups presented a good degree of awareness of their skills and knowledge base, both within the groups themselves as well as those external stakeholders they connect with. These varied widely from those transferable skills and knowledge associated with some group members' existing employment, such as "teaching" and "project

management", to those more specific to their groups' activities, including "conservation management", "horticulture", and "volunteer mentoring and co-ordination". As one participant said:

"*We currently have the knowledge and skills needed to complete our work. Our wide variety of backgrounds means that we can draw on a wealth of knowledge and experience to support our work. Some members are experts on plants and animals found in the woods, some have expertise in woodland management and others in administration and use of IT. The group can also draw on outside expertise through the local council and contractors. Two of our members also are qualified in chainsaw use, two others are qualified to use herbicides, and a number of members have experience of using a brush cutter. But only one group member has access to a four by four vehicle, which we use for transporting heavy equipment and product around the woods*".

Similarly, most groups recognised their ability to make a wider contribution to their local environmental and community work, with one commenting:

"*[We] serve the local community by providing herbs and lots of edible plants and educating young people who visit on school trips as well as those who have fallen out of school … liaising with local shops and businesses for prizes for the summer events which they organise*".

In addition, the majority of groups highlighted areas that they felt there was room for improvement, such as particular skills and knowledge as well as how these characteristics are distributed within the group themselves as well as those external stakeholders they connect with. For instance, as one participant stated:

"*We feel that more conservation knowledge is desired because knowledge of the plants specific to our reserve is limited. But logistics and cost limit our ability to do this. Also, we feel somewhat uncomfortable with public relations and using newspapers, so more development of public relation skills are needed. We do have access to these skills and knowledge through some members, but the members won't necessarily have the time to spare. Also, we feel that the group is dependent on certain members bringing skills and knowledge from other areas of their life and so over the*

*long term there is a danger of not replacing any that are lost if [volunteer] recruitment is low*".

By contrast, there was slight variability in stakeholder's reflections of groups' skills and knowledge base relating to a host of factors. For instance, some stakeholders scored lower than local groups (n=2), looking beyond their existing skills to those more long-term intergenerational, with one commenting:

"*In the long-term the group will need to attract younger members to pass on this local knowledge to ensure the group remains strong and capable to continue its excellent operation*".

Conversely, other stakeholders scored higher (n=3), basing their perspectives on the groups' willingness to enhance their skills and knowledge, with one stating:

"*The group is very confident but also never shies away from asking for advice with regards to woodland management*."

Finally, all local community groups reported a moderate to high level for their connections. Examples of connections included family, friends, schools, other local community groups, funders, members of the councils, housing associations and contractors. However, differences were identified in the amount of connections each group had. Reasons for these differences in the amount of connections related to a number of factors, such as time availability, size of the group as well as how connections are distributed within the group. Of those groups who presented a wide range and amount of connections, many individual connections were shared equally across the group. As one participant commented:

"*We have a strong range of connections we currently use, and many individual connections are shared between so in the event of loss of one of our committee members there would not be too much of an impact and increase our degree of resilience. We also have consistent ideas about what further connections we need and are gradually expanding the reach of our group where necessary*".

Conversely, those groups reporting a low amount of connections identified the need to expand their connections and outreach as well as distributing connections more widely within the group to ensure their long-term sustainability. As one participant noted:

"*Two of the group have the majority of the connections and each of these group members have different points of contact. This will be helpful in acquiring different skills and knowledge. Potential contacts are limited, but we could use them to meet the needs for working on the greenspace. These [potential contacts] could be the local garden centre, scouts, guides, local flower shop and national lottery funding. If these contacts are used effectively as well as our existing contacts our group could achieve its main aim of becoming an enjoyable space in a short amount of time*".

Similarly, variability was also reported in stakeholders' perception of groups' connections in their community. Most commented that the groups had a wide network of local volunteers, attributing this with the groups' '*friendly nature*' and degree of outreach within the community. Other stakeholders instead noted a lower level of connectivity, suggesting that contacts and responsibilities should be shared more evenly throughout the group in order to ensure the future resilience of the group:

*"While the group has a large variety of contacts, most of the interaction with key contacts, such as those which could provide funding, is carried out by one member of the group of whom the group heavily relies".*

## 7.4 Discussion

Overall, this chapter explored the health and wellbeing impacts associated with TCV's environmental volunteering activities, taking account of volunteers' perceptions of health as identified in the previous chapter (chapter 6). Information generated serves to assess the performance delivery of these environmental volunteering programmes and enhance existing knowledge on the long-term health and related impacts associated with these activities. This is particularly important if outcome data is to affect learning, provide information to key constituencies and enable programmes to be managed effectively as well as contribute to the volunteer sector. This was achieved

using additional forms of qualitative and quantitative methodological approaches, to analyse volunteer data collected by TCV which focused on health and related behaviours, social-ecological resilience and pro-environmental behaviours. Further, findings also sought to provide suggested recommendations for TCV's ongoing future delivery, which I discuss in chapter 8. I will now discuss the following three areas of volunteer data used to explore the health and wellbeing impacts associated with TCV's environment volunteering activities: health and wellbeing, pro-environmental behaviours and social-ecological resilience.

*Health and wellbeing*

The chapter found that those who engaged in environmental volunteering presented moderate to high levels of physical activity and wellbeing, which were consistent throughout. These findings resonate with existing research (Pillemer *et al*., 2010; Kragh *et al*., 2016), providing further evidence on the long-term trends and outcomes associated with environmental volunteering programmes. However, there was no observable change or relationship between volunteers' level of wellbeing and the amount of time they engaged in TCV's volunteering activities. One reason for this, as explained, may relate to the fact that surveys were administered at variable intervals after starting volunteering sessions because of the nature and practicalities of volunteering activities. It is assumed that a person's baseline is established early on at the start of volunteering, and remains uncertain if these findings are attributed to TCV's environmental volunteering activities and thus whether TCV deliver wellbeing impacts. It is therefore suggested that future data collection processes used by TCV needs to capture volunteers' baseline data to identify their true delivery of physical health impacts.

Further, mixed findings were observed when examining volunteer's sub-types of wellbeing. In the first round of questionnaire surveys, volunteers reported the ability to 'think clearly', 'make up own mind' and 'feel optimistic about the future' as the largest contributing factors to wellbeing. Possible explanations for these factors include improved cognitive functioning (Lov, 2005), social aspects associated with membership of a group (Molsher and Townsend, 2016), and stress reduction relating

to physical activity (Pretty *et al*., 2005). It is noteworthy that these factors were not highlighted by volunteers in the previous chapter when describing elements of wellbeing, thus having a different perspective of the wellbeing concept. In contrast, by the third wave of the questionnaire survey, volunteers instead reported the ability to 'feel useful' and being 'closer to other people' were the largest contributing factors to their wellbeing, factors which were also mentioned by volunteer groups in chapter 6. Similar findings have also been identified in other related studies on environmental volunteering that examine the motivations of environmental volunteers (Ryan *et al*., 2001; Asah and Blahna, 2013). Reasons for this change in findings may relate to volunteers' social enjoyment and personal motivations for volunteering. These mixed findings are useful for understanding the types of wellbeing outcomes experienced by volunteers who engage in TCV activities. Yet, as others note (Pillemer *et al*., 2010; Jenkinson *et al*., 2013), it would be useful to also know what type of environmental volunteering activities (e.g. pond weeding) contributed to volunteers' health-related impacts (e.g. sub-type of wellbeing), an area of knowledge which is currently unknown or cannot be determined due to the existing sample size and variable structure of TCV's current dataset for this type of analysis. For instance, volunteers engage in a multitude of conservation activities, but are asked to reflect on their wellbeing since the preceding survey making it hard to distinguish which activities contribute to particular health-related impacts. Such information would be helpful for TCV in relation to the future design of their environmental volunteering programmes to include those activities that would be most beneficial to volunteers' health and thus presumably increase their current deliveries of health impacts.

Moreover, this chapter also identified that TCV volunteers presented moderate to high levels of physical activity, regarded by volunteers as a key contributing factor to a person's physical health (see chapter 6). These high levels were consistent throughout their time engaged in environmental volunteering activities. In general, volunteers reported that they were active for 3 or more days week. Similar findings have also been identified in existing research on volunteering and associated physical health benefits (e.g. Pillemer *et al*., 2010), though tended to use small sample sizes, focused on aging populations or lacked baseline data to make causal linkages. Yet, just like

volunteers' wellbeing scores, there was no observable change or relationship between the number of days they were physically active and the amount of time they engaged in TCV's volunteering activities. In addition, whilst most volunteers said that they were active for 1 to 7 days each week, few volunteers responded that they were active for 0 days. Reasons for this may include a volunteers' time availability, lifestyle choices and other commitments (Jenkinson *et al*., 2013). Such knowledge is valuable for understanding the amount of physical activity TCV volunteers currently engage in, but as noted above, it would be recommended that volunteers' baseline data were collected to enable a fuller picture of TCV's health impact delivery to be understood. Further, information about volunteers' level of physical activity is useful for TCV in relation to the future design of their environmental volunteering programmes to improve their current deliveries of health impacts.

*Pro-environmental behaviours*

Findings from this study observed that those volunteers who engaged in TCV environmental activities presented a slight positive increase in pro-environmental behaviours over time, with variable differences between the two volunteering programmes: Green Gyms and Action Teams. This may relate to the differences in focuses of the two programmes and the motivations of those that attend. For instance, a large proportion of those who join a Green Gym are referred by health practitioners or join because of a motivation to improve their own health rather than environmental concerns. In contrast, Action Teams primarily attract volunteers who are motivated by the idea of undertaking work to improve the environment and so may start from a much higher level of appreciation of environmental issues. These findings progress existing research (Nisbet *et al*., 2009; Cooper *et al*., 2015), providing further evidence on the long-term trends, outcomes and impacts associated with different environmental volunteering programmes. In this way, TCV's programmes could be viewed as an intervening process to help promote pro-environmental behaviours and enhance existing ecosystem services, thereby indirectly improving the wellbeing of humans and non-humans alike (Wolch *et al*., 2014; Clark *et al*., 2014). Further, it suggests that TCV may need to reach out to those who would not conventionally

engage with environmental activity in order to have the greatest 'return' on their efforts in terms of increased pro-environmental behaviour, and thus delivering a greater 'impact'.

In general, TCV volunteers presented positive change across almost all the eight pro-environmental behavioural indicators used. These findings resonate with similar studies (Donald, 1997; England and Marcinkowski, 2007; Cooper *et al*., 2015). Yet, it is noteworthy that none of these behaviours were noted by volunteers in chapter 6 when they described elements of the natural environment as an external factor relating to health, instead referring to environmental pollution. Further, these results also suggest that those that engaged longer in TCV's environmental volunteering activities tended to rate themselves more similarly (see chapter 5 for a description of long-term volunteers). One reason might be that social interactions amongst those more regular volunteers have the ability to both influence and support individual's attitudes and behaviour (e.g. advice on food growing activities) via perceived social norms (Göckeritz *et al*., 2010; Dresner *et al*., 2014). In contrast, findings identified a negative trend in waste management behaviour amongst almost all volunteers, which to our knowledge has not been found in other similar studies. As such, this trend may be attributed to a few factors, including personal finance, time availability, and current infrastructure supporting pro-environmental behaviours (Kaiser *et al*., 1999; Bamberg and Schmidt, 2003; Thøgersen, 2005). Alternatively, this may also relate to an individual's perceived view of their pro-environmental behaviours. For instance, a person's view of their individual change behaviours in relation to attaining a goal can differentiate according to the scale (e.g. size of the goal), framing (e.g. at an individual level or compared to the rest of the human population) and attainability of the goal itself (Lindenberg and Steg, 2007; Venhoeven *et al*., 2013). These findings provide useful insights into the types of pro-environmental behaviours volunteers engage in and factors which may shape them. Moreover, such knowledge can be valuable for designing future volunteering programmes to encourage those pro-environmental behaviours which currently present a negative or low level of positive change, thereby improving TCV's current deliveries of environmental and associated impacts (e.g. health and wellbeing).

*Social-Ecological Resilience*

Overall, the chapter suggests that those local community groups who engaged in environmental volunteering activities, presented a moderate to high scores for those characteristics which have the potential to promote and support a social-ecological resilience and their sustainable functioning. This suggests that the relationship between social-ecological resilience, civic ecology and the natural environment is not only present in instances of climate change, resource depletion and natural disasters (Berkes and Jolly, 2001; Krasny *et al*., 2014), but also extends into local community groups who engage in environmental volunteering activities (e.g. Barthel *et al*., 2010). Such knowledge is useful for assessing the resilience of these local community groups, information which could be used help to increase their long-term sustainability and success (Steiner and Markantoni, 2014; Folke *et al*., 2016). Further, it could help policy makers understand the role these groups' activities have in fostering social-ecological resilience and adaptive capacity as well as how this might be used to work towards sustainable development (Tidball and Krasny, 2012).

To date, few studies have explored the extent to which local community groups could foster social-ecological resilience through their environmental volunteering activities (Barthel *et al*., 2010; Connolly *et al*., 2014). This chapter therefore provides further insight in this area of research and aimed to explore those characteristics which have the potential to strengthen social-ecological resilient outcomes of those local community groups involved in environmental volunteering activities. In general, local community groups presented moderate to high scores across almost all of the four characteristics explored. Those groups which were more proactively engaged, presented higher overall scores for the other characteristics explored: socially connected, self-organised and skills. These findings resonate with similar studies (Norris *et al*., 2008; Kelly *et al*., 2015). This was also reflected in focus group interviews, which identified variable responses linked to a number of positive and negative attributes. For instance, whilst some groups reported a high level of self-organisation presenting a strong degree of long-term management and self-sufficiency, others were hindered by both internal (e.g. volunteer retention and

insufficient decision-making process) as well as other external factors (e.g. financial resources and issues of landownership). Several factors might explain these trends, including community competence, adequate tangible support, as well as flexibility (Norris *et al*., 2008). Further, the results also suggest that groups tended to rate themselves more similarly in relation to their level of connectivity, skills and knowledge, than activity and ability to self-organise. One reason for this owes to a group's degree of heterogeneity in building relationships, whereby the wider and more diverse a group's social network, this thus enhances their ability to share and learn information (Tidball and Krasny, 2012; O'Sullivan *et al*., 2015). These findings provide useful insights into what characteristics could be used to promote or hinder resilience as well as the factors which may influence them. This information can be helpful to these local community groups, enabling them to tailor future programmes to enhance the fit between volunteers' contributing attributes as well as the group's sustainable functioning (Magis, 2010; Barthel *et al*., 2010).

Finally, small but appreciable differences in perceived characteristics were found between the scores reported by local community groups and external stakeholders. Overall, findings by external stakeholders were slightly higher throughout than those self-reported scores by local groups. As such, this suggests that the local community groups perceived their characteristic scores differently to external stakeholders. This may relate to various factors, such as variable perceptions of characteristics, local knowledge, culture and societal norms (Norris *et al*., 2008; Magis, 2010; Krasny and Tidball, 2012; O'Sullivan *et al*., 2015). In addition, the level of activity was again slightly higher than the other characteristics explored, with these trends being replicable across each stakeholder. This shows there to be a degree of comparability between stakeholder and group self-reported scores, and suggests that through engaging in these environmental volunteering activities, local community groups might help foster further engagement and interaction in their communities. These findings are comparable with other studies, which may lead to a range of associated impacts which have the potential to foster sustainable development, including human, and social capital as well as advocating public health benefits (Barthel *et al*., 2010; Tidball and Krasny, 2012; Kelly *et al*., 2015).

### 7.4.1 - Study limitations

This section presents three main limitations relevant to the current study. Further general limitations of the thesis methodological approach can be found in chapter 8.

Firstly, findings observed were case specific to volunteers in the Greater London region that engaged in environmental activities with TCV. It is therefore recommended that further work on a much larger scale is needed to explore the health and wellbeing impacts delivered by environmental organisations' volunteering programmes in other rural and urban UK regions as well as make comparisons with other UK environmental volunteering organisations. As such, it would therefore enable one to determine whether these findings are more widespread.

Secondly, due to the nature and practicalities of volunteering activities, questionnaire surveys were administered after volunteers initially engaged in volunteering sessions. It is assumed that a person's baseline is established early on at the start of volunteering and is primarily based on self-reported measures, which therefore reduces our ability to make causal conclusions. With this in mind, future research assessing causal relationships between health and environmental volunteering activities could provide a more comprehensive understanding of its multidimensional complexity as well as associated benefits and drawbacks emerging from these relationships.

Thirdly, though this study provides a general descriptive understanding of volunteer's self-reported physical activity and wellbeing, such analytical method fails to provide some further explanation to the changes experienced that might be otherwise found if additional forms of qualitative methodological approaches (e.g. interviews and observations) were implemented. There is therefore a need to use mixed quantitative and qualitative approaches in future research, as used to explore volunteers' pro-environmental behaviours and social-ecological resilience. In addition, such mixed method allows for a multilevel of perspectives, identifying not only the magnitude and frequency of when something occurs, but to equally examine the meaning and understanding of the construct behind its occurrence (Bryman, 2012).

Fourthly, due to the small number of volunteers completing all three waves of the Green Exercise and Change! Tool questionnaire surveys, this affect my ability to

undertake any further in-depth statistical analysis. In addition, as the findings are based on only those volunteers who responded to all three surveys and not those who either only responded to the first round of surveys or those who may have only added one-session of volunteering and did not receive a survey. As such, this may have created a non-response bias, with care needing to be taken when interpreting these findings (Bryman, 2012). Future research is therefore needed on a much larger scale to assess whether there is an association between engaging in environmental volunteering activities and increasingly adopting healthier lifestyles and related behaviours over time.

## 7.5 Summary

This chapter explored the health-related impacts associated with TCV's environment volunteering activities. Information generated served to assess the performance delivery of TCV's environmental volunteering programmes and enhance existing knowledge on the long-term health and related impacts associated with their activities. This was demonstrated through implementing mixed method approaches to analyse volunteer data collected by TCV which focused on health and related behaviours, social-ecological resilience and pro-environmental behaviours.

Findings from this chapter found that volunteers who engaged in environmental activities presented moderate to high levels of physical activity and wellbeing which were consistent throughout. This study therefore provides further evidence on the long-term trends and outcomes associated with environmental volunteering programmes. Further, this chapter also observed an overall positive change in volunteers pro-environmental behavioural attributed to their first-hand experience engaging in environmental activities. Findings also identified a negative trend in waste management behaviour amongst most volunteers.

The chapter then found that those local community groups who engaged in environmental volunteering activities, presented moderate to high scores across almost all of those characteristics which have the potential to promote social-ecological resilience. Further, those groups which were found to be more proactively engaged, presented higher overall scores for the other characteristics explored:

socially connected, self-organised and skills. In particular, groups tended to rate themselves more similarly in relation to their level of connectivity, skills and knowledge which may reflect their degree of heterogeneity in building relationships. Groups also differed in how they perceived the characteristics and may relate to various factors, such as variable perceptions of characteristics, local knowledge, culture and societal norms. Finally, findings show there to be a degree of comparability between the perspectives of external stakeholders and group self-reported scores.

The chapter then went on to identify areas of limitations. For instance, this study serves as a descriptive case study focusing on the Greater London region. Similarly, the study was unable to make in-depth causal conclusions between health and environmental volunteering activities due to the study's absence of baseline data and descriptive nature.

In the next chapter (chapter 8), it draws together all the empirical findings and discussions in both this chapter and the preceding chapters, 4 to 6. It then reviews the thesis in relation to its aims and objectives as well as the effectiveness of the research methodology. From this, it then provides a reflection of working within an organisational context as well as the organisational perspectives of the research process. Finally, it outlines the implications of the thesis in related research fields and suggests avenues for further research.

# Chapter 8: Thesis discussion and conclusions

## 8.1 Introduction

In this concluding chapter, I first revisit the thesis aim, research questions, objectives and the research process (section 8.2) used in the thesis as well as provide an overview of research findings observed in the four case study chapters 4 to 7 (section 8.3). I then evaluate the effectiveness of the theoretical framework and mixed methods implemented in the thesis as well as the sampling regions, sampling populations and recruitment methods used (section 8.4). Following this, I review data reliability and quality (section 8.5) as well as ethical considerations, TCV partnership and change of personnel during the research process (section 8.6). Finally, I discuss contributions to knowledge and implications of findings observed in this thesis (section 8.7), highlighting its limitations and suggest areas which warrant further research (section 8.8).

## 8.2 Revisiting the thesis aim, research questions, objectives and research process

As noted in chapter 2, there is an emerging body of literature exploring the potential link between connecting with the natural environment and human health. This has resulted in a gradual rise in the numbers of programmes aimed to help improve human health and the environment, including the development of health focused programmes amongst some environmental volunteering organisations (Depledge, 2011). In response, studies have started to explore the physical, mental and social health benefits of environmental volunteering activities (e.g. Pillemer *et al*., 2010; Kragh *et al*., 2016). However, it remained uncertain to what extent volunteering organisations deliver health-related impacts through their volunteering activities (Jenkinson *et al*., 2013). This owed in part to an insufficient amount of evidence demonstrating the causal directions between volunteering activities and health-related impacts as well as a deeper understanding of the delivery of these programmes (e.g. frequency, dose, type of activity).

Chapter 2 also highlighted how the functionality and how volunteering organisations interact with impact measurement systems has the potential to affect how volunteer

data is inputted and subsequently interpreted (Voida *et al*., 2011). Understanding those characteristics which can influence or shape these systems (e.g. people's perceptions and contextual factors) can provide valuable insight into the nature, veracity and meaning of volunteer data (see section 2.9). These factors are particularly important if outcome data is to affect learning, provide information to key constituencies, enable programmes to be managed effectively and contribute to the volunteer sector (Metcalf, 2013). However, whilst some researchers have reviewed literature on the characteristics which may influence an organisations' impact measurement system and volunteer data collected (Harlock, 2013; Metcalf, 2013), none have to date undertaken an in-depth empirical research exploring this area.

The thesis therefore aimed to explore some of these gaps in knowledge and contribute to this field of research. More specifically, the thesis explored the characteristics which may influence an organisations' impact measurement system, volunteer data collected, the delivery of environmental volunteering programmes (e.g. frequency), as well as the extent volunteering organisations deliver health-related impacts through their volunteering activities. Thus, the overarching aim of this research was:

*To explore to what extent environmental volunteering organisations deliver health-related impacts*.

As the thesis aim was regarded as a broad topic I felt it was not feasible to address its entirety in this thesis. Instead, I narrowed the research focus reporting from the perspective of UK environmental charity, The Conservation Volunteers (TCV), for reasons outlined in section 3.3.2. Therefore, the thesis more specifically was to investigate the extent to which TCV deliver health-related impacts through their environmental conservation volunteering activities. To address this aim, I developed and explored the following the three following subsidiary questions (RQ), which are outline more fully in section 3.1:

**RQ1** *How do the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected?*

**RQ2** *How do volunteers engage in programmes delivered by environmental volunteering organisations?*

**RQ3** *How do volunteers' perceptions of health information influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts?*

To answer the above research questions, the thesis set out to address the following three objectives which are described more fully in section 3.1.

**Objective 1** *To examine how the contextual characteristics of environmental volunteering organisations influence their impact measurement systems and volunteer data collected.*

**Objective 2** *To identify how volunteers engage in programmes delivered by environmental volunteering organisations.*

**Objective 3** *To explore how volunteers' perceptions of health information may influence volunteer data collected as well as our understanding of environmental volunteering organisations' delivery of health-related impacts.*

The above research questions and objectives were approached using a pragmatic theoretical framework for reasons outlined in section 3.2.1. Thus, knowledge emerged by method of inquiry and practical exploration, being exploratory in nature and situated within context. In this way, the theoretical framework guided the research process in terms of its methodological approaches, methods, validity, scope and interpretation of research findings.

The research process in the thesis comprised of four phases undertaken over a three-year period. Each of these four phases of the research practices correspond with case study chapters 4 to 7. These phases were guided by an iterative process that was aided by reflective inquiry based on evaluation of data information collected. Throughout these phases, the thesis presents various mixed method approaches used for inquiry and data exploration (sections 3.2.2 to 3.2.9). Such diversity in research methods

offered both a richer insight and complementary views each phase of experimental inquiry. Table 8.1 summarises thesis research phases, research questions (RQs), objectives and methods used. The table also highlights the key outcomes achieved by each research phase, with an overview of findings from each of the four case studies found in the next section (section 8.3).

Table 8.1: Thesis research phases, research questions (RQs), objectives and methods used.

| Research Phase | RQ & Objective | Methods Used | Outcome | Main general findings |
|---|---|---|---|---|
| **1 – Chapter 4:** TCV's management information and impact measurement system: A contextual inquiry | 1 | Contextual inquiry (semi-structured interviews and observation studies)<br>General inductive analytical approach<br>Exploratory data analysis (Transaction log analysis) | Provided a contextual understanding of TCV's work contexts, practices, impact measurement systems, and real-world environmental factors. | The impact measurement practices are reflective and shaped by the social, cultural and organisational characteristics of TCV.<br>Volunteer data collected was also idiosyncratic, motivated by features in staff's work context and impacts associated with volunteering programmes.<br>Various tools (e.g. database software) were used and developed internally by staff to collect or store volunteer and related data. |
| **2 – Chapter 5:** Exploring the engagement characteristics and behaviours of TCV's environmental volunteers | 2 | Exploratory and confirmatory data analysis | Investigated the engagement characteristics, contributor activity and behavioural profiles of TCV environmental volunteers. | Findings presented differences in yearly retention levels and longevity behaviours of volunteers between the three UK regions examined. Of these, Greater London exhibited both a higher volunteer population as well as those engaging in volunteering activities over a longer duration.<br>Few volunteers contributed the most and many volunteers contributed the least.<br>Findings also showed that the majority of volunteers lived within a 20-mile distance of TCV sites, with fewer travelling farther distances.<br>Cluster analysis revealed three main types of volunteer |

| | | | | |
|---|---|---|---|---|
| | | | | engagement profiles which are similar in scale across all regions, namely participants can be grouped into "One-Session," "Short-Term," and "Long-Term" volunteer.<br><br>"One-Session" volunteers accounted for the largest group of volunteers. |
| **3 – Chapter 6:** Understanding TCV volunteers' perceptions of health | 3 | Focus group interviews<br><br>General inductive analytical approach<br><br>Content analysis<br><br>Exploratory data analysis | Explored TCV volunteers' perceptions of health, examining patterns in communications used as well as attributes associated with health and their interrelationships. | Findings showed that volunteer groups presented were relatively similar in how they defined the term health, with their overall conceptual model closely resembling that of the World Health Organization 1948 definition.<br><br>Whilst some small differences were identified, these were found to pose no significant effect on how volunteers perceive health and would therefore not influence how volunteer data is collected and then interpreted.<br><br>Volunteers presented variations in terminology used, word frequency and their usage.<br><br>Finding also showed 'individual wellbeing', 'health' and 'relationships' were viewed by most groups as highly important attributes contributing to our overall health. |

| | | | | |
|---|---|---|---|---|
| **3 – Chapter 7:** Exploring TCV's delivery of health-related impacts | 3 | Exploratory and confirmatory data analysis<br>General inductive analytical approach<br>Focus group interviews<br>Structured interviews<br>E-mail questionnaire surveys | Examined the health-related impacts delivered and associated with TCV's environment volunteering activities. | Findings found that volunteers who engaged in environmental activities presented moderate to high levels of physical activity and wellbeing which were consistent throughout.<br>Findings presented an overall positive change in volunteers pro-environmental behavioural attributed to their first-hand experience engaging in environmental activities except waste management.<br>Findings also found that those local community groups who engaged in environmental volunteering activities, presented moderate to high scores across almost all of those characteristics which have the potential to promote social-ecological resilience. |

## 8.3 What has been learnt from the thesis case study chapters (4 to 7)

In this section, I provide an overview of the case study chapters undertaken in this thesis as well as how they interrelate in order to address the aims and objectives outlined in section 8.2 above.

### 8.3.1 Case study 1: TCV's management information and impact measurement system: A contextual inquiry

The first case study of the thesis was presented in chapter 4 and aimed to address the first research question and objective. The chapter presented similarities and differences in the roles, responsibilities and associated tasks of TCV staff who engaged in this first case study, identifying four main roles: community project officers, green gym project officers, green impacts project officers and area managers. These roles were subdivided into two levels, managerial (e.g. area managers) and operational (e.g. community and Green Gym project officers), each varying in their responsibilities and associated tasks. For instance, operational staff spent more time

engaging directly with volunteers in outdoor practical conservation activities than those managerial, and less time undertaking work-related activities in the office. These differences between roles were also observed in how staff interacted with TCV's MIS database, suggested to be explained by job specifications, seasonal variations in volunteering activities and time availability (Voida *et al*., 2011). Further, staff also differed in how they coordinated and managed their responsibilities to support TCV's activities (e.g. regional and localised levels) and was found to be reflected in the types and scale of volunteer data collected as well as data collection efforts.

The chapter went on to present variations in the types of volunteer and relate data collected. Firstly, there were variable differences between managerial and operational staff. Managerial staff were found to collect more information which related to volunteer data (e.g. financial or funding information). Conversely, operational staff were found to collect the majority of volunteer data (e.g. personal details and tasks engaged in) using the same procedures, thereby increasing the consistency and internal reliability of volunteer data collected. Similarly, few differences were found in the types of volunteer data collected by operational staff (e.g. questionnaire survey data) between regional offices and the types of volunteering programmes (e.g. Green Gyms®) staff engaged in. Suggested effects on TCV's volunteer datasets included increased heterogeneity and variabilities.

Further, similarities and differences were identified in the physical items used to support the activities of staff in collecting volunteer and related data (e.g. paper forms and the MIS database). Physical items used and information requirements on these items (e.g. volunteer details) were found to be motivated by features in TCV staffs' work context, a finding also identified in relating studies exploring databases used by US volunteering organisations (Merkel *et al*., 2007; Goecks *et al*., 2008; Voida *et al*., 2011). Moreover, as all staff collected volunteer and associated data using the same procedural method, this enhanced the overall quality of volunteer data, minimising any inconsistencies and other anomalies that may occur. Few noticeable differences were found in physical items used by staff to collect volunteer data or store related procedural and guideline information (e.g. other information systems). These

differences related to additional data or staff requirements not met by the MIS database. Yet, these posed no significant effect on volunteer and associated data.

Finally, the chapter went on to highlight internal and external influences affecting TCV's organisational context, impact measurement systems and volunteer data. Those internal influences identified were training and communication. Training was highlighted by few staff owing to issues of usability, the general functioning of the MIS database and its appearance. Moreover, staff also noted a limited amount of communication regarding changes that occurred on the MIS database (e.g. structure and appearance). Whilst issues relating to training were viewed as small and created non-systematic biases in volunteer data collected, by contrast those issues relating to communication have the potential to increase heterogeneity and variability between datasets. These issues also have a potential effect on the standardisation of volunteer data collected due to differences in communication and collaborative networks between staff across offices, regions and volunteering projects. Further, TCV staff, external stakeholders and funders were identified as key external influences, shaping the type and geographical spread of volunteer data collected (e.g. funded projects). Understanding the structure of volunteer data collected is particularly important when evaluating the true nature and scale of how TCV's volunteering activities deliver impacts, such as those health-related.

### 8.3.2 Case study 2: Exploring the engagement characteristics and behaviours of TCV's environmental volunteers

The second case study of the thesis was presented in chapter 5 and aimed to address the second research question and objective, describe further in section 8.2.

Chapter 5 presented differences in net annual volunteer numbers and longevity behaviours between the three UK regions examined. Of these regions, Greater London had both the highest volunteer population who engaged in TCV for longer periods of time in comparison to the other regions, Greater Manchester and Yorkshire. Suggested reasons include population density, social factors, as well as project organisation (Ryan *et al.*, 2001; Asah and Blahna, 2013). Further, ratio proportions of 'One-Session' and 'Multi-Session' volunteers and their associated contributions to TCV

volunteering activities revealed that few volunteers contributed the most to volunteering activities and many volunteers contributing the least. This trend was common throughout all three regions and resonates with similar research findings on charitable giving, volunteering and participation in civic associations (Reed and Selbee, 2001; Mohan and Bulloch, 2012).

Chapter findings also found that most TCV volunteers lived within a 20-mile distance of the TCV volunteering sites they attended, with fewer travelling from further distances. These trends were replicable between both 'One-session' and 'Multi-Session' volunteers, with slight noticeable differences between regions. Suggested explanations included public transport services, vehicle ownership, population density, and financial resources (Pope, 2005; O'Brien *et al.*, 2008; Tulloch and Szabo, 2012).

Finally, the chapter identified three types of volunteer engagement profiles were identified which are similar in scale across all regions, namely the 'One-Session', 'Short-Term' and 'Long-Term' volunteer. Firstly, the 'One-Session' volunteer accounted for the largest proportion of the volunteer numbers, travelling the least distance and committing the shortest amount of time. This type of volunteer shares similar characteristics to those causal and episodic types of volunteering and may relate to people's limited time availability and motivations to volunteer (Hyde *et al*., 2016; Rochester, 2006). Secondly, those classified as 'Long-Term' volunteers represented the smallest proportion, travelling the furthest distance and committed the longest amount of time to the organisation. These volunteers presented engagement characteristics that closely resemble those which have been described as the 'classic' typology, (section 2.6; Holmes, 2014). Thirdly, those classified as 'Short-Term' have a profile type mid-way between the other two. Few studies (Cnaan and Amrofell, 1995; Rochester, 2006) have described this profile type, and has been assumed to be a combination or transitional overlap of the proceeding profiles by variable degrees, with further research still required.

### 8.3.3 Case study 3: Understanding TCV volunteers' perceptions of health

The third case study of the thesis was presented in chapter 6 and aimed to address research question three, detailed in section 8.3. The chapter explored TCV volunteers' perceptions of health, examining patterns in communications used as well as attributes associated with health and their interrelationships.

In general, TCV volunteer groups were relatively similar in how they defined the term health, with their overall conceptual model closely resembling that of the World Health Organization 1948 definition (e.g. physical, social and mental wellbeing). Some explanations include improved health literacy, promotion, and education (Patrick, 1997; Zeng and Tse, 2006; Yuen *et al*., 2016). However, there were a few differences in concepts used by volunteers to describe health identified. For instance, volunteers defined the term health using concepts often regarded as external factors (e.g. socio-demographic description) rather than a description of health itself (e.g. wellbeing). Volunteers also described mental health as "subjective physical health" (e.g. presence or absence of pain), a concept which tends to be used instead to describe a self-reported measure of physical health, rather than a direct definition of health. These findings suggest there to be small but appreciable misconceptions in volunteers' perceptions of terms used to describe health itself.

Volunteers presented variations in terminology used, word frequency and their usage. Volunteers' terminology and phrases used to describe concepts of health tended to combine general descriptive language (e.g. mind and body) and technical terminology (e.g. lung capacity). These findings may be attributed to a few factors, including personal experiences and medical encounters, as well as contextual, societal and cultural associations (Zeng and Tse, 2006). Frequency of prominent words used between groups was also observed, with those terms describing attributes of mental health were used slightly more than those physical health attributes. One suggested reason for this is that these words used to describe aspects of health were important to volunteers (Grbich, 2013). Other reasons for this may include increased awareness, public acceptance as well as mental health literacy (Schomerus *et al*., 2012).

Similarities and differences were observed in how each of the volunteer groups perceived attributes associated with health in terms of their degree of importance.

Attributes were based on those domains used by the National Office of Statistics to measure the UK's health and wellbeing (see section 6.2). Findings found that 'individual wellbeing', 'health' and 'relationships' were viewed by most volunteer groups as highly important attributes owing to their direct impact on a person's health (e.g. personal wellbeing and social connectedness). It is noteworthy that one group instead viewed external factors 'natural environment', 'governance' and 'economy' as highly important attributes contributing to our overall health. The domains 'what we do', 'where we live', 'personal finance' and 'education and skills' were generally perceived by volunteer groups as moderately important, being viewed by what many in the health sector term as determinants of health (both directly and indirectly). Finally, national 'economy' and 'governances' were ranked by most volunteer groups as lowly important and highly important by one group. This may relate to various factors, such as value priorities and individual experiences (Brodie *et al*., 2007).

Finally, exploring those characteristics which help form shared mental models, concepts, terminology and structure, enabled me to gather an understanding of how volunteers perceive health (Jones *et al*., 2011). In general, volunteers' collective conceptual representation and structural organisation of health concepts occurs at multiple levels. This is also reflected in terminology used by volunteers (e.g. general and specific). This is supported by frequency findings and card sorting activities which revealed those attributes of health which appear to be most important to volunteers. Based on findings, concepts relating to mental health were more significant, followed by main concepts physical health and external factors, respectively. Similarly, some subsidiary concepts are equally found to play more significance than others (e.g. sociodemographic status and democracy). When compared to the World Health Organization's definition of health, the mental model shared by volunteers is largely similar, with small differences. Such differences posed no significant effect on how volunteers perceive health and will therefore not influence how volunteer data collected by TCV is then interpreted.

### 8.3.4 Case study 4: Exploring TCV's delivery of health-related impacts

The fourth case study of the thesis (chapter 7) aimed to address the third research question and objective (section 8.2). The chapter explored the health-related impacts

associated with TCV's environmental volunteering activities, using volunteer data stored on the organisation's MIS database. The following three areas of volunteer data were used to explore the health-related impacts associated with TCV's environmental volunteering activities: health and wellbeing, pro-environmental behaviours and social-ecological resilience (see section 7.1).

Findings from this chapter found that volunteers who engaged in environmental activities presented moderate to high levels of physical activity and wellbeing which were consistent throughout. These findings resonate with existing research (Pillemer *et al*., 2010; Kragh *et al*., 2016). Yet, it must be noted that as the findings are based on only those volunteers who responded to all three surveys and not those who either only responded to the first round of surveys or those who may have only added one-session of volunteering and did not receive a survey. As such, this may have created a non-response bias, with care needing to be taken when interpreting these findings (Bryman, 2012).

Further, there was no observable change or relationship between volunteers' level of wellbeing and the amount of time they engaged in TCV's volunteering activities. One suggested explanation owed to the survey design which did not include a baseline survey from which causal relationships might have otherwise been inferred. Mixed findings were also observed when examining volunteer's sub-types of wellbeing. For example, volunteers reported a change in wellbeing, with the ability to 'think clearly', 'make up own mind' and 'feel optimistic about the future' as the largest contributing factors to wellbeing in the first wave of questionnaire surveys. By the third wave, volunteers reported the ability to 'feel useful' and being 'closer to other people' as the largest contributing factors. Suggested explanations for this change may relate to volunteers' social enjoyment and personal motivations for volunteering, identified in other related studies on environmental volunteering that examine the motivations of environmental volunteers (Ryan *et al*., 2001; Asah and Blahna, 2013).

The chapter also observed that those volunteers who engaged in TCV environmental activities presented a slight positive increase in pro-environmental behaviours over time. In general, volunteers presented a positive change across almost all the eight

pro-environmental behavioural indicators used and resonates with similar findings in related studies (Donald, 1997; England and Marcinkowski, 2007; Cooper *et al*., 2015). Waste management, however, presented a negative change across all volunteers and may be attributed to personal finance, individual perception, time availability, and current infrastructure supporting pro-environmental behaviours (Kaiser *et al*., 1999; Bamberg and Schmidt, 2003; Thøgersen, 2005). Again, similar to physical health and mental wellbeing findings, I was unable to make causal relationships between volunteers' pro-environmental behaviours and the amount of time they engaged in TCV's volunteering activities due to the questionnaire survey design (e.g. no baseline data).

Finally, the chapter then explored those characteristics which have the potential to promote and support the social-ecological resilience and sustainable functioning of local community groups who engaged in environmental volunteering activities. Findings generally presenting a moderate to high score for each of the characteristics explored. Moreover, findings found that those groups which were more proactively engaged, presented higher overall scores for the other characteristics explored: socially connected, self-organised and skills. These findings resonate with similar studies (Norris *et al*., 2008; Kelly *et al*., 2015). However, it remains uncertain if these findings are attributed to environmental volunteering activities due to the survey's snapshot design and may also relate to other associated factors. Further, small but appreciable differences in characteristic scores between local community groups self-reflection scores and external stakeholder's reflective scores of local community groups. Local stakeholders external scores tending to be higher than those self-reflective scores by local community groups. This shows there to be a degree of comparability between stakeholder and group self-reported scores.

### 8.3.5 Interconnectivity between the four case studies

Findings from each of the four case studies outlined above presented various interconnectivities and owes to the research questions, objectives and methodological design of the thesis. In this way, each of the individual case studies served as background information to provide further understanding for proceeding case studies.

In chapter 4, findings gathered helped to gain valuable insight into of the nature, veracity and meaning of volunteer data collected by TCV, that I used in proceeding chapters 5 and 7. This is because there is a risk of misinterpretation about what the information represents and what it informs us about the activities of volunteers. For instance, I identified that work contexts, data requirements, supporting infrastructures (e.g. the MIS), external stakeholders and real-world environmental factors were found to have shaped TCV's volunteer data collected. From this, I was able to examine variations in the types of volunteer data collected (e.g. spatial scale), information which was used to design analytical approaches and variables used when exploring volunteer's engagement characteristics (e.g. volunteer attendance and data descriptives). Such knowledge also helped to identify the different impact measurement tools were used to measure health-related behaviours and how they worked in order to measure TCV's impact delivery (chapter 7). Further, few noticeable differences were found in physical items used by staff to collect volunteer data or store related procedural and guideline information (e.g. other information systems). Yet, as noted (section 8.3.1), these differences posed no significant effect on the veracity of volunteer and associated data which is analysed in later chapters, 5 and 7.

In chapter 5, findings provided valuable background information for chapters 6 and 7 about the delivery of TCV's Action Team volunteering programme and how volunteers engage in these programmes (section 8.3.2). For instance, in chapter 5 the Greater London region presented the highest TCV volunteer population who engaged in volunteering activities over a longer duration than those other regions investigated (e.g. Yorkshire). This suggests that TCV are able to reach a larger volunteer population for lengthier time periods and may have contributed to some of the pro-environmental behavioural outcomes TCV delivered (sections 8.3.4). However, uncertainty still remains about how volunteers engage with local community group and Green Gym® volunteering programmes. Such knowledge could provide a deeper understanding of the delivery of these programmes (e.g. frequency and type of activity) and their health-related impacts. Additionally, chapter 5 presents the engagement characteristics of short and long-term types of volunteers. These findings

were useful not only to provide an insight into the engagement typologies of this volunteering population, but also to gain knowledge about its full size and breadth relative to those who participated in chapter 6.

Finally, findings from chapters 6 and 7 presented similarities and differences between how volunteers' perceived health and measurement indicators used by TCV to measure their delivery of health-related impacts. For example, volunteer's responses in chapter 6 perceived health as inclusive of physical health as well as the concept 'resilience', referred to as people's relationships, family and friends. Each of these aspects were also used as indicators to measure health-related behaviours by TCV. By contrast, few subtypes of wellbeing used in the Green Exercise survey were not highlighted by volunteers in the previous chapter when describing elements of wellbeing. These subtypes were 'think clearly', 'making up own mind' and 'feeling optimistic about the future'. Such variability between volunteer's perceptions and TCV's measurement of health-related behaviours, may relate to differences in the mental models of volunteer groups by comparison to the empirically tested or theoretically developed indicators created by health professionals and academics. This difference of perception has also been noted by others in health research between the public and health professionals (e.g. Zeng and Tse, 2006). Further, as suggested in chapter 6, it is reasonable to expect that a volunteer's perception of health might also influence how they perceived TCV's impact measurement tools and could have a potential impact on how datasets are then interpreted. For instance, 'happiness' was found to be the most commonly used word by volunteers to described health and suggests its general importance by comparison to other indicators. However, happiness was not used by TCV to measure health. Similarly, whilst TCV included 'involvement in local community decisions' to measure pro-environmental behaviours, volunteers viewed governance as a least important contributing factor to health. These findings suggest that impact measurement tools currently used by TCV are capturing a partial picture of health-related impacts delivered.

## 8.4 Effectiveness of theoretical framework, mixed methods and sampling frame

This section reviews the strengths and weaknesses of the theoretical framework, mixed methods and sampling frame used in the thesis (sections 8.4.1 and 8.4.2), with further details of each of these found in sections 3.2 and 3.3.

### 8.4.1 Theoretical framework and mixed methods

The thesis benefited from using a pragmatic inquiry approach, in which our understandings and ideas of the world are grounded in the consequences or outcomes of experimental inquiry (Dalsgaard, 2014). As noted in section 3.2, the thesis was guided by an iterative process that was aided by reflective inquiry based on evaluation of data information collected. In using this approach, it allowed flexibility to focus on promising avenues of exploration that might not have otherwise been explored (Bryman, 2012). It also provided a more detailed understanding of findings observed that were enriched through the knowledge gained in a real-life context and is particularly useful when knowledge is either not known or remains limited (Onwuegbuzie and Leech, 2005). One drawback of this approach as some note (Dalsgaard, 2014) is that it regards knowledge as emergent and never fully finalised. In this way, knowledge remains unfixed and unstable, but instead situated in the context in which it emerged. As such, temporary stability can be established through emphasising the research's reflectiveness of a snapshot in time and noting what is beyond the scope of a project (Dalsgaard, 2014).

The research process was strengthened in part by the thesis' pragmatic approach. As pragmatist researchers have noted, one strength of implementing pragmatism as a philosophical approach is that it enables researchers to be flexible when selecting methods to address their research goals, needs and skills base (Onwuegbuzie and Leech, 2005). As such, the research process used in the thesis could be adapted according to various logistical aspects, including researcher's skills base, project scope, organisational needs, time and resource availability as well as where it is situated in the research process. For example, in chapter 6 focus groups sessions were adapted to be held in outdoor settings (e.g. woodlands and beside urban lakes) during the lunchtime breaks of each volunteering group. This was due to the time and resource availability of both TCV project officers and volunteers. In doing so, this created further benefits, such as forming relaxed working partnerships and fostering

further trust from volunteers, which may not have occurred if sessions were held in places less familiar to volunteers. One challenge of being pragmatic, however, were the additional costs to time, research effort and resources. For instance, both chapters 4 and 6 implemented three research methods (e.g. observations, interviews and exploratory data analysis) which required significant amounts of time to collect, analyse and interpret data using several different resources (e.g. analytical software packages, research equipment and expenses). Such weakness is one shared by other researchers and is characteristic of pragmatic research (Onwuegbuzie and Leech, 2005).

A further strength identified through using a pragmatic approach was the ability to observe the wider perspectives of my findings through implementing a mixed method approach (e.g. qualitative and quantitative methods). The thesis presented various forms of methodological triangulation using a series of different mixed methods across each of the four case study chapters. One strength of this approach, as noted by other researchers (Thurmond, 2001; Onwuegbuzie and Leech, 2005), is that it enables one to view findings through a bi-focal lens (i.e. both quantitative and qualitative data), combining macro and micro-levels of a given research issue. Chapter 4 is an example of this and uses three techniques (a transaction log analysis, one-to-one semi-structured interviews and observation sessions) to gain an in-depth understanding of the characteristics that influence TCV's impact measurement systems and volunteer data collected. In doing so, findings present people's tacit knowledge exposed by observation studies which may not always be freely articulated during interviews as well as characterise and directly measure peoples' interactions with a system through transaction log analysis (Jansen, 2009; Bryman, 2012). Similarly, chapter 6 implemented additional methods, general inductive and quantitative content analysis, to reveal how volunteer's defined health, identifying not only the magnitude and frequency of attributes to describe health, but examining the meaning and understanding behind their occurrence (Bryman 2012). However, implementing a mixed method design was not attainable across all case studies (e.g. chapter 5) for various reasons, such as accessibility to volunteer data and time availability. As such, findings are observed from only a single-focal lens (e.g. quantitative).

Finally, implementing a mixed method approach can enhance the reliability and quality of findings observed. Though reviewed in further depth in section 8.5 below, here I provide a general overview. As others highlight (Thurmond, 2001), such approach attempts to decrease potential biases ensuring that findings can be interpreted with a comfortable degree of assurance. For instance, in chapter 7 the use of structured and focus group interviews enabled me to provide further understanding of and validate volunteer's responses made in email questionnaire surveys, Change! Tool and Resilience Framework (Richards, 2009). In this way, such approach enhanced internal reliability and consistency of findings. Yet, as others note (Onwuegbuzie and Leech, 2005), there can be instances where a lack of overlap in datasets, conflicting datasets or the need for further methods can bring about uncertainties over the reliability and quality of findings observed. For example, in chapter 5 methods used to explore engagement characteristics of volunteers were predominantly quantitative and failed to provide further contextual explanation behind these volunteers' patterns of engagement (e.g. motivations to volunteer). In addition, server usage logs extrapolated for transaction log analysis in chapter 4 did not included staffs' individual session lengths or navigation paths on the MIS. As such, staffs' interactive behaviours with the MIS could not be fully interpreted. Nevertheless, as Thurmond (2001) states, methodological triangulation has the potential of exposing unique differences or meaningful information that might have otherwise been unknown if only one approach or data collection technique had been used in the study.

### 8.4.2 Sampling regions, sampling populations and recruitment methods

This section reviews the strengths and weaknesses of sampling regions, sampling populations and recruitment methods used in the thesis, with further details of each of these found in chapter 3 (section 3.3).

*Sampling regions*

As noted in section 3.3.1, findings observed throughout the thesis research were based on various sampling regions. I will now review the strengths and weaknesses of their use with relevance to the thesis.

In chapter 4, the Greater London and South East sampling regions were selected and each presented a number of strengths and weaknesses. For instance, due to the region's similarities in sample size, shared similar employee positions, and job role diversity, I was able to easily compare and contrast between them. In addition, sampling regions were easily accessible in travelling distance, being both cost and time effective (Bryman, 2012). However, the chapter's findings were based on two neighbouring regions, increasing susceptibility to the effects of spatial autocorrelation and cannot therefore be generalised. As such, this may have reduced the ability to detect differences relating to factors, such as direct interaction between participants or spatial diffusion of work practices across regional boundaries (Griffith, 2005).

In chapter 5, I selected the following three sampling regions to explore TCV volunteer's motivations and engagement patterns: Greater London, Greater Manchester and Yorkshire. One strength of this approach was that I was able to distinguish any influences of population density distributions in semi-rural to urban areas, differences in mobility potential (e.g. public transport services), as well as cross-examination between relatively similar urban regions. Such influences have also been noted in other related areas of research (e.g. Pope, 2005). Moreover, as proceeding chapters 6 and 7 use the Greater London region as their selected sampling regions, findings from chapter 5 provide further background knowledge about TCV volunteers. This was a strength for two reasons. Firstly, I was able to use findings from chapter 5 to help design focus group sessions and resources needed (e.g. equipment) in chapter 6. Secondly, findings from chapter 5 provided further insight into how TCV delivers their volunteering programmes, knowledge which I found useful when exploring their delivery of health-related impacts (e.g. frequency, dose, type of activity). Yet, it is noteworthy that there may be small but appreciable differences between these sampling regions explored with the nine further UK regions where TCV operate. Reasons for not examining all regions owed to the large size and scale of volunteering datasets which were accessible and would not have been cost effective in terms of research time. As such, case regions were instead used and is a recommended approach used by other researchers (Bryman, 2012).

In chapter 6, I selected the Greater London region to conduct my focus group interviews with TCV volunteers for reasons outlined in section 3.3.1. There were various strengths to using a single case study region. Firstly, findings from chapter 6 could be viewed in addition to findings from the other three case study chapters (4, 5 and 7) which also focused on the Greater London region. In this way, this approach provided a more in-depth understanding from various perspectives about TCV's environmental volunteers, volunteering programmes and health-related impacts delivered. Secondly, as found in chapter 5 the Greater London region contains the largest population of volunteers who engage in TCV activities over a longer duration than those other regions examined: Greater Manchester and Yorkshire. As such, this increased the potential of obtaining an adequate sample size population in chapter 6. Conversely, one limitation of using a single sampling region was that findings observed were case specific to TCV volunteers in Greater London (section 6.4.1). In this way, findings in this chapter are harder to generalise to the larger population of environmental volunteers and do not provide a cross-examination between relatively similar urban regions as well as comparisons between semi-rural to urban areas (Bryman, 2012).

Finally, in chapter 7 the sampling region focused on the Greater London region for reasons explained in section 3.3.1. In doing so, selecting a single sampling region presented a number of strengths and weaknesses. Firstly, as the volunteer data collected by TCV to measure health-related impacts (e.g. social-ecological resilience and pro-environmental behaviours) were predominantly collected in Greater London, it was therefore important to analyse those datasets where there was a consistent overlap. As such, I was able to conduct a more comprehensive evaluation of health-related impacts in the Greater London region. Moreover, datasets could be explored with relevance to the three previous chapters as essential background knowledge relating to the characteristics which influence volunteer data collected (chapter 4, 5 and 6). In this way, this enabled me to gather a comprehensive understanding of TCV's delivery of health-related impacts. Yet, similar to chapter 6 above, findings observed were case specific to TCV volunteers in Greater London (section 7.4.1) and are not generalisable to the larger population of environmental volunteers. It is also

uncertain whether there are similarities and differences (e.g. rural-urban) across other UK regions where TCV operates.

*Sample populations*

As described in section 3.3.2, the thesis included five sampling populations: TCV staff, Action Teams, Green Gyms, local volunteer groups and external stakeholders. I will now review the strengths and weaknesses of their use with relevance to the thesis. In chapter 4, TCV staff were recruited as the sampling population owing to their relevance to the research question and objective one. There were some strengths and weaknesses of using this sampling population in this chapter. For instance, as the sampling population covered a range of workplace environments, employee positions and their associated tasks, this ensured that as many key characteristics relevant to the research scope were identified. This approach is recommended by Holtzblatt and Beyer (2015) when conducting Contextual Inquiries (section 3.2.2). Conversely, chapter findings were based on sampling populations from two neighbouring regions, Greater London and South East of England. Such approach has the potential to increase susceptibility that TCV organisational practices were similar and cannot therefore be generalised. In this way, this may have reduced my ability to detect differences relating to factors, such as direct interaction between staff across these regions.

In chapters 5, 6 and 7, findings were based on three volunteer sampling populations owing to their relevance to each chapter's research questions and objectives: Action Teams, Green Gyms and local community groups. Reasons for recruiting these three volunteer sampling populations have been described more fully in section 3.3.2. Few strengths and weaknesses of using varied sampling populations in these chapters have been identified. For example, the use of Action Teams as a sampling population in chapters 5 and 6 had two benefits. Firstly, the programme's volunteering sessions tend to be more flexible with volunteers attending as and when they can commit their time, by comparison to Green Gyms which has a more structured programme design. As such, engagement characteristics found in chapter 5 are more representative and could be extendable to other environmental volunteer populations which often use a flexible

programme design (Asah and Blahna, 2013). Secondly, the programme was not designed with a health focus, unlike TCV's Green Gym programme. This reduced the potential for any bias in volunteers' responses about their perceptions of health (chapter 6), with findings therefore being more representable of the views made by other environmental volunteer populations which share a similar focus. By contrast, the use of varied sampling populations in these chapters equally posed some weaknesses. For instance, the three volunteer populations were not consistently used across all three questionnaire surveys in chapter 7 due to the differences in research design. This therefore reduced my ability to draw inferences about or representative of the TCV volunteering population more generally. It is also noteworthy that the engagement characteristics of Green Gyms® and local community volunteers were not included in chapter 5 due to the size and scale of volunteer datasets despite their health-related findings feature in chapter 7. Engagement characteristics identified were therefore not fully representative of all TCV volunteering programmes (Bryman, 2012).

Finally, as part of the Resilience questionnaire survey in chapter 7, data is also based on external stakeholders selected by TCV who worked outside or in partnership with but were not a direct member of the local community groups (see above). A strength to selecting this sampling population is that they provided an external viewpoint of each local community groups' self-report data collected, thus enhancing the external reliability of findings observed (Bryman, 2012). However, similar to the above sampling populations (excluding TCV staff), this population was not consistently used across all three questionnaire surveys evaluated in chapter 7 due to the differences in research design. As such, an external perspective of volunteer's self-reported physical health, mental wellbeing and pro-environmental behaviours is not known, an approach which may have strengthened the validity of findings and external reliability (Bryman, 2012). Further, it is not known in what capacity and the duration external stakeholders have worked with the local community groups, information which may have provided additional insight into the nature, veracity and meaning of stakeholder's external reflections gathered.

*Recruitment methods*

As outlined in section 3.3.3, I used three methods to recruit participants in this thesis: gatekeeper, snowballing, and email recruitment strategy. I will now review their strengths and weaknesses of use with relevance to the thesis.

In chapters 4, 6 and 7 the gatekeeper method was used in addition to snowballing (below) where I worked closely with 8 TCV employees (e.g. organisation directors, area managers and project officers) to gain access to my selected sampling populations whom I wanted to involve in my thesis research. I have identified various strengths to implementing this method into the thesis. Firstly, despite my previous knowledge of TCV prior to the start of the thesis research, as the sampling populations (e.g. volunteers and staff) were largely unknown to me and I did not have access to a full list of the population to be able to contact them. This owed in part to my experience with just two out of the many UK's TCV volunteering sites. With the assistance of those staff who acted as gatekeepers, I could access and gain knowledge of this otherwise hard to reach sampling population and is regarded as one of the method's strengths (Bryman, 2012). Secondly, these TCV staff members were effective in diffusing knowledge about my research across volunteering sites across the Greater London and South East geographical regions, as well as helping to foster collaboration and trust between myself and my sampling populations (Rattani and Johns, 2017). However, similar to what others have noted (McFadyen and Rankin, 2016), I found one main challenge of this method was gaining access to a full sampling population. Reasons for this related to TCV organisation protocols and sensitivity of research issues which may have had an effect on the representativeness of my findings. In an effort to try to limit this, I worked in close collaboration with gatekeepers throughout the research process, ensuring that I fully understood and adhered to the values and practices of TCV, an approach recommended by McFadyen and Rankin (2016). Moreover, this non-probability method did not give all individuals in the population an equal chance of being selected (Bryman, 2012). As such, the sampling population used in these chapters may not be truly representative of the whole population, reducing the validity of finding observed and increasing unknown biases (e.g. how representative is the sample of the population).

In chapters 4, 6 and 7 the snowballing method was used in addition to the gatekeeper (above) approach, where I was able to recruit further participants for the thesis research from an initial small pool of participants that met the eligibility criteria (Heckathorn, 2011). I have found various strengths to implementing this method into the thesis. Firstly, as mentioned above the sampling population were largely unknown to me and I found the method to be helpful in recruiting participants who met the eligibility criteria for each chapter. This view is supported by other researchers (Heckathorn, 2011; Bryman, 2012), and enabled me to effectively expand my sampling population size in a reasonable time period which was cost-effective. Secondly, the method helped me to gain trust with selected sampling populations and was particularly useful in chapter 4 due to the sensitive nature of information data collected (Grbich, 2013). This was because research for this chapter was carried out during a time of internal staff review and it was important to ensure that the wishes and trust of staff remaining paramount, as staff could have potentially put their position at the organisation and career at risk (Grbich, 2013). Yet, despite these strengths a few weaknesses have been identified with this method. For instance, uncertainty remains surrounding the true sampling population sizes in each of the case studies. As others note (Heckathorn, 2011), this non-probability sampling technique can affect one's ability to make statistical inferences using confirmatory data analysis. To alleviate this affect, descriptive statistics were used to describe the sampling population and findings observed, before I applied any confirmatory analytical approaches (see section 3.2.9). Moreover, it is unknown whether the sampling populations recruited contain unknown biases (e.g. how representative is the sample of the population) being of a size and direction that was unknown. Following the recommendations of Heckathorn (2011), my initial participants were selected in a target area known to the gatekeepers as well as representing a diverse sample, where possible, to enhance the spread of data information collected, thus attempting to minimise any unknown biases.

Finally, in chapter 7 findings were based on volunteer data collected by TCV staff in the form of email questionnaire surveys and implemented an email recruitment strategy, using email communication to recruit potential participants from a known

sample population (Bryman, 2012). I have noted a number of strengths and weakness relevant to the thesis research. Firstly, one strength of this method, was its ability to be used as a cost-effective way to recruit volunteers over a large UK geographical scale, a strength shared by other researchers (Evans and Mathur, 2005). Secondly, the method ensured volunteers voluntarily consented to being involved (Bryman, 2012). However, despite using follow-up emails to try and enhance participant numbers (see Fan and Yan, 2009), the self-selection non-probability sampling technique has been shown to have a potentially low response rate which may affect the representativeness of the chapter's findings. One suggested reason for this low response rate may relate to engagement patterns of volunteers (e.g. one-session volunteers), as noted in chapter 5. It is also noteworthy that a small proportion of volunteers who attend TCV volunteering sessions do not have accessibility to a computer at home and could create a nonresponse bias (Evans and Mathur, 2005). In this way, the sampling population may not therefore be truly representative, thus reducing validity of findings observed and increasing unknown biases (Bryman, 2012).

## 8.5 Data reliability and quality

In this section, data reliability, validity and quality in the thesis is evaluated using Dellinger and Leech (2007)'s Validation Framework (section 3.4). The framework incorporates elements from quantitative, qualitative and mixed method research. I will now review each of these elements in turn with relevance to the thesis.

Quantitative methods used in the thesis presented a relatively good degree of accuracy, and consistency (internal reliability) where possible (Dellinger and Leech, 2007). This was attained through implementing the following practices, described more fully in each of the case study chapters: adequate samples sizes, measure internal consistency, study description, descriptive analysis, analysis of secondary datasets as well as regional and office comparisons. For instance, the Green Exercise survey used in chapter 7 was based on two well-known and widely used impact measurement tools (e.g. SWEMWBS and single-item physical activity measure) which have been previously validated (Stewart-Brown *et al*., 2009; Milton *et al*., 2011). This ensured both internal (construct) validity and reliability of volunteer data collected using these tools. Further, prior to analysing volunteer data collected by TCV for chapters 5 and

7, it was important to evaluate the nature, veracity and characteristics of these datasets. As Creswell (2003) notes, some key challenges of reliability and validity which can affect data quality relate to various factors, including accuracy of data and data collection methods used. Based on findings from chapter 4 which explored these datasets, non-systematic biases were found. In this way, there could be no systematic error in measurements or estimates in volunteer data analysed and would therefore not significantly affect the quality and reliability of findings in later chapters 5 and 7. However, as noted in most case study chapters, findings observed were case specific to regions evaluated. As such, findings are only generalisable to other studies which share a similar context and not the broader environmental volunteering population (Bryman, 2012).

Qualitative methods throughout this thesis are evaluated using those measures relevant to the type of research method undertaken. As explained in 3.4, there exists multiple quality measures (e.g. credibility and trustworthiness), owing to differences in epistemologies, ontologies and methodologies to those quantitative methods (Dellinger and Leech, 2007). This was attained through implementing various practices outlined in section 3.4. For example, in chapter 6 I ensured both credibility (internal validity) and transferability (external validity) of findings. This was achieved through using multiple coders, a mutual codebook, measuring intercoder reliability, and providing a thick description of the case study. Such approach is recommended by Campbell *et al* (2013) as it increases consistency in coding, intercoder reliability, provides training and support to all coders as well as facilitates a systematic approach. Similarly, throughout chapters 4, 6 and 7 I maintained both dependability (reliability) and confirmability (objectivity) of findings. This was achieved through regularly receiving stakeholder and supervisory feedback, identifying the applicability of findings to other related studies and provided in-depth descriptions of research methods. These approaches acted as an external audit, which led to the development of stronger and better articulated findings, with an opportunity to assess adequacy of data (Guba and Lincoln, 1985). However, semi-structured interviews using probing techniques were used in chapter 4 to increase the richness and strengthens the depth of responses. As noted in section 3.2.3, some report the use of probing increases the

likelihood of obtaining difficult to compare answers thereby weakening data reliability (Doody and Noonan, 2013). Nevertheless, as the chapter's purpose was to ensure that as many key characteristics relevant to the research scope were identified, this method was therefore suitable and increased the breadth of findings obtained (Holtzblatt and Beyer, 2015).

Finally, the quality of mixed methods is evaluated against Dellinger and Leech (2007)'s five validity elements: foundation element, construct validation of the three method types (quantitative, qualitative and mixed), inferential consistency, the utilization/historical element and consequential element. Most of these were obtained through various means. For instance, evidence of my prior understanding (i.e. foundation element) of a phenomenon being explored or method being used was highlighted. This can be seen in section 3.2.7 where I detailed my previous knowledge, experienced and reasons for using a general inductive approach. As such, this provides evidence of construct validity and reduces biases when selecting methods used (Dellinger and Leech, 2007). Further, I ensured inferential consistency and a historical perspective (historical element) through examining the appropriateness and providing historic overview of methods used (section 3.2). These are also viewed as acceptable ways of representing and providing evidence for construct validity. Yet, it is uncertain to what extent consequential validity has been achieved. Consequential validity refers to the consequences of findings and measures used as well as how they contribute to the meaning of data. As Dellinger and Leech (2007) note, this type of validity cannot be assessed by the researcher of a study or by those examining only the original study. Instead, it can be assessed by the subsequent or result of using measures and results that have emerged. Therefore, achieving this type of validity may not be fully known until after thesis completion and are potentially beyond the scope of the thesis.

## 8.6 Ethical considerations, TCV partnership and change of personnel

Throughout undertaking the thesis, I experienced and managed significant ethical responsibilities whilst working closely with TCV staff and their volunteers. For instance, when conducting semi-structured interviews and transaction log analysis in chapter 4, I relied especially on staff's trust and willingness to openly discuss TCV's

work practices. As this case study occurred during a time of internal staff review and due to the sensitive nature of information, it was important to ensure that the wishes and trust of staff remaining paramount, as staff could have potentially put their position at the organisation and career at risk (Grbich, 2013). Additionally, chapters 5 and 7 were based on volunteer data from an identical copy of TCV's MIS database system (section 3.5), following a signed data sharing agreement with TCV. Whilst data relating to volunteer's personal, sensitive or identifying information were removed as well as being both confidential and anonymous, I adhered to all ethical and data protection procedures. This was because not only was it important to protect volunteer data, but also TCV's MIS database system, both of which the organisation rely on as part of their performance evaluations and to gain funding opportunities. Similar ethical considerations have been identified by researchers undertaking studies within an organisational setting in nearby fields (see Milliken *et al*., 2003; Holian and Coghlan, 2013). In response to these ethical considerations, I implemented and maintained high ethical standards throughout the research process, thereby reducing any potential undue risk or harm to TCV staff and volunteers who participated.

A key strength during the research process was the collaborative partnership between myself and TCV. This was felt to benefit areas of the research process including accessibility to TCV staff, volunteers and resources. The partnership was strengthened through various approaches. Firstly, through conducting quarterly meetings with stakeholders (e.g. TCV and funders) which provided an opportunity to reflect on what had been attained, forthcoming actions to achieve research aims as well as the progression of the project plan. Secondly, through using the gatekeeper recruitment method I was able to access sampling populations which were largely unknown to me as well as to foster both collaboration and trust between myself, staff and volunteers. Whilst other researchers (Rattani and Johns, 2017) have identified challenges when gaining accessibility to a sampling population (e.g. organisation protocols or sensitivity of research issues), I tried to reduce these challenges by working in close collaboration with gatekeepers, adhering to the values and practices of TCV (McFadyen and Rankin, 2016). Thirdly, I was fortunate to have volunteered under various roles (e.g. weekend warden) for TCV from April 2009 to June 2013, thus

having a good level of first-hand knowledge and understanding of the charity's environmental volunteering programme as well as a good working relationship with staff. Though some researchers suggest having a previous working relationship with participants has the potential to pose ethical and analytical challenges (Yuan, 2014), others note that through implementing high standard ethical procedures (e.g. practicing reflexivity and establishing well defined roles) this maintains the researcher-participant relationship, thus reducing the possibilities of these challenges (See Milliken *et al*., 2003; Holian and Coghlan, 2013). I therefore ensured these strategies throughout the research process.

Additionally, multiple changes in TCV personnel who acted as gatekeepers during the research process presented various challenges. Some examples included changes in research directions and research visibility. These challenges have also been reported by others undertaking similar or related research (Rattani and Johns, 2017). However, upon reflection I can also see the positive effects these changes in the personnel had over the course of my partnership and collaboration with TCV. For example, collaborating with TCV's data analyst team provided me with further insight into the organisations' various impact measurement tools used as well as more accessibility to volunteer data. Further, working closely with TCV's health and wellbeing director increased the research visibility and thus enhanced staff and volunteer's willingness to partake in each of the case studies.

## 8.7 Contributions to knowledge and implications of findings

The thesis has made a number of original contributions to knowledge within the areas of volunteer engagement, impact measurement systems, health perceptions and health-related impacts. Implications of thesis findings will provide valuable insight to researchers and practitioners within both the volunteering sector as well as those in public health. Thesis contributions to knowledge and implications of findings are outlined below.

The thesis progresses existing knowledge about the types of health-related impacts of those volunteers who engage in TCV's volunteering activities. In particular, findings present volunteer's long-term trends of both direct (e.g. physical activity and mental

wellbeing) and associated indirect factors (e.g. pro-environmental behaviours and social-ecological resilience) contributing to environmental volunteer's overall health (sections 2.7 and 7.1). As noted in section 2.6.1, existing knowledge was generalised and still emerging, focusing primarily on volunteers; physical activity, mood states and wellbeing. It is therefore anticipated that our current understanding of the health-related impacts of environmental volunteering will be further understood as well as the pathways between environmental volunteering and those behaviours associated with health. This in turn would allow volunteering services to better develop programmes to further encourage these health-related behaviours. In addition, it will allow metrics of success for volunteering services to be enhanced and thus presumably increased their health-related impacts.

Further, the thesis progresses existing knowledge about MIS databases used by volunteering organisations (sections 2.8 and 2.9) and provides an introduction to their use as data collection tools to measure their project deliverables in the context of the UK environmental volunteering sector. Findings from chapter 4 also build on from existing research and shows how contextual characteristics can shape the development of organisations' impact measurement tools and volunteer data collected (Voida *et al*., 2011). Such knowledge could be considerably valuable in helping practitioners and researchers in the volunteering field in areas of impact measurement tool design, using the information and methods applied to meet their own requirements, skills, contextual background and values (Harlock, 2013). For example, this information can also be used when planning a data collection framework such as the type, frequency and spatial distribution of volunteer data needed. In doing so, this increases the usability of the impact measurement tool as well as improves the nature, veracity and meaning of volunteer data collected.

Findings also served to provide a deeper understanding about the delivery of and volunteers' engagement in programmes by environmental volunteering organisations and contributes to various areas of knowledge. Firstly, such knowledge progresses existing studies within volunteering research (Reed and Selbee, 2001; Mohan and Bulloch, 2012) providing a deeper understanding of the delivery of environmental volunteering programmes (e.g. frequency, dose, type of activity). This is supported by

Jenkinson *et al* (2013) who highlighted this to be an area of knowledge previously unknown. Secondly, there is scope for analytical approaches used in chapter 5 to be applied to other volunteering organisations who collect similar volunteer data and wish to explore volunteer engagement for project management purposes. Such knowledge has been valuable in assisting practitioners in similar field (e.g. citizen science) in their understanding, recruitment, and retention of individuals who engage in their activities. However, this remains an understudied area in volunteering research, with no studies to date using these approaches to characterise the nature of engagement in volunteering projects. Using these analytical approaches could therefore be viewed as valuable in assisting practitioners in the volunteering field in their understanding, recruitment, and retention of individuals who engage in their activities. Knowledge gained from this analytical approach could help to increase long-term sustainability and design of volunteering projects and bring them in alignment with volunteer's engagement typologies and overall participatory patterns. For instance, by understanding volunteers' population size and longevity behaviours, project staff overseeing volunteer projects can be better equipped in organising resources required (e.g. equipment) as well as planning which tasks to undertake and how many (e.g. practical conservation activities and data collection), thus strengthening the continuity of their practices.

Finally, this thesis builds on existing knowledge within the research fields of public health and volunteering, providing further insights into volunteers' perceptions of health. These findings attempt to progress existing research (Sørensen *et al*., 2015; Nudelman and Shiloh, 2015; Brodie *et al*., 2007), providing further evidence on how some populations of the general public perceive health by comparison to health care professionals or established conceptual models used in health literature. In particular, findings provide further insight into the health perceptions of volunteers who engage in environmental volunteering activities as well as providing recommendations in areas of design. For instance, ensuring future impact tools incorporate volunteers' needs and understandings of health information. Such knowledge generated could therefore be viewed as valuable in assisting practitioners in the environmental

volunteering field when designing a health impact measurement tool in an effort to use more effective communication.

## 8.8 Limitations of thesis findings and future research areas

The thesis has identified limitations of thesis findings and areas that warrant further research. I have outlined each of these below.

Though this thesis found that those who engaged in environmental volunteering presented moderate to high levels of physical activity, wellbeing, pro-environmental behaviours and characteristics which promote social-ecological resilience (chapter 7). As noted, it remains uncertain whether these observed findings can be associated with environmental volunteering activities. In part, this owes to the nature of the impact measurement tools used (section 8.7), limiting one's ability to make causal conclusions. It is therefore suggested that future data collection processes used by TCV needs to use more robustly designed intervention methods (e.g. inclusion of baseline datasets and evaluation designs), to identify their true delivery of health-related impacts. Such recommendation has also been highlighted by Jenkinson *et al* (2013). Future research assessing causal relationships between health and environmental volunteering activities could provide a more comprehensive understanding of its multidimensional complexity as well as associated benefits and drawbacks emerging from these relationships.

Similarly, chapter 7 revealed mixed findings when examining volunteer's sub-types of wellbeing and was found to change over time. Yet, whilst these findings are useful for understanding the types of wellbeing outcomes experienced by volunteers who engage in TCV activities, it was hard to distinguish which activities contribute to particular health-related impacts. As such, it would be useful to also know what type of environmental volunteering activities (e.g. pond weeding) contributed to volunteers' health-related impacts (e.g. sub-type of wellbeing). This is an area of knowledge which is currently unknown or cannot be determined due to the existing sample size and variable structure of TCV's current dataset for this type of analysis. Such information would be helpful for TCV as well as others researching this area in relation to the future design of their environmental volunteering programmes to

include those activities that would be most beneficial to volunteers' health and thus presumably increase their current deliveries of health impacts. This recommendation is also shared by others (Pillemer *et al*., 2010; Jenkinson *et al*., 2013).

A further suggestion is the redesign of the questionnaire surveys analysed in chapter 7 to meet and reflect the engagement behaviours of volunteers. As noted, due to the nature and practicalities of volunteering activities, questionnaire surveys were administered after volunteers initially engaged in volunteering sessions. However, as identified in chapter 5, approximately 94.4% of TCV volunteers only attend one session and suggests that a large proportion of volunteers are under-represented in findings. As such, this may have created a non-response bias, with care needing to be taken when interpreting these findings (Bryman, 2012). With this in mind, a new questionnaire design is needed that captures the health-related impacts of volunteers which is equally reflective of their engagement profiles (e.g. one-session and long-term). It is therefore suggested that an alternative survey design might be sought. One example is the experience survey, designed to measure people's moods in relation to an experience thereby enhancing one's ability to make causal relationships, and can be used both as a one-off as well as longitudinally (see Csikszentmihalyi and Larson, 1987; McLean *et al*., 2017).

Additionally, the thesis highlighted the importance of understanding contextual factors, people's perceptions and behaviours for shaping both existing as well as designing impact measurement tools. In concern of existing impact measurement tools, chapters 4 to 6 illustrated how these characteristics were used to provide valuable insight into of the nature, veracity and meaning of volunteer data collected by TCV. In this way, methods used could be applicable to other volunteering organisations to evaluate the performance of their existing impacts measurement tools and any associated influences on volunteer data collected. Similarly, these characteristics could be useful methods for designing future impact measurement tools in the volunteering sector and nearby fields. In particular, data gathered could be helpful when deciding the logistics of the tool needed, including measurement indicators, sampling populations, language and physical items used.

In Chapter 5, it must also be noted that the number of hours a volunteer dedicates to a single volunteering session remains unknown and is not record by TCV. It is therefore uncertain whether volunteering hours are variable between volunteers, with the findings instead representing the number of volunteering sessions attended irrespective of hours. Based on my own experience working as a volunteer at TCV, I am aware that volunteers can often differ in the numbers of hours they commit to a volunteering session. Findings therefore do not truly compare volunteers in terms of their overall contributions to TCV sessions with one-off volunteers being as equally valuable as those who volunteer for a lengthier period. This is because a one-off volunteer who engages in a volunteering session for 8 hours may be as valuable as a volunteer who engages in volunteering sessions over a 4-month period for 30 minutes each session. It is therefore recommended that future research includes the numbers of hours a volunteer has engaged in a volunteering session to present the true value of their contribution.

Findings observed across each of the four case study chapters were case specific to TCV staff and volunteers who engaged in the research. It is noteworthy that similar, more generalised findings on volunteer databases, volunteering engagement patterns, the public's health perceptions, and health-related impacts have also been identified in existing volunteering and public health research (e.g. Voida, *et al*., 2011; Boakes *et al*., 2016; Zeng and Tse, 2006; Pillemer *et al*., 2010). This suggests that these findings, though case specific, could be extendable. Further work is therefore needed to understand whether findings observed in this thesis are attributable to other volunteer organisations and related projects in nearby fields. Suggested areas that warrant further research include place (e.g. rural-urban), scale (e.g. local, regional and national), programme or activity type (e.g. environmental conservation, advocacy, and monitoring) and organisational comparisons.

As echoed throughout each of the four case studies there is a need to use both quantitative and qualitative methods for reasons explained in section 8.6.1. Chapter 4 is an example of this, using both qualitative (e.g. semi-structured interviews and observations) and quantitative (e.g. exploratory data analysis) methods to gather an in-depth understanding of the characteristics that influence TCV's impact

measurement system and volunteer data collected. By contrast, chapter 5 used only a quantitative analytical methodology and is explained in further detail in above section 8.6.1. It is therefore recommended that future research use complementary forms of qualitative methodological approaches (e.g. interviews and observations) in conjunction with quantitative approaches to provide a more in-depth understanding of volunteer engagement. Similarly, whilst findings associated with pro-environmental behaviours and social-ecological resilience of volunteers were explored in-depth using mixed methods, health impacts (e.g. physical health and mental wellbeing) were solely based on quantifiable measures (chapter 7). Again, it is recommended that future research investigating health impacts associated with environmental volunteering activities incorporate a qualitative perspective to gather an understanding behind findings observed (e.g. reasons for changes in subtypes of wellbeing over time).

Based on the sections outlined throughout this chapter, further research is greatly needed to shed additional light on these initial findings identified in this thesis. Specifically, there are three avenues of research which would be of great benefit to the field of environmental volunteering and health. Firstly, as highlighted in 8.7 future research exploring the health impacts associated with engaging in environmental volunteering activities needs further evidence-based findings to identify any causal relationship. As also noted, a large proportion of volunteers attend one session and are under-represented in findings. One research agenda would be to research the causal relationships, if any, between engaging in environmental volunteering activities and associated health impacts using various methods (quantitative and qualitative) to capture the multidimensional nature of health (e.g. physical, mental and social components). These findings would also have implications for public health policy, providing an evidence-base to support ongoing and future policies to improve current public health through the inclusion of more environmentally focus health programmes (Depledge, 2011). Secondly, whilst thesis findings are useful for understanding the types of health-related impacts experienced by volunteers who engage in TCV activities, it was hard to distinguish which activities contribute to particular health-related impacts. One future research recommendation would be to identify which

types of environmental volunteering activities (e.g. pond weeding) contribute to different health components (e.g. physical, mental and social health). Such information would be useful for other practitioners in the field who work on similar health focused environmental volunteering programmes (e.g. Green Gyms), designing future programmes to include those activities that would be most beneficial to people's health. Through motivating people to be part of these programmes, this intervention may help them reduce the growing trend in the number of chronic diseases and associated costs to the UK's National Health Service (NHS) (Depledge, 2011). Thirdly, as noted in section 2.8 there are those in the volunteering sector who are experiencing some challenges in impact measurement tool development and suggests the need to use design strategies that meet their requirements, skills, contextual background and values. In the context of health and environmental volunteering, this thesis suggests that there might scope for usability methods to be applied to other volunteering organisations wanting to examine and develop their own impact measurement practices and related issues. One other research agenda might be to evaluate the feasibility and effectiveness of using usability methods to assist voluntary organisations in working towards designing impact measure tools across a broad spectrum of subject areas beyond health (Jansen, 2009; George, 2013).

Drawing on from the above proposed research agenda as well as my experience throughout working on this thesis, I aspire to be an academic researcher investigating people's health experiences whilst engaging in nature-based activities. Specifically, there are three research areas I would like to pursue beyond this thesis. Firstly, I would like to go on to examine the causal relationships between health and people's engagement with nature, such as environmental volunteering activities, providing a more comprehensive understanding of its multidimensional complexity as well as associated benefits and drawbacks emerging from these relationships. To date, this remains an area of knowledge yet to be explored (Jenkinson *et al*., 2013). Secondly, I would like to assess and identify which types of environmental volunteering activities (e.g. pond weeding) contribute to different health components (e.g. physical, mental and social health). Such information would be useful for other practitioners in the field who work on similar health focused environmental volunteering programmes (e.g.

Green Gyms), designing future programmes to include those activities that would be most beneficial to people's health. Through motivating people to be part of these programmes, this intervention may help them reduce the growing trend in the number of chronic diseases and associated costs to the UK's National Health Service (NHS) (Depledge, 2011). Thirdly, I would like to work closely with volunteering organisations to develop future health impact measurement tools, implementing usability methods applied in this thesis to meet the needs, requirements and skills of volunteering staff and volunteers. In doing so, this would improve the design of existing work practices or tools used by these individual users or organisations, improving the overall quality of volunteer data used to assist in promoting issues for public attention as well as policy related impacts (Metcalf, 2013).

## 8.9 Summary

In this concluding chapter, findings revealed that work contexts, data requirements and real-world environmental factors were found to have shaped TCV's impact measurement tool and volunteer data collected. Findings also identified differences in engagement patterns and contributor activity of volunteers who engaged in TCV's volunteering programme, Action Teams. Overall, volunteers who engaged in TCV activities presented moderate to high levels of health-related behaviours. However, causal relationships could not be made due to the design methods used. Findings also presented similarities and differences between how volunteers' perceptions of health and measurement indicators used by TCV to measure their delivery of health-related impacts. This suggests that impact measurement tools currently used by TCV are capturing a partial picture of health-related impacts delivered.

The chapter also evaluated the effectiveness of the theoretical framework and mixed methods implemented in the thesis as well as the sampling regions, sampling populations and recruitment methods used. In addition, the chapter reviewed the strengths and weaknesses of the thesis' data reliability and quality, ethical considerations, TCV partnership and change of personnel during the research process in this thesis.

Finally, contributions to knowledge and implications of findings observed in this thesis were identified, highlighting its limitations and suggest areas which warrant further research. For instance, it remains uncertain whether these observed findings can be associated with to environmental volunteering activities due to the nature of the impact measurement tools used. It is therefore suggested that future data collection processes used by TCV needs to use more robustly designed intervention methods (e.g. inclusion of baseline datasets and evaluation designs), to identify their true delivery of health-related impacts. Similarly, the thesis provides further knowledge about the following: how volunteers engage with environmental volunteering programmes, how volunteers perceive health, and measurement indicators used by TCV to measure their delivery of health-related impacts. Such knowledge can be used to provide recommendations for similar volunteering programmes, particularly when evaluating and developing health measurement tools, ensuring it incorporates volunteers' needs, their engagement behaviours and understandings of health information.

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**Appendix 1 –** Volunteer registration and welfare form

# Volunteer welfare information

The Conservation Volunteers is committed to providing a safe, healthy and inclusive working environment for all its volunteers. We expect you, the volunteer, to contribute positively to this environment by respecting our policies, procedures and working practices. Please complete the personal information requested below so we can establish your health and welfare needs and improve your volunteering experience.

All information is treated in the strictest confidence. (*Mandatory information for volunteering)

**Your details**

| |
|---|
| Mr ☐ Mrs ☐ Miss ☐ Ms ☐ |
| *First name |
| *Last name |
| *Address<br><br>*Postcode |
| *Telephone/mobile |
| E-mail |
| *Date of Birth &/or age |

**Your emergency contact details**

| |
|---|
| *First name |
| *Last name |
| *Relationship to you |
| *Address<br><br>*Postcode |
| *Telephone/mobile:<br>Daytime:<br><br>Evenings: |

**The Conservation Volunteers and you**

In order to celebrate the work of our volunteers we often take photographs of our activities. Are you happy for us to use photographs of you for publicity purposes? Yes ☐ No ☐

**Your health and welfare**

*I understand that it is advisable to have protection against tetanus when working outdoors..... ☐

*To help us plan your First Aid and welfare provision please answer the following:
Is there any work you may find difficult for health reasons? Yes ☐ (describe below) No ☐

*Are you taking any medication that a first aider or doctor would need to be aware of? Yes ☐ (describe below) No ☐

*Is there any information we may need to ensure your safety (e.g. colour blindness, hearing impairment, learning difficulties)? Yes ☐ (describe below) No ☐

Continue on separate sheet if required

**Your volunteer declaration**

Data Protection Act 1998. The personal data on this form will be used by The Conservation Volunteers to send you information about us. It will only be used by The Conservation Volunteers and will not be made available to any third party.

"I am involving myself of my own free will and declare that to the best of my knowledge the information given is correct and I know of no reason why I should not participate. I consent to the personal details supplied on this form being used by The Conservation Volunteers for the purposes outlined. I consent to follow The Conservation Volunteers policies and procedures when involved in their projects"

| |
|---|
| ***Your signature:** |
| ***Date:** |

**Please turn over....**

## **Appendix 2** – Green Exercise project: Questionnaire survey

Please fill out the date this questionnaire was completed and answer the questions below.

1. In the past week, on how many days have you done a total of 30 minutes or more of physical activity which was enough to raise your breathing rate? (please circle a number) This may include sport, exercise, brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that is part of your job.

   0 1 2 3 4 5 6 7 8 9 10

2. Below are some statements about feelings and thoughts. Please tick the box that best describes your experience of each over the last 2 weeks.

I've been feeling optimistic about the future.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I've been feeling useful.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I’ve been feeling relaxed.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I’ve been dealing with problems well.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I’ve been thinking clearly.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I’ve been feeling close to other people.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

I’ve been able to make up my own mind about things.

□ None of the time (1 point)

□ Rarely (2 points)

□ Some of the time (3 points)

□ Often (4 points)

□ All of the time (5 points)

# **Appendix 3** – Change! Tool project: Questionnaire survey

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**SECTION 1: GETTING STARTED**

Q1: What is the name of the group you are part of? Please tick one box only.

□ Richmond Project

□ Waltham Forest BAT

□ Haringey Project

□ Croydon Project

□ Greenwich

□ Lambeth BAT

□ Dulwich Woods

□ Kings Cross BAT

□ Lavender Pond

□ Camden Green Gym

□ Penge Green Gym

□ Waltham Forest Green Gym

□ Stave Hill

Other _____

**SECTION 2: GETTING ABOUT**

We would like to ask you some questions about how you get about and how you use transport.

Q2a: Do you make journeys by car?

□ Yes Go to question 2b

□ No Go to question 2d

---

Q2b: Which of the following statements most closely relates to your car use? Tick one box only.

□ I sometimes feel I should reduce the number of journeys I make by car.

□ I often feel I should reduce the number of journeys I make by car.

□ I am starting to reduce the number of journeys I make by car.

□ I have tried to reduce the number of journeys I make by car, but have found it hard to stick to.

□ I have reduced the number of journeys I make by car and think I could reduce them more.

□ I have reduced the number of journeys I make by car and cannot reduce them further

□ I don't think it is necessary to reduce the number of journey I make by car because I don't see car use as an issue.

Q2c: Please tell us more about why the statement you have chosen relates to you?

Q2d: Have you taken holidays using air travel in Europe the last 5 years?

□ Yes Go to question 2e

□ No Go to question 3a

Q2e: Which of the following statements most closely relates to you? Tick one box only.

□ I sometimes feel I should reduce the number of European flights I take

□ I often feel I should reduce the number of European flights I take

□ I am starting to reduce the number of European flights I take

□ I have tried to reduce the number of European flights I take but found it hard to stick to

□ I have reduced the number of European flights I take and think I could reduce them more.

□ I have reduced the number of European flights I take cannot reduce them further.

□ I don't think it is necessary to reduce of European flights I take because I don't see

air travel as an issue.

Q2f: Please tell us more about why the statement you have chosen relates to you.

**SECTION 3: IN THE HOME**

The following group of questions help us to understand what you do in your home.

Q3a: Which of the following statements most closely relate to your energy use? Tick one box only.

□ I sometimes feel I should reduce the amount of energy I use in my home.

□ I frequently feel I should reduce the amount of energy I use in my home.

□ I am starting to reduce the amount of energy I use in my home.

□ I have tried to reduce the amount of energy I use in my home, but have found it hard to stick to.

□ I have reduced the amount of energy I use in my home and think I could reduce it more.

□ I have reduced the amount of energy I use in my home and cannot reduce it further

□ I don't think it is necessary to reduce the amount of energy I use in my home because I don't see energy use as an issue.

Q3b: Please tell us more about why the statement you have chosen relates to you.

Q3c: Which of the following statements most closely relate to your water use? Tick one box only.

□ I sometimes feel I should reduce the amount of water I use in my home.

□ I frequently feel I should reduce the amount of water I use in my home.

□ I am starting to reduce the amount of water I use in my home.

□ I have tried to reduce the amount of water I use in my home, but have found it hard to stick to.

□ I have reduced the amount of water I use in my home and think I could reduce it more.

□ I have reduced the amount of water I use in my home and cannot reduce it further

□ I don't think it is necessary to reduce the amount of water I use in my home because I don't see water use as an issue.

Q3d: Please tell us more about why the statement you have chosen relates to you.

Q3e: Which of the following statements most closely relate to your waste use? Tick one box only.

□ I sometimes feel I should increase the amount of waste that I recycle

□ I frequently feel I should increase the amount of waste that I recycle

□ I am starting to increase the amount of waste that I recycle

□ I have tried to increase the amount of waste that I recycle but have found it hard to stick to.

□ I have increased the amount of waste that I recycle and think I could increase it more.

□ I have increased the amount of waste that I recycle and cannot increase it further

□ I don't think it is important to increase the amount of waste I recycle because I don't see recycling as an issue.

Q3f: Please tell us more about why the statement you have chosen relates to you.

**SECTION 4: YOUR FOOD**

We would like to hear a little bit about how you make your shopping choices and the actions you undertake in your garden or even on your window sill.

Q4a: Which of the following statements most closely relate to you? Tick one box only.

□ I sometimes feel I should try to buy more locally, regionally or nationally grown

products.

□ I frequently feel I should try to buy more locally, regionally or nationally grown products.

□ I am starting to buy more locally, regionally or nationally grown products.

□ I have tried to buy more locally, regionally or nationally grown products, but have found it hard to stick to.

□ I usually buy locally, regionally or nationally grown products, but could buy more

□ I usually buy locally, regionally or nationally grown products and cannot buy any more than I already do.

□ I do not feel that it is necessary to locally, regionally or nationally grown products, as I don't see buying locally grown products as an issue.

Q4b: Please tell us more about why the statement you have chosen relates to you.

Q4c: Do you have a garden, yard, balcony or window box that you are allowed to cultivate?

□ Yes Go to question 4d

□ No Go to question 5a

Q4d: Which of the following statements most closely relate to you? Tick one box only.

□ I sometimes feel I should try to grow some of my own food.

□ I frequently feel I should try to grow some of my own food.

□ I am starting to grow some of my own food.

□ I have tried to grow some of my own food, but have found it hard to stick to.

□ I usually grow some of my own food, but could grow more.

□ I usually grow some of my own food and can't grow any more than I do now.

□ I do not feel that it is important to grow any of my own food, as I do not feel growing my own food is an issue.

Q4e: Please tell us more about why the statement you have chosen relates to you.

**SECTION FIVE: IN YOUR COMMUNITY**

Q5a: Which of the following statements most closely relate to you, in relation to taking an active part in helping to organize community activities or clubs, for example: neighbourhood watch, a parent and toddler session or being on the committee organising a local event?

□ I sometimes feel I should try to take an active part helping with community activities or clubs

□ I frequently feel I should try to take an active part helping with community activities or clubs

□ I am starting to take an active part helping with community activities or clubs

□ I have tried to take an active part helping with community activities or clubs, but have found it hard to stick to

□ I usually take an active part helping with community activities or clubs

□ I usually take an active part helping with community activities or clubs, and can't take on more than I do now

□ I do not feel that it is important to take an active part helping with community activities or clubs

Q5b: Which of the following statements most closely relate to you, in relation to taking an active part in decisions about your community by, for example: commenting on council plans, taking part in council meetings, being involved in your local residents or neighbourhood meetings?

□ I sometimes feel I should try to take an active part in decisions about my community

□ I frequently feel I should try to take an active part in decisions about my community

□ I am starting to take an active part in decisions about my community

□ I have tried to take an active part in decisions about my community, but have found it hard to stick to

□ I usually take an active part in decisions about my community

□ I usually take an active part in decisions about my community, and can't take on more than I do now

□ I do not feel that it is important to take an active part in decisions about my community

## **Appendix 4 –** Change! Tool project: Structured interview questions

1. What did you think of your volunteer experience with TCV?
2. What did you enjoy? And what could have been better?
3. What do you dislike about it?
4. Why did you join?
5. What were you doing before?
6. What effect has it had on you, and your health/wellbeing?
7. What pro environmental behaviour changes, if any, have you adopted since volunteering with TCV? (*If none, go to 13)*
8. What was the main thing that triggered the pro-environmental behaviour change/s above?
9. What was the role of TCV staff / Leaders? in bringing about the change?
10. What was the role of environmental volunteering in bringing about the change?
11. What impact, if any, has this pro-environmental behavioural change had on those around you (family, friends, and community)?
12. Do you feel empowered to learn more about pro-environmental behaviours independently?
13. What pro environmental changes might you make in the future?
14. What was the main thing that triggered the pro-environmental behaviour change/s above?

15. Have you told anyone about your volunteering experience, if so who (e.g. Family, friends, community members, co-workers etc) and how many? Were you positive or negative about your experience?

16. Have you encouraged or persuaded someone else to volunteer due to your experience?

17. Are there any additional comments you would like to mention?

**Thank you for taking part in our study.**

## **Appendix 5** – Resilience Project: Focus group interview questions

1. How active would you say your group was? Please give examples and discuss (5 points).

2. How self-organised would you rate your group? Please give examples and discuss (5 points).

3. How connected would you rate your group as? Please give examples and discuss (5 points).

4. Please discuss the skills and knowledge of those in your group, giving examples (5 points).

Semi-structured questions presented to external stakeholders (section 7.2.2), were the same as above, though paraphrased so participants could provide an external perspective of local community groups (e.g. How active would you say the group was?).

## **Appendix 6** – First authored paper (a)

# The human-nature relationship and its impact on health: A critical review

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**Abstract**

Within the past four decades, research has been increasingly drawn towards understanding whether there is a link between the changing human-nature relationship and its impact on people's health. However, to examine whether there is a link requires research of its breadth and underlying mechanisms from an interdisciplinary approach. This article begins by reviewing the debates concerning the human-nature relationship which are then critiqued and redefined from an interdisciplinary perspective. The concept and chronological history of 'health' is then explored, based on the World Health Organisation's definition. Combining these concepts, the human-nature relationship and its impact on human's health, are then explored through a developing conceptual model. It is argued that using an interdisciplinary perspective can facilitate a deeper understanding of the complexities involved for attaining optimal health at the human-environmental interface.

**Keywords:** human health, human-nature relationship, natural environment, interdisciplinary

## 1. Introduction

During the last century, research has been increasingly drawn towards understanding the human-nature relationship [1-2] and has revealed the many ways humans are linked with the natural environment [3]. Some examples of these include humans' preference for scenes dominated by natural elements [4], the sustainability of natural resources [5-6] and the health benefits associated with engaging with nature [7-9].

Of these examples the impacts of the human-nature relationship on people's health have grown with interest as evidence for a connection accumulates in research literature [10]. Such connection has underpinned a host of theoretical and empirical research in fields which until now have largely remained as separate entities.

Since the late 19th Century a number of descriptive models that have attempted to encapsulate the dimensions of human and ecosystem health as well as their interrelationships. These include the Environment of Health [11], Mandala of Health [12], the Wheel of Fundamental Human Needs [13], the Healthy Communities [14], One Health [15] and the bioecological systems theory [16]. Each, however, have not fully incorporated all relevant dimensions, balancing between the biological, social and spatial perspectives [17-18]. In part this is due to the challenges of the already complex research base in relation to its concept, evidence base, measurement and strategic framework. Further attention to the complexities of these aspects, interlinkages, processes and relations is required for a deeper sense of understanding and causal directions to be identified [19].

This article reviews the interconnectivities between the human-nature relationship and human health. It begins by reviewing the each of their concepts and methodological approaches. These concepts will be converged to identify areas of overlap as well as existing research on the potential health impacts in relation to humanity's degree of relationship to nature and lifestyle choices. From this, a developing conceptual model is proposed, to be inclusive of the human-centered perspective of health, viewing animals and the wider environment within the context of their relationship to humans. The model combines theoretical concepts and

methodological approaches from those research fields examined in this review, to facilitate a deeper understanding of the intricacies involved for improving human health.

## 2. Defining the human-nature relationship

It is beyond the scope of this paper to review the various connections at the intersect of humanity and the natural environment. Instead I summarize key concepts and approaches from those four research fields (Evolutionary biology, social economics, evolutionary psychology and environmentalism) outlined below which have paid most attention to studying this research area. I then summarize areas of convergence between these connections in an attempt to describe the human-nature relationship, that will serve as background to this review.

It is anticipated that through drawing on these different fields of knowledge, a deeper level of understanding can be brought to the growing issue of humanity's relationship with nature and its impact on health. This is because examining the human-nature relationship from a single disciplinary perspective could lead to partial findings which neglect other important sources as well as the complexities that exist between interlinkages, causal directions, processes and relations.

### 2.1 Evolutionary biology

Evolutionary biology is a branch of research that shortly followed Darwin's [20] Theory of Evolution. It concerns the adaptive nature of variation in all animal and plant life, shaped by genetic architecture and developmental processes over time and space [21]. Since its emergence over a century ago, the field has made some significant advances in scientific knowledge, but with intense debate still remaining amongst its central questions, including the rate of evolutionary change, the nature of its transitional processes (e.g., Natural Selection) [22]. This in part owes to the research field's interdisciplinary structure, formulated on the foundations of genetics, molecular biology, phylogeny, systematics, physiology, ecology and population dynamics; integrating a diverging range of disciplines, thus producing a

host of challenging endeavours [23-24]. Spanning each of these, human evolution centers on humanity's life history since the lineage split from our ancestral primates and our adaptive synergy with nature.

In the last four decades, evolutionary biology has focused much attention on the cultural-genetic interaction and how these two inherent systems interrelate in relation to lifestyle and dietary choices (*Culturgen Evolution*, [25]; *Semi-Independent*, [26]; *Dual-Inheritance model*, [27]). Some of the well-known examples include humans' physiological adaptation to agricultural sustenance [28], the gradual increase in lactose tolerance [29] as well as the susceptibility of allergic diseases (e.g., asthma and hay fever) in relation to decreasing microbial exposure [30].

This coevolutionary perspective between human adaptation and nature has been further conceptualized by Gual and Norgaard [31] as embedding three integrated systems (biophysical, biotic and cultural). In this, culture is both constrained and promoted by the human genetics via a dynamic two-way interaction. However, bridging the gap between these research fields continues to generate much controversy, particularly as the nature of these evolutionary development processes differs widely (e.g., internal and external factors). This ongoing discussion is fuelled by various scholars from multiple disciplines. Some have argued that one cannot assume all evolutionary mechanisms can be carried over into other areas [32-33], where genomes cannot evolve as quickly to meet modern lifestyle and dietary requirements [34]. Conversely, others believe that humans have not entirely escaped the mechanisms of biological evolution in response to our cultural and technological progressions [35].

### 2.2 Evolutionary psychology

Evolutionary psychology is a recently developed field of study which has grown exponentially with interest since the 1980s. It centers on the adaptation of psychological characteristics said to have evolved over time in response to social and ecological circumstances within humanity's ancestral environments [36-38]. This reverse engineering approach to understanding the design of the human mind

was first kindled by evolutionary theorist Charles Darwin [20] in the last few pages of *Origin of Species*;

*"In the distant future … Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation"* [p. 447].

As such, evolutionary psychology is viewed by some to offer a metatheory that dissolves the traditional boundaries held in psychology (e.g. cognitive, social, personality and development). Within this all psychological theories implicitly believed by some to unify under this umbrella [37]. However, the application of evolution to the study of psychology has not been without controversial debate in areas relating to cognitive adaptation, testability of hypotheses and the uniformality of human nature [39].

During the past few decades, the field has presented numerous concepts and measures to describe human connectedness to nature. These include Deep Ecology [40], Extinction of Experience [41], Inclusion of Nature in Self [42] and Connectedness to Nature [43]. The Biophilia hypothesis [44] remains, however, the most substantially contributed to theory, and argues for the instinctive aesthetic preference for natural environments and subconscious affiliation for other living organisms. Supportive findings include humans' preference for scenes dominated by natural elements [4], improved cognitive functioning through connectivity with nature [45] as well as instinctive responses to specific natural stimuli or cues (e.g., a common phobia of snakes) [46]. More recently, evidence is emerging to suggest that connectivity to nature can generate positive impacts on one's health, increasing with intensity and duration [47].

The underpinning of the Biophilia hypothesis centers on humanity's source of attachment to nature beyond those on the surface particulars. Instead it reflects thousands of years of evolutionary experience closely bonding with other living organisms [44]. Such process is mediated by the rules of prepared and counter-prepared learning which shape our cognitive and emotional apparatus; evolving by natural selection via a cultural context [48]. This innate value for nature is suggested to be reflected in the choices we make, experiences expressed as well as our

longstanding actions to maintain our connection to nature [49]. Nevertheless, many have gone on to recognize the research field's need for revision and further evidentiary support through empirical analysis [50]. Similarly, as other researchers have argued, these innate values should be viewed in complementary to other drivers and affinities from different sources that can also be acquired (e.g. technology and urban landscapes). This is because at the commonest level, as Orr [51] explains, humanity can learn to love what becomes familiar, a notion also reflected in the Topophilia ("love of place") hypothesis [52].

### 2.3 Social economics

Social economics is a metadiscipline in which economics is embedded in social, political, and cultural behaviors. It examines institutions, choice behavior, rationality as well as values in relation to markets [53]. Owing to its diverse structure, the human-nature relationship has been explored in various contexts. These include the reflections of society's values and identities in natural landscapes [54], Condition of Placelessness [55] and humanity's growing ecosynchronous tendencies [56] as well as how the relationship has evolved with historical context [57-59]. Whilst the dynamics of human and nature coupled systems has become a growing interdisciplinary field of research, past work within social economics has remained more theoretical than empirically based [59].

The connection between the start of industrialized societies and the dynamically evolving human-nature relationship, has been discussed by many [60], revealing a host of economic-nature conflicts. One example includes those metaphorically outlined in the frequently cited article "*The Tragedy of the Commons*". In this it argues that the four laws of ecology are counter intuitive with the four laws of capitalism [5-6]. Based on this perspective, the human-nature relationship is simplified to one of exchange value, where adverse costs to the environment are rarely factored into the equation [6]. However, this is not to say that humanity's increasing specialisation and complexity in most contemporary societies are distinct from nature, but still depend on nature to exert [61].

Central to the tenets outlined in *Tragedy of the Commons* is the idea of 'gradually diminishing freedom' where a population can increasingly exceed the limits of its resources if avoidance measures are not implemented (e.g., privatization or publicly owned property with rights of entry) [5,62]. Yet, such avoidance measures can be seen to reflect emerging arguments in the field of environmental justice, which researches the inequalities at the intersection between environmental quality, accessibility and social hierarchies [63]. These arguments derive from the growing evidence that suggests the human-nature relationship is seemingly disproportionate to those vulnerable groups in society (e.g., lack of green spaces and poor air quality), something public health researchers believe to be a contributing factor to health inequities [64]. As such, conflicts between both private and collective interests remain a challenge for future social economic development [65]. This was explored more fully in Ostrom's [66] research on managing a common pool of resources.

### 2.4 Environmentalism

Environmentalism can be broadly defined as an ideology or social movement. It focuses on fundamental environmental concerns as well as associated underlying social, political and economic issues stemming from humanity's interactions affecting the natural environment [67-68]. In this context, the human-nature relationship has been explored through various human related activities, from natural resource extraction and environmental hazards to habitat management and restoration. Within each of these reflects a common aspect of 'power' visible in much of the literature that centers on environmental history [69]. Some examples included agricultural engineering [70], the extinction of animals through over hunting [71] as well as the ecological collapse on Easter Island from human overexploitation of natural resources, since disproven [72-74]. Yet, in the last decade the field's presupposed dichotomy between humans and nature in relation to power has been critically challenged by Radkau [75] who regards this perspective as misleading without careful examination. Instead they propose the relationship to be more closely in synchrony.

Power can be characterized as "*A person, institution, physical event or idea … because it has an impact on society: It affects what people do, think and how they live*" [76]. Though frequently debated in other disciplines, in the context of the human-nature relationship the concept of 'power' can be exerted by both nature and humanity. In regards to nature's power against humanity, it has the ability to sustain society as well as emphasize its conditional awareness, environmental constraints and fragilities [77]. In contrast, humanity's power against nature can take the form of institutions, artefacts, practices, procedures and techniques [70]. In the context of this review, it focuses on nature's powers against humanity.

It has been argued that human power over nature has altered and weakened in dominance [78] since the emergence of Rachel Carson's book *Silent Spring* in 1962, and later concepts of Gaia [79], Deep Ecology [40] and Sustainable Development [80]. Instead, humanity's power towards nature has become one of a moral sense of protectionism or the safeguarding of the environment [81]. This conservative behaviour (e.g., natural defences, habitat management and ecological restoration) can be termed 'Urgent Biophilia' [82], and is the conscious urge to express affinity for nature pending an environmental disaster. As Radkau [69] suggests, with warnings of climatic change, biodiversity loss, and depletions in natural resources, this poses a threat to humanity. As such, this will eventually generate a turning point where human power is overwhelmed by the power of nature, bringing nature and power into a sustainable balance. Nonetheless, as many also highlight, humanity's responses to environmental disasters can directly impinge on an array of multi-causalities of intervening variables (e.g., resource depletion and social economics) and the complexity of outcomes [83].

### 2.5 An interdisciplinary perspective of the human-nature relationship

Through exploring the key concepts found in evolutionary biology, social economics, evolutionary psychology and environmentalism, this has enabled a broader understanding of the various ways humans are connected to the natural environment. Each should not be viewed as separate entities, but rather that they share commonalities in terms of mutual or conjoint information and active research

areas where similarities can occur (See table 1 below). For example, there is a clear connection between social economics, evolutionary psychology and biology in areas of health, lifestyle and biophilic nature [53,40,82] as well as between social economics and the environment in regards to balancing relationships of power [5,78]. Similarly, economic-nature conflicts can occur between disciplines evolutionary psychology and social economics in relation to people's affiliation for nature and industrial growth.

[Table 1 goes here].

**Table 1** A summarized overview of human-nature relationship connections between those research fields explored.

Our understanding of the human-nature relationship and its underlying mechanisms could be further understood from an interdisciplinary perspective. In essence, the human-nature relationship can be understood through the Biophilia concept of humanity's affiliation with nature as well as related concepts and measures to describe human connectedness to nature [49-53]. Equally, Orr's [60] perspective that at the commonest level humans can acquire other affinities to or learn to love different elements than those of the natural world (e.g., technology and urban environments) adds to this understanding. Further, whilst humanity, and indeed nature also, has not entirely escaped change, it cannot be assumed that all have been shaped by evolutionary mechanisms [42,44]. Some have been shaped by what Radkau [78] terms as the power shift between humans and nature, which is evolving, as it has and will keep on doing. As such, the human-nature relationship goes beyond the extent to which an individual believes or feels they are part of nature. It can also be understood as, and inclusive of, our adaptive synergy with nature as well as our longstanding actions and experiences that connect us to nature. Over time, as research and scientific knowledge progresses, it is anticipated that this

definition of the human-nature relationship will adapt, featuring the addition of other emerging research fields and avenues.

## 3. Defining health

Conceptualizing ‘health’ has often generated complex debates across different disciplines owing to its multidimensional and dynamic nature [84]. It is, however, beyond the scope of this paper to review the many ways these concepts have been previously explored [85-87]. Instead, ‘health’ is reviewed viewed more generally through the lens of the World Health Organisation 1948 definition.

The World Health Organisation defined ‘health’ simply as the physical, social and mental wellbeing of humanity, in which ‘health’ was widened beyond those biomedical aspects (e.g., disease and illness) to encompass the socioeconomic and psychological domains [86]. This classical definition advocated health’s shift towards a holistic perspective, with emphasis on more positive attributes [85,88], and was not simply “*the mere absence of disease and infirmity*” [84, p. 1]. It also reflected people’s ambitious outlook after the Second World War, when health and peace were seen as inseparable [84,85]. Since then, this shift has seen a major growth in the last 30 years, primarily in areas of positive health and psychology [89-93].

Despite its broad perspective of human health, the definition has also encountered criticism in relation to its description and its overall reflectance of modern society. For instance, the use of the term ‘completeness’ when describing optimal health, has been regarded by many as impractical. Instead, Huber et al [84] propose health to be the “ability to adapt and to self-manage” and invite the continuation of further discussions and proposals of this definition to be characterised as well as measured through its three interrelated dimensions; physical, mental and social health. Similarly, others have highlighted the need to distinguish health from happiness [85] or its inability to fully reflect modern transformations in knowledge and development (e.g., technology, medicine, genomics as well as physical and social

environments) [87]. As such, there have been calls to reconceptualize this definition, to ensure further clarity and relevance for our adaptive societies [84].

Broadly, health has been measured through two theoretical approaches; subjective and objective [86]. The subjective approach is based on individual's perceived physical, emotional and cognitive experiences or functioning. By contrast, the objective approach measures those variables which are existing and measurable external to an individual's internal experience such as living conditions or human needs that enable people to lead a good life (e.g., health markers, education, environment, occupational attainment and civic involvement) [86]. Together, these approaches provide a more comprehensive picture of a person's health status, which are applicable across its three health components (physical, mental and social), as described below.

Firstly, physical health is defined as a healthy organism capable of maintaining physiological fitness through protective or adaptive responses during changing circumstances [84]. Whilst it centers on health-related behaviours and fitness (including lifestyle and dietary choices), physiological fitness is considered one of the most important health markers thought to be an integral measure of most bodily functions involved in the performance of daily physical exercise [94]. These can be measured through various means, with examples including questionnaires, behavioral observations, motion sensors and physiological markers (e.g., heart rate) [95].

Secondly, mental health is often regarded as a broad concept to define, encapsulating both mental illness and wellbeing. It can be characterized as the positive state of wellbeing and the capacity of a person to cope with life stresses as well as contribute to community engagement activities [96,84]. It has the ability to both determine as well as be determined by a host of multifaceted health and social factors being inextricably linked to overall health, inclusive of diet, exercise and environmental conditions. As a result, there are no single definitive indicators used to capture its overall measurement. This owes in part to the breadth of methods and tends to represent hedonic (e.g., life satisfaction and happiness) and eudaimonic

(e.g., virtuous activity) aspects of wellbeing, each known to be useful predictors of physical health components [97].

Thirdly, social health can be generalized as the ability to lead life with some degree of independence and participate in social activities [84]. Indicators of the concept revolve around social relationships, social cohesion and participation in community activities. Further, such mechanisms are closely linked to improving physical and mental wellbeing as well as forming constructs which underline social capital. Owing to its complexity, its measurement focuses on strengths of primary networks or relationships (e.g., family, friends, neighbourliness and volunteering in the community) at local, neighbourhood and national levels [98].

## 4. Current knowledge on the human-nature relationship and health

This section summarizes existing theoretical and literature research at the intersection of the human-nature relationship and health, as defined this this review. This has been explored through three subsections: physical health, mental health and social health. It aims to identify areas of convergence as well as gaps and limitations.

### 4.1 Physical health

Though it is widely established that healthy eating and regular exercise have major impacts on physical health [100], within the past 30 years research has also identified that exposure to nature (e.g., visual, multisensory or by active engagement) is equally effective for regulating our diurnal body rhythms to ensure physical vitality [101]. Such notion stems from Wilson's [44] proposed 'Three Pillars of Biophilia' experience categories (Nature of Space, Natural Analogues and Nature in Space) which relates to natural materials and patterns experienced in nature, inducing a positive impact on health [102]. Empirical research in this domain was first carried out by Ulrich [46] who found that those hospital patients exposed to natural scenery from a window view experienced decreased levels of pain and shorter recovery time after surgery. Following this, research in this academic field

has grown exponentially and encompasses a large literature base on nature's health benefits. These include improvements in neurological and circadian rhythms relating to exposures to natural sunlight [103-104], undergoing 'Earthing' or physical contact with the Earth's surface regulates diurnal body rhythms [105] as well as walking activities in forest environments reducing blood pressure levels [8].

In spite of its increasing findings, some have suggested the need for further objective research at the intersect of nature-based parameters and human health [102]. One reason for this is that most studies have yet to be scrutinized to empirical scientific analysis [55,106] owing to the research area's reliance on self-reported measures with the need for inclusion of more quantitative forms of data (e.g. physiological and biochemical indicators). This presents inherent difficulty in comparing assessment measures or different data types relative to the size and scale of the variables being evaluated [102]. Further, there still remains evidence gaps in data on what activities might increase levels of physical health as well as limited amount of longitudinal datasets from which the frequency, duration and causal directions could be inferred [107].

### 4.2 Mental health

Mental health studies in the context of connecting with nature has also generated a growing research base since the emergence of the Biophilia concept in the mid-1980s [45]. Much of its research within the Evolutionary Psychology discipline, examines the recuperative effects of nature on wellbeing and its beneficial properties following researcher's arguments of humanity's affiliation for nature [108]. Supporting research has been well documented in literature during the last few decades. These include 'Heraclitean motion' or natural movement [109], natural sounds [110], children's engagement activities within green settings [7,111] as well as aesthetic preferences for nature and natural forms [4,49].

Criticisms of this research area center on the inability to decipher causal effects and direction of such benefits and in part relates to its predominant focus on 'recuperative measure' than that of detecting its 'source' [108]. In light of this, reviewers repeatedly remark on researchers' tendencies to focus on outcomes of

wellbeing, neglecting the intervening mechanisms that sustain or inhibit wellbeing [128]. Similarly, further mixed-method approaches and larger sample sizes are needed in this research field. This would enhance existing evidence gaps to enhance existing knowledge of variable interlinkages with other important sources (e.g., physical and social health aspects) as well as the diversity that exists between individuals [112].

### 4.3 Social health

In the last two decades the relationship between people and place in the context of green spaces has received much attention in academic literature in regards to its importance for the vitality of communities and their surrounding environments [113]. As studies have shown, the presence of green space can promote social cohesion and group based activities, aspects which are crucial for maintaining social ties, developing communities and increasing individual's wellbeing (e.g., horticulture and ecological restoration) [114]. Examples of findings include usage of outdoor space exponentially increases with number and locality of trees [115], children's activities in green spaces improves social development [7] as well as accessibility to green spaces enhances social bonds in communities [116].

One of the main limitations within this field relates to the generally perceived idea that public green spaces are freely open to everyone in all capacities [117]. This limitation has been as already highlighted from the emerging arguments in the field of environmental justice and economic-nature conflicts [63]. As such, many researchers highlight the need to maintain awareness of other barriers which might hinder cohesion and community participation (e.g., semi- public space and social exclusion). Further, there still remains a gap between academic research and local knowledge which would otherwise lead to more effective interventions. However, without implementing participatory engagement, many studies risk misrepresenting the true social, economic and political diversity that would increase both our understanding of 'real life' problems of concern as well as bringing depth to data collected [118]. Nonetheless, for such approach to be implemented requires

sufficient time, cost and an adequate scale of resources to ensure for aspects of coordination, communication and data validation [119].

## 5. Impacts of the human-nature relationship on health

During the past four decades, researchers, health practitioners and environmentalists alike have begun to explore the potential link between the human-nature relationship and its impact people's health [10]. This in part owes to the increasing evidence accumulating in research literature centering on the relationships between the following areas: chronic diseases and urbanization, nature connectedness and happiness, health implications of contemporary society's lifestyle choices as well as the adverse impacts of environmental quality on the health of humans and non-humans alike [120-121].

Such health-related effects that have been alluded to include chronic diseases, social isolation, emotional wellbeing as well as other psychiatric disorders (e.g., Attention Deficit Disorders and anxiety) and associated physical symptoms [7,122]. Reasons for these proposed links have been suggested to stem from various behavioral patterns (e.g., unhealthy diets and indoor lifestyles) associated with consumerism, urbanization and anthropogenic polluting activities [123,124]. Further, these suggested links have been inferred, by some, to be visible in other species (e.g. insects, mice and amphibians) as a consequence to living in unnatural habitats or enclosures [See 125-127]. Nonetheless, research within this field remains speculative with few counter examples (e.g. some species of wildlife adapting to urban environments), requiring further empirical analysis [128].

With a growing trend in the number of chronic diseases and psychiatric disorders, costs to the U. K.'s National Health Service (NHS) could rise as the use of prescriptive drugs and medical interventions increases [129]. However, this anticipated trend is considered to be both undesirable and expensive to the already overwhelmed health care system [130]. In concurrence are the associated impacts on

health equity [131-132], equating to further productivity and tax losses every year in addition to a growing gap in health inequalities [133].

Furthermore, population growth in urbanized areas are expected to impact future accessibility to and overall loss of natural spaces. Not only would this have a direct detrimental effect on the health of both humans and non-humans, but equally the functioning and integrity of ecosystem services that sustain our economic productivity [134]. Thereby, costs of sustaining our human-engineered components of social-ecological systems could rise, having an indirect impact on our economic growth and associated pathways connecting to health [135-136]. As such, researchers have highlighted the importance of implementing all characteristics when accounting ecosystem services, particularly the inclusion of natural and health related capital, as well as their intervening mechanisms. This is an area which at present remains difficult to synthesize owing to fragmented studies from a host of disciplines that are more conceptually rather than empirically based [137].

## 6. Towards an interdisciplinary perspective of human and ecosystem health

Since the late 19th Century, a number of descriptive models have been developed to encapsulate the dimensions of human health and the natural environment as well as their interrelationships [17]. These include the Environment of Health [11], Mandala of Health [12], the Wheel of Fundamental Human Needs [13] and the Healthy Communities [14]. As VanLeeuwen et al [17] highlight in their review, each have not fully incorporated all relevant characteristics of ecosystems (e.g., multiple species, trade-offs and feedback loops, as well as the complex interrelationships between socioeconomic and biophysical environments). Further, the Bioecological systems theory model encapsulates the biopsychological characteristics of an evolving theoretical system for scientific study of human development over time [16,138]. However, the model has been suggested by some [139-140], to be static and compartmentalized in nature, emphasizing instead the importance of evolving synergies between biology, culture and technology.

More recently, the concept ‘One Health’ has gradually evolved and increased with momentum across various disciplines [15]. It is broadly defined as the attainment of optimal health across the human-animal-environmental interfaces at local, national and global levels. It calls for a holistic and universal approach to researching health, an ideology said to be traceable to pathologist Rudolf Virchow in 1858 [18]. Yet, the concept has received criticisms regarding its prominence towards the more biological phenomena (e.g., infectious diseases) than those of a social science and spatial perspective [18,141]. Some have therefore suggested its need to adopt an interdisciplinary approach to facilitate a deeper understanding of the complexities involved [13].

To address these limitations identified in the above models, a suggested conceptual model has been outlined below (Figure 1). It is both inclusive of all relevant characteristics of ecosystems, their continuously evolving synergies with human health as well as a balance between the biological, social and spatial perspectives. This is achieved through combining the perspective of the human-nature relationship, as summarized in section 2 of this review, with those human-centered components of health (physical, mental and social), as defined by the World Health Organisation in 1948 in section 3. It aims to facilitate a deeper understanding of the complexities involved for attaining optimal human health [19]. I will now describe the conceptual model.

[Figure 1 goes here].

**Figure 1** Interdisciplinary perspective of Human and Ecosystem Health (Image on the inside circle is by [142] with the background image, added text and embedded illustrations being the author’s own work).

Firstly, the outer circle is representative of ‘nature’ that both encompasses and interconnects with the three human-centered components of health (physical, mental

and social). Through this it emphasizes humanity's interrelationship with the environment. As identified in section 2 of this review, the human-nature relationship can be experienced through various biological, ecological, and behavioural connections. For instance, social, political and economic issues stemming from humanity's interactions affecting the natural environment (e.g., natural resources, environmental hazards, habitat management and restoration), as explored in subsections 2.3 and 2.4.

Secondly, the inner circle the three components of human health (physical, mental and social) are interconnected through a cohesive triangle to reflect their interdisciplinary and dynamic natures, as outlined in section 3. Further, this cohesive triangle acts on two levels. Firstly, as a single construct of health based on these components combined. Secondly, the underlying intervening mechanisms that sustain or inhibit health which can derive from each of these separately [108]. Thereby, it not only focuses on the outcomes or 'recuperative measure' of health, but also the source of such outcomes and their directions, as highlighted in section 4.2 [112].

The middle circle represents the interconnected relationship between humanity and the natural environment with relevance to human health (See section 4). This has been indicated by the two-way arrows and incorporates Gual and Norgaard [31]'s coevolutionary perspective between human adaptation and the natural environment. In this way, the relationship is continually interconnected via a two-way physical and perceptual interactions. These are embedded within three integrated systems (biophysical, biotic and cultural), with all humanity knows of the world comes through such mediums [31]. As such, the human-nature relationship goes beyond the extent to which an individual believes or feels they are affiliated with nature (e.g., biophilia concept). It can also be understood as, and inclusive of, our adaptive synergy with nature as well as our longstanding actions and experiences that connect us to nature.

Utilizing this developing conceptual model, methodological approaches can be employed from those research fields explored in this review, enabling a more

interdisciplinary framework. The characteristics, descriptions, implications and practicalities of this are detailed in table 2 below. The advantage of this is that a multitude of knowledge from both rigorous scientific analysis as well as collaborative participatory research can be combined bringing a greater depth to data collected [118]. This could be achieved through using more mixed-method approaches, and adopting a pragmatic outlook in research. In this way, both the true social, economic and political diversity of 'real life' as well as the optimal human health at the human-environmental interface can be identified. As such, a more multidimensional perspective of human health would be gained, knowledge which could be implemented to address those issues identified in section 5 (e.g., improving nature and health ecosystem service accounting). Nonetheless, adopting a pragmatic outlook brings its own challenges, as explored by Onwuegbuzie and Leech [143], with several researchers proposing frameworks that could be implemented to address these concerns [144-145].

**Table 2** A summarized overview of human and ecosystem health from an interdisciplinary perspective.

## 7. Summary and conclusion

One of the imperatives for this article is to review existing theoretical and research literature on the many ways that humans are linked with the natural environment within various disciplines. Although widely discussed across the main four research fields - evolutionary psychology, environmentalism, evolutionary biology and social economics – there has been comparatively little discussion of convergence between them on defining the human-nature relationship. This paper therefore attempts to redefine the human-nature relationship to bring further understanding of humanity's relationship with the natural environment from an interdisciplinary perspective. The paper also highlights important complex debates both within and across these disciplines.

The central discussion was to explore the interrelationships between the human-nature relationship and its impact on human health. In questioning the causal relationship, this paper addresses existing research on potential adverse and beneficial impacts in relation to humanity's degree of relationship to nature and lifestyle choices. The paper also acknowledged current gaps and limitations of this link relative to the different types of health (physical, mental and social), as characterised by the World Health Organisation in 1948. Most of these relate to research at the intersect of nature-based parameters and human health being in its relative infancy. It has also been highlighted that the reorientation of health towards a wellbeing perspective brings its own challenges to the already complex research base in relation to its concept, measurement and strategic framework. For a deeper sense of understanding and causal directions to be identified, requires further attention to the complexities of these aspects interlinkages, processes and relations.

Finally, a developing conceptual model of human and ecosystem health that is inclusive of the human-centered perspective, is proposed. It is based on an interdisciplinary outlook at the intersection of the human-nature relationship and human health, addressing the limitations identified in existing models. To achieve this, it combines theoretical concepts and methodological approaches from those research fields examined in this review, bringing a greater depth to data collected. In attempting this, a balance between both rigorous scientific analysis as well as collaborative participatory research will be required, adopting a pragmatic outlook. In this way, an interdisciplinary approach can facilitate a deeper understanding of the complexities involved for attaining optimal health at the human-environmental interface.

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## Competing Interests Statement

The author has declared that there are no competing interests.

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Table 1

| Research field | Type of connection | Description | Examples |
|---|---|---|---|
| Evolutionary biology | Cultural-genetic interaction (coevolution) | The interrelationship between two or more inherent systems (e.g., biophysical, biotic and cultural). Examples used in this review related to lifestyle and dietary choices.<br>Overlaps identified between the following research disciplines and fields: human health (See section 3), genetics, evolutionary studies, culture and social economic behaviours. | Lumsden and Wilson 1980 [25]; Boyd and Richerson, 1985 [27]; Cohen and Armelagos, 1984 [28]; Laland et al. 2010 [29]; Bloomfield et al. 2006 [30]; Gual and Norgaard, 2010 [31]; Simon, 1980 [32]; Nelson, 2006 [33]; Carrera-Bastos et al. 2011 [34]; and Powell, 2012 [35]. |
| Evolutionary psychology | Affiliation to nature | The instinctive aesthetic preference and value for nature. Examples used in this review related to people's feelings of connectedness to nature.<br>Overlaps identified between the following research disciplines and fields: evolution, mental health and wellbeing (See section 4.2) social and behavioural ecology, psychology, culture and human development. | Wilson, 1984 [44]; Naess, 1973 [40]; Pyle, 1978 [41]; Schultz, 2001 [42]; Mayer and Frantz, 2004 [43]; Howell et al. 2011 [45]; Ulrich, 1984 [46]; Gullone, 2000 [48]; Depledge et al. 2011 [49]; Joye and van den Berg, 2011 [50]; Orr, 1993 [51]; and Tuan, 1974 [52]. |
| Social economics | Economic-nature conflicts | The values of nature are counter intuitive with those values and actions of capitalism. Examples used in this review related to natural resource management.<br>Overlaps identified between the following research disciplines and fields: social economics, ecosystem accounting (See section 5) power relationships, conservation and resource management, affiliation to nature, and biophysical systems. | Relph, 1976 [55]; Hay, 2005 [56]; Glacken, 1967 [57]; Buckeridge, 2009 [60]; Small and Jollands, 2006 [61]; Hardin, 1968 [62]; Van Vugt, 2009 [65]; and Ostrom, 1999 [66]. |
| Environmentalism | Power relationships | Those power relationships exerted by both nature and humanity. Examples used in this review related to conservation behaviours and management of the natural environment.<br>Overlaps identified between the following research disciplines and fields: economic-nature conflicts, conservation management, social and cultural behaviours, social health (See section 4.3), affiliation to nature, and biophysical systems. | Radkau, 2013 [69]; Richards, 2003 [71]; Whited, 2013 [77]; Hodder and Bullock, 2005 [81]; Tidball, 2012 [82]; and Adger et al. 2009 [83]. |

Table 2

| | Characteristics | Description | Implications and Practicalities |
|---|---|---|---|
| Human Health (Inner circle) | Physical, mental and social health | The three components of human health (See section 3): physical, mental and social. | This acts on 2 levels: collectively and intervening mechanisms.<br><br>To identify and evaluate the sources, directions as well as outcomes of health. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include questionnaires, governmental and public datasets, behavioral observations, and physiological markers.<br><br>To enhance understanding and accounting of health capital, as well as intervening mechanisms. To use such knowledge to foster and support healthy lifestyles and communities. |
| Human-nature relationship (Middle circle) | Biophysical, biotic and cultural interaction | Describes humans' connections with the natural environment (Section 2) and the interrelationship between two or more inherent systems (e.g., biophysical, biotic and cultural).<br><br>These connections were explored and summarized from those four research fields which have paid most attention to studying the interface of humanity and the natural environment: evolutionary biology, evolutionary psychology, social economics and environmentalism. | This refers to a two-way relationship between human health and nature.<br><br>To identify and evaluate the sources, directions as well as outcomes of these 4 human-nature connections, using an interdisciplinary perspective. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include participatory research methods, governmental and public datasets, as well as systematic and thematic reviews. |

| | | | |
|---|---|---|---|
| | | | To enhance ecosystem services accounting, to be inclusive of natural and health related capital. To integrate nature-based activities into health care systems. To design human environments, social economic systems and 'power' relationships to be more in balance with nature. |
| Nature (Outer circle) | Nature in space, nature of space and natural analogues | Describes humanity's exposure to nature and experience categories which relates to natural materials and patterns experienced in nature, both visually and non-visually (See sections 4 and 5). | Exposure refers to those visual, multisensory or by active engagement.<br><br>To identify and evaluate the sources, directions as well as outcomes of exposure to nature. To measure these through both objective and subjective indicators, using a mixed method approach. Examples include interviews, governmental and public datasets, and questionnaires.<br><br>To enhance understanding and accounting of natural capital, as well as intervening mechanisms. To include such knowledge in human practices (e.g., public policies) and design. |

# **Appendix 7** – First authored paper (b)

**Title:**

Exploring Engagement Characteristics and Behaviours of Environmental Volunteers

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**Abstract**

Environmental volunteering and environmental citizen science projects both have a pivotal role in civic participation. However, one of the common challenges is recruiting and retaining an adequate level of participant engagement to ensure the sustainability of these projects. Thus, understanding patterns of participation is fundamental to both types of projects. This study uses and builds on from existing quantitative approaches used to characterise the nature of volunteer engagement in online citizen science projects, to see whether similar participatory patterns exist in offline environmental volunteering projects. The study uses activity records of environmental volunteers from a UK environmental charity 'The Conservation Volunteers', and focuses on three characteristics linked to engagement: longevity, frequency and distance travelled. Findings show differences in engagement patterns and contributor activity between the three UK regions of Greater London, Greater Manchester and Yorkshire. Cluster analysis revealed three main types of volunteer engagement profiles which are similar in scale across all regions, namely participants can be grouped into 'One-Session', 'Short-Term', and 'Long-Term' volunteer. Of these, the 'One-Session' volunteer accounted for the largest group of volunteers.

**Keywords:**

environmental volunteering, volunteer engagement, typologies, participatory patterns.

## Introduction

Environmental volunteering refers to the practice of unpaid volunteers spending time engaging in a wide range of practical conservation and outdoor-based activities, including pond weeding, dry stone walling, and coppicing trees (Bruyere and Rappe 2007). Examples include environmental volunteering or certain Non-Governmental Organisations (NGO) projects (e.g., the Burrenbeo Trust in Ireland). Environmental volunteering shares some parallels with environmental citizen science projects, as each engage members of the public in activities that help contribute to the conservation and restoration of natural environments (Roy et al. 2012). What distinguishes these two practices is the types of activities they engage in. Whilst in environmental citizen science projects volunteers typically collect data about the environment (e.g., number of species identified) in partnership with scientists, environmental volunteering project staff work with their volunteers to restore the environment through practical conservation activities (e.g., days spent coppicing trees).

Environmental volunteering and citizen science projects both play a pivotal role in civic participation and require a continuity of volunteers to sustain their practices (Reed and Selbee 2001; Mohan and Bulloch 2012; Chu et al. 2012). For both types of projects, recruiting and retaining an adequate level of participant engagement to ensure long term sustainability of project activities is challenging (Hyde et al. 2016). Therefore, developing a volunteering or citizen science project that matches both the motivations and engagement levels of participants can be important for increasing and sustaining the level of long-term contribution (Chu et al. 2012).

The last 10 years have seen an increase in the use of computerised databases and online platforms by both environmental volunteering organisations and citizen science projects. For the context of this study, we first describe two broad types of computerised databases and online platforms used in citizen science projects--1) online and 2) information and communication technology (ICT)-dependent—and then compare them to those used in environmental volunteering.

Online projects are those in which participants volunteer their efforts and abilities while working in networked environments on tasks that cannot exist offline (Liu and Ram 2011; Balestra et al. 2016). These projects are also known as "Citizen Cyberscience" (Grey 2009). Information on volunteers and their activities in these projects are recorded through their transaction log data as they engage directly with computerised databases and online platforms. Examples include Volunteer Thinking Citizen Science Projects (e.g., Snapshot Serengeti, Galaxy Zoo, Wikipedia), in which participants volunteer their cognitive abilities and classify information or images to help scientists and researchers solve research problems (Nov et al. 2011; Ponciano and Brasileiro 2014).

ICT-dependent projects are designed to actively involve volunteers in data collection as part of a scientific enquiry, using smartphones or an online system (Silvertown et al. 2015; Boakes et al. 2016). The volunteers might be in a situation where they have no Internet connection (e.g., in a remote location in a national park); in this case, the activity supports the recording of information offline which is later uploaded through the use of smartphones or websites, such as iSpot (Silvertown et al. 2015). Information about volunteers (e.g., identification codes) and their associated activities in these projects (e.g., data collected about species) are collected in a similar way to online projects, via online databases and mobile platforms. Examples include projects in which observers collect data to report on a local phenomenon which is then used for multiple purposes, including estimation of species trends or measurement of noise and light pollution levels in different neighbourhoods. Like online projects, engagement patterns of those who volunteer in ICT-dependent projects can be analysed using a log of volunteers' activities.

By contrast, in environmental volunteering projects internally created online databases are used to manage volunteers' activities which all occur offline, and volunteers do not engage directly with ICT tools or the data-collection process. Information about volunteers (e.g., volunteering sites, regions, and projects attended) and their associated activities (e.g., number of days and tasks contributed) are collected by the project's staff and stored in an online database. Volunteer data collected is often used by project staff to report back to project funders to review

volunteering project deliverables. Research that addresses participation in these projects has to date used national governmental surveys, which explore the total amounts of charitable giving and participation in civic engagement (Reed and Selbee 2001; Mohan and Bulloch 2012).

Using information collected about volunteers (e.g., identification codes) and their associated activities (e.g., tasks undertaken), researchers have begun to evaluate the activities of volunteers to identify participatory patterns in online and ICT dependent citizen science projects. One example found in citizen science research is Participatory Inequality, in which highly differentiated patterns of contribution are recognized amongst the volunteers (Nielsen 2006; Haklay 2016). Identifying volunteers' engagement characteristics and behavioural patterns has been achieved using both exploratory (graphic and non-graphic descriptive data summaries) and confirmatory (traditional statistical tools of inference, significance, and confidence) techniques. Such knowledge has been valuable in assisting practitioners in citizen science fields in their understanding, recruitment, and retention of individuals who engage in their activities. However, this remains an understudied area in volunteering research, with no studies to date using these approaches to characterise the nature of engagement in volunteering projects. Thus, knowledge about volunteering engagement would be considerably valuable in helping practitioners in the volunteering field in areas of project design and management.

This study applies and builds on existing quantitative approaches used to characterise the nature of volunteer engagement in online and ICT dependent projects. By using similar analytical methods, comparisons could be made to identify whether similar participatory patterns exist in environmental volunteering projects. Despite differences in their activities, it is reasonable to expect that some parallels can be drawn between environmental volunteering and environmental citizen science projects, with each of these projects engaging members of the public in activities that help contribute to the conservation and restoration of natural environments. In particular, we explore the engagement characteristics and contributing behaviours of volunteers who engage in environmental volunteering activities managed by the UK charity, The Conservation Volunteers (TCVs), using

volunteer data extrapolated from their online database. Described as one of the UK's largest environmental volunteering charities, TCV share some similarities with online and ICT dependent citizen science projects in relation to the types of volunteer information data they collect (e.g. number of tasks completed).

*Characteristics of engagement in volunteer and citizen science projects*

In the last decade, the study of engagement has gradually emerged in both volunteering and citizen science research literature. The subject of engagement itself has been studied widely across other disciplines and includes user (Chapman 1997), work (Kahn 1990; Maslach 2011), and student engagement (Newmann 1992; Garrett 2011).

The term "engagement" has no generally agreed upon definition or conceptual framework. Instead, it is broadly defined and oriented towards the research field that is being studied. For instance, in studies on user engagement, the term has been defined loosely as "a process and product of interaction" in which its degree of intensity can alter with time depending on a host of factors, including attention, aesthetics, challenges, feedback, and motivation (O'Brien and Toms 2008). By contrast, work engagement centres on an employee's cognitive connection to their work and is said to be persistent in the event of challenges encountered. Within each of these study fields, there are two types of engagement: Attentional (intensity or degree of involvement and duration expenditure) and emotional (perception, motivation, cognitive, and experience) (Maslach 2011). In this study, we focus on attentional engagement, referred to here as the interaction or behaviour presented by a volunteer in relation to the project in which they engage. These behaviours can be used to understand a volunteers' level of engagement and are an area of limited yet valuable research amongst the volunteering sector with regards to volunteer recruitment and project management (Reed and Selbee 2001; Mohan and Bulloch 2012).

Often employed in user engagement research for website design, attentional engagement can be derived from a person's engagement characteristics (e.g., click-through rates, page views, and time spent on a web site). These can be measured

through a series of metrics (e.g., length, frequency, and geographical location of activity), with those characteristics being evaluated according to what information is obtainable or required. Researchers have begun using this approach to evaluate the attentional engagement of volunteers who engage in online and ICT dependent citizen science projects, using information collected about volunteers (e.g., identification codes and tasks contributed) via computerised databases and online platforms (Ponciano and Brasileiro 2014). A similar type of data about volunteers' attentional engagement is also being collected by some volunteering projects (e.g., The Conservation Volunteers), which has the potential to be used to characterise the nature of volunteer engagement within the volunteering sector.

This study used the following engagement characteristics: Longevity, frequency, and distance travelled. These characteristics were previously evaluated in online and ICT dependent citizen science projects (e.g. Tulloch and Szabo 2012; Ponciano and Brasileiro 2014; Boakes et al. 2016) and were selected for the current research owing to their importance to the sustainable management and design of environmental volunteering projects.

Longevity is the length of time that a person continues to be involved in volunteering and citizen science activities. Research has long shown much variation in the length of time that a person commits to engaging in volunteering and citizen science activities relating to a number of internal and external factors including intrinsic motivation, time availability, and type of volunteer project (Macduff 2005; Nov et al. 2011; Dunn et al. 2016). Understanding volunteers' longevity behaviours is important for overall project management in relation to the sustainability and continuity of their practices, adequacy of recruitment and retention, and the allocation of resources (e.g., equipment and training) (Nov et al. 2011; Chu et al. 2012).

Frequency refers to the regularity of a person's involvement in volunteering and citizen science activities. Online user engagement research commonly measures a person's level of involvement in an activity. The higher a person's level of involvement in an activity, the more engaged they are considered to be. This

measurement is important from a project management perspective, particularly when planning for regular activities (e.g., weekly or monthly) or single events (Ponciano and Brasileiro 2014).

Finally, distance travelled measures the distance that a person travels to a volunteering or sample site from a starting location. In the context of this study, we refer to distance travelled as the distance that a volunteer travels to a volunteering project from their place of residence. Unlike most citizen science projects where volunteers can choose to do an activity either from home or in close proximity (depending on the project), environmental volunteering projects are organised group sessions that often occur for an entire day in set locations which require volunteers to travel. To date, no studies in volunteering research have looked into patterns of distances travelled; instead, they have identified the importance of distances travelled to a person's willingness to engage in environmental volunteering activities (Pope 2005; O'Brien et al. 2008; Tulloch and Szabo 2012). Potential barriers include insufficient public transport, car accessibility, and reimbursement of transport costs (Pope 2005; Tulloch and Szabo 2012). Nonetheless, such knowledge is of particular importance to project managers in both environmental volunteering and citizen science projects to assist in identifying funds for volunteers' travel reimbursement, selecting locations to hold volunteering sessions or data collection surveys, and to organise travel arrangements if required (e.g., minibus or car sharing).

*Related work and existing gaps in knowledge*

Characterising volunteer's motivations that can underlie their engagement has a wide literature base in volunteering and citizen science research, examining both qualitative (e.g., questionnaires) and quantitative dimensions (e.g., measurement indexes). Previous research has touched on many areas including motivations to volunteer (Clary and Snyder 1999); the linkage between volunteer role and self-identity (Stryker 1980); comparing the relationship between volunteer motivation and project contributions (Nov et al. 2011; Balestra et al. 2016); individual trait-based characteristics of those who choose to volunteer (Davis Smith 2005); and task or activity preferences (Willems and Walk 2013). Studies have revealed how factors

of personality characteristics, team affiliation, social enjoyment, types of volunteering projects, current life situations, and personal motivations can predict a person's initial and ongoing involvement in volunteering activities. Yet, whilst these findings provide useful insights into volunteers' underlying motivations for project engagement, more research is needed which focuses on project management and adaptability to levels of volunteer retention in order to help strengthen their practices. This is particularly important in volunteering fields where there has been limited empirical research.

Studies in volunteering research which have focused on the engagement behaviours of volunteers include exploring the total amounts of charitable giving, volunteering and participation in civic engagement, and analysing associations between civic engagement and religiosity (Reed and Selbee 2001; Mohan and Bulloch 2012). Quantitative methods used in each of these volunteering studies were descriptive (e.g., percentage proportions and total counts) and derived from governmental surveys based on subsamples of the national population. In each of these studies researchers found that few volunteers contributed the majority of UK volunteering activities, findings that resonate closely with patterns of participatory inequalities identified amongst online and ICT dependent citizen science projects (Haklay 2016). Further, the study of Mohan and Bulloch (2012) which explored the socio-demographic backgrounds of highly contributing volunteers found that they were most largely from prosperous, middle-aged, and highly educated sections of the UK population. However, findings from volunteering studies remain largely generalised in scope and have not yet fully explored the different types of volunteer engagement characteristics or volunteering projects, nor have they cross-examined these patterns amongst urban-rural population density distributions. Such knowledge would help to identify variability in volunteers' engagement patterns as well as any relating factors (e.g., level of engagement, type of volunteering project, and transport mobility).

Research on engagement behaviours of volunteers has also emerged in the field of human computation, in particular Volunteer Thinking projects (e.g., Zooniverse, SETI@home, and The Milky Way Project). Existing studies in this area include analysing the contributing activity of volunteers (Neis and Zipf 2012),

understanding volunteers' recording behaviours in species monitoring (Boakes et al. 2016), characterising volunteer engagement (Tulloch and Szabo 2012; Ponciano et al. 2014), and volunteer engagement profiling (Ponciano and Brasileiro 2014). The studies use various quantitative analytical approaches (e.g., descriptive statistics and cluster analytical approaches) to evaluate the activity logs of volunteers who engage in online and ICT dependent citizen science projects. These studies reveal how these analytical approaches can be used to identify volunteers' contributing behaviours and engagement patterns in these projects. For instance, Ponciano and Brasileiro (2014) used a clustering analytical approach to identify engagement profiles of volunteers, grouping volunteers according to similarities and dissimilarities between their engagement characteristics. This inductive analytical inquiry is a commonly used technique for classifying information data into categories or groups that share similar characteristics and is used where no previous knowledge of these categories or groupings exists. Whilst the analytical approaches in these studies have been used to explore citizen science projects specifically, there is scope for these methods to be applied in other related or nearby fields (e.g., volunteering) who wish to explore people's engagement for project management purposes.

## Methodology

To examine the engagement characteristics and profiles of those involved in environmental volunteering, we used descriptive and cluster analytical approaches, implementing significance testing where possible. These analytical approaches were conducted from June to December 2015 to assess the characteristics (e.g., longevity) that form the basis of volunteers' engagement profiles using information from the UK environmental charity, The Conservation Volunteers (TCV).

### *Data Source*

Described as one of the UK's largest environmental volunteering charities, TCV has engaged people from diverse backgrounds and abilities who have taken part in various practical conservation projects since it was established in 1959. In this study, we focus on the charity's larger and more well-known projects, the Action Teams. This project was established when the charity was initially set up and engages

environmental volunteers in practical conservation work, including pond weeding, dry-stone walling, and coppicing trees. Despite differences in types of activities, environmental volunteering projects share goals with many environmental citizen science projects, as each engage members of the public in activities that help contribute to the conservation and restoration of natural environments (Roy et al. 2012). TCV was selected as a case study project to identify whether participatory patterns in environmental citizen science projects exist in environmental volunteering projects. Findings observed in this study may be applicable to both environmental volunteering and citizen science projects in areas of project design and management.

In 2001, the charity was one of the first in its field to develop an online database initially as a simple volunteering tracking system in Northern Ireland. Its information functionality and requirements have been shaped by TCV's management approach and work context. Since then, the database has evolved into a complex national volunteer project management tool, storing a total of 222,605 records of volunteers who collectively have undertaken 241,990 conservation tasks over 12 UK geographical regions. The information in the system was collected by TCV staff using both paper and online forms to record volunteer's information (e.g., socio-demographics, TCV sites, regions, and projects attended) as well as their activities (e.g., number of days and conservation tasks contributed) usually after the activity ended. Much of the data collected about volunteers and their activities are similar to the types of volunteer data collected in online and ICT dependent citizen science projects.

To calculate the characteristics (longevity, frequency and distance travelled) previously identified as being important for measuring engagement patterns in environmental volunteering projects, we selected the following data items: volunteer identification code, region identification, site identification, total active days, start and end dates of volunteering, and postcodes of volunteer's places of residence and TCV sites attended. This enabled us to explore engagement characteristics and contributing behaviours of volunteers who engaged in TCV projects. Further, due to

the scale and volume of volunteer records, the study was based on all volunteers registered from January 2010 to December 2013.

The analysis focused on the following volunteering regions: Greater London (n=6690), Greater Manchester (n=810), and Yorkshire (n=2871). We analysed these three regions to identify any influences of population density distributions in rural (e.g., Yorkshire) to urban areas, differences in mobility potential (e.g., public transport services), and as cross-examination between relatively similar urban regions (e.g., Greater London and Manchester). All volunteer information was both confidential and anonymised in line with ethical practices and a data sharing agreement with TCV. No personal or sensitive information was used in the analysis, including gender, ethnicity, and economic status.

*Data analysis*

Data analysis consisted of two main parts; first, engagement characteristics and contributor activity, and second, volunteer engagement profiles. All statistical analysis was performed using R Version 3.1.1 (R Core Team 2014) and all spatial analysis was conducted using ArcGIS (Version 10.1).

Engagement characteristics and contributor activity of volunteers was identified and assessed as follows. First, exploratory data analysis, both graphical (bar graphs) and non-graphical (descriptive tables, ratio proportions, and percentages) was used to reveal and visually represent the underlying features of the dataset in relation to the following: numbers of volunteers, net annual changes in volunteer numbers, length of time volunteering, number of volunteering sessions attended, number of days between sessions, proportion of "One-Session" to "Multi-Session" types of volunteers, and their individual contributions to overall volunteering activities. Second, confirmatory data analysis was used to assess relationships and differences among geographical regions, year of analysis, and TCV sites. This was carried out using a series of a 2-Way ANOVA (with replication) statistical tests on the following data information (Dytham 2011); volunteering numbers and number of volunteering sessions (also referred to as activities).

Volunteer engagement profiles were identified using engagement metrics and clustering algorithms described by Ponciano and Brasileiro (2014), which analysed

engagement patterns of those who participated in Volunteer Thinking projects that are part of the Zooniverse. Unlike Ponciano and Brasileiro's (2014) analysis, the current study includes volunteers who attended only one volunteer session. This was to ensure a full analysis of all volunteers that 'engage' in volunteering activities and their engagement characteristics could be made and understood (Rochester 2006).

Three of the four engagement characteristics defined by Ponciano and Brasileiro (2014) were used: Activity Ratio, Relative Activity Duration, and Variation in Periodicity. Such characteristics are particularly useful for understanding a volunteer's level of productivity, attendance frequencies, and length of time spent volunteering. Activity Ratio is the number of days that a volunteer was active divided by the total days they are linked to the volunteering project, i.e., all of the days between the first and last days of engaging in volunteering activities. A volunteer was considered to be active if they attended at least one session. Relative Activity Duration is the ratio between the numbers of days that a volunteer was active divided by the overall study observation period in days. Finally, Variation in Periodicity is the average number of days elapsed between two sequential days that an individual was active divided by the total average number of days elapsed between active days of all individuals. Engagement metrics were then normalised to span 0 to 1 using the following normalisation scaling formula where *x* is the engagement metric and *i* is the volunteer:

$$X_{i=\frac{x_i - x_{min}}{x_{max} - x_{min}}}$$

In addition to the three engagement characteristics outlined above, distances travelled by volunteers was included in the engagement profiling method. This was calculated using ArcGIS. Volunteer's place of residence and TCV sites were first geocoded using Code-Point® Open dataset and ESRI's World Street base map data. As 2,896 (27.9%) of volunteer postcodes for their places of residence were either missing or incorrect, the analysis was based on a total of 7,475 volunteers for the three regions, Greater London (n=4887), Greater Manchester (n=624), and Yorkshire (n=1964). Using OS Master Map® Integrated Transport Network Layer dataset (Version 09/2015), we calculated the shortest distance (in miles) between

each volunteer's places of residence and TCV volunteering sites, approximating the distance travelled by volunteers using the shortest route between locations inclusive of roads (Zhu et al. 2013). This ensured a higher degree of accuracy than the Euclidean (straight line) distance, taking account for actual street network structures (e.g., bridges, rivers, and road networks) that can affect volunteer's distances travelled and time investment (Nicoară and Haidu 2014). This is particularly important in London, where a short distance across the river can be translated to a much longer travel time on the road, due to the limited number of bridges. Following this, we identified behavioural profiles of volunteers who exhibited similar engagement characteristics using a clustering analytical approach (Ponciano and Brasileiro 2014). This inductive analytical inquiry is a commonly used technique for classifying information data into categories or groups that share similar characteristics, and is used where no previous knowledge of these categories or groupings are known. Firstly, the hierarchical cluster analysis using the R package "cluster" (Maechler et al. 2015) was applied to understand the grouping of volunteers using Ward's Minimum Variance method to estimate the observed similarities and dissimilarities between volunteer's engagement metrics. This enabled the datasets to be organised into distinguishable grouped clusters where no predefined number had been selected (Fielding 2007). Drawing on this, the within-group sum of squares by the number of clusters for each dataset region was then plotted to identify the number of grouped clusters. K-Means clustering approach was then applied to partition data points into the *k* number of groupings selected, which sorted data values according to the nearest mean at each cluster's centre (Wagstaff et al. 2001). An Averaged Silhouette Width (Hennig 2015) was then used to validate the numbers of clusters selected and evaluate each cluster's degree of tightness and separation (Rousseeuw 1987). Those scores equal to or larger than 0.51 were used as a reference to indicate sufficient partitioning. In addition, Spearman's rank correlation coefficients were used to observe whether relationships could be identified between each of the engagement metrics that would further explain volunteer engagement profiles.

## Results

*Volunteer characteristics: Total volunteering numbers and retention levels*

We calculated the total numbers and retention levels of TCV volunteers from January 2010 to December 2013 (See Table 1). First, the total number of volunteers from each of the three geographical regions varied widely. Greater London presented the highest overall volunteer population (2539 to 724) by comparison to Greater Manchester (237 to 178) and Yorkshire (907 to 592). From this, the percentage of each region's volunteering population size relative to the TCV's overall volunteering population (6989 to 3693) was calculated as follows; Greater London (19.6 - 36.3%), Greater Manchester (2.7 – 4.8%) and Yorkshire (10.8-16%). Further, there were no stable trends in volunteering numbers across sites, instead being quite variable. Similarly, there were no differences in volunteering numbers between months throughout the year.

Volunteers' yearly retention levels differed across each region presenting no clear trends. In general, volunteering numbers increased from 2010 to 2012, with decreases occurring across all regions between 2012 and 2013. The Greater London region accounted for most of these yearly changes in volunteering numbers, having the highest retention levels. By comparison, Greater Manchester and Yorkshire have lower retention levels.

In summary, there were no clear trends in volunteer numbers across all three regions, both yearly and between individual volunteering sties. Greater London exhibited the highest volunteer population and retention levels, compared to the other two regions. Further, seasonal variability shows no bearing on volunteer numbers, with the volunteering site having more of an impact.

*Volunteer characteristics: Longevity, frequency, and distance travelled*

We calculated the total length of time that volunteers were actively engaged (longevity) in volunteering activities as well as the number of volunteering sessions they attended (frequency) for each region. The total length of time that volunteers were actively engaged varied from 1 day to up to 3 years. We also observed differences in the number of sessions volunteers attended and the amount of time

that lapsed between these sessions. Overall, findings showed similar trends in longevity and frequency characteristics across all geographic regions (See Figures 1 and 2), with a higher number of volunteers engaging in one volunteering session. Ratio proportions of “One-Session” to “Multi-Session” volunteers varied. The overall value for the UK was 18:7 which differed to Greater London (5:1), Greater Manchester (3:2), and Yorkshire (1:1). Overall, participatory patterns across all regions revealed that a small percentage of “Multi-Session” volunteers contributed the most to volunteering activities, with a larger proportion of “One-Session” volunteers contributing the least. For instance, of the 207,671 total volunteering activities for all UK regions (Table 2), 89.1% were conducted by “Multi-Session” volunteers, who make up 27.6% of the total volunteers. This participatory pattern of “Multi-Session” volunteers is similar across each in the regions: Greater London 11.1% of volunteers contributed 95.6% activity, while in Greater Manchester 39.5% contributed 80.4% of activity, and in Yorkshire 33% contributed 96.7% of activity. Findings showed that the numbers of volunteers decreased with increasing distances travelled. These trends were replicable between both ‘One-Session' and ‘Multi-Session' volunteers, with the majority living within a 20-mile distance of the TCV site they attended. Overall estimated distances travelled by volunteers for each region were as follows: Greater London about 32 miles, Greater Manchester about 36.5 miles, and Yorkshire about 42.3 miles. Findings also showed that in the two urban regions most volunteers (Greater London 79.9 %, Greater Manchester 85.56%) lived within a 5 to 20-mile distance from the TCV site they attended. By contrast, most volunteers (62.05%) in Yorkshire lived within close proximity of up to 5 miles from the TCV sites they attended. These findings were consistent whether a volunteer attended one or multiple sessions, as illustrated in Table 3.

To summarise, similar trends were observed in longevity and frequency characteristics across all geographic regions, with a large proportion of volunteers engaging in one volunteering session. Additionally, participatory patterns across all regions revealed that a small percentage of volunteers contributed the most to volunteering activities, with a larger proportion contributing the least. Finally, most

volunteers lived within a commutable distance of the TCV site they attended, with few travelling from further distances.

*Volunteer engagement profiles*

A clustering analytical approach identified engagement profiles of volunteers, grouping volunteers according to similarities and dissimilarities between their engagement characteristics. This analytical approach reveal three distinguishable profiles of volunteers termed as One-Session, Short-Term, and Long-Term. These were shown to be the number that best optimised the trade-offs between the number of groups and the within-group sum of squares. This was validated in Averaged Silhouette widths, with scores above 0.51 indicating sufficient partitioning of the clustered groupings (Greater London 0.58; Greater Manchester 0.55; Yorkshire 0.57). Table 4 shows the general descriptives of the three regions' engagement metrics subdivided into profile types as defined by Ponciano and Brasileiro (2014). In general, the average number of days that volunteers were active during the time they volunteered (Activity Ratio) were moderate to high across all regions, as indicated in means, medians and quartiles. The length of time that volunteers actively engaged in environmental volunteering activities (Relative Activity Duration) tended to be longer in Greater Manchester, with a higher proportion volunteering for a short duration. Further, the number of days elapsed between each volunteering session (Variation in Periodicity) shows a slight variability between regions, as indicated in the range. For instance, volunteers in Yorkshire attended sessions less frequently than that of volunteers in urban regions (e.g., Greater Manchester). In addition, the mean average distance travelled is relatively similar across each region with most volunteers living within a proximity of up to 10 miles to the TCV sites they attend.

Volunteer's engagement profiles (see Table 5) are outlined below.

**One-Session volunteer***:* These volunteers accounts for the largest proportion of the volunteer population, travelling the least distance and committing the shortest amount of time.

**Short-Term volunteer**: These volunteers had a profile type mid-way between the other two.

**Long-Term volunteer**: These volunteers represented the smallest proportion of the volunteering population, travelling the furthest distance and committed the longest amount of time to the organisation.

Regions differed in engagement characteristics. In general, activity ratios were relatively similar in Greater London and Manchester, with volunteers being active for shorter periods than those in Yorkshire. Marked differences was also observed in the time elapsed between the number of volunteering sessions attended (periodicity) by volunteers as well as in their distances travelled. This suggests that each of the profile types have a variable range with noticeable distinctions between those more urbanised regions (e.g., Greater London and Manchester) to those semi-urban and rural (e.g., Yorkshire). Further, there is a noticeable gradient in engagement metrics across each engagement profile. This is supported by a series of Spearman's rank correlation coefficient (as data presented a non-normal distribution) where a statistical significance was observed between each of the four engagement metrics ($p < 0.001$).

Numbers and percentages of volunteers classified in each engagement profile grouping are shown in Figures 3 and 4. One-Session volunteers make up the largest group of volunteers, with Long-Term volunteers being the smallest, and is a pattern present across all regions.

In summary, there were clear distinctions between those more urbanised regions to those semi-urban and rural, with volunteers from urban regions (e.g., Greater London) being more actively engaged in volunteering activities for longer periods than those in semi-urban and rural areas (e.g., Yorkshire). Further, we identified three types of volunteer engagement profiles that are similar in scale across all regions. Volunteer engagement profiles presented a distinct gradient in their engagement characteristics, with 'One-Session' and 'Long-Term' being on opposite ends of the spectrum.

## Discussion

Overall, this study demonstrates that descriptive and clustering analytical approaches used to characterise the nature of volunteer engagement in online and ICT dependent projects were applicable to TCV's volunteering dataset.

Comparisons could be made to identify whether similar participatory patterns (e.g., Participatory Inequality) exist in environmental volunteering projects, discussed further below. In addition, this study showed the potential for alternative measures of volunteer's engagement (e.g., distances travelled) to be incorporated into future assessments, both in environmental volunteering and citizen science projects. Such analytical approaches could therefore be viewed as valuable in assisting practitioners in both environmental volunteering and citizen science fields in their understanding, recruitment, and retention of individuals who engage in their activities. Knowledge gained from this analytical approach could help to increase long-term sustainability and design of environmental volunteering and citizen science projects and bring them in alignment with volunteer's engagement typologies and overall participatory patterns (Chu et al. 2012).

Our findings presented differences in yearly retention levels and longevity behaviours of volunteers between the three UK regions examined. Of these, Greater London exhibited both a higher volunteer population as well as those engaging in volunteering activities over a longer duration. Several factors might explain this trend, including population density, social factors, and project organisation (Ryan et al. 2001). By understanding volunteers' population size and longevity behaviours, project staff overseeing environmental volunteer and citizen science projects can be better equipped in organising resources required (e.g., equipment) as well as planning which tasks to undertake and how many (e.g., practical conservation activities and data collection), thus strengthening the continuity of their practices.

In relation to the ratio proportions of "One-Session" and "Multi-Session" volunteers and their associated contributions to volunteering activities, a common trend was identified across all regions in which a few volunteers contributed the most and many volunteers contributing the least, demonstrating that "participation inequality" is happening in environmental volunteering as well as in citizen science projects and online web platforms, e.g., OpenStreetMap and Wikipedia (Liu and Ram 2011; Neis and Zief 2012; Tulloch and Szabo 2012; Ponciano and Brasileiro 2014). This suggests that participation inequity is present not only in online social media or citizen science initiatives but also in offline environmental volunteering projects.

Such information is important for the project management of environmental volunteering and citizen science projects and can be useful in relation to planning the frequency of sessions (e.g., weekly or monthly) and the type or length of time allocated to a task (e.g., single event or ongoing project) (Ponciano and Brasileiro 2014).

Considering the distance travelled in both environmental volunteering and environmental citizen science projects, our findings showed that the majority of volunteers lived within a 20-mile distance of TCV sites, with fewer travelling farther distances. These trends were replicable between both "One-session" and "Multi-Session" volunteers, with slight noticeable differences between regions. Similarly, the proportion of volunteers decreased with increasing distance travelled, with those in Yorkshire travelling farther than those in the other two regions. Possible explanations include the improved mobility potential in large urban areas such as public transport services (Pope 2005). In addition, vehicle ownership, financial resources, and the lower number of volunteering opportunities in areas with a lower population density can influence the distance travelled (O'Brien et al. 2008; Tulloch and Szabo 2012). Such knowledge can be valuable to project managers in both volunteering and citizen science projects when selecting locations to hold volunteering sessions or data collection surveys, and suggests the need to choose sites that maximise volunteer numbers for the purpose of the volunteering activity. Further, knowing how far volunteers travel to a site can assist project managers when allocating financial resources (e.g., travel reimbursement) as well as when organising travel arrangements (e.g., minibus or car sharing) for those travelling from further distances, if required.

Volunteer engagement profiles were identified using a clustering analytical approach, grouping volunteers according to similarities and dissimilarities between their engagement characteristics. Such approach is commonly used where, as for the case with this study, no previous knowledge of these categories or groupings were known. This approach indicated there to be three main profile types of similar scale across all three regions; 'One-Session', 'Short-Term' and 'Long-Term'. This suggests there to be a general consistency in profile types with no marked regional

variation, and are similar to those identified in related studies. We will now summarise these profiles more fully below.

Firstly, ‘One-Session’ volunteer accounting for the largest group of volunteers, travelling the least distance and committing the shortest amount of time. Findings concur with similar studies in existing citizen science (e.g. Boakes et al. 2016) and volunteering projects (e.g. Holmes 2014; Hyde et al. 2016), providing further evidence on the emerging shift in engagement patterns towards those more causal and episodic (Rochester 2006). Suggested explanations for this trend include time availability and motivations (Clary and Snyder 1999; Davis Smith 2005; Rochester 2006; Balestra et al. 2016).

Secondly, those classified as ‘Short-Term’ have a profile type mid-way between those ‘One-Session' and ‘Long-Term’. This transition was also identified by Cnaan and Amrofell (1995) who suggested there to be no distinctions between volunteer typologies (e.g. one-off versus ongoing volunteer typologies). Instead they proposed a gradient or continuum of typologies, with those classified episodic and causal being placed at the lower end of the spectrum committing the least amount of time. Very few studies (Rochester 2006; Ponciano and Brasileiro 2014) have described this profile type, placing more emphasis on those episodic or long-term. In this way, it can only be assumed that the ‘Short-Term’ volunteer is a combination or overlap of the proceeding profiles by variable degrees, with further research still required.

Finally, those classified as ‘Long-Term’ volunteers represented the smallest proportion, travelling the furthest distance and committed the longest amount of time to the organisation. These volunteers presented engagement characteristics that closely resemble those which have been described as the ‘classic’ typology, who have a high level of unconditional dedication and a strong sense of affiliation with the organisation they volunteer with (Hustinx and Lammertyn 2003). Similar findings have also been identified in other studies (Boakes et al. 2016).

By understanding volunteers’ engagement profiles, environmental and citizen science project staff can tailor their projects to both meet their project requirements (e.g., practical conservation tasks or data to be collected) and volunteers’ level of

engagement, which may help to increase volunteer participation. Further, a knowledge of how and in what ways volunteers engage in environmental volunteering and citizen science projects not only helps us to understand how these projects can increase their contribution to conservation and restoration of natural environments, but increases our understanding of how these projects are important to people.

*Study limitations and future research*

In terms of future research directions, we would highlight the following issues. Firstly, though this study is able to characterise the nature of engagement in environmental volunteering projects, such quantitative analytical method fails to provide some further contextual explanation behind these volunteers' patterns of engagement (e.g., motivations to volunteer). There is therefore a need to use complementary forms of qualitative methodological approaches (e.g., interviews and observations) in conjunction with quantitative approaches to provide a more in-depth understanding of volunteer engagement. Such mixed methods would allow for multiple perspectives, identifying not only the magnitude and frequency of volunteers' engagement patterns, but examining the meaning and understanding behind its occurrence (Bryman 2012).

Secondly, whilst figures calculated for volunteer's shortest distance path travelled served as a good estimate of distances travelled, the study does not include the mode of transport in which a volunteer has travelled. Yet, as findings suggest distance travelled to be associated with a volunteer's level of engagement, it is recommended that future research in this area implement these factors to ensure a more accurate assessment of volunteer's travelling distance.

Thirdly, whilst engagement profiles observed were case specific to those that attended TCV, similar more generalised findings on differentiated patterns of contribution also have been identified in existing volunteering research (Reed and Selbee 2001; Mohan and Bulloch 2012). This suggests that these findings could be extendable. Further work is therefore needed to understand whether the profile

types, scales (e.g., individual, regional, and national) as well as their proportional structures over time are attributable to other volunteer organisations. Further research would provide a more in-depth understanding of volunteering typologies to help organisations adapt and accommodate their volunteering opportunities to existing trends in recruitment and retention.

## Conclusion

This study demonstrates that the quantitative analytical approaches used to characterise the nature of volunteer engagement in online and ICT dependent projects were applicable to TCV's volunteering dataset as well as the potential for alternative measures of volunteer's engagement (e.g., distances travelled) to be used. These enabled comparisons to be made between environmental volunteering and citizen science projects to identify whether they shared any similarities in participatory patterns. Further, it suggests potential for these methods to be applied in other related or nearby fields wishing to explore people's engagement for project management purposes (e.g., volunteer retention and project design) if the relevant data are available.

The study also identifies areas that warrant more research. For example, it is recommended that future research should implement additional forms of qualitative (e.g. semi-structured interviews and observational studies) methods to explore contextual information associated with volunteers' engagement patterns, including underlying motivations. In addition, the study opens questions as to whether the profile types as well as their proportional structures over time are attributable to other volunteer organisations. Such evidence would provide a more holistic and realistic perspective of our existing knowledge and understandings of engagement presented by volunteers.

## Declarations of Interests

Authors declare there to be no competing interests.

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## Tables

Table 1: General descriptives of TCV's annual volunteer numbers between years 2010 to 2013 for each geographical area.

| | Total UK | Greater London | Greater Manchester | Yorkshire |
|---|---|---|---|---|
| Mean | 5692 | 1673 | 203 | 718 |
| Medium | 6042 | 1716 | 198 | 686 |
| 1st Quartile | 4861 | 1403 | 184 | 606 |
| 3rd Quartile | 6873 | 1986 | 216 | 797 |
| SD | 1547 | 744 | 26 | 147 |
| Range | 6989 | 2534 | 237 | 907 |

Table 2: Annual volunteering activities for each geographic area.

| Regions | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|
| Greater London | 3372 | 5467 | 5160 | 7386 |
| Greater Manchester | 1552 | 1282 | 1610 | 1920 |
| Yorkshire | 4332 | 4190 | 7073 | 7053 |
| Total UK Activities | 43187 | 49734 | 56420 | 58330 |

Table 3: Volunteer travelling distances in percentage across the three geographical regions for each volunteer type.

| Volunteer Type | Regions | Distance Travelled (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | < = 1 Mile | < = 5 Miles | < = 10 Miles | < = 20 Miles | < = 30 Miles | 30+ Miles |
| One -Session | Greater London | 3.3 | 28.4 | 29.4 | 30.9 | 7 | 0.9 |
| | Greater Manchester | 2.3 | 27.8 | 39.7 | 20.7 | 7.9 | 1.6 |
| | Yorkshire | 8.2 | 52.9 | 19.7 | 13.6 | 4.5 | 1.6 |
| Multi-Session | Greater London | 9.9 | 61.5 | 20 | 6.2 | 1.9 | 0.3 |
| | Greater Manchester | 1.2 | 24.1 | 50.6 | 20.7 | 4.1 | 1.2 |
| | Yorkshire | 14.8 | 53.8 | 14.9 | 9.4 | 5.7 | 1.2 |

Table 4: General descriptives for each of the engagement characteristics (Activity Ratio [AR], Relative Activity Duration [RAD], Variation in Periodicity [VP] and Distance Travelled in miles [Distance]) compared across each region.

| | Greater London | | | | Greater Manchester | | | | Yorkshire | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AR | RAD | VP | Distance | AR | RAD | VP | Distance | AR | RAD | VP | Distance |
| Mean | 0.8 | 0.02 | 0.6 | 8.7 | 0.63 | 0.04 | 0.9 | 6.1 | 0.7 | 0.07 | 1 | 8.8 |
| Medium | 1 | 0.05 | 0.8 | 3.3 | 1 | < 0.01 | 0.05 | 7 | 1 | < 0.01 | 0.09 | 3.5 |
| 1st Quartile | 0.04 | 0.01 | 0.4 | 1.9 | 0.14 | < 0.01 | 0.05 | 4.7 | 0.13 | < 0.01 | 0.09 | 1.8 |
| 3rd Quartile | 1 | 0.02 | 2 | 8.9 | 1 | 0.03 | 0.3 | 11.2 | 1 | 0.03 | 0.7 | 6.6 |
| SD | 0.3 | 0.09 | 2.7 | 6.7 | 0.4 | 0.1 | 3.1 | 7.2 | 0.4 | 0.2 | 2.7 | 6.6 |
| Range | 1 | 1 | 34 | 32 | 1 | 1 | 41 | 42.3 | 1 | 1 | 19.4 | 36.5 |

Table 5: Mean centroids for each of the engagement characteristics (Activity Ratio [AR], Relative Activity Duration [RAD], Variation in Periodicity [VP] and Distance Travelled in miles [Distance]) compared across each region and subdivided by profile type.

| Profile Type | Regions | Engagement Characteristics | | | |
|---|---|---|---|---|---|
| | | AR | RAD | VP | Distance |
| One-Session | Greater London | 0.97 | 0.01 | 0.8 | 4.6 |
| | Greater Manchester | 1 | < 0.01 | 0.4 | 3.5 |
| | Yorkshire | 0.88 | 0.02 | 0.7 | 2.4 |
| Short-Term | Greater London | 0.9 | 0.02 | 0.4 | 8.9 |
| | Greater Manchester | 0.88 | 0.5 | 1 | 11.6 |
| | Yorkshire | 0.78 | 0.04 | 0.9 | 6.2 |
| Long-Term | Greater London | 0.8 | 0.03 | 0.6 | 28.3 |
| | Greater Manchester | 0.68 | 0.77 | 1.1 | 30.1 |
| | Yorkshire | 0.61 | 0.05 | 1.8 | 35.9 |

Figures



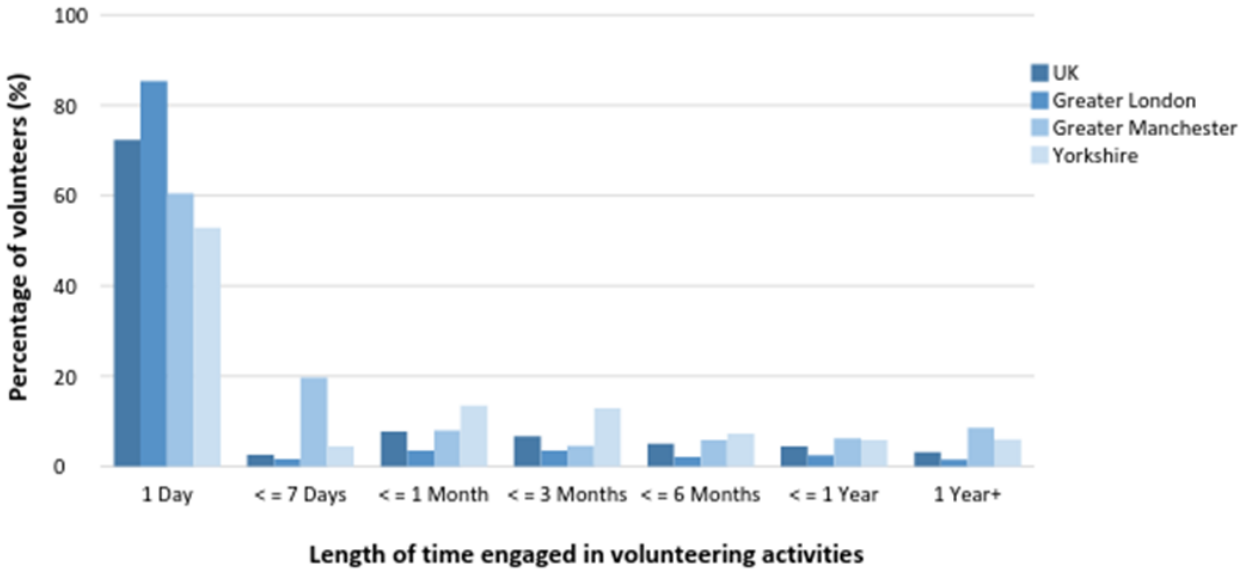


Figure 1

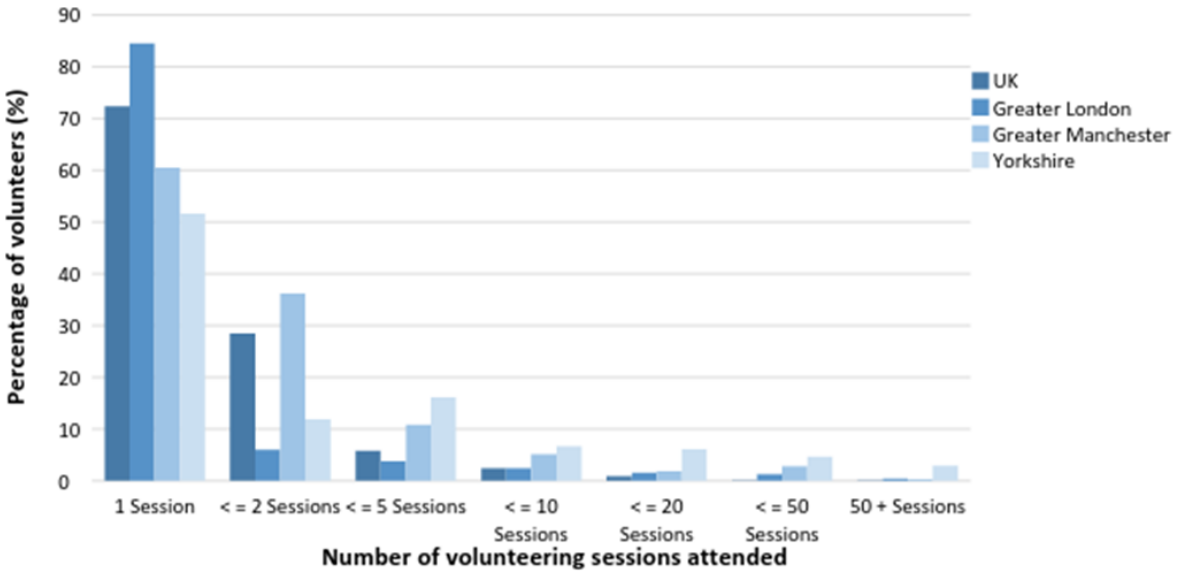


Figure 2

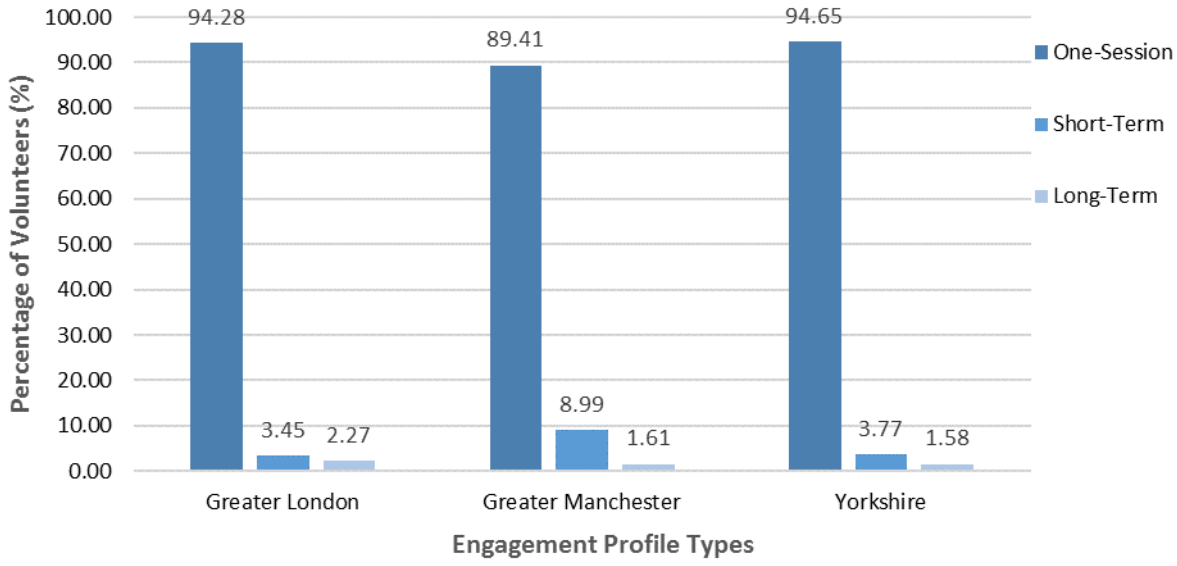


Figure 3

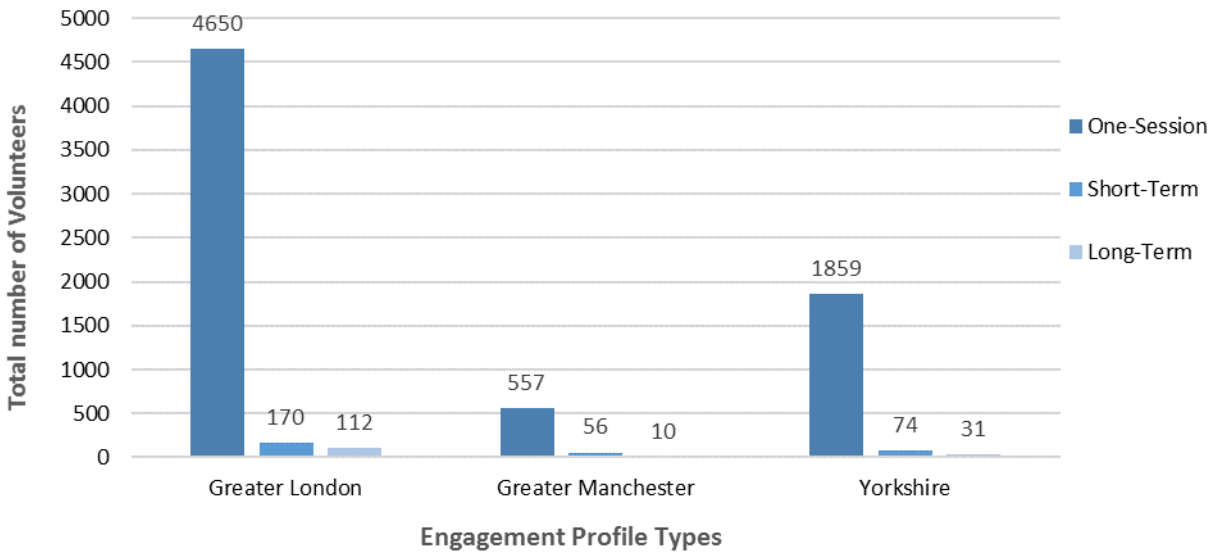
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Total number of Volunteers
4650
170
112
557
56
10
1859
74
31
Greater London
Greater Manchester
Yorkshire
Engagement Profile Types
One-Session
Short-Term
Long-Term

Figure 4

# **Appendix 8** – First authored paper (c)



**Title:**

Understanding the impact of volunteering on pro-environmental behavioural change

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**Abstract**

This study examines the whether there is an association between engaging in environmental volunteering activities and pro-environmental behavioural change. Utilising self-reported surveys, the study explores the potential impact that environmental volunteering has on people's pro-environmental behaviour over time, using The Conservation Volunteers' two volunteering programmes, Green Gyms and Action Teams, as a comparative case study. Our findings show a positive association between environmental volunteering activities with a person's self-reported pro-environmental behaviours over time. Further, volunteers presented improved impact across almost all of the eight pro-environmental behaviours measured, with differences observed between the two volunteering programmes as well as socio-demographic groupings.

**Keywords**

environmental volunteering, pro-environmental behaviour, impact measurement, online survey.

## Introduction

Within the last decade, the relationship between engaging in environmental activities (e.g. habitat management, ecological restoration and monitoring wildlife) and pro-environmental behaviours (e.g. recycling, reduced energy consumption and homegrown food) has received increasing attention with regards to its importance for the vitality of communities and the environment (Monroe, 2003; Hargreaves et al, 2011). More recently, the UK government and voluntary sector representatives have highlighted the potential role of volunteering organisations in encouraging people to adopt environmentally friendly behaviours (Hale, 2010; Cabinet Office, 2011). To date, studies are beginning to explore the potential impact that engaging in environmental volunteering may have on people's pro-environmental behaviours and suggest the need to examine these impacts over time as well as any mediating mechanisms and the relationships that may exist between them (Steward et al, 2009; Büchs et al, 2012; Cooper et al, 2015).

This article reports a study which implemented a longitudinal research design, using self-reported surveys, based on two volunteering programmes from a UK environmental charity, The Conservation Volunteers (TCV). TCV is an apolitical charity which avoids activism, and engages in a wide range of environmental activities including habitat management, monitoring wildlife, and ecological restoration.

Specifically, the study aimed to:

- explore whether environmental volunteering has an impact on peoples' self-reported pro-environmental behaviours;
- assess the types of impact environmental volunteering has on peoples' self-reported pro-environmental behaviours; and,
- examine volunteers' self-reported pro-environmental behavioural change over time, the mediating mechanisms which may cause these, and the relationships that may exist between them.

### *Environmental volunteering and pro-environmental behaviour*

Research has long identified the role of moral concerns, intrinsic motivations and external factors underlying pro-environmental behaviours. Such underlying influences include individual value-based environmental concerns (Dunlap and van Liere, 1978; Stern et al, 1993; de Groot and Steg, 2008), the influence of social norms and culturally accepted behaviours (Cialdini et al, 1991), goal framing and performance (Lindenberg and Steg, 2007), as well as contextual factors and

other interventions (Kaiser et al, 1999; Bamberg and Schmidt, 2003; Thøgersen, 2005; Ballantyne and Packer, 2011). Further, some argue that if pro-environmental behaviours are associated with an increase in environmental awareness, then it could be hypothesised that engagement in environmental activities - such as environmental volunteering - might increase these behaviours (Jensen, 2002; Kollmuss and Agyeman, 2002).

Environmental volunteering can be described as the practice of unpaid volunteers, who spend time engaging in a wide range of conservation and outdoor based activities, including habitat management and ecological restoration (Bruyere and Rappe, 2007). A range of benefits for people over the course of their lives has been shown, from civic engagement and enhancing social cohesion to environmental awareness and individual wellbeing (Putnam, 1995; Molsher and Townsend, 2015). On these, research has begun to emerge over the association of pro-environmental behaviours with the ability to promote behaviour which aims to improve environmental quality (Stern, 2000; Steg et al, 2014). Such an assumption is strengthened by findings which suggest a positive link between people's pro-environmental behaviour and engagement in environmental activities, including connectedness (Nisbet et al, 2009), environmental literacy (Dresner et al, 2014) as well as wildlife recreation advocacy (Cooper et al, 2015). In this way, participating in environmental volunteering and nature-based activities can be seen as equally important, increasing a person's engagement in pro-environmental behaviours and commitment through direct experience (Chalwa, 1999; Hartig et al, 2007). To date, studies are beginning to explore the potential impact that engaging in environmental volunteering may have on people's pro-environmental behaviours and suggest the need to examine these impacts over time as well as any mediating mechanisms and the relationships that may exist between them (Steward et al, 2009; Büchs et al, 2012; Cooper et al, 2015).

It is therefore anticipated that our current understanding of the benefits of volunteering on creating pro-environmental behaviours would be better understood if we identify the long-term trends as well as the relationships and pathways between environmental volunteering and pro-environmental behaviours. This in turn would allow volunteering services to better develop programmes to encourage pro-environmental behaviours. In addition, we believe it will allow metrics of success for volunteering services to be enhanced. Therefore, this article aims to explore this gap in knowledge as well as variables affecting environmental volunteers' pro-environmental behaviours.

*Variables affecting volunteers' pro-environmental behaviour*

Researchers have highlighted methodological challenges associated with measuring pro-environmental outcomes owing to the inability to ascertain the reason for a change in behaviour. This can make it difficult to know the extent to which change derives from an individual cause or intervention (Steward et al, 2009). As such, more in-depth and longitudinal research is needed to distinguish long and short term affects as well as other external influences (Büch et al, 2012). In response, the study reported here pays particular attention to three key variables.

First, the time duration and level of engagement in environmental volunteering activities. As studies show, an individual's measure of environmental concern and behaviour can be associated with their measure of connectedness to the environment, such as through engaging in nature-based activities and wildlife recreation (Mayer and Frantz, 2009; Nisbet et al, 2011). As such, this has led some researchers to view environmental activities as a cost-effective approach to enhance pro-environmental behaviours (Collado et al, 2015). In this way, this article attempts to build upon previous studies that find environmental experiences to be fundamental in influencing nature-related values, affiliations and pro-environmental behaviours in association with environmental volunteering activities (Büchs et al, 2012; Dresner et al, 2014; Collado et al, 2015; Molsher and Townsend, 2016).

Second, the type of environmental volunteering programme that a person engages in with relevance to context, activities, and experiences. To date, emerging studies explore the differences between types of wildlife recreational activities (e.g. hunting and birdwatching) and show how these factors may impact on volunteers' pro-environmental behaviours (See Cooper et al, 2015). Much of our understanding is therefore drawn from this literature as well as other related fields. For example, in organisational research workplace factors (e.g. culture, support and environmental infrastructure) can influence or shape people's attitudes and behaviours when faced with new interventions (Young et al, 2015). Similarly, some studies on environmental sustainable behaviours in eco-tourism remark that intervention activities (e.g. workshops and educational materials) increase people's awareness and education in related issues, each generating various outcomes (Ballantyne and Packer, 2011). With this in mind, the study reported here compares two volunteering programmes which differ in regards to their focus and associated activities in an effort to understand if and how these factors may have an impact on volunteers' pro-environmental behaviours.

Third, external factors and mediating mechanisms which can affect pro-environmental outcomes. These can include socio-demographic status (Chen et al, 2011), skills development and learning

(Donald, 1997; England and Marcinkowski, 2007) as well as social interactions and perceived social norms (Göckeritz et al, 2010; Dresner et al, 2014; Kalkbrenner and Roosen, 2015). However, due to the size and scale of collecting such data, the article explores and focuses on one of these aspects: socio-demographic status (gender, age, income and ethnicity). To date, more generalised studies considering socio-demographic status effects associated with pro-environmental behaviours show mixed findings across gender (Stern et al, 1993; Zelezny and Bailey, 2006; Lee, 2009), age (Scott and Willits, 1994; Tindall et al, 2003), income (van Liere and Dunlap, 1980; Chen et al, 2011) and ethnicity (Dresner et al, 2014). This study therefore aims to progress existing research (Nisbet et al, 2009; Dresner et al, 2014; Cooper et al, 2015), providing further evidence on the long-term trends and outcomes associated with different environmental volunteering programmes across the demographic spectrum.

## Methodology

To explore whether there is a relationship between environmental volunteering and pro-environmental behaviours, providing a more accurate and in-depth measure over time (Bryman, 2012), a longitudinal research design using self-reported surveys was implemented.

### *Participating Programmes*

Recruitment for the respondents in this study is from two volunteering programmes led by The Conservation Volunteers (TCV), an environmental charity based in Greater London, United Kingdom (UK). The first programme – Green Gyms® – is a volunteering programme that focuses on improving the health and wellbeing of volunteers through engaging in practical work sessions within green spaces to promote biodiversity and organic food growing (e.g. planting trees, sowing meadows and establishing wildlife ponds). It includes warm up and cool down sessions in preparation for a range of light to vigorous activities to suit all abilities. The programme was established in 1997 in collaboration with Dr William Bird, a general practitioner and Strategic Health Advisor to Natural England, who promotes exercise in natural environments. It has been endorsed by the Department of Health to have proven impacts on the volunteers' health and wellbeing as well as on their community spaces. Volunteers that attend these programmes do so on their own initiative as well as those attending following advice by their GP.

The second programme – Action Teams – is a volunteering programme aimed at managing and conserving a wide range of natural habitats throughout Greater London. The programme holds weekly sessions throughout the year and engages volunteers in a variety of conservation projects.

Projects include habitat management, creation, restoration and maintenance as well as creating new nature gardens for local communities and schools. The programme was established in 1959 when the charity was initially set up to engage volunteers in practical conservation work. Volunteers that attend these programmes do so on their own initiative.

This study has no specifications in relation to sampling populations, including as many voluntarily consenting participants as possible without undue coercion. This study's recruitment methods aim to gain a representational cross-section of those volunteers in each of the two volunteering programmes. This includes contacting volunteers by email and assistance from TCV staff within the volunteering setting.

The sample comprises of 952 volunteers each of whom completed a baseline survey, 161 completed a first follow up survey, and 63 completed a second follow up survey – a response rate of 13.8% and 5.4% respectively. This attrition rate between surveys is consistent with participatory patterns of TCV volunteers identified by Seymour and Haklay (2016), where only a small proportion of volunteers continue to engage in long-term volunteering activities. Similar quantitative patterns are noted in other related volunteering studies (Reed and Selbee, 2001; Mohan and Bulloch, 2012; Hyde et al, 2016). This small number of volunteers completing all three waves of the questionnaire survey affected our ability to undertake any in-depth statistical analysis (e.g. between socio-demographic categories), and may also have created possible non-response bias. As table 1 shows, volunteers in both programmes are from a diverse demographic backgrounds, and those continuing to engage in the first and second follow up surveys are mostly representative of the overall baseline sample's demographic characteristics.

**Table 1:** Descriptive statistics of volunteers' demographic characteristics ($n$ = 952) in percentage.

[Table 1 goes here].

*Research Design and Data Collection*

This study uses a longitudinal design to assess the impacts of environmental volunteering on respondent's behaviours over time. It assesses the self-reported responses of volunteers to the Change! Tool self-completion questionnaire survey (See appendix 1), which was initially developed by the World Wildlife Fund (WWF) and CAG Consulting (See www.community-engagement.co.uk). The survey is based on the Transtheoretical Model developed by Prochaska

and DiClements (1986), which incorporates the stages, processes and decisions central to the behavioural change cycle (Norcross et al, 2011). The Change! Tool uses a set of questions to measure a person's self-reported pro-environmental behaviours, using a 5 point Likert scale with a total score of 40. Indicators used in this study focused on the following eight sustainable lifestyle choices: travel, waste management, food growing, community involvement, local decision making, energy use, awareness of local wildlife (termed here as 'Your Area') and shopping behaviour.

Data collection was conducted from 2011 to 2014, using both paper surveys and the online data collection tool Survey Monkey®. Surveys were administered by the project officers through e-mail to those who voluntarily consented, at variable intervals of approximately one, three and six months after starting volunteering sessions. This was due to the nature and practicalities of volunteering activities, where there can be difficulty for surveys to be completed before such sessions begin, particularly if the population sample are unknown before engaging in these activities. It is therefore assumed that a person's baseline is established early on at the start of volunteering.

*Data Analysis*

Data was evaluated and summarised using a descriptive approach, due to the nature and scale of the survey data. Total scores and differences between each Change! Tool questionnaire survey completed were first calculated for each volunteer. Differences in baseline scores between respondents and those non-respondents to the later rounds of the survey were calculated to assess the overall representativeness of longitudinal dataset. General descriptions of total in-person scores were then calculated, measuring their central tendency (mean and median) and spread (upper and lower quartiles, standard deviations and range). This was done for those volunteers that completed the baseline and later follow-up surveys only, excluding non-respondents. Total scores were then further subdivided by individual question, demographic category (gender, level of deprivation, age groups and ethnicity) and volunteer programme (Green Gyms and Action Teams). These were explored using a descriptive summary, due to the nature and scale of the dataset, providing a general exploration of the dataset (Costello, 2009). Level of deprivation is a measure of deprivation of the area in which a volunteer lives. Here, we use the Index of Multiple Deprivation (IMD) 2010 dataset for England, calculated at a small area level (i.e. Lower Super Output Area, containing an average population of 1,722) based on selected measurement domains: income, employment, health and disabilities, education, crime, housing and services as

well as living environment. In this way, the degree and types of impacts in relation to environmental volunteering activities on people's pro-environmental behaviours could be explored across different demographic groupings as well as different volunteer programmes to assess for variable differences (Dytham, 2011).

Finally, comparisons in volunteer's overall pro-environmental behaviour change scores between first and third surveys was identified using a Paired-Sample *t*-test, which tests whether the mean difference between these scores is different from 0 (Dytham, 2011). Though the sample size to conduct this analysis was small (n=63), the test was regarded as feasible, having a large effect size (calculated as the size of the difference between the two-variable means), thereby minimizing the effects of Type I or II errors (See Cohen, 1988 and De Winter, 2013).

All the above analysis was performed using TCV's online database as well as statistical programme R Version 3.1.1 (R Core Team).

**Results**

General descriptive summaries of volunteers' responses to the Change! Tool questionnaire surveys can be found in table 2. Overall, the average in-person self-reported pro-environmental behaviour scores, which excludes non-respondents, present a slight positive increase from those identified in first and proceeding surveys as indicated in means and medians. Variation between average scores is relatively small, as shown by standard deviations (SD) and quartiles, with most volunteers displaying moderate levels of pro-environmental behaviours. Further, the range between lowest to highest scores is wider in the first and second surveys, with those in the third survey being narrower. Not only is this reflective of sample sizes for each survey, but also suggests that those who engage longer in TCV's environmental volunteering activities rate themselves more similarly. Moreover, a change in sample means is also observed between those volunteers that completed both the first and third surveys only (Paired $t\ (_{61}) = -3.24$, p=< .002), with an increased mean score of 2.83. As no differences in baseline scores between respondent and those non-respondents to the later rounds of the survey are observed, this suggests longitudinal data can be thought of as representative of the overall sample.

**Table 2:** General descriptive summaries of TCV volunteers' total scores for each of the Change! Tool questionnaire surveys.

[Table 2 goes here].

In general, volunteers present improved impact across most of the pro-environmental behaviours (except waste management), with those showing the greatest areas of change being travel and taking part in local decision making activities. Waste management includes the amount of weekly waste that has been recycled as well as water and energy usage in the home. Travel includes the mode of transport used on a regular basis as well as holiday travel. Taking part in local decision making activities includes council meetings, and being involved in local residents' or neighbourhood meetings.

[Figure 1 goes here].

**Figure 1:** Percentage change in volunteers' mean scores for pro-environmental behaviours measured from first to third surveys.

General descriptive summaries of volunteers' total scores across socio-demographic categories can be found in table 3. First, volunteers living in those areas classified as most deprived are most likely to engage in new behaviours with a direct economic impact (e.g. transport and energy use) than those from least deprived areas which show the lowest level of change. Similarly, differences are observed between gender groups, where on average females show a higher level of pro-environmental behavioural change than males. For example, male volunteers exhibit positive change in relation to travel, tending to report a reduced level of impact in greener shopping behaviours, whereas female volunteers present positive change associated with taking part and organising local activities in their communities, with reduced levels of impacts reported in waste management. Further, positive change is more evident in the 25–54 age range than either the younger or older age groups, and is the case across all of the behaviour change categories. Finally, in terms of ethnicity, volunteers who described themselves as from a non-white ethnic background are more likely to get involved in organising community activity than their fellow white volunteers, but appear less inclined to address issues to do with an environmentally friendly lifestyle.

**Table 3:** Change in total scores of volunteers' pro-environmental behaviours from first to third surveys, subdivided by socio-demographic grouping.

[Table 3 goes here].

Differences were also observed between the two programmes – Green Gyms and Action Teams – with the former presenting greater impact than the latter whose baseline surveys show a much higher level of awareness for environmental issues. For instance, those volunteers who engage in the Green Gyms programme present greater impact across six of the eight pro-environmental behavioural changes (with little or no significant changes for shopping behaviour and waste management). By contrast, those volunteers who attend the Action Teams programme show a reduced level of impact across most of the pro-environmental behaviours, except food growing and travel which present small but appreciable positive impacts.

[Figure 2 goes here].

**Figure 2:** Change scores total in volunteers' pro-environmental behaviours between volunteering programmes.

**Discussion and implications**

Overall, this study finds that volunteers who engage in environmental activities present a slight positive increase in pro-environmental behaviours over time, with variable differences between the two TCV environmental volunteering programmes: Green Gyms and Action Teams. This may relate to the differences in focuses of the two programmes and the motivations of those that attend. For instance, a large proportion of those who join a Green Gym are referred by health practitioners or join because of a motivation to improve their own health rather than environmental concerns. In contrast, Action Teams primarily attract volunteers who are motivated by the idea of undertaking work to improve the environment and so may start from a much higher level of appreciation of environmental issues. These findings progress existing research (Nisbet et al, 2009; Dresner et al, 2014; Cooper et al, 2015), providing further evidence on the long-term trends and outcomes associated with different environmental volunteering programmes across the demographic spectrum. Further, it suggests that voluntary organisations and policy makers may need to reach out to those who would not conventionally engage with environmental activity in order to have the greatest 'return' on their efforts in terms of increased

pro-environmental behaviour (Chalwa, 1999; Hartig et al, 2007; Hale, 2010; Cabinet Office, 2011).

To date, few studies examine the environmental performance outcomes of interventions, instead many focus on the methods and tools used to measure behavioural change patterns (Young et al, 2015). This study therefore provides further insight in this area of research and aimed to measure specific self-reported behavioural change outcomes of those involved in environmental volunteering activities. In general, volunteers present positive change across almost all of the eight pro-environmental behavioural indicators used. These findings resonate with similar studies (Donald, 1997; England and Marcinkowski, 2007; Cooper et al, 2015). Further, these results also suggest that those who engage longer in TCV's environmental volunteering activities tend to rate themselves more similarly. One reason, as Dresner et al (2014) explains, might be that social interaction amongst those more regular volunteers has the ability to both influence and support individual's attitudes and behaviour (e.g. advice on food growing activities) via perceived social norms (Göckeritz et al, 2010; Dresner et al, 2014).

By contrast, findings identify a negative trend in waste management behaviour amongst almost all volunteers, which to our knowledge has not been found in other similar studies. As such, we attribute this trend to a few factors, including personal finance, time availability, and current infrastructure supporting pro-environmental behaviours (Kaiser et al, 1999; Bamberg and Schmidt, 2003; Thøgersen, 2005). Alternatively, this may also relate to an individual's perceived view of their pro-environmental behaviours. For instance, a person's view of their individual change behaviours in relation to attaining a goal can vary according to the scale (e.g. size of the goal), framing (e.g. at an individual level or compared to the rest of the human population) and attainability of the goal itself (Ajzen, 1991; Lindenberg and Steg, 2007; Venhoeven et al, 2013).

Finally, differences in pro-environmental behaviours are also present when making comparisons between volunteers in terms of their socio-demographic status (e.g. age, gender, ethnicity and level of deprivation) which are largely reflective of those already identified in existing research. First, results show a gender variation in pro-environmental behaviours with females tending to display a higher level of behavioural change, a phenomenon widely supported in existing literature (McStay and Dunlap, 1983; Mohai, 1992; Lee, 2009; McCright and Xiao, 2014). Theoretical explanations for this include the socialisation or process of learnt gender-specific behaviour (Zelezny and Bailey, 2006) as well as value orientation whereby females present stronger values towards those biospheric or environmental components (Stern et al, 1993).

Second, a positive change is more evident between the ages of 25 and 54 years. Chen et al (2011) suggest that this age group has been more exposed to increasing awareness of environmental issues, with other studies reporting mixed findings (Scott and Willits, 1994; Tindall et al, 2003). Third, though our results suggest that certain types of behavioural change adopted are associated with income (e.g. travel), current research shows more of a mixed picture. Other factors include personal freedom and ability to meet their material needs (van Liere and Dunlap, 1980) as well as being associated to a person's degree of direct exposure to the consequences of environmental degradation (Chen et al, 2011). Lastly, volunteers from ethnic minorities present a higher level behavioural change in areas of civic engagement (e.g. local decision making and community involvement) than those relating to an environmentally friendly lifestyle. A similar finding is also observed by Kalkbrenner and Roosen (2015), whereby social norms and trust are found to be strongly associated with a person's participation in local renewable energy projects, followed by environmental concern. One reason may relate to increased empowerment relating to the volunteering experience itself and working collectively with others for the common good of a local community, with a snowballing effect (Dresner et al, 2014).

*Study limitations and future research*

This study has four main limitations. First, the findings are specific to volunteers in the Greater London region who engage in environmental activities with TCV. Further work on a much larger scale is needed to explore the relationship between environmental volunteering activities and self-reported pro-environmental behaviours (including external drivers) in other rural and urban UK regions as well as making comparisons with other UK environmental volunteering organisations. As such, it would therefore enable one to determine whether these findings are more widespread. In addition, it would also provide further understanding about the type and scale of external factors that might contribute to these findings, including underlying motivations, contextual factors, socio-demographic status, response biases as well as other associated factors (Aarts and Dijksterhuis, 2000; Thøgersen, 2005; de Groot and Steg, 2008).

Second, due to the nature and practicalities of volunteering activities, surveys were administered after volunteers initially engaged in volunteering sessions. It is assumed that a person's baseline is established early on at the start of volunteering and is primarily based on self-reported measures, which therefore reduces our ability to make causal conclusions. With this in mind, future research assessing causal relationships between pro-environmental behaviours and environmental volunteering activities could provide a more comprehensive understanding of its

multidimensional complexity as well as associated benefits and drawbacks emerging from these relationships (Steward et al, 2009; Büchs et al, 2012).

Third, the small number of volunteers completing all three waves of the questionnaire survey affected our ability to undertake any further in-depth statistical analysis (e.g. between socio-demographic categories). It may also have created possible non-response bias. Future research is therefore needed on a much larger scale to assess whether there is an association between engaging in environmental volunteering activities and increasingly adopting pro-environmental behaviours over time.

Fourthly, though this study provides a general descriptive understanding of volunteer's self-reported pro-environmental behaviours, further explanation of the changes experienced might be found through the use of qualitative methodological approaches (e.g. interviews and observations). This suggests a need to use mixed quantitative and qualitative approaches in future research. In addition, such mixed method approach allows for a multiple level of perspectives, identifying not only the magnitude and frequency of when something occurs, but equally to examine the meaning and understanding of the construct behind its occurrence (Bryman, 2012).

**Conclusion**

This study explores the potential impact that environmental volunteering has on people's pro-environmental behaviour over time using UK environmental charity, The Conservation Volunteers', as a case study.

Our findings show that volunteers who engage in environmental activities present a slight positive increase in pro-environmental behaviours over time. In general, volunteers present improved impacts across most of the pro-environmental behaviours, with those that engage longer in TCV's environmental volunteering activities rating themselves more similarly. By contrast, almost all volunteers present a decline in waste management behaviour which may relate to various reasons, such as personal finance, time availability, current infrastructure supporting pro-environmental behaviours and perceived social norms. Further, variable differences are observed between the two TCV environmental volunteering programmes compared in this study, Green Gyms and Action Teams, the former presenting a higher measure of impact. Since Green Gyms engages with those who would not conventionally engage with environmental activity, this suggests that voluntary organisations and policy makers may need to reach out here to those to have the greatest 'return'.

We identify differences in pro-environmental change behaviours when making comparisons between volunteers according to their socio-demographic status (e.g. age, gender, ethnicity and level of deprivation) and volunteering programmes. Results show a gender variation, with females tending to display a higher level of pro-environmental behavioural change. A positive change is more evident between the ages of 25 and 54 years. Volunteers who describe themselves as from an ethnic minority background are more likely to get involved in organising community activity. Volunteers living in those areas classified as most deprived are most likely to engage in new pro-environmental behaviours that have a direct economic impact (e.g. transport and energy use) than those from least deprived areas which exhibit the lowest level of change. However, their interrelationships and other associated factors remain unclear.

The study also identifies areas warranting more research. For instance, this study serves as a case study focusing on the Greater London region. Future research should make further large scale comparisons across other UK regions and environmental volunteering activities. Similarly, the study is unable to make in-depth causal conclusions due to the nature and practicalities of volunteering activities. It is therefore recommended that any future research uses a mixed method approach to identify potential causal relationships between pro-environmental behaviours and environmental volunteering activities as well as examining the meaning and understanding of pro-environmental behaviours.

**Declarations of Interests**

All authors declare there to be no competing interests.

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**Figures**

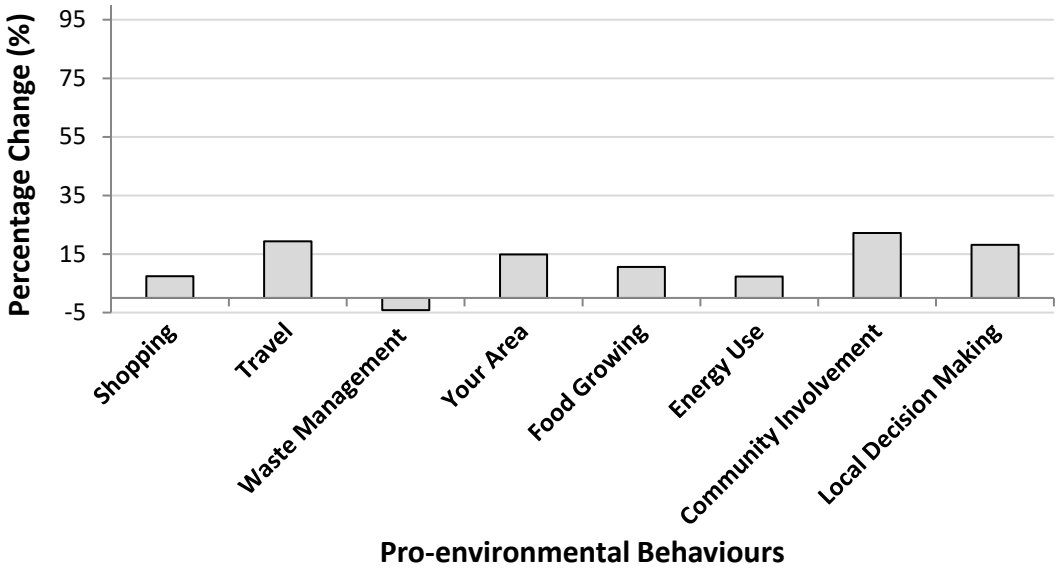


Figure 1.

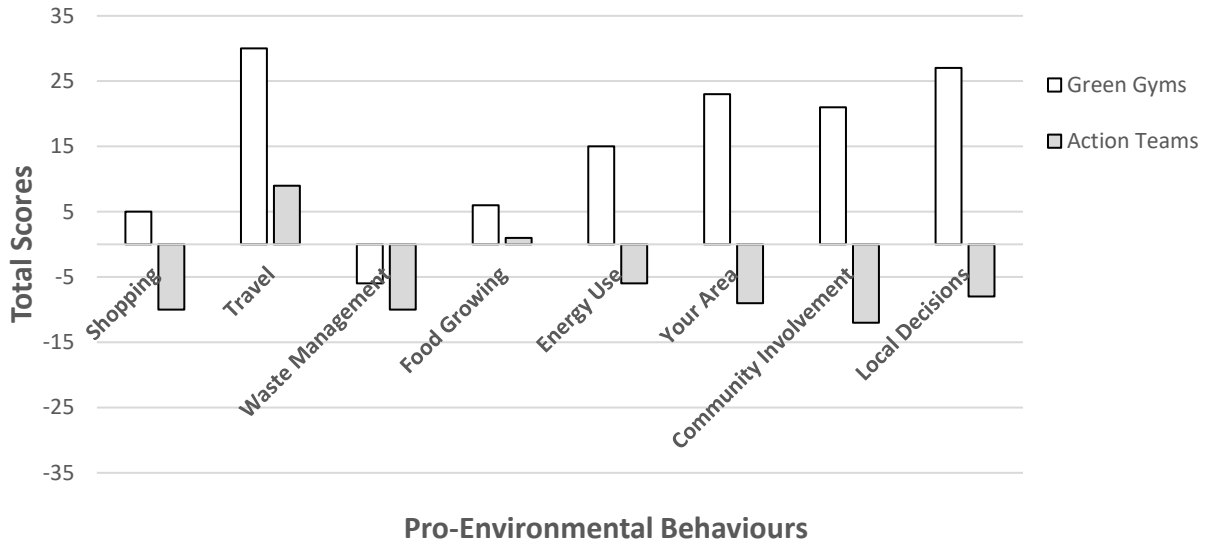


Figure 2.

**Tables**

Table 1.

| **Demographic Category** | **Baseline (*n*=952)** | **1st follow-up (*n*=161)** | **2nd follow-up (n=63)** |
|---|---|---|---|
| Gender | | | |
| Female | 431 | 74 | 28 |
| Male | 518 | 87 | 35 |
| Missing | 3 | - | - |
| Age Range | | | |
| 18-24 | 130 | 21 | 8 |
| 25-34 | 287 | 48 | 19 |
| 35-44 | 194 | 32 | 13 |
| 45-54 | 151 | 26 | 9 |
| 55-64 | 118 | 19 | 7 |
| $65^{+}$ | 46 | 8 | 3 |
| Missing | 26 | 7 | 4 |
| Ethnicity | | | |
| White British | 562 | 95 | 37 |
| Other | 380 | 66 | 26 |
| Missing | - | - | - |
| Deprivation (IMD[1]) | | | |
| Most Deprived (0-20%) | 314 | 53 | 20 |
| 21-40% | 316 | 52 | 21 |
| 41-60% | 141 | 23 | 9 |
| 61-80% | 107 | 18 | 7 |
| Least Deprived (81-100%) | 68 | 11 | 4 |
| Missing | 6 | 4 | 2 |

Table 2.

| | First Survey | Second Survey | Third Survey |
|---|---|---|---|
| **Mean** | 20.6 | 22.5 | 23.5 |
| **Median** | 21 | 22 | 23 |
| **1st Quartile** | 17 | 18 | 19 |
| **3rd Quartile** | 26 | 28 | 28 |
| **SD** | 7.5 | 7.8 | 6 |
| **Range** | 32 | 36 | 25 |

Table 3.

| Demographic Category | Shopping | Travel | Waste Management | Your Area | Food Growing | Energy Use | Community Involvement | Local Decision Making |
|---|---|---|---|---|---|---|---|---|
| Gender | | | | | | | | |
| Female | 7 | 15 | -4 | 9 | 9 | 12 | 16 | 20 |
| Male | -2 | 18 | -3 | 17 | 3 | 6 | 3 | 5 |
| Age Range | | | | | | | | |
| 18-24 | 2 | -2 | -1 | 1 | 0 | -1 | 2 | 2 |
| 25-34 | -1 | 0 | 4 | 4 | 5 | -1 | 0 | -1 |
| 35-44 | 1 | 12 | 1 | 11 | 3 | 11 | 8 | 12 |
| 45-54 | 5 | 15 | -4 | 5 | 4 | 2 | 15 | 9 |
| 55-64 | 0 | 11 | -6 | 1 | -1 | 3 | -8 | -6 |
| $65^{+}$ | 0 | -2 | 2 | 2 | 3 | 4 | 0 | 7 |
| Ethnicity | | | | | | | | |
| White British | 10 | 24 | 1 | 20 | 6 | 10 | -5 | 12 |
| Other | -5 | 9 | -8 | 6 | 6 | 8 | 24 | 13 |
| Deprivation (IMD[1]) | | | | | | | | |
| Most Deprived (0-20%) | -9 | 14 | -3 | 15 | 10 | 15 | 1 | 8 |
| 21-40% | 0 | 7 | 2 | 4 | 0 | 2 | 3 | 10 |
| 41-60% | 13 | 5 | 4 | 3 | 5 | 7 | 11 | 9 |
| 61-80% | -1 | 2 | -4 | 2 | -3 | 0 | 6 | 0 |
| Least Deprived (81-100%) | 2 | 1 | -2 | 2 | 0 | -2 | 2 | 2 |