Understanding Drivers of Deforestation using Socio-Psychological Behavioural Theory and the Capability Approach

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DECLARATION

I certify that the work contained in this thesis, or any part of it, has not been accepted in substance for any previous degree awarded to me, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy being studied at the University of Greenwich. I also declare that this work is the result of my own investigations, except where otherwise identified by references and that the contents are not the outcome of any form of research misconduct.

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ABSTRACT

There is continuing concern about the rapid loss of forests globally, as the loss of terrestrial carbon stocks has significant implications for our ability to curb the effects of anthropogenic climate change. Understanding drivers of deforestation is essential for developing any successful intervention to reduce forest degradation or loss, yet there remains relatively little consensus or clarity on how drivers should be identified and classified. I therefore propose a model that combines social-psychological behavioural theory with the Capability Approach to understand and structure drivers of deforestation and forest degradation (DD).

Using a case study in Guatemala, I developed a proof of concept by analysing questionnaire responses from land users using a statistical data reduction technique and validating the resulting interpretations with land users and others in focus group discussions. I then explored the links between shared values and DD behavior, and found that different cultural groups (Q'eqchi Maya and Ladinos) act differently depending on how they relate to their shared values. The results also indicated the presence of value orientations as a mediating factor between shared values and behaviours. These value orientations influenced the capabilities that were relevant to individuals in relation to DD behaviours.

The conceptual model was also used to explore drivers of DD from a Guatemalan REDD+ (reduction of emissions from deforestation and forest degradation) decision maker perspective, and how processes within the decision making arena may impact DD. The results suggest that decision makers should take barriers to transformational change into account as drivers of DD when designing policies and interventions.

The findings highlight the importance of developing coherent models and approaches to effectively understand and structure analysis of drivers of DD. Additionally, the findings suggest the need for a broader conceptualisation of drivers of DD that includes social and institutional processes that act within the policy and other intervention design arenas.

CONTENTS

FIGURES

TABLES

GLOSSARY

(Or, 'The World According to Jane')

Achieved functions: The achievement of a valued function (Robeyns, 2003; Sen, 2001)

Attitude statements: Statements used to elicit attitudes, to which individuals had to answer on a scale of 'strongly agree' to 'strongly disagree', with 'neither agree nor disagree' as a middle point.

Barriers to transformational change: Issues that do not allow for a shift in discourses, power relations and deliberate actions away from business as usual, usually acting within the decision making process.

BCD model: Behaviour-Capability-Driver conceptual model and methodological approach, developed as part of this thesis, incorporating socio-psychological behavioural theory, the Capability Approach, a revised classification of drivers of DD and a mixed methodology.

Belief statements: The statements used in the land user and REDD+ decision maker questionnaire to elicit shared values, to which individuals had to answer on a scale of 'strongly agree' to 'strongly disagree', with 'neither agree nor disagree' as a middle point.

Beliefs: "An acceptance that something exists or is true, especially one without proof." (OED 2016).

Capabilities: The freedoms or valuable opportunities available to an individual to achieve their valued function (Robeyns, 2005; Sen, 2001). In this thesis, capabilities are also factors, events or situations that are occurring in the world, which will influence behaviour and beliefs. These capabilities further represent underlying and indirect drivers of deforestation in the BCD model.

Direct drivers: Human activities that directly affect land use and forest cover.

Drivers of deforestation and forest degradation (DD): The activities and facilitating processes that lead to a reduction of forest cover.

Exploratory factor analysis (EFA): Factor Analysis is a variable reduction technique EFA uncovers the latent, common underlying constructs of a large number of measured variables (Mulaik, 1987; Norris and Lecavalier, 2010; Suhr, 2005).

Factor scores: The score for each participant for each factor, where their answer to each belief statement is graded 1 to 5 (where 1 = strongly agree and 5 = strongly disagree) and averaged across the belief statements in the factor.

Factors: The collections of belief statements identified through exploratory factor analysis, interpreted as values in this approach.

Indirect drivers: Intermediary processes that do not have a direct effect on the environment but facilitate direct drivers.

Institutions: Rules and norms that constrain human behavior (North, 1990).

Means: The items or context that is available for an individual to achieve their valued function.

Negative capabilities: Used to describe the capabilities that are lacking or inhibitive, in order to achieve a valued function, relating to drivers of deforestation and forest degradation.

Social norms: Social norms 'guide how we should behave' (Darnton 2007) or are "customary rules that govern behaviour in groups and societies" (SEP 2014).

Transformational change (TC): '…a specific shift in discourse, power relations, and deliberate actions away from business as usual' (Di Gregorio et al., 2013, p. 63).

Underlying drivers: Aspects such as culture and social norms, that facilitate indirect drivers.

Valued functions: Beings and doings that people have reason to value (Robeyns, 2003; Sen, 2001).

Values: "[Collections of] beliefs that individuals use as standards for evaluating attitudes and behaviour" (Rokeach 1973).

LIST OF ACRONYMS AND ABBREVIATIONS

AGEXPORT: Guatemalan Association of Exporters
CC Law: Climate Change Law, Guatemala
CDM: Clean Development Mechanism
CEAB: Centre for Environment and Biodiversity Studies, Universidad del Valle de Guatemala
CICIG: International Commission Against Impunity in Guatemala
CNCC: National Council on Climate Change
CNCG: Climate, Nature and Communities Guatemala
CONAP: National Council for Protected Areas, Guatemala
ERPA: Emissions Reduction Payment Agreement
FCPF: Forest Carbon Partnership Facility
FDN: Foundation for the Defenders of Nature
FIP: Forest Investment Programme
GCI: Interinstitutional Coordination Group, Guatemala
ICDP: Integrated Conservation and Development Project
IPCC: International Panel on Climate Change
INAB: National Institute of Forests, Guatemala
LOI: Letter of Intent (for potential purchase of emissions reductions)
MAGA: Ministry of Agriculture, Guatemala
MARN: Ministry of Environment and Natural Resources, Guatemala
MinFin: Ministry of Public Finance, Guatemala
NGO: Non-Governmental Organisation
PES: Payments for Environmental Services
PGN: National Procurator General, Guatemala
PINFOR: Incentive Programme for Forests
PINPEP: Incentive Programme for Small Possessors
RBSM: Sierra de Las Minas Biosphere Reserve
REDD+: Reduction of Emissions from Deforestation and Forest Degradation
SGCCC: Guatemalan System for Climate Change Sciences
UNFCCC: United Nations Framework Convention on Climate Change
USAC: University of San Carlos, Guatemala

CHAPTER 1: INTRODUCTION

Forests have been an important natural resource for human development for thousands of years. In many countries, forests are important sources of food, water and employment for large numbers of the population (Bryant et al., 1997). It is estimated that around 800 million of the world's poorest rely significantly on forests for their livelihoods (Groom and Palmer, 2012). It is for this, and the fact that many tropical forests contain much of the world's biodiversity and terrestrial carbon stocks (Saatchi et al., 2011), that there is continuing concern about the rapid loss of forests globally. The impact of loss of terrestrial carbon stocks has significant implications for our ability to curb the effects of anthropogenic climate change, which could have dire consequences for millions of vulnerable people across the globe.

There is a wealth of literature that attempts to explain why deforestation and forest degradation (DD) occurs, from local to global scales (Burgi et al., 2004; DeFries et al., 2010; Geist and Lambin, 2002, 2001; Hosonuma et al., 2012; Kissinger et al., 2012; Morales-Barquero et al., 2015; Nelson et al., 2006; Qasim et al., 2013; Wehkamp et al., 2015). Explanations involve agricultural expansion, technological and infrastructure expansion, population growth, land tenure and governance issues. Part of understanding the reasons for DD has involved the development of many models and a range of terminologies including broad terms such as causes, factors, drivers or driving forces, and sub-classifications such as direct or proximate, indirect or underlying (Burgi et al., 2004; Hosonuma et al., 2012; Kaimowitz and Angelsen, 1998; Meyfroidt, 2015). We will use the term "driver" in this study as it is the most commonly used term in the literature (Sonter et al., 2015). However, as Meyfroidt (2015) highlights, although there have been advances in modelling efforts, descriptions and contextual explanations of why DD occurs, there has been little progress in theory development and generalisations, a situation that could largely be due to the lack of consistency in terminology, and approaches for explaining causality.

In the literature, classes of driver tend to be limited to two (also with varying terminologies): direct (or proximate) and indirect (or underlying). However, there has been little to no differentiation between the drivers that occur within the indirect (or underlying) category which will often include demographic and economic factors as well as cultural and institutional, and as such this category is wide ranging and complex. One of the most well-known and used conceptual models of drivers of DD by Geist and Lambin (2001) also includes public attitudes, values, beliefs and individual and household behaviour as underlying drivers of land use change. However, from a social-psychological behaviour perspective, attitudes, values, beliefs and norms underlie and determine behaviours (Fishbein and Ajzen, 1975) therefore, the Geist and Lambin model fails to fully account for the causality within their categories of underlying drivers. As many drivers such as policy making, migration or agricultural production are actions, behaviours or results of decisions, it seems appropriate to build on Geist and Lambin's inclusion of behavioural aspects in drivers investigations, and explore what behavioural theory can do to inform drivers studies.

Behavioural science is well placed to conceptualise and understand the predictors of environmental and economic consumption, specifically through analysing behaviours (Swim et al. 2011; Stern 2011). Yet although its usefulness is widely expressed, behavioural science perspectives remain largely underrepresented in mainstream climate and environmental research (Pongiglione & Cherlet 2015; Clayton, Devine-Wright, Stern, et al. 2015; Clayton, Devine-Wright, Swim, et al. 2015). Anderson et al. (2016) and Burton (2004) consider this is likely due to the perceived complexity and unknowns in behavioural theory and associated methods. However, exploring the role of values in behavioural outcomes has increased in forest conservation literature in recent years (Berninger and Kneeshaw, 2009; Cubbage et al., 2007; Eriksson et al., 2015; Hardin, 1968; Krutilla, 1967; Moyer et al., 2008; Nordlund and Westin, 2010; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2015, 2013).

In response to the increase in values approaches to understanding environmental behaviour, Tadaki et al. (2017) developed a typology of values to encourage researchers to distinguish between different concepts of 'value'; such as values as priorities (social-psychological approaches) versus values as magnitudes of preference (economic approaches); emphasising the importance of these distinctions to research design, outcomes and application. Several more recent studies have drawn specifically upon social-psychological models of behavioural theory, often with a specific focus on attitudes and norms that contribute to adoption of specific sustainable practices (e.g. Drescher et al., 2017; van Dijk et al., 2016; Van Hulst and Posthumus, 2016), with useful implications for policy making.

Social-psychological behavioural theory stipulates that specific attitudes and norms influence associated behaviours (Fishbein and Ajzen, 1975). In this field, attitudes and norms are themselves derived from, and are predicted by, values (Fulton et al., 1996; Homer and Kahle, 1988; Li et al., 2010; Schwartz, 2001). The broad and stable nature of these values can provide an insight into a wide range of behaviours (Hofstede, 1980; Rokeach, 1973; Schwartz, 2001). As DD is often a result of a range of different behaviours or decisions, values could provide an effective starting point for a holistic exploration of drivers of DD. However, although values can provide explanations for a range of actions, many theorists have noted that there is often a gap between an individual's values, attitudes or intentions and their actual behaviours. Kollmuss and Agyeman (2002) and Darnton (2008) provide extensive reviews of a variety of models that account for this 'value-action-gap' (Blake, 1999). Broadly, the value-action-gap is thought to be populated by a combination of attitudes, social norms, behavioural intentions and other factors such as information, feelings/emotions, external political, social and economic factors and feedback systems.

In the Capability Approach, this value-action-gap is filled with the freedom to achieve. These 'freedoms' are individually referred to as capabilities, and collectively as a person's capability set (Sen, 2001). Robeyns (2006, 2005, 2003) uses the concept of specific personal, social and environmental 'conversion factors' to categorise and explain these capabilities. Within these conversion factor categories, many of the factors mediating the value-action-gap identified by behavioural theorists (e.g. social norms, feelings/emotions or information) can be accounted for. The conversion factors also relate practically to drivers of DD, providing an explicit categorisation

system that nevertheless remains broad enough to account for both social-psychological and external factors. The Capability Approach has been used in a variety of contexts, including assessing the impacts of ecosystem services on human wellbeing (Polishchuk and Rauschmayer, 2012) and exploring scenarios for sustainable development from a value orientation perspective (de Vries and Petersen, 2009); however, Robeyns' interpretation of the Approach using conversion factors has never been combined with socio-psychological behavioural models or applied to understanding drivers of DD.

The relationship between forest values and behaviour has been explored quantitatively (Ní Dhubháin et al., 2007; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2015; Vaske and Donnelly, 1999), although often with a focus on a specific type of value (e.g. forest values, value orientations or individual values) or mediating factor (e.g. attitudes, norms). However, shared values have been increasingly noted as important to ecosystem services and landscape level approaches to decision making (Brunetta and Voghera, 2008; Fish et al., 2011; Kenter et al., 2015).

The concept of a set of shared universal human values has been well developed in the literature, but large scale empirical studies also show that preferences for, or orientations towards, these values may differ across cultures (Hofstede, 1980; Rokeach, 1973; Schwartz, 1994; Schwartz et al., 2012). Studies specifically on forest values have similarly found that although people may have similar forest values, value orientations (e.g. ecological vs production) often vary between different cultures and social groups (Eriksson et al., 2015; Vaske and Donnelly, 1999). The differences in these orientations or preferences are often a result of how different cultures and social groups view themselves in relation to other objects and people, so an understanding of these perspectives is important for identifying social and cultural norms that populate the value-action gap and help predict behaviours (Hills, 2002; Kluckhohn and Strodtbeck, 1961). Therefore, to capture the full range of values and mediating factors that may contribute to land use decisions, behaviours, and ultimately change, an approach derived from a shared values perspective that includes a range of values associated with whole landscapes and ecosystems is required.

Identifying and aligning forest values has been noted as essential for designing effective sustainability and forest management policies (Cubbage et al., 2007; Hardin, 1968; Krutilla, 1967; Moyer et al., 2008; Sharaunga et al., 2015). Analysis of drivers of DD for policy design is, however, a highly complex process where many have noted the difficulty of identifying social and cultural drivers and their interactions in time and space (Munteanu et al., 2014; Rudel and Roper, 1996; Stern, 1992; Walker, 1987). Confounding the difficulties in identifying and addressing drivers through policies and interventions, are the internal processes that occur within the policy design arena. 'Transformational change' refers to '…a specific shift in discourse, power relations, and deliberate actions away from business as usual and toward policy reforms that…tackle the drivers of deforestation and forest degradation' (Di Gregorio et al., 2013, p. 63). Barriers to transformational change may include issues such as the maintenance of the status quo through promotion of sectoral interests that facilitate DD activities, conflicts of interest that reduce individuals' ability to make independent decisions relating to reduction of DD, delegation of

decision making or power without providing adequate resources and capacity, political inaction, and lack of challenges to political and other power structures (Babon et al., 2014; Brockhaus et al., 2014; Di Gregorio et al., 2013). The discussion of these issues is largely confined to the environmental governance literature as these barriers to transformational change often act at the decision maker level, while explicit reference to the effect of these barriers on land users (and land use change) as drivers of DD, is rare. By treating barriers to transformational change and drivers of DD separately at a conceptual level, it is easy to overlook important causal relationships between the two that may affect decision making.

The overarching problem this thesis aims to address is the limited understanding about why DD occurs. To date, there has been little generalisable theory development to explain drivers of DD. This is characterised by a lack of continuity in terminologies and insufficient depth of analyses suitable for informing policy and other interventions. In order to address these issues, the aim of this thesis is to deepen the current understanding of drivers of DD by developing a conceptual model for understanding and structuring drivers of DD from a socio-psychological behavioural theory perspective.

The research questions that guide this thesis are:

RQ1. How do land users' shared values inform our understanding of capabilities related to land use?

RQ2. How do land users' capabilities contribute to DD behaviour?

RQ3. Do decision maker capabilities related to DD constitute barriers to transformational change?

I therefore applied and tested the model, which incorporates an interpretation of Robeyns' Capability Approach conversion factors and a revised interpretation of the Geist and Lambin drivers of DD categories, using a shared values approach and mixed qualitative and quantitative methods in two linked case studies in Guatemala.

This thesis begins with an introductory chapter, beginning with a review of the literature on drivers of deforestation and forest degradation, including their importance for policy and intervention design and the models and approaches used to understand and explain DD. I then go on to discuss the development of the conceptual model, from the role that socio-psychological theory can play in explaining environmental change to behavioural theory models and Robeyns' Capability Approach. In Chapter 3, I discuss the justification for my approach to applying and testing the conceptual model in practice, beginning with explaining my personal philosophical approach, followed by a discussion of my choice of a shared values approach and the different methods available for identifying and exploring these values. I also discuss my choice of a case study approach, and the details of my specific case studies are described in the following chapter. I then present an overview of my methodological approach, then describe my specific methods in detail along with their limitations.

The first two results chapters are presented as papers which have been submitted to the journals Land Use Policy and Environmental Conservation, respectively. Chapter 4 details the initial

application of the conceptual model to a case study with land users living in and around the Sierra de Las Minas Biosphere Reserve in Guatemala, serving as a proof of concept for the use of the model and approach for identifying drivers of DD in response to research question one. Chapter 5 builds on the results of Chapter 4 by expanding the case study area to land users in the Sarstún Motagua region of Guatemala to explore how land user capabilities link to land use behaviour; and may interact and differ between groups with different stakeholder characteristics, in response to research question two.

The subsequent results chapter presents the application of the model to a linked case study scenario of Guatemala's UN-REDD+ (United Nations Reduction of Emissions from Deforestation and Forest Degradation) Programme design, to explore decision maker perspectives and capabilities associated with drivers of DD and how these interact and differ among decision makers with differing stakeholder characteristics. The start of this chapter is presented as an introduction to a paper, and sets the scene for the following two parts, the first of which, Part 1, acts as a proof of concept for the use of the model and approach to identify drivers of DD in the REDD+ decision maker context. Part 2 then builds on the results of Part 1 and adds to it using data from decision makers 18 months on in the REDD+ process with a view to exploring how capabilities differ among decision makers with different stakeholder characteristics. Additionally, I discuss the practical application of the conceptual model to intervention design contexts including countries' development of REDD+, and provide suggestions for successful policy and intervention design.

In Chapter 7, I combine the results from all three results chapters to understand how capabilities interact across land users and decision makers, in response to research question three. I then discuss the implications of the results on the structure of the conceptual model and place my results within broader behavioural theory and investigation.

CHAPTER 2: CONCEPTUALISING DRIVERS OF DEFORESTATION AND FOREST DEGRADATION

Chapter Summary

In Part 2.1, I review the most commonly identified drivers and how previous authors have conceptualised and defined drivers of deforestation and forest degradation (DD). I then look more closely at how drivers of DD have been classified and categorised in the literature, and use this to develop a case for approaching the understanding of drivers of DD from a socio-psychological behavioural perspective.

This is followed by a review of how drivers of DD have been identified, noting the complexities associated with identifying and linking drivers and their interactions across time and space. Finally, I explore how an assessment of drivers of DD has been used in the design of policies and other interventions, highlighting weaknesses of existing models and approaches, and how an understanding of the process of intervention design can be important for understanding drivers of DD.

In Part 2.2 I build up an alternative conceptual model for understanding drivers of DD by drawing on socio-psychological behavioural theory and the Capability Approach. Following a brief background to socio-psychological behavioural theory and an introduction to the Capability Approach, I explain how the two will be combined. A revised classification of drivers of DD is then discussed, together with an explanation of how this contributes to the complete conceptual model. Finally, I discuss how the model involves a feedback cycle and how this is important for understanding how to change behaviour through policy and other intervention design.

Part 2.1: Understanding Drivers of Deforestation

What are drivers of DD?

Deforestation is a significant global problem leading to biodiversity loss, increased greenhouse gas emissions and decreased terrestrial carbon storage capacity, contributing to anthropogenic climate change (Tacconi, 2007). Since the 1980s, understanding why deforestation and forest degradation (DD) occurs has been, and remains, one of the most contentious issues in global environmental change research, with the exploration of the numerous potential factors and variables involved being described as a 'formidable task' (Meyer and Turner, 1992 p52). A range of terminologies have been used for describing the reasons for DD, including causes, factors, drivers or driving forces, however, I will use the term "driver" in this thesis as it is the most commonly used term in the literature (Sonter et al., 2015). The main drivers of DD that have been identified in the literature are briefly introduced below.

Population

Population has long been recognised as a driver of DD (e.g. Carr, 2004a; Ferretti-Gallon and Busch, 2014; Sandler, 1993; Vanclay, 1993; Wibowo and Byron, 1999). However, Boserup (2005) argued that increasing population was likely to increase agricultural intensification, potentially having positive impacts on the environment. This theory was later tested by other authors (e.g. Brush and Turner, 1987; Pingali and Binswanger, 1988; Turner et al., 1977), and held firm.

In Turner et al.'s (1977) test of Boserup's theory, they recognised that population density alone could not account for all of the variation in land use changes identified. Further studies explored a range of other forces that act in combination with population and intensification, finding that there are multiple forces involved, including kinship, culture, ecological conditions, market integration, the use of technologies, agricultural inputs, migration and urbanisation (Ahmed and Sanders, 1998; Brush and Turner, 1987; DeFries et al., 2010; Ferretti-Gallon and Busch, 2014; Shriar, 2001). Similarly, in an analysis of the impact of family planning on deforestation in the Ecuadorian Amazon, Sellers (2017) found no significant correlation, noting that in order to understand the relationship between population and deforestation, the numerous different pathways between the two must be addressed.

As Geist and Lambin (2001) note, studies often use fuzzy terms such as 'population pressure' when exploring its effect on the environment. Many studies that explore population, really explore the different aspects related to population increase: the need for agricultural expansion due to increased demand for food (FAO, 2015a; López-Carr and Burgdorfer, 2013) and wood related products, such as fuelwood for energy (Angelsen and Kaimowitz, 1999; Geist and Lambin, 2001; Kissinger et al., 2012), infrastructure expansion (e.g. houses, transport, market access etc.) (Geist and Lambin, 2001), as well as a change in the distribution of DD due to urbanisation (FAO, 2015a).

Technological development

In a broad categorisation of technological development including loans and assistance, Mena et al. (2006) suggested that initially, this will have a negative effect on DD due to lag times between the uptake and full efficiency of the technologies. Mena et al. (2006) do acknowledge that technology can also provide benefits to agricultural intensification, but Tilman et al. (2001) note that even the best technologies properly deployed, cannot always reduce DD. According to Tilman et al. (2001), regionally appropriate education, laws and incentives would be needed to ensure the effective adoption of appropriate technologies. The FAO (2015b) also noted that lack of access to, and potential for, misinformation or misinterpretation of the required information and education to engage with technologies, or to comply with new policies, can be a barrier to the uptake of technological advances, and this is linked to the operations of the state and its institutional functioning.

Institutions

Institutions can be considered as both formal rules (e.g. laws) and informal constraints (e.g. social norms, taboos, traditions), which often influence our decisions (North, 1990). According to Culas (2006), appropriate institutions can reduce uncertainty, improve allocative efficiency and feasibility in engaging in economic activities. In his exploration of the impact of institutions on income and deforestation, Culas (2006) found that improvement in institutions can empower people through, for instance, securing of property rights and better environmental policies. Similarly, Bray et al. (2004) found that institutional innovation was a key component driving sustainability and conservation in Mexico. However, Culas (2006) found that the role of institutions was only found to be significant in Latin America, suggesting that it is important to take the nature of the culture and institutions into account before drawing conclusions on their impact on DD.

Institutional conflicts have been identified as drivers of DD in Brazil (May et al., 2011). Seemann (2016) also identified legal structures and power relations as promoting unequal distribution of resources and decision-making power in Bolivia surrounding water resources, which could lead to degradation of resources. Gadgil et al. (2003) acknowledge the role that institutions play in modifying the way in which resources are used, where knowledge and observations of the surrounding environment influence institutions associated with resource management, which in turn changes the way they are used. Leach et al. (1999) took a more behavioural view on institutions and defined them as patterns of behaviour between individuals and groups, and went on to explore their mediating role in people-environment relationships in South Africa and Ghana. They highlight the importance of diverse institutions operating at multiple scales affecting environmental priorities and natural resource claims through power and relationship dynamics, but note that there has been little documented understanding of those arrangements. As such, Leach et al. (1999) noted that this has impeded the progress of understanding the role of institutions in land use decision making and DD interventions.

Values, attitudes and beliefs

Associated with the complexities of international institutions are the in-state local, national and international cultures and institutions that define how those countries and their policies are

developed, structured and function (FAO, 2015b). The likelihood of a nation to transition effectively from capital accumulation through use of forest resources, to capital accumulation through other sources may be a reflection of their national values and culture: states that collectively value the environment may transition faster, or it could be a reflection of the current populace wishing to maintain their current lifestyles (O'Flaherty, 2015).

Conflicts, over land or resources have also been noted as potential drivers of DD. In East Africa, Cavanagh et al. (2015) discuss the conflicts that surround forests. They note that these conflicts often arise over different interpretations of legality and illegality. According to Heyman (2013), legality is best conceptualised when considered as processes that reflect underlying interests and values. Similarly, Coombes et al. (2012) and Le Guen et al. (2013) consider resource conflicts to often be intertwined with culture, identity and social and political differences. This difference of institutions and values can exacerbate resource conflicts, particularly when between customary and state law, or competing claims to land ownership (Cavanagh et al., 2015; Lund, 2012).

Poverty

Poverty and deforestation have been hypothesised to be linked in a causal relationship (Jalal, 1993). Yet there have been several later studies which refute this relationship (e.g. Duraiappah, 1998; Peterson Zwane et al., 2002). Hanauer and Canavire-Bacarreza (2015) explored Bolivia's protected areas system and its impact on poverty, finding that there was no clear correlation between the two. However, they did find evidence for other biophysical aspects in these areas that are associated with poverty exacerbation, highlighting the potential for heterogeneity in impacts of policies on the poverty-deforestation nexus.

However, many studies do not specifically link 'poverty' simply to deforestation, often exploring only one facet of the concept (e.g. a macroeconomic variable (Wibowo and Byron, 1999) or as economic impoverishment (Rudel and Roper, 1997)). Several studies have found that a lack of alternative income generating opportunities leads to a reliance of poorer communities on natural resources for their livelihoods (Córdova et al., 2013; Holden, 1993; Ledesma et al., 2007; Ludger J. Loening and Markussen, 2003; Sharaunga et al., 2015; Vakis, 2003). This is related to the 'forest transitions' hypothesis, usually discussed using an environmental Kuznetz curve, which suggests that at lower levels of income, deforestation will increase, but once incomes have reached a certain level, deforestation will reduce (Grainger, 1995; Mather, 1992).

For those living in rural areas that have other non-forest or agriculture incomes in Guatemala, the vast majority are remittances (Córdova et al., 2013; Vakis, 2003), which have been found to have a significant positive effect in enabling families to improve the sustainability of their environmental livelihood practices in eastern Guatemala (Holder and Chase, 2012). Conversely, with rising incomes can come an increase in the demand for forest products, or a shift such as towards pre-processed items, which may worsen issues of poor forest management and excessive and illegal logging (FAO, 2015b).

Therefore, as with 'population', it appears that 'poverty' may simply not be a term that accurately describes the myriad factors that act in combination to affect the environment. According to

Geist and Lambin (2001), poverty can be considered as a cross-cutting concept that includes the negative environmental effects of: 'resource-poor farming, survival economies, insufficient food production, chronic food deficit, displacement, limited land endowment, growing land scarcity, landlessness, land division, creation of poor landholdings, low living standard, joblessness, extremely low income levels, social deprivation, marginalization, and low empowerment of local user groups' (Geist and Lambin, 2001, p. 13).

Land tenure

The availability of land is often closely linked to poverty. Some evidence suggests that secure land tenure reduces DD (Godoy, 1996; Pichón, 1997; Southgate et al., 1991). For instance, secure property rights (and/or increased social capital) can incentivise people to care more for the land (Katz, 2000). However, contrary evidence points to land titling as a potential driver of DD (Angelsen, 1999; Kaimowitz, 1996), as titling encourages less risky investment. Similarly, there is evidence to suggest that deforestation is a process by which people can achieve land titles, and therefore a driver of DD (Anderson and Hill, n.d.; Angelsen, 1999; Mendelsohn, 1994). In a study of cattle-farming in Guatemala, Zander and Durr (2011), found a self-exacerbating cycle of increased land owned (or grabbed) by cattle ranchers forcing small land holders to lease out their lands while they work as labourers on the cattle ranches, for lack of economic alternatives. Other research points to tenure effects varying depending on the type, where Bonilla-Moheno et al. (2013) found a difference in land use change effects depending on whether the tenure type was communal or private. In a review of the literature on forest outcomes and land tenure, Robinson et al. (2013) found that tenure clearly matters to land use change, but the nature of this effect will vary depending on the cultural, institutional and environmental context, and the form of land tenure being explored. For instance, forest concessions in the Maya Biosphere Reserve in Guatemala have been studied extensively, and many studies have emphasised that their success often relies on the nature of the unique context of each concession (Bray et al., 2008; Radachowsky et al., 2012; Taylor, 2010). Therefore, when it comes to land tenure issues, like other institutional issues, the effects of titling and various forms of ownership (e.g. concessions) have vastly different impacts depending on place and culture.

Trade and Globalisation

Linked to rising incomes is the nature of international trade and demand, increasingly important as a driver of DD (Henders and Ostwald, 2014). Countries are keen to take advantage of the value-added forest products trade, although the majority of forest product trade flows are intraregional, as 80% of European forest product trade is between European countries (FAO, 2015b). According to Geist and Lambin (2001), land use change is also influenced by globalised flows of commodities, especially with the growing urbanised consumer class. With increased trade and globalisation, the process of economic liberalisation and increasing interdependence of nations provides opportunities for growth, but also shared vulnerability (Meyfroidt et al., 2013). Both developed and developing countries are vulnerable to the effects of climate change, and a shared responsibility is necessary to tackle it, however increased tensions between developed and developing countries could mean that the ability to form a resilient approach to the changing climate is increasingly complex (FAO, 2015b).

International influence

Along with globalisation will come increased engagement of countries in the international arena, and International pressure in the form of concern about the environment, forests and biodiversity can also shape forest cover. The UN and NGOs have brought many of these issues to the fore, influencing governments to alter and improve their forest policy programmes (FAO, 2015b). However, some spokespeople from countries engaging in activities to reduce DD have accused countries in the 'global north' of unfairly offsetting their own emissions by punishing countries currently developing (Nielsen, 2014; Špirić et al., 2016). O'Flaherty (2015) dubbed this 'free-riding', and noted that it is important to ensure that this is not mistaken for progress, therefore steps need to be taken to challenge the discourses of climate change mitigation at national and international levels.

Deriving a definition of 'drivers of DD'

"There is no clear definition of 'deforestation', neither are there reliable estimates of its extent nor its primary causes, and – partly – as reflection of these – there is no consensus on the underlying causes" (Angelsen, 1995, p. 1713)

Considering the many and varied different drivers of DD that have been identified, it is understandable that there are few clear definitions put forward for the concept of 'drivers of DD', with those available being rather vague:

> "Deforestation results from complex socio-economic processes, and in many situations it is impossible to isolate a single cause" (Walker, 1987, p. 19)

Geist and Lambin (2001) noted the 'abundant and contradictory' notions of drivers of DD and decided to break down their understanding of drivers into three categories: proximate causes, underlying driving forces and 'other factors'. This sub-categorisation formed the basis of their popular model of Causes of Forest Decline (Geist and Lambin, 2001). Similarly, many others that have tried to understand drivers have focused on breaking down the broad and complex concept of 'drivers of DD' into sub-classifications such as direct or proximate, indirect or underlying (Burgi et al., 2004; Hosonuma et al., 2012; Kaimowitz and Angelsen, 1998; Meyfroidt, 2015; Sonter et al., 2015). However, Meyfroidt (2015) notes that the imprecise nature of the terminology surrounding drivers of land use change means that the field lacks structured methods and approaches to understanding causality. Therefore, below I attempt to develop an overall definition for 'drivers of DD', before I later expand on the discussion of sub-categories and conceptualisations of drivers of DD in a subsequent section.

Often, by focusing solely on the localised processes of technological development, population growth, or poverty, it is easy to miss the 'bigger picture' within which these processes exist and evolve – which may include processes of globalisation or the intangible institutions, attitudes and beliefs of the public. When approached from this way, increased use of technology alone may not be a driver of DD, but the outcome of a multitude of 'drivers' that act 'behind the scenes'. In a similar vein of thought, the Forest Carbon Partnership Facility asks countries completing their Emissions Reduction Programmes to 'identify effective incentives it would provide to facilitate changes in land use behaviour' (FCPF, 2013 p2). Following on from this logic, if the incentives are

there to reverse the current facilitation process that causes negative land use behaviours, then it follows that drivers of DD can be considered as: the activities and facilitating processes that lead to a reduction of forest cover.

Methods for investigating drivers of DD

With such a broad definition of drivers of DD there will be multiple different types of drivers acting at different levels, tangible or intangible. However, not enough is yet known about these drivers and their interactions in different contexts of time, space and society to be able to fully understand how to tackle them (Murali and Hedge, 1997; Rudel and Roper, 1997, 1996).

In order to identify drivers of DD (including cultural and institutional drivers) and their interactions and then link them with forest cover change data, complex methodologies are needed that include both detailed qualitative and quantitative information at the right scale(s). In response to this complexity, Rindfuss et al. (2004), Cheong et al. (2012) and Turner et al. (2007) have emphasised the need for interdisciplinary assessments of drivers of DD, which cross the human, environmental and geographical information/remote sensing boundaries in an interdisciplinary context. Kleps and Turner (2001) also emphasised the importance of historical context in assessing drivers of land cover change, what others have termed the 'path dependency' of drivers (Coomes et al., 2011).

In empirical assessments of drivers at the local to regional scale, methods such as landscape level remote sensing or GIS are combined with community or household demographic surveys (e.g. Bray et al., 2004; Cheong et al., 2012; Eakin and Bojórquez-Tapia, 2011; Ellis et al., 2010; Morales-Barquero et al., 2015; Schmitt-Harsh, 2013). In Bray et al. (2004), they linked regional level landsat images to national level historical policy analysis to conclude that the main drivers of forest cover change were institutional innovations, but their conclusions do not provide any concrete links to which institutional changes might have specific impacts in the future. Ellis et al. (2010) noted that socioeconomic factors did not have any effect on tree cover loss, however their measurement of socioeconomic variables was limited to factors such as distance from markets. Therefore, the use of landsat, remote sensing or GIS based technologies appears to tend towards the exploration of a limited set of factors (i.e. slope, land use, distance to city/roads), with little room to explore more intangible factors (i.e. social and cultural factors) that may contribute to land use change, and how they interact with the more tangible factors.

Focusing more on national assessments, Kissinger et al. (2012), suggest gathering commodity export, economic and production data to compare with landscape level GIS or remote sensing data to develop national assessments of drivers of DD. Also at the regional to national and international scale, some assessments of drivers of DD have relied on a mixture of document analysis, stakeholder interviews, literature searches and satellite data (e.g. Paudel et al., 2014; Vinya et al., 2011). However, Kissinger et al. (2012) and O'Sullivan et al. (2015) acknowledge the significant difficulties in establishing causal links between different types of drivers and the over-reliance of some methods on good availability of data at a regional and national level.

Burgi et al. (2004) believed it is important to find a balance between generalisation and specification when assessing drivers. Geist and Lambin (2001) recognised the need for comparative analyses of the main processes of land cover change, noting that there are two major approaches to understanding drivers of DD, one of which is the single factor causation approach and the other is irreducible complexity. Both have their limitations, where the single factor causation approaches focus on population or shifting cultivation as the major drivers, which has largely fallen out of fashion in recent years. The irreducible complexity approach is probably more accurate, however this approach has little wider application as it often results in many and varied analyses, with no distinct pattern that can be used to draw conclusions at different scales.

The approaches briefly discussed above, although valid, often have limitations either in combining qualitative and quantitative data formats, accurately addressing the full range of drivers and their interactions (i.e. including social and cultural) or addressing drivers at scale(s) useful to policy and intervention design. Part of the problem of lack of appropriate methodologies for identifying drivers of DD may be due to the way drivers have been conceptualised. As Geist and Lambin (2001) demonstrated using empirical case studies, the development of a model that places various types of drivers within a broader conceptual framework can be useful for describing and understanding how multiple drivers interact in different contexts, although they acknowledge that the need for an overarching theory of drivers of DD remains.

Weatherley-Singh and Gupta (2015) also acknowledged that analysis of drivers of DD is a highly complex process but consider there to be a lack of critical discussions on what drivers are and how they may interact to influence land use change. In a review of approaches and terminology for causal analysis in land systems science, Meyfroidt (2015) drew further attention to the fact that although there have been advances in modelling efforts, descriptions and contextual explanations of why DD occurs, there has been little progress in theory development and generalisations, a situation that could largely be due to the lack of consistency in terminology, and approaches for explaining causality. Without these discussions and a coherent terminology, model or framework with which to understand and structure drivers of DD, it is unlikely that appropriate methods can be chosen to explore these drivers and interactions.

How have drivers of DD been conceptualised?

Categories and classifications of DD

For several of the drivers discussed above, notably poverty and population, these titles were too broad to explain exactly why they may or may not lead to DD in different contexts. Poverty and population appeared to be umbrella terms for a range of different drivers that act in combination to create a facilitating environment for forest cover changes. In response to this issue of inadequate terminology and the realisation that drivers may work at different levels, there have been several attempts to break each of these concepts down, in the hope of creating a coherent framework within which to structure drivers and their interactions.

In their meta-analysis of 117 spatially explicit econometric studies of what drives DD, Ferretti-Gallon and Busch (2014) found that results often vary depending on the context, the 'facet' of the driver the studies are discussing, and the focus of the study (whether one driver in particular was singled out for exploration). Unclear, mixed results were often found when only the broadest concepts (e.g. rising income, protected areas) were used, but clearer and more consistent pictures were discovered when these were broken down (e.g. into rural income support versus payments for environmental services (PES), legal status versus geographical remoteness). Therefore, titling drivers individually appears to only generate increased complexity. With a greater number of concepts it becomes harder to identify and keep track of the causal relationships between them and how they apply and act in different combinations across different contexts. Therefore, various authors have tried to categorise drivers of DD.

Munteanu et al. (2014) based their assessment of drivers of DD on five categories of driver: institutional, economic (and technological), social-demographic, cultural and climatic. However, later in their discussion they identified that broader political decisions were often underlying factors that constrained economic and social conditions, and noted that culture was not an important driver for their study, as the effects of culture only became important over longer timescales. Burgi et al. (2004) and Brandt et al. (1999) also identify five broad driving forces: socioeconomic, political, technological, natural and cultural, but note the highly complex nature of 'culture' as a driver means it is often left vaguely interpreted in discussions on drivers. However, this broad categorisation of drivers into themes is not always considered adequate for understanding causality between the groups, which is why many authors have favoured a classification scheme based on the way in which drivers interact with the environment.

Classes of driver tend to be limited to two: direct (or proximate) and indirect (or underlying). For instance, according to Kissinger et al. (2012), proximate (or direct) drivers are human activities that directly impact forest cover and underlying (or indirect) drivers are the interactions of social, economic, political, cultural and technological processes that influence the proximate drivers that cause DD. However, the specific definitions of these direct, indirect or underlying drivers can vary across studies, for example Nelson et al. (2006) describe their interpretation of a direct driver as one that influences ecosystem processes, while indirect drivers operate diffusely, altering the direct drivers.

The Geist and Lambin (2001) 'Causes of forest decline-II' model is the most widely used in analysis of drivers of DD in recent literature. It clearly identifies three types of driver of DD: proximate causes, underlying causes and 'other' factors. They define their proximate causes after Turner et al. (1993), as near final human activities that directly affect the environment, and note that in terms of scale, these causes often operate specifically at a local scale. Following earlier DD literature (Kaimowitz and Angelsen, 1998), they separate proximate drivers into three categories of agricultural expansion, wood extraction and infrastructure expansion, within which are grouped multiple, more specific activities. The underlying causes category of the Geist and Lambin (2001) model includes several factors, including demographic, economic, technological, policy and institutional, and cultural (including individual and household behaviour). They class these types of drivers as social processes, or those fundamental forces that underpin proximate

causes. In terms of scale, they note that these drivers can operate at a range of levels from local to national or even global. These drivers are significantly more complex than the proximate drivers, and include a much wider range of factors, from market growth and technological change, to attitudes, beliefs and values.

The 'other' factors in Geist and Lambin's (2001) model included environmental (non-human) factors in their categorisation of drivers. This included land characteristics, biophysical drivers and one potentially human-related factor of social trigger events (which could include wars, or droughts and forest fires). They noted that these factors could theoretically span both proximate and underlying drivers in terms of the type of impact they exert on the environment (direct, indirect) and the scale (including timescale) at which they act. Due to the rather heterogeneous nature of this factor, Geist and Lambin (2002, 2001) acknowledge that a more refined approach to this group could be taken, identifying the modifying factors, filters or contextual variables that explain these drivers.

Stern et al. (1992) also distinguished between proximate causes and driving forces (or social driving forces as they are also referred to) of global environmental change. They detailed a number of 'driving forces' (i.e. population change, economic growth, technological change, political-economic institutions and attitudes and beliefs) that influence the human activities that proximately cause global change and used several case studies to demonstrate the complex relationships between these driving forces and proximate causes. For instance, proximate causes for DD in the Brazilian Amazon included: logging, agricultural and livestock expansion, increased infrastructure, complex land tenure systems, financial incentives, economies of development, population growth as well as financial speculation, ideology and politics (Stern et al., 1992). Following Geist and Lambin (2001), they also noted that attitudes and beliefs cause and respond to major social forces, for example capitalism is underlain by a specific set of cultural beliefs and attitudes towards material production. The hierarchy of attitudes and beliefs among other driving forces is acknowledged by Stern et al. (1992) as one of the major controversies in drivers research, where the extent to which they can be classed as a driver in and of themselves is a key question.

From this section, it is clear that there is little agreement on what classes of driver should be, or include. Additionally, within classes across different studies there is little to no distinction between the types of drivers that occur within the classes. The Geist and Lambin (2001) model was one of the first major models of drivers of DD that included behavioural factors (i.e. attitudes, beliefs and values and individual and household behaviours). As many drivers of DD (the activities and facilitating processes that lead to a reduction of forest cover) such as policy making, migration or agricultural production are actions, behaviours or results of decisions, it seems appropriate to build on the work of both Geist and Lambin (2001) and Stern et al. (1992) in their inclusion of behavioural aspects in driver investigations, and explore what behavioural theory can do to inform drivers studies.

From the review of institutional and cultural drivers in Part 2.1, and noted by Stern et al. (1992) and Rudel and Roper (1996), DD 'has multiple causes with the particular mix of causes varying

from place to place' (Rudel and Roper, 1996, p. 160), drivers will vary across cultures and within different institutional contexts. Therefore, although it may be possible to identify and describe why DD occurs at a local level, it may vary with time and place, so that in depth understandings of why DD occurs that can be generalised and used at larger scales are rare. In socio-psychological behavioural theory, it is well noted that factors which influence behaviour such as values, attitudes, beliefs and institutional/social norms will vary across cultures (Ajzen, 1991; Fishbein and Ajzen, 1975; Schwartz and Bilsky, 1990). Therefore, it follows that socio-psychological theory could provide an appropriate framework for understanding and structuring drivers of DD.

Using socio-psychological behaviour theory to conceptualise drivers of DD

Psychology, and behavioural science, is well placed to conceptualise and understand the predictors of environmental and economic consumption, specifically through analysing behaviours (Stern, 2011; Swim et al., 2011). Broadly, the scientific community acknowledges that many of the drivers and impacts of climate change are social and behavioural (Reay et al., 2007; Stern, 1992), for instance, the American Psychological Association (2009) created a flowchart that explains environmental consumption through predictors of change. They posited that context (situational and social opportunities and constraints) sets the scene for individual behaviours, which is further modified by individual characteristics. These aspects then influence economic and environmental consumption in the form of collective and individual behaviours, which in turn influence climate change.

The usefulness of behavioural science to exploring the relationships with humans and the environment is widely expressed, yet remains underrepresented in mainstream climate research (Pongiglione and Cherlet, 2015). Anderson et al. (2016), Burton (2004) and Dietz et al. (1998) consider that this is likely due to the perceived complexity and unknowns in behavioural theory and associated methods, and the tendency for studies to fail to maintain connections with other disciplines. This often results in over-simplistic approaches to understanding agricultural decision making, which fail to take account of the full range of factors involved, and as such do not provide useful insights for policy making. In addition, Dietz et al. (1998) point out that theoretical development has been hampered due to lack of available datasets that can be used to confirm proof of concepts for both socio-demographic factors and psychological constructs. However, the arguments for continuing with a behavioural approach to agricultural decision making research are strong from the policy making perspective, for example at the European level due to the varied nature of the EU and the need for comparative analyses (Bryden and Geisler, 2007; Wilson and Hart, 2000). A more detailed discussion of how I will use socio-psychological behavioural theory in this thesis can be found in Part 2.2.

Drivers in policy and other interventions

Frameworks, models and approaches for intervention design

Many drivers of DD have been identified as falling outside of the forestry sector (Hosonuma et al., 2012; Kissinger et al., 2012; Salvini et al., 2014). However, many interventions are not designed to address these broader issues (Robiglio et al., 2014; Salvini et al., 2014; Weatherley-Singh and Gupta, 2015). This may be due to the inherent complexity in identifying drivers of DD,

as Walker (1987 p19) notes 'Deforestation results from complex socio-economic processes'. Without effectively tackling these social, cultural and institutional drivers alongside the other more 'technical' drivers, there can be no great success in tackling the problem of DD overall.

In a review of integrated tools and frameworks for behaviour change for The Forestry Commission, Morris et al. (2012) identified the 4Es and MINDSPACE frameworks as potentially useful to the forestry sector. The 4Es model by Jackson (2005) was developed to address behaviour change from four angles: enabling, encouraging, engaging, exemplifying. The basis of the model is in changing individual attitudes and behaviours, and as a result, Morris et al. (2012) criticised it for failing to fully take account of the social context within which decisions take place. Additionally, although the model is derived from behavioural theory, there is no clear framework for understanding how each of the factors interact, or an approach to measure the efficacy of interventions which draw from this model.

The MINDSPACE framework (Dolan et al., 2012) is derived from a behavioural economics perspective with roots in individual behaviour change and takes into account aspects such as who communicates information, what others do, social norms and path dependencies, all of which are important aspects related to the broader social context within which decisions are made. Morris et al. (2012) however notes that the nature of the MINDSPACE framework may be more relevant to reviewing and revising current situations and practices, rather than identifying new avenues for behaviour change interventions.

The MINDSPACE framework focuses on changing the environments within which people act, which has had an increasing focus in policy making contexts in recent years (see John and Robb, 2017; Thaler and Sunstein, 1975). However, Dolan et al. (2012) note that they have not provided much more than a useful 'checklist' for integration of MINDSPACE into policy making, and that more should be done to generate data and analyses from field experiments on behaviour interventions. However, in a review of behavioural approaches to citizen compliance and cooperation by John and Robb (2017), although there were many field studies of behaviour change interventions, most did not ground their investigations in a particular theory of behaviour change, yet they found that using social norms (by influencing, challenging or emphasising perceived norms, or stigmatising individuals in the face of social norms) were some of the most broadly effective techniques for achieving behaviour change.

Few behavioural models for understanding drivers of DD have a dedicated methodological framework. Even models designed to explain drivers and their interactions may be insufficient if not coupled with an appropriate and verifiable methodology. For example, in an attempt to uncover the patterns of causality between categories of drivers, Geist and Lambin (2001) conducted a frequency analysis of studies of drivers of DD to identify causal links between drivers which they then applied to their model. Although Geist and Lambin (2001) recognise some limitations of their analysis, they did not acknowledge the potential issue of demographic factors not being a determinant of infrastructure expansion (a category which includes settlements, transport and public services) in their model, highlighting the need for the combined refinement and focus of models and approaches to exploring drivers and causalities.

de Vries and Petersen (2009) also created a conceptual model that connected value orientations with the Capability Approach in order to create scenarios for sustainable development by exploring how people's value orientations inform us of the capabilities they prefer. They detailed a methodology to complement this conceptual framework, based on the Netherlands Environmental Assessment Agency's Sustainability Outlook survey, which surveyed thousands of individuals across the Netherlands over a number of years. Although this model and approach proved successful at creating scenarios for sustainable development in this context, it is unlikely that countries facing the problem of large scale tropical deforestation, often developing countries, have the technical and financial capacity at the decision making level and the public level (in terms of education and literacy) to generate and analyse the kind of data needed for the methodology (Hosonuma et al., 2012). In a similar vein, Drescher et al. (2017) explored socio-psychological determinants of conservation scheme participation by private landowners in Canada using a mail survey of 21 pages and 250 questions. They received a good response rate of 54.9% (almost 600 responses), but this type of in depth survey is unlikely to be successful if applied to a developing country context.

These studies indicate that even if there is a dedicated methodological framework for a model, it may not be one that is appropriate for use in contexts with limited capacity. Although the development of a model without a methodological framework leaves room for tailored approaches that can take account of local conditions, it lays the onus of finding an appropriate methodology on individuals or organisations who may not have sufficient knowledge, experience or resources to identify or develop an appropriate methodology. Without a combined method and approach, the comparability of results between regions, countries, or potentially across time, will remain limited.

In order to develop effective interventions, understand the current land use change context, and being able to compare the effect of interventions to this 'baseline' is important. Ideally, the ability to compare to the baseline should also be cost and resource effective, not requiring significant time and resources, otherwise it is unlikely that a realistic assessment of the efficacy of interventions will be carried out. However, another limiting factor to effective intervention design will be the nature of the policy/intervention design process itself, as discussed in the next section.

How intervention design influences land use change

Studies of the impact of interventions (e.g. those summarised by Duchelle and Jagger (2014)) discuss enabling and inhibiting conditions that affect the efficacy of interventions. These conditions include aspects such as lack of law enforcement, the need for tenure clarification and education, and institutional path-dependency. Institutions are considered important in determining the effectiveness of interventions. For instance, economic interventions to tackle DD can have impacts on institutional arrangements and organisational structures of communities, in a form of institutional bricolage (Cleaver, 2001; Díaz and Koning, 2015). Cote and Nightingale (2012) critiqued a study by Adger et al. (2005), who claimed that inequitable and illegitimate institutions undermine the potential for welfare gains, arguing that there must be

trade-offs between equity and legitimacy. Institutions in the form of norms (following North, 1990) and their role in driving environmental change and management of natural resources has also been acknowledged (Leach et al., 1999). In resilience studies, institutions as norms are considered by-products of broader institutional design or structures, but conversely, Cote and Nightingale (2012) along with others (Parks and Roberts, 2010; Schroeder and Suryanata, 1996) argue that norms, including power relations and values are essential to cultural change, and the dynamics that mediate human-environment relationships.

Somorin et al. (2013) details how institutional arrangements within the policy process in Cameroon can have an effect on the outcomes of land use policy or intervention design. In terms of tackling these issues, Tucker et al. (2007) found that the presence of favourable biophysical factors can influence the strength of institutions in conserving the environment. Institutions can also become more legitimate with continued maintenance of highly hierarchical and discriminatory institutions (Agrawal, 2005). However, institutions and social norms are often embedded in wider culture, and so challenging of these institutions can lead to violent opposition from those who support the current status-quo (Berry, 2009; Sikor and Lund, 2009). Chhatre (2007) and Ribot (2009) also both found that implementing highly participatory processes can heighten vulnerabilities and create instability.

'Transformational change' refers to '…a specific shift in discourse, power relations, and deliberate actions away from business as usual' (Di Gregorio et al., 2013, p. 63). Understanding the conditions that enable or inhibit transformational change is essential for ensuring sustainable outcomes from interventions. Although the barriers to transformational change describe processes that act mainly within the decision making arena, some of the issues highlighted are very similar to the drivers of DD discussed above, and arguably the processes that go on 'inside' the policy making process will affect the efficacy of interventions, and therefore resulting land uses. Understanding barriers to transformational change as potential drivers in themselves (i.e. not only as aspects which need to be considered to ensure the successful design of an intervention) could mean that more effective interventions could be designed in the first place, and important causal relationships between the issues are not overlooked. This will be discussed more in Chapter 6.

Conclusion

There are many conceptualisations, classifications and models of drivers, but without a clear definition of what drivers are or how to conceptualise them, they cannot be effectively identified or understood. Therefore, I have defined drivers of DD as the activities and facilitating processes that lead to a reduction of forest cover.

Drivers often involve, and differ across, cultures and institutions, but the methods and approaches used to identify drivers and their interactions are currently limited and fragmented. Taking this definition and the differing nature of drivers depending on context into account, socio-psychological behavioural theory appears to provide a potentially useful framework within which to conceptualise drivers of DD, and will be discussed further in Part 2.2.

Often models or methodologies for identifying and structuring drivers of DD are developed in isolation, ultimately causing problems for effective policy and intervention design. The key aspects that I aim to achieve with the conceptual model and approach developed as part of this thesis (discussed in more depth in Chapter 3) are:

1. To develop an integrated model and methodological approach, as many models either focused on one or the other, making it difficult for users of the model/approach to either understand the theory behind their interventions and outcomes or achieve accurate and comparable data on the outcomes;
2. To use a methodology that could provide qualitative and quantitative data on the social and cultural aspects within the model to enable decision makers to make informed decisions;
3. For the approach to be do-able in countries with limited capacities.

Finally, understanding what goes on within policy making processes is also important to understanding drivers of DD. Greater acknowledgement of the importance of these 'internal' processes in discourses surrounding drivers of DD could ensure that important interactions between drivers at different levels are not overlooked (this is discussed further in Chapter 6).

Part 2.2: Building the Conceptual Model

Behavioural Theory

Human behaviour has been the subject of much study for decades, and as such is a highly complex field, 'bordering on the unmanageable', according to Jackson (2005). Standard economic theory, based on the concept of rational choice, is the basis for many behavioural models. However, the rational choice approach to understanding behaviour has significant limitations, and has led to the development of economic research into areas more associated with preferences and behaviour (Coyle, 2007; Darnton, 2008). Simon (1955) therefore developed the concept of 'bounded rationality' to explain how, when individuals are pursuing rationality, their decisions may still be constrained by or 'bounded' by personal/psychological and situational/environmental factors. In this way, economics brought in lessons from psychology in order to explain decision making within the context of realistic human behaviour (Dawnay and Shah, 2005).

Simple coupling of rational choice theory with behaviour models results in a linear process that generally fits the form of information/knowledge – attitude – behaviour (e.g. Kollmuss and Agyeman, 2002). However, information has been shown to have a less important role than other factors (such as social, cultural and economic conditions) in forming attitudes and perceptions (Fernández-Llamazares et al., 2016). Similarly, the link between attitudes and behaviour does not always appear linear, and has been termed the value-action gap (Blake, 1999). In Blake (1999), the gap is filled with personal attitudes and situational constraints to achieving behaviours.

Many social-psychological models draw upon personal, social and situational barriers as influencing behaviour. These barriers are often characterised as factors that can influence a broad range of end behaviours. The most basic social-psychological model of behaviour is the Expectancy Value Theory, which balances beliefs about a behaviour with the value attached to the associated characteristics (Darnton, 2008). One of the earliest behavioural models is the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), which uses attitudes as a primary factor driving behavioural intentions, alongside subjective norms and the relative importance (or value) of both. In time, this model was adapted to take greater account of the other factors that influence behavioural intentions, one of the most well-known of which is Ajzen's Theory of Planned Behaviour (TPB) (1991), which includes the concept of 'perceived behavioural control' which influences norms, behavioural intent and behaviour.

Attitudes are derived from values, and are specific to individual behaviours and situations (Fulton et al., 1996; Homer and Kahle, 1988; Li et al., 2010). As a result, values are less effective at predicting behaviour, but they have a strong predictive power on attitudes over time (Schwartz, 2001). Rokeach (1973) and Schwartz (2001; 1992) suggest that values are 'single, stable beliefs that individuals use as standards for evaluating attitudes and behaviour' and 'values are beliefs, cognitive structures that are closely linked to affect', respectively. However, Stern et al. (1999) and Ajzen (1991) believe that values influence beliefs. In Stern et al.'s (1999) Value Belief Norm theory, value orientations affect beliefs about the consequences of environmental actions and

subsequently create a sense of obligation to act in a pro-environmental manner. In the Theory of Reasoned Action and Theory of Planned Behaviour, as well as Stern et al. (1999), beliefs and evaluations about behaviours and norms (or other factors influencing final behaviours) form attitudes. Similarly, the Stern et al. (1995) Causal Model of Environmental Concern places values as antecedent to beliefs and attitudes.

Although there is some controversy over whether beliefs influence values or vice versa, Stern et al. (1999), Ajzen (1991) and Schwartz and Bilsky (1990) agree that values are broad, stable dispositions formed early in life during the socialisation process, that transcend specific actions and situations (as opposed to attitudes that are 'snap-shots' specific to individual behaviours (Beedell and Rehman, 2000)). The socialisation process is a process by which individuals acquire culture through learning about values and norms; this process continues throughout an individual's lifetime and can occur in many different contexts (e.g. family, work, environment), implying that values can also vary, change and adapt (Grusec and Hastings, 2014). According to Inglehart (1997), Kohn (1989) and Schwartz (2001), common experiences people have because of shared situations and social structures influence their values. Therefore, I have decided to use a model structure where values are influenced by beliefs about the world, albeit over time (Figure 1).

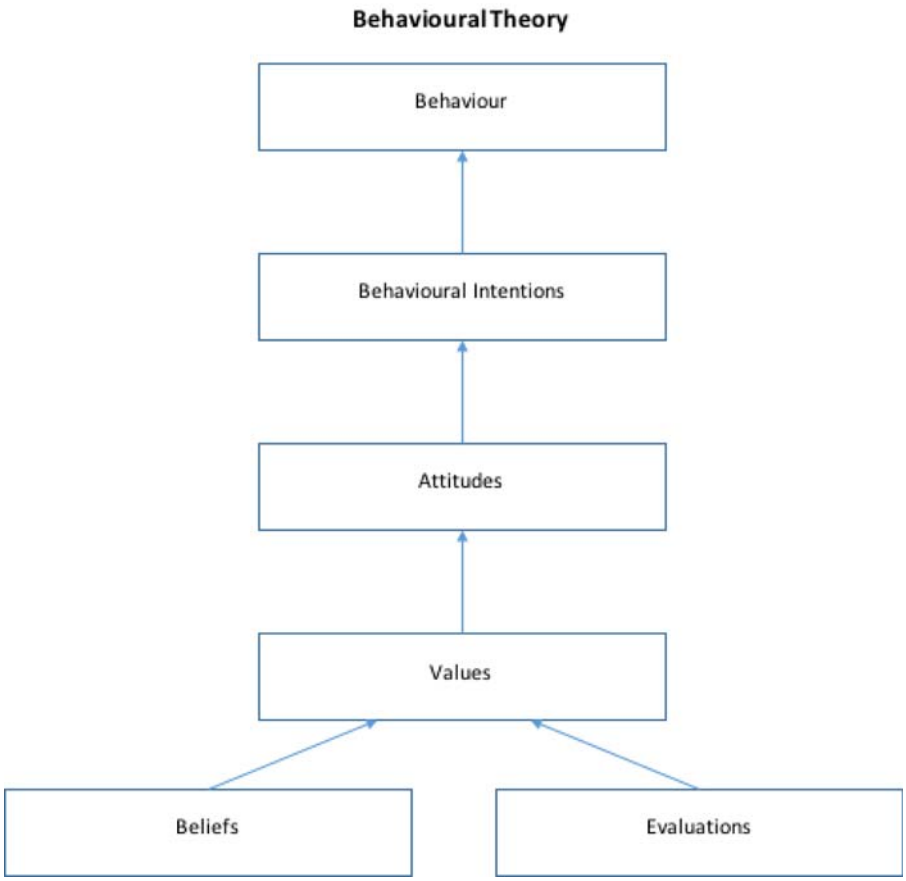

Figure 1: A summary of socio-psychological theories of values, attitudes and behaviour

The Capability Approach

The Capability Approach is a concept initially developed by Sen (Sen, 2001; Sen and McMurrin, 1979), and further built on by Nussbaum (2003), initially in response to monetary indicators of wellbeing commonly found in development planning and assessment. The 'wellbeing' considered in the Capability Approach is that of 'functionings' that people have a reason to value, such as being educated or having self-respect. However, in line with the value-action gap concept in behavioural theory, the act of achieving specific functionings is mediated by the 'freedom to achieve' these functionings. These freedoms could involve the process of being able to be educated, or being able to express oneself freely. In the Capability Approach, these freedoms are individually referred to as capabilities, and collectively as a person's capability set (Sen, 2001).

Robeyns (2005, 2003) built further on the Capability Approach, focusing specifically on the working of the capability set. She set out to clarify the steps between the means of achievement, the creation of the capability and the final achieved functioning. In order to identify which factors constitute capabilities, and how they can be enhanced, it is important to know the means available to an individual, and subsequently the process of conversion that occurs to transform these into capabilities (Sen, 2001). Robeyns (2005) categorised these conversion factors into three groups: personal, social and environmental. Personal conversion factors are specific to the individual (i.e. physical strength, sex, intelligence); social conversion factors are social practices and norms; and environmental factors include geographic location, infrastructure and public goods. These factors interact to either create or destroy capabilities available to the individual. For example, an individual may wish to be educated (their valued function), but due to their disability, gender role or lack of access (personal, social and environmental conversion factors respectively) to the nearest school they cannot, and therefore do not possess the right capability set to achieve their valued function. The concept of personal, social and environmental opportunities and barriers constraining or enabling behaviours was also used by the American Psychological Association in their predictors of climate change and consequences for environmental consumption (in Swim et al., 2009).

In socio-psychological behavioural theory, the value-action gap was filled with social norms and perceived behavioural control, but the nature and process of their influence on behavioural intentions and behaviour was largely unclear. In the Capability Approach, there is a clear conceptual link between the valued function and the achieved functioning through the process of conversion to form a capability set, which aligns closely with Blake's (1999) situational constraints to achieving a behaviour which included social norms and other economic, demographic and political contexts.

The Capability Approach was developed in the context of development and social policy and as such is designed to specifically address issues particularly important in development planning. Nussbaum (2003) argues that the Capability Approach can help provide a normative approach to social justice as a reference for legal and political development (in contrast to Sen who favoured a comparative approach). The Capability Approach has been used in a variety of contexts, from assessing small-scale development projects to understand the extent to which they enhanced

capability sets (Alkire, 2005), debating and empirically assessing policies (Lewis and Giullari, 2005; Schokkaert and Ootegem, 1990), in conceptualising sustainable development (Lessmann and Rauschmayer, 2013; e.g. Schultz et al., 2013), exploring environmental justice (Ballet et al., 2013) and critiquing and assessing social norms (Lavaque-Manty, 2001). Polishchuk and Rauschmayer (2012) also made the case for the Capability Approach to be used in assessing the impacts of ecosystem services on human wellbeing, by looking at how ecosystem services can contribute to people's capabilities and freedoms.

The explicit nature of Robeyns' (Robeyns, 2005, 2003) personal, social and environmental conversion factors in the Capability Approach, the use of the approach in development contexts and potential for use in an environmental context forms the basis for my choice to incorporate the Capability Approach into my conceptual model, in order to fill the value-action gap. Figure 2 shows how I have combined socio-psychological behavioural theory and the Capability Approach, where the capability set fills the value-action gap.

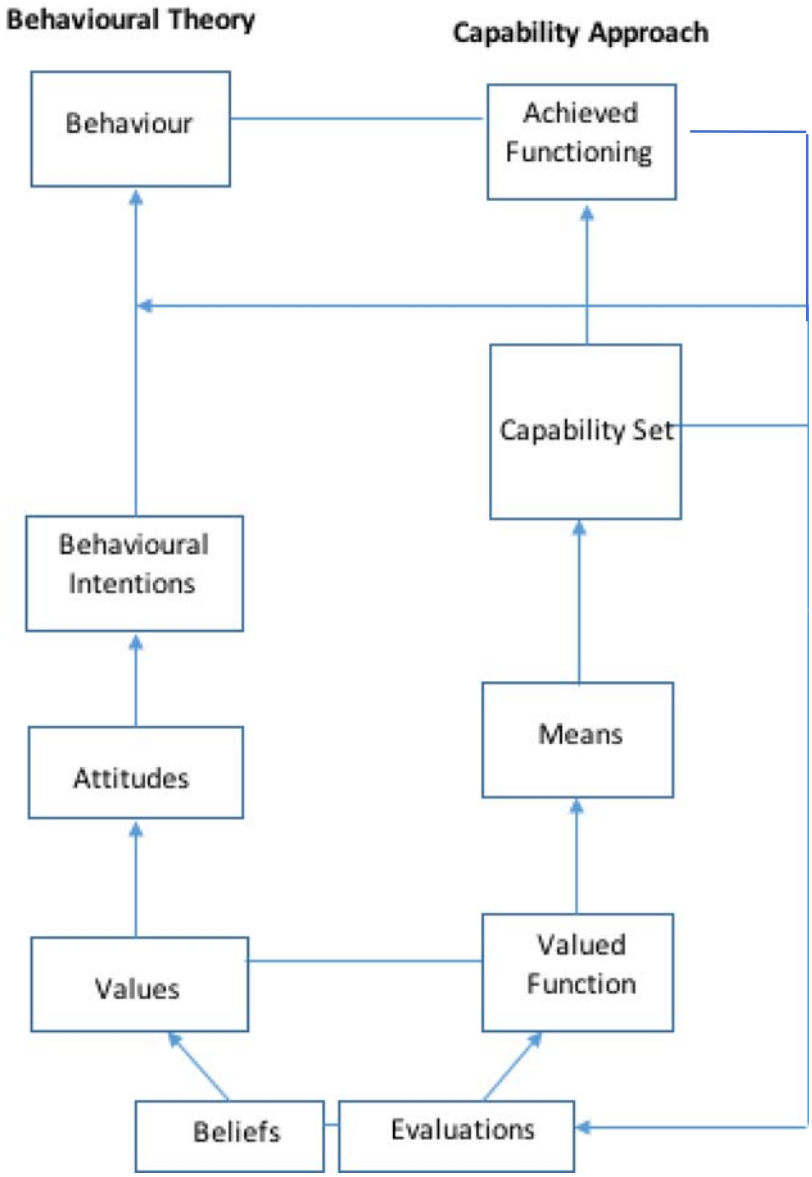

Figure 2: Combining socio-psychological behavioural theory and the Capability Approach

A behavioural approach to classification of drivers of DD

One of the most well-known and used conceptual models of drivers of DD is the Causes of Forest Decline – II model by Geist and Lambin (2001). Geist and Lambin (2001) postulated that 'cultural' factors such as public attitudes, values and beliefs and individual and household behaviour fall within an 'underlying' category of drivers. However, from a socio-psychological behavioural perspective, attitudes, values, beliefs and norms underlie and determine behavioural intent and behaviour. Individual and household behaviour should therefore not be in the same category as public attitudes, values and beliefs in a classification of drivers of DD.

Institutions, according to North (1990), are rules and norms that constrain human behaviour, separate to policies which are ideas or plans developed for specific situations and agreed on formally by a group, organisation, government or political party. In Geist and Lambin (2002, 2001), policy and institutional factors are grouped together in underlying causes. However, in socio-psychological behavioural theory, norms play a key role in influencing behavioural intention rather than behaviour, so it would be more appropriate to group institutions with other factors which influence behavioural intentions such as attitudes, beliefs and values.

The other categories within the broad 'underlying drivers' category of the Geist and Lambin model (demographic, economic and technological factors such as population density and market growth) are all outcomes of enacted behaviours which themselves derive from values, attitudes, beliefs and norms. However, they are also clearly distinct from the 'proximate causes' category which includes infrastructure extension, agricultural expansion and wood extraction, which are all descriptions of end behaviours which will have a direct and tangible impact on the physical environment. Therefore, it would make sense to separate the demographic, economic and technological factors into another category of their own, distinct from the institutions, attitudes, beliefs and values.

The final part of Geist and Lambin's model includes the 'other factors' of biophysical drivers, social trigger events and pre-disposing environmental factors. As I have chosen to explore drivers from a behavioural, and therefore intrinsically human, perspective, non-human factors (i.e. land characteristics, biophysical) drivers will not be accounted for directly in my model. However, it should be noted that they will be accounted for to an extent in the capability set by how people adapt to and manage environmental factors. Social trigger events such as war, social disorder and abrupt economic shocks rarely occur independently of a multitude of other converging factors, such as demographic changes, economic factors, technological or deeper cultural and institutional factors, and as such these social trigger events should be taken account of within these categories.

I have therefore revised the classification of drivers of DD. In my classification, both direct and indirect drivers are enacted behaviours. Underlying drivers are factors that drive human behaviour, such as collections of values and norms that form cultures and institutions. As with the Geist and Lambin (2001) model and after Turner et al. (1993), direct drivers remain as near final human activities that directly affect the environment and often act on a strictly local scale; and indirect drivers consist of the numerous intermediary activities that do not necessarily have a direct effect on the environment and can operate at local, national and global scales, but are still the result of behaviours driven by underlying factors (i.e. the decision to have children, use technologies, make investments and develop policies will be the result of values held regarding families, capitalism etc.). This revised classification also follows Burgi et al. (2004) in their suggestion of a tertiary, nested, structure of drivers.

The Behaviour-Capability-Drivers model

Figure 3 has been developed by combining the models discussed above: behavioural theory, the Capability Approach and my revised drivers of DD classification. I have therefore named the model the Behaviour-Capability-Drivers (BCD) model.

In the context of intervention design, if we can change beliefs and evaluations about the world, these could alter behavioural intentions to be 'good' (e.g. environmentally friendly). However, even if behavioural intentions are 'good', they may not be achievable due to the capabilities available (or not) to an individual. This means that the capabilities also need to be altered to ensure that individuals can achieve their behavioural intentions. In the BCD model, capabilities also equate to factors, events, situations that are occurring in the world, which will influence beliefs. Therefore, in order to influence both behavioural intentions and the ability to achieve these intentions, the right capability set needs to be available.

As such, it is the capabilities that can be equated to drivers of DD in the BCD model. As can be seen in Figure 3, the social capabilities can be equated to underlying drivers of DD (social/institutional and cultural drivers), and situational capabilities to indirect drivers of DD (policies, economic, technological and demographic drivers). The end behaviours (or actions) are comparable to the direct drivers, that which physically affects the environment (wood extraction, agriculture expansion etc.).

In order to facilitate behaviour change for policies and interventions, feedback has been incorporated into the model. The Cultural Capital Framework (Knott et al., 2008) is a nested model that places individual behaviour change within the context of policy design for wider cultural change. The Framework describes a similar feedback process to that in the BCD model using six key steps: 1) Values and attitudes are developed from beliefs and evaluations about the world; 2) These form behavioural intentions with regard to more specific actions; 3) The resulting behaviour is influenced by the intention but also external factors (capabilities); 4) Over time, the end behaviours will pass into social norms; 5) People will form beliefs and evaluate these actions and norms, which will become part of their values and attitudes; 6) The cycle starts again.

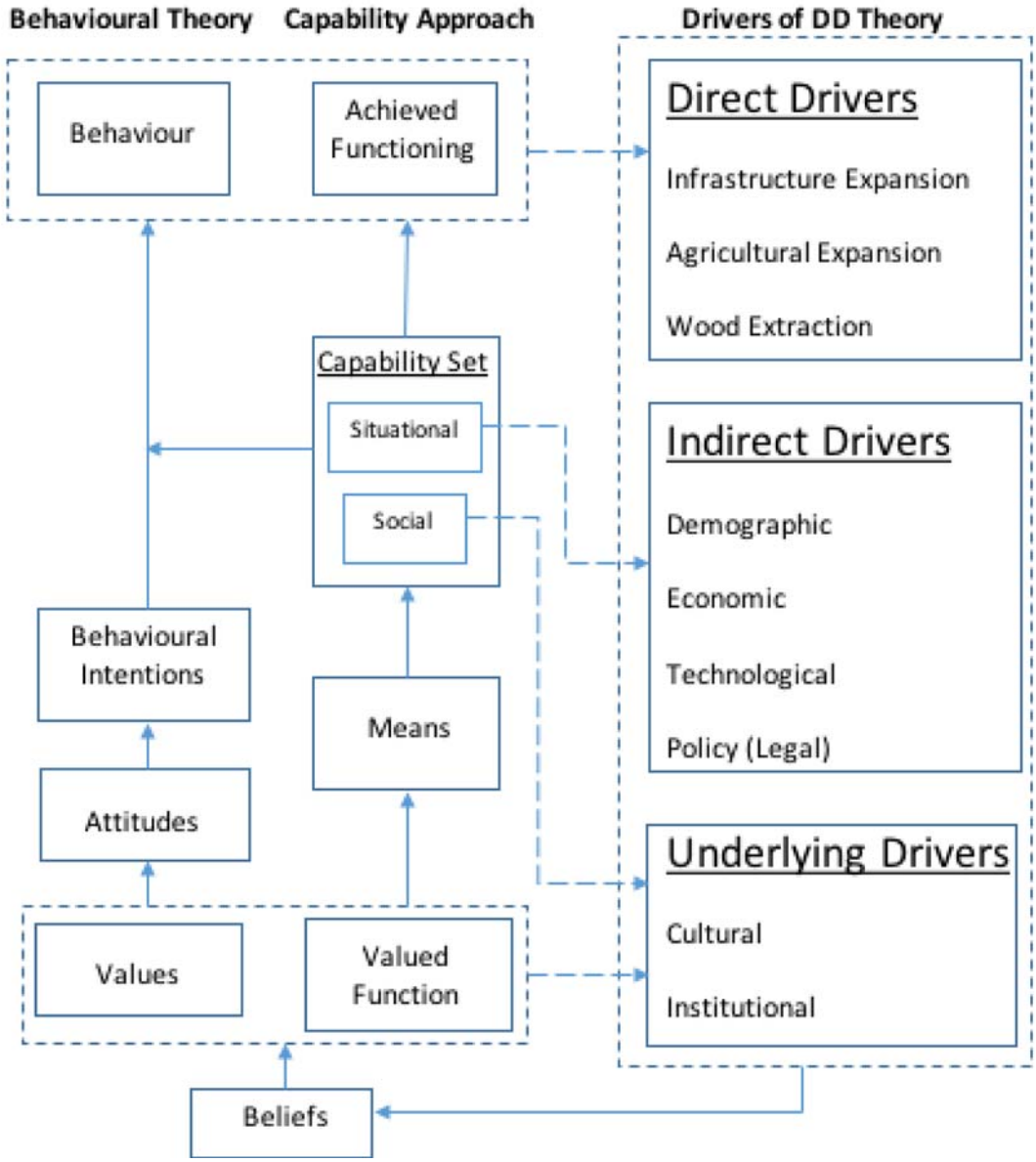

Figure 3: The full conceptual model - the Behaviour-Capability-Drivers (BCD) Model

CHAPTER 3: APPLYING THE CONCEPTUAL MODEL

Chapter Summary

This chapter first explores my philosophical approach and how it guides my choice of methods for applying and testing the BCD model. I then detail why values are the logical precursor to exploring the stakeholder capabilities, and why shared values are the most appropriate type of values to use as a conceptual basis in a land use change context. Next, I describe the context of Guatemala as a case study location for applying and testing the BCD model, and finally I detail the methods and limitations to the approaches used in this thesis.

Part 3.1: Methodological Justification

My Philosophical Approach

In explaining my reasons for choosing a behavioural approach to assessing drivers of deforestation, it is important to address my own beliefs about knowledge, as this provides a crucial insight into my reasoning behind choosing the approach and methods in this project. As proposed by Durant-Law (2005), a useful way to approach this is through examining my position within the philosophical trinity of ontology, epistemology and axiology.

Ontology explores world views of reality (Heron and Reason, 1997) and asks whether there is a reality outside of our own constructions of knowledge. My personal placement on this issue is that 'reality' is a social construct in itself. We have come up with the concept of reality to define what we believe is right and wrong, there or not there. This 'reality' has changed over time, for instance, there was a point in time for many in the western world when 'reality' was that the earth was 6000-years-old. According to this view, I therefore do not fit into the essentialist school of thought which posits that there are fundamental and enduring differences in social phenomenon that exist across space and time. I therefore subscribe to the anti-foundationalist school which says that all social phenomena are socially constructed and as such must be positioned in time, space and culture.

Epistemology is the philosophy of knowledge and justification (Audi, 2010). The question that shapes the epistemological stance is whether objective relations between social phenomena can be identified and if so, how. I believe I fall into the realist school of thought, which maintains that sensing and reasoning is both derived from the object of knowledge itself, and is mediated by perception through social and cultural lenses. This position complements my ontological stance, where 'reality' is socially constructed, while acknowledging that we can also build knowledge through sensing objective phenomena and objects that exist around us.

Finally, axiology is associated with values, questioning the purpose of knowledge (Mingers, 2003). I believe that within our socially constructed 'reality', knowledge is often most useful when it is applied in order to enable positive change, meaning that I sit within the applied school of thought in axiology. Therefore, in developing my methodology, I developed my approach with the following requirements in mind: to take into account different understandings of knowledge through multiple social and cultural lenses and place the results in time and space; to fully explain the phenomena using sensing and reasoning in order to understand its nature as fully as possible; and to use the results to enable positive change.

Investigating the Behaviour-Capability-Drivers (BCD) model

Values are the precursor to many of the behavioural elements in the BCD model, including capabilities, as they are derived from beliefs about the world. Values can therefore provide insights into how people interpret the world around them and could be used to identify capabilities – as capabilities are equated to drivers of DD in the BCD model (see Chapter 2). Values

are also the most stable over time and are not specific to one behavior, therefore it makes sense methodologically to try and identify capabilities through the identification of values.

Decisions are not made in isolation, instead they are mostly made within social contexts, especially so within communities that are forest dependent (Morris et al., 2012). In individual behaviour theories, social norms are included to understand the social context of actions, however, wider social contexts of practices and actions are not fully taken into account with these individual decision making models. The social-material contexts within which decision making occurs is the crux of social practice theory, where the choices and attitudes of individuals are secondary to the contextual factors (including material and social contexts) in defining behaviours (Morris et al., 2012; Reckwitz, 2002). Therefore, a 'social' approach to understanding values may be most appropriate for applying to the BCD model and understanding capabilities.

Social values have been referred to as values that represent community or cultural values and norms of wider society and in the context of natural resources (Kenter et al., 2015). Kennedy and Thomas (1995) suggested that social values about natural resources are determined in part by the social system and in part by the political system, so that all social values are layered, with one underlying layer determined socially and the second, more contextual layer determined by the more specific political system. Shared social values are more often described as specifically deliberated values (Norton and Steinemann, 2001; Stagl, 2004) and have been associated with group and social learning processes (Reed et al., 2010; Webler et al., 1995).

Shared values can reflect the values that are shared by different communities or groups (Stein et al., 1999), or as Sagoff (1998) and Daily et al. (2009) believe, something more akin to social values, in that they are underlying cultural values that individuals ascribe to their communities and groups. The concept of a set of shared universal human values has been well developed in the literature, but large scale empirical studies also show that preferences for, or orientations towards, these values may differ across cultures (Hofstede, 1980; Rokeach, 1973; Schwartz, 1994; Schwartz et al., 2012). Studies specifically on forest values have similarly found that although people may have similar forest values, value orientations (e.g. ecological vs production) often vary between different cultures and social groups (Eriksson et al., 2015; Vaske and Donnelly, 1999). The differences in these value orientations are often a result of how different cultures and social groups view themselves in relation to other objects and people, so an understanding of these perspectives is important for identifying social and cultural norms that populate the value-action gap and help predict behaviours (Hills, 2002; Kluckhohn and Strodtbeck, 1961). Shared values have also been increasingly noted as important to ecosystem services and landscape level approaches to decision making (Brunetta and Voghera, 2008; Fish et al., 2011; Kenter et al., 2015). As Fish et al. (2011) note "Valuing the contribution that ecosystem services make to human well-being cannot be reduced to individual preferences and motivations alone." (p 1184).

As Kenter et al. (2015) point out, the use of 'shared', 'social' and 'shared social' value terms remain ambiguous. However, there is a significant body of literature that uses the term 'shared values' in contexts which can be appropriately applied to the purpose of this study: to capture the full range of values and mediating factors that may contribute to land use decisions,

behaviours, and ultimately change. Therefore, an approach derived from a shared values perspective that includes a range of values associated with whole landscapes and ecosystems is required.

Approaches to exploring values

Various approaches have been developed for measuring values. Hofstede (1980) produced one of the first value measurement scales in order to profile cultural regions, with specific reference to work related values. Rokeach (1973) designed a scale to rank 18 values and has provided useful relationships between these values and socio-demographics (Braithwaite and Scott, 1991), although it has been criticised for missing key values (Schwartz, 2001). These scales have been developed and revised over time, for example by Schwartz et al. (1990; 2012) with their set of universal human values, and how they vary across cultures. Dunlap and Van Liere (1978) also created the New Environmental Paradigm (NEP) scale specifically for measuring pro-environmental orientations. The NEP became widely used in studies exploring pro-environmental value orientations and has been incorporated into other measures including the Stern et al. (1999) Value Belief Norm Theory (VBN). However, one of the major criticisms of the NEP (in all its versions) is that it is not necessarily applicable outside of Western nations (Chatterjee, 2008). Similarly, it is unclear whether such biased or 'universal' understandings of values would be useful for identifying land use capabilities (or lack thereof), therefore I wanted to look for an approach which could integrate a stakeholder-derived set of shared values that can be applicable to a relatively heterogeneous group of people, without being so broad as to lose specificity related to stakeholder capabilities. However, although the value scales and measurements approaches are not specifically designed for eliciting shared values, Klamer (2003) consider that shared or social values can be elicited through simple aggregation of individual values and identifying underlying common values, suggesting that lessons can be taken from the approaches to identifying individual values when exploring shared values.

Although the value scales and measurements above have used innovative methods to understand and quantify their value data, they do not demonstrate a basis for linking the values to actual behavior. However, the relationship between forest values and behaviour has been explored quantitatively (Sharaunga et al., 2015a; Vaske and Donnelly, 1999), although often with a focus on a specific type of value (e.g. forest values, value orientations or individual values) or mediating factor (e.g. attitudes, norms). Dietz et al. (1998) also noted that little research had managed to link the psychological structures associated with environmental values and attitudes with socio-demographics. They then attempted to remedy this using Principal Component Analysis (PCA) on national level 1993 General Social Survey data which included items associated with specific behaviours, attitudes and beliefs, general worldview and socio-demographic variables, explained using the Stern and Oskamp (1987) framework. The Dietz et al. (1998) findings did not clearly link specific socio-demographic variables with psychological constructs in the context of environmental concern, yet noted some interesting findings (e.g. a link between religion and environmentalism). Their study nonetheless suggests that more data collection (e.g. including more refined demographic data) and further analytical methods such as calculation of factor scores and analyses of variance could generate clearer results.

Factor analysis (which includes PCA) is a well-known method of measuring values and attitudes in the social sciences. Factor Analysis is a variable reduction technique (Suhr, 2005), where for example, variables could be people's beliefs, and the way in which participants respond to these beliefs could be used to identify broader constructs (i.e. values). Sharaunga et al. (2015) used PCA to explore factors influencing forest value orientations in South Africa, finding that households tended to hold more anthropocentric, utilitarian values and linked this to the high levels of poverty of many of the households, generating greater reliance on forest products. Bonaiuta et al. (2002) also used PCA to explore pro-environmental attitudes with respect to identity and place attachment, finding that local groups were often more opposed to protected areas than non-locals. Hedlund-de Witt et al. (2014) also used PCA to identify how environmental attitudes and sustainable lifestyles relate to worldviews, finding that economic considerations and secular materialism lead to less sustainable lifestyles. These studies chose PCA as their method of analysis because they were using specific value/worldview measurements and they perceived the measured items to be highly correlated.

Another variation of factor analysis has been used to explore relationships between environmental attitudes and other factors. Milfont and Gouveia (2006) used confirmatory factor analysis (CFA) to explore the relationship between time perspective, values and environmental attitudes in order to test previous theories on time perspectives and values. Their findings confirmed that time perspective and values underlie environmental attitudes, and supported the expanded social dilemma framework where environmental issues represent a social conflict between self and other and short- and long-term interests. Vaske and Donnelly (1999) also used CFA to understand the relationship between value orientations and wildland preservation attitudes, finding first that the value orientation could indeed predict attitudes, and further that attitudes mediated the relationship between value orientations and behaviour. Further, Schultz (2000, 2001) used CFA to explore the effects of perspective (self or other) on environmental value orientations and the distinction between egoistic, altruistic and biospheric environmental concern. As these studies were all testing previous theories rather than exploring specific values, they chose CFA.

The correct type of factor analysis is often the first decision a researcher makes, but reviews of the psychological literature have found that often studies use the wrong approach (Fabrigar et al., 1999; Norris and Lecavalier, 2010). For studies aimed at exploring the range of factors associated with a particular issue or community which are unknown and may not be directly measurable (which would be the purpose of this thesis), Exploratory Factor Analysis (EFA) is the preferred method (Fabrigar et al., 1999; 2006, 2005). EFA uncovers the latent, common underlying constructs of a large number of measured variables (Mulaik, 1987; Norris and Lecavalier, 2010). The theoretical underpinnings of EFA rely on several assumptions: each measured variable is a linear function of a set of latent common factors as well as specific to a single, unique latent factor; as the factors are presumed uncorrelated, correlations between variables must be due only to the latent factors they have in common (Mulaik, 1987). Therefore, based on these assumptions, EFA can be used to discover, indirectly, explanations for variables

(beliefs, about the external world, the capabilities) in the form of yet unmeasured (or unmeasurable) latent factors (shared values).

Robb et al. (2013) and Dillon et al. (2013) used EFA to explore stakeholder values associated with cultural heritage, where the original variables were derived from stakeholder interviews, meaning that the resulting values are more likely to honestly reflect real constructs related to the stakeholders' world. If the resources are available, it is also useful to combine EFA with CFA, as in Milfont and Duckitt (2004), who used EFA then CFA to explore environmental attitudes and their prediction potential with respect to ecological behaviour and economic attitudes. Robeyns (2006) and Kuklys (2005) also identified factor analysis as a valid method of identifying and selecting capabilities in the context of the Capability Approach.

Part 3.2: Methodology

Chronological account

At the time of accepting the PhD, the fieldwork location was Sierra Leone. However, in 2014, the Ebola crisis was taking hold, and I therefore decided to change my fieldwork location. Guatemala was presented as an option by my primary supervisor as he had good contacts there and knew they were currently developing a REDD+ programme. A couple of months after deciding on Guatemala as the new fieldwork location, during which I focused on learning Spanish, I could travel there for my first phase of fieldwork. My supervisor was completing a project with partners and was present for the first two weeks of my trip, which enabled me to meet several useful contacts and visit a number of field sites within Guatemala.

Initially, I did not intend to begin developing or implementing my methodology as part of this first scoping trip. However, after a short period familiarising myself with Guatemala and the immediate research and working environment, the opportunity arose to actively take part in some of the REDD+ development in-country. The university department I was collaborating with, the Centre for Environment and Biodiversity studies (CEAB) within the Universidad del Valle de Guatemala (UVG), was working on the Climate, Nature and Communities Guatemala (CNCG) project, a section of which was tasked with developing the carbon baseline and an assessment of the drivers of DD in the Sarstún Motagua region of Guatemala, one of the five REDD+ regions, to contribute to the national REDD+ strategy.

I arrived in March 2015 and the final CNCG report was required in September 2015. Shortly after my arrival, I happened to sit in on a meeting in which the member institutions working on the Sarstún Motagua area (including the Rainforest Alliance, Foundation for the Defenders of Nature (FDN) and Fundaeco) were discussing which methodology to use to address the drivers of DD. I then asked to present an approach to the members of the CNCG project and proposed its implementation at a regional scale in the Sarstún Motagua. The members agreed, and committed to supporting me in developing the method and generating the data and responses required. This was invaluable for my data collection, as it enabled me to access a wide group of land users across a significant area, and gather the large numbers of responses needed for the data reduction technique.

Due to the deadlines for the CNCG project, I was required to begin the design and delivery of my methodology sooner than originally planned. This led to the full development of the conceptual model coming after my data had been gathered. However, in designing the methodology for the CNCG project, I already had the idea to identify land user values associated with land use, as a way in which to explore underlying drivers of DD. The data was then interpreted using the conceptual model, initially using data only from the Sierra de Las Minas Biosphere Reserve, in order to develop a proof of concept for the model.

As the data I had gathered for the CNCG project came from the whole Sarstún Motagua region and the proof of concept had been a success, I then analysed the entirety of the data and applied

it to the conceptual model. The size of the dataset also allowed me to carry out further statistical analyses to identify links between capabilities and behaviour.

As I was in Guatemala at the time I was analyzing the Sarstún Motagua dataset, I wanted to take the opportunity to interview REDD+ decision makers about the REDD+ process in Guatemala. I used this data to then create another questionnaire which I disseminated to REDD+ decision makers and analysed using the same data reduction technique as the land user questionnaire. In a final return to Guatemala 18 months later, I then validated the results of both the Sarstún Motagua region and REDD+ decision maker results interpretations.

The full chronological process is detailed in Figure 4, however the methodology as presented in the remainder of Part 3 discusses the methodology as applied to the BCD model.

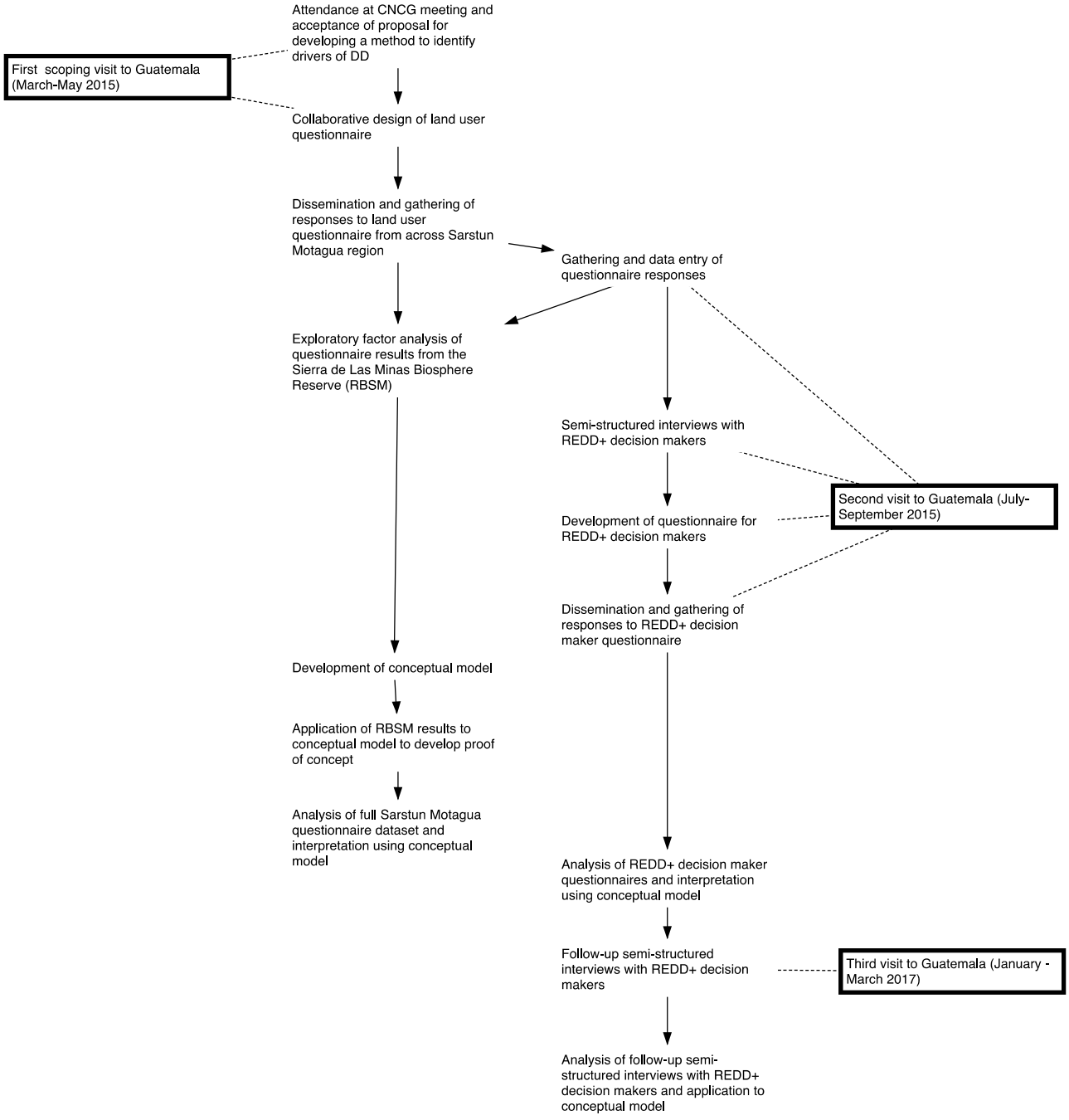

Figure 4: Chronological order of methodology. Boxes represent fieldwork phases in Guatemala. Dotted lines represent the steps that were undertaken within these fieldwork phases.

Overview of approach to developing a proof of concept for the BCD model

Figure 5 describes the methodological steps applied to the Behaviour-Capability-Drivers model for the whole thesis, coded to indicate how the methodologies explore each component of the model.

I initially developed a land user questionnaire consisting of belief statements (step 1), which I then statistically analysed using exploratory factor analysis to identify participants' shared values associated with land use (step 2). By looking at the belief statements that made up the shared values, I identified the situational capabilities related to each factor (step 3). A comparison of the relevance of the factors to participants with different stakeholder characteristics (e.g. ethnicity, gender etc.) using analyses of variance (ANOVAs) helped me to identify the associated social capabilities (step 4). I then used the interpretation of the shared values and capabilities to identify drivers of DD (step 5). Using collaborative focus groups I then validated the shared values, capabilities and the link between capabilities and land use behaviours (step 6).

The Sierra de Las Minas Biosphere Reserve in northeast Guatemala was used to develop a proof of concept for the BCD model and approach (Chapter 4). The fieldwork (questionnaires, focus groups and interviews) was ethically approved by the University of Greenwich in June 2015.

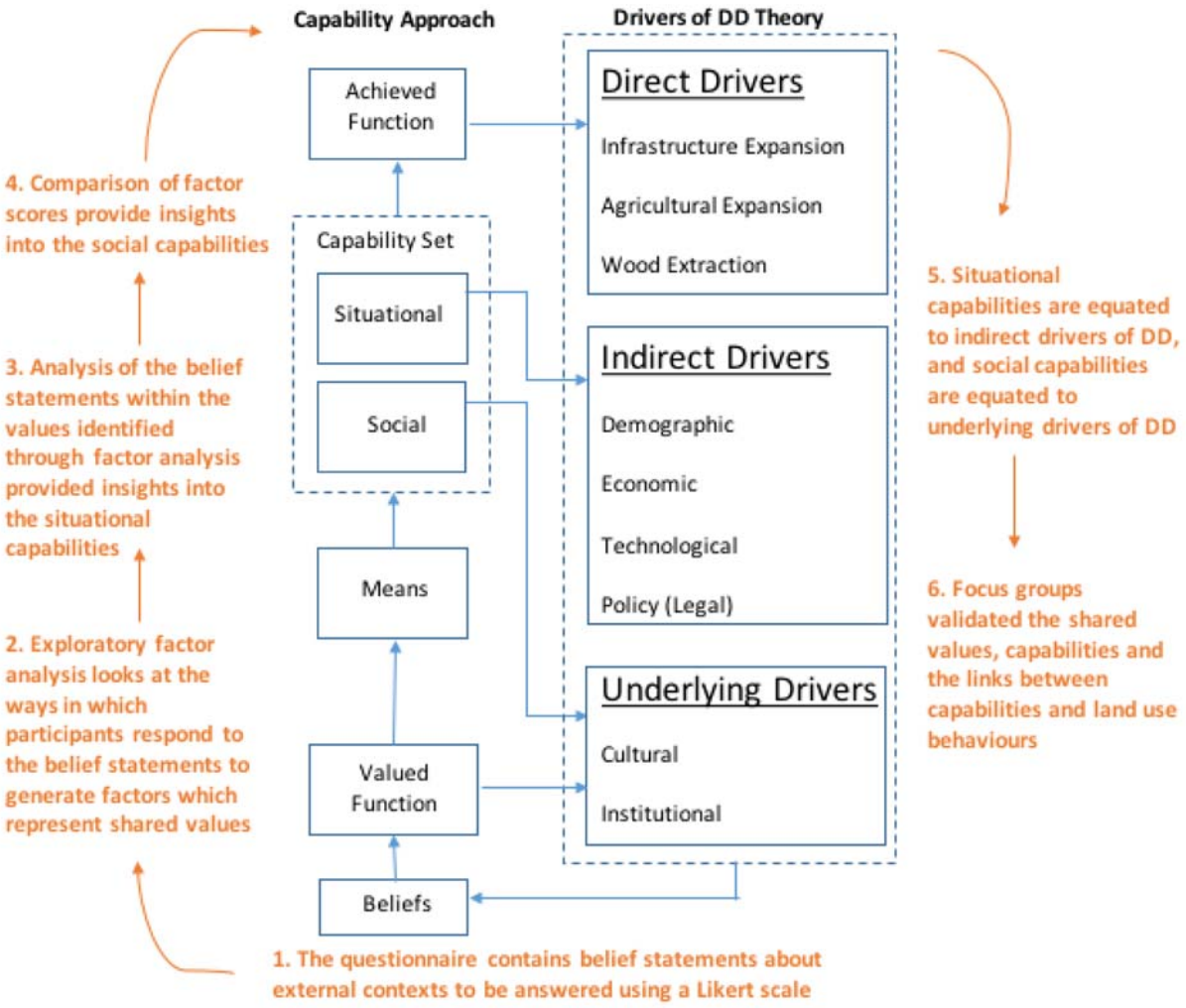

Figure 5: Overview of basic approach.

Questionnaire Development: Land Users

The questionnaire was designed specifically to collect data from a sample of land users, including labourers, land owners and those who rent or hold use rights. This choice was partly informed by the fact that the most behaviours that directly affect land use are made by these groups. In addition, EFA requires a relatively heterogeneous sample (Fabrigar and Petty, 1999), but due to the unique nature of drivers the sample cannot be too heterogeneous to risk respondents finding the questions irrelevant and generating only a small number of common factors.

There were three major parts to the questionnaire: one part for the belief statements used to identify the shared values (more details of the development of this part of the questionnaire can be found in Chapter 4), and a second part including open answer and demographic questions, broadly following the format of the Dillon et al. (2012) VALUE questionnaire on archival collections and the Robb et al. (2013) questionnaire on the social value of geological collections in museums. The demographic questions included gender, age, number of children, location, cooperative association membership, sector, land ownership status and ethnicity. These were

used to identify some of the capabilities that mediate between values and behaviour and reflect some of the issues identified as drivers of DD and land use issues in Guatemala (see Part 3.3).

Location was used to explore the land use policy context, and gender and age were both used to explore social norms that may exist and differentiate between old and young, or male and female. Number of children was used to understand economic status, where the greater number of children is hypothesised to correlate with lower economic status (income), a situation observed across Latin America (Lóapez and Valdés, 2000). Sector was used to understand economic status, where those whose primary source of income/livelihood is from subsistence farming were considered to have low economic status, while those engaged in cattle farming were considered to have a high economic status (Katz, 2000; Zander and Durr, 2011).

Coop membership was used to explore socio-economic status, where those who are members of a coop are considered to have increased access to technologies, education and higher market prices (Kolade and Harpham, 2014; Wollni and Zeller, 2007). Land ownership status was used to understand socio-economic status, as the rich (often non-indigenous people) tend to have land titles in Guatemala, while those with land use rights tend to be poor and indigenous (Alonso-Fradejas, 2012; FDN, 2010).

Ethnicity was used to explore culture, as those of the same ethnicity are more likely to have similar experiences, outlooks and ideas (Volokh, 1996). Although this is an extremely simplified view and there have been many criticisms of using ethnicity as a proxy for culture (Desmet et al., 2017; Scollan-Koliopoulos et al., 2012), I used ethnicity to explore culture as it was the most practical approach, in terms of generating a categorical variable that can be compared with other EFA data to use in further analyses. In Chapter 5, I discuss the validation of the use of ethnicity to identify capabilities related to culture and cultural differences.

The open part of the questionnaire asked about the nature of the respondents' connection to the land (i.e. whether they own land, rent, have use rights or are a labourer) and the sector in which they worked. This was followed by questions designed to generate forest cover change values (in percent) for respondents, which could be used as an indicator of deforestation behaviour.

There is a risk that self-reported data can potentially result in significant bias (Kinsey et al., 1948; Weinhardt et al., 1998), especially in studies which deal with particularly 'taboo' subjects (e.g. Knight et al., 1983). In the RBSM in particular, FDN field technicians informed us that 'deforestation' was known to be a taboo subject as cutting down trees without permission from the National Institute for Forests (INAB) is illegal, and communities were often involved in projects which encouraged sustainability. Weinhardt et al. (1998) reviewed the reliability and validity of self-reported data on sexual activity and came up with several recommendations which I followed when designing the questions on change in forest cover, including:

- Designing appropriate questions using clear language
- Having a trusting relationship between interviewer and interviewee
- Sequencing the enquiry from least to most threatening questions

- Validating the results using focus groups

The process for designing appropriate and clear questions, as well as the dissemination process for the questionnaire can be found in Chapter 4. 'Deforestation' was never mentioned, instead, a series of questions were included from which % forest cover change could be calculated (how much land do you own, how much is forested land, how much was forested when you first acquired it). Details of the focus group validations can be found below, and in Chapter 5.

The open question and demographic sections were placed at the end of the questionnaire to avoid negative feelings about providing personal or sensitive information that may impact the participant's willingness to answer the questionnaire honestly (Oppenheim, 1996; Singer et al., 1988). An introduction was added at the beginning of the questionnaire to explain the context of the research, as providing a brief introduction to questions has been found to increase data quality (Andrews, 1984; Blair et al., 1977).

Exploratory Factor Analysis

EFA is commonly classed as a complex statistical method, but the analytical approach itself is linear, although it involves many options (Thompson, 2004). A flow chart of all the options is shown in Figure 6. As with many other statistical methods, the overall success of the method revolves around the quality of the study design (Fabrigar et al., 1999).

The first major consideration in EFA survey design is sample size and selection. There are multiple competing guidelines regarding sample size requirements for EFA analysis (Fabrigar et al., 1999; Norris and Lecavalier, 2010; Taherdoost et al., 2004). A frequently adhered to guideline is that of the 5:1 participant to variable ratio (Gorsuch 1983), but most authors note that the sample size should never fall below 100 (Hair et al., 1995). However, it is acknowledged that a sample size as low as 50 is acceptable as long as the communalities are high (De Winter et al., 2009; MacCallum and Widaman, 1999). Unfortunately, it is often only after the data has been collected that it is truly possible to identify whether the sample size is sufficient for EFA (Fabrigar et al., 1999; MacCallum and Widaman, 1999). For this study, a sample size of 200 was the target, as this would satisfy the 5:1 ratio (with an estimated 40 belief statements), lie above the minimum sample size of 100 and be practically feasible.

Once the data has been entered, it is useful to explore the distribution of the data. Normality is not a requirement for exploratory factor analysis (Fabrigar and Petty, 1999). Instead, EFA requires a good spread across the scale in order to explore the variance in the dataset (Tabachnick and Fidell, 2008).

Pairwise deletion was then chosen for dealing with missing data, as this maximises the data available (Roth, 1994) and was considered suitable due to the low number of missing cases in the dataset (where the maximum number of missing values was n = 7 (5%) for any one question). Using principal axis factoring (PAF) (Norris and Lecavalier, 2010), the first outputs to identify the factorability of the dataset are the Keiser-Meyer-Olkin (KMO) measure of sampling adequacy and

Bartlett's Test of Sphericity values. A KMO value of >.5 and a Bartlett's test output of <.05 indicates the dataset is suitable for factor analysis (Dziuban and Shirkey, 1974; Hair et al., 1995; Tabachnick and Fidell, 2008).

Having confirmed the dataset's suitability for factor analysis, examination of the scree plot indicates the factor solutions that should be chosen for initial extraction (Cattell, 1966; Ledesma et al., 2007). The scree graph plots the eigenvalues of the correlation matrix in descending value. The point of the last substantial drop in the eigenvalues indicates the maximum number of factors to extract (Fabrigar et al., 1999; Taherdoost et al., 2004), and this has been shown to be relatively accurate in predicting factors to retain (Zwick and Velicer, 1986).

The next step in conducting a factor analysis is to decide what rotational method to use, which determines whether a researcher believes (or wants) the factors to be correlated or not (Williams et al., 2012). Rotation in itself helps achieve high variable loadings on as few factors as possible and as few multiple factor loadings as possible (Browne, 2001). Orthogonal rotation (the most common being varimax) produces uncorrelated factors and provides more easily interpretable results than oblique rotations, which assumes that factors are correlated (Costello and Osborne, 1994). Fabrigar et al. (1999) believe that, although simpler, orthogonal rotations may be more misleading, especially in the social and psychological sciences where most constructs will be correlated. However, an orthogonal (varimax) rotation was chosen for this study as it is overwhelmingly the most commonly used in psychological research (Fabrigar et al., 1999; Taherdoost et al., 2004), and the uncorrelated nature of the results mean these can be used for further analysis such as regression analyses if need be (Chatterjee and Hadi, 2006).

Stability of the factor structures and the final chosen solution is determined based on a number of further criteria:

- The number of communalities >.3 (Fabrigar et al., 1999), where low communalities indicate statements for which the common factors explain little variance. In addition, item communalities should be between .04 and .07 (Fabrigar et al., 1999; Velicer and Fava, 1998)

- The total number of significant variables (significant factor loadings >.32) (Tabachnick and Fidell, 2008; Williams et al., 2012) and the number of marker variables (those .2 above any other factor loadings) (Bedford, 1997)

- The number of cross-loading and non-loading statements, as cross-loading indicates the item is poorly written and/or has been spuriously interpreted (Comrey and Lee, 2013; Costello and Osborne, 1994; Jean Lee, 1992; Tabachnick and Fidell, 2008)

- The total variance explained, which in the social sciences is generally acceptable at around 50-60% (Hair et al., 1995)

- The internal stability of factors relating to how much different variables switch factor in subsequent runs, where the factors that consistently retain the same items are likely to be more reliable (Costello and Osborne, 1994; Dillon et al., 2012)

According to Comrey and Lee (2013) and Burton and Mazerolle (2011), the minimum loading of an item with no cross-loadings should be .5, although most analyses accept loadings as low as .32 (Tabachnick and Fidell, 2008). However, if none of the variables in one factor load at .5 or above, it indicates that none of the items associate strongly with this factor, and it is likely to be unstable.

Statements that do not load onto any factor, or do not load significantly onto any factor are then deleted to see whether their removal improves the overall stability of the factor structure (Norris and Lecavalier, 2010). In this thesis, a 'three strikes' rule was used for deletion of statements, where a statement that did not load significantly onto three successive solutions would be deleted. This allowed for the retention of as many statements as possible. The deletion of statements is likely to reflect a lack of clarity in their wording and therefore in how people have answered/interpreted them, or simply that the statement is unrelated to any of the common factors (Costello and Osborne, 1994; Fabrigar et al., 1999), and it is for this reason that the study design is so important. The final solutions should have the highest number of marker and strong marker variables and the lowest number of cross- and non-loading variables.

The final number of factors to extract requires the balancing of a reasonable number of factors and the need for those factors to adequately account for the variance (Fabrigar et al., 1999), with the need for conceptual sense (Dillon et al., 2012; Williams et al., 2012). Empirical evidence has shown that choosing too few factors in a model is a more severe error than too many factors, as fewer factors may hide smaller factors, and so the true factor structure (Comrey and Lee, 2013; Velicer and Fava, 1998). However over-factoring should also be avoided as larger solutions are often weak and unstable and could result in postulating about a concept that is unreal (Comrey and Lee, 2013; Costello and Osborne, 1994).

The final solution can further be tested for reliability using a number of methods including CFA, split data tests or Cronbach's alpha (Cronbach, 1951). It is not possible to conduct CFA in SPSS and the University of Greenwich does not have software capable of carrying out this method, therefore only split data and Cronbach's alpha tests were carried out as statistical validation in this thesis. Qualitative interpretation then helps to confirm the conceptual sense of the factors and check whether some of the smaller factors present may be representing important ideas and are therefore important to retain in the final solution (Williams et al., 2012).

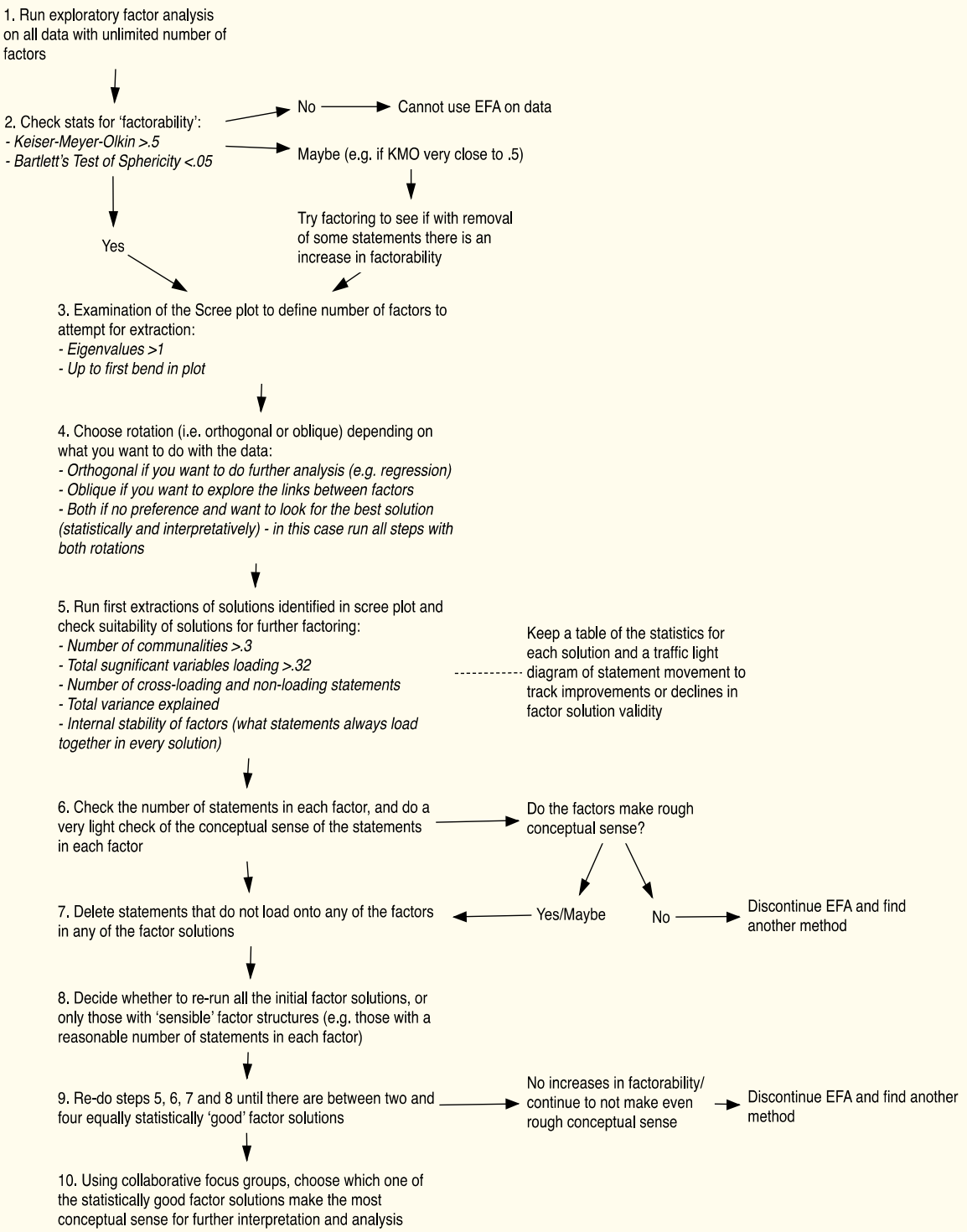

Figure 6: Flow map of the exploratory factor analysis process

Factor Scores and further analysis

Factor scores are composite variables that represent an individual's alignment with a factor derived from the EFA analysis (Distefano et al., 2009). In order to use the results of EFA in follow up investigations (i.e. ANOVAs for comparing relevance of shared values to land users with different characteristics), factor scores must be computed. There are multiple ways for factor scores to be computed, but one of the simplest is by averaging the raw scores on each statement per factor for each individual respondent (Comrey and Lee, 2013; Distefano et al., 2009). This sum scores method allows for easier interpretation of the results, comparisons across factors where there are differing numbers of items (Distefano et al., 2009), preservation of the variation in the original data (Tabachnick and Fidell, 2008) and the results are often desirable for exploratory analyses (Hair et al., 1995; Tabachnick and Fidell, 2008). More details of the further analyses can be found in Chapters 4, 5 and 6.

Focus Groups

Focus groups can be used to evaluate or develop activities (Race et al., 1994). In this study, focus groups were used to validate the EFA results for the Sarstún Motagua land user shared values and elaborate on associated social capabilities. Details of the specific focus groups used in this study can be found in Chapters 4, 5 and 6.

Focus groups have long been used in market, consumer and health research (Morgan, 1996; Powell et al., 1996). They can be used to explore participants' feelings, attitudes and beliefs in ways that are not feasible through other methods (Gibbs, 1997), as group discussions allow individuals to build on the explanation of others, leading to more elaborate accounts of topics (Stewart and Shamdasani, 1990). This interaction between participants forms the basis of focus group theory (Morgan, 1996), helping to explore people's values and beliefs about the world (Kitzinger, 1994).

According to Kenter et al. (2014) and Reed et al. (2010), shared social values are the outcome of processes of effective social interaction. Deliberative processes such as focus groups can allow the exchange of information and perspectives on values, beliefs and norms which is essential for bringing out these shared values (Kenter et al., 2011; Reed et al., 2013), making focus groups an ideal method for this study. For the participant, there is also evidence to show that focus groups make them feel their values have been better considered and expressed after group consideration, as well as being empowering spaces (Goss and Leinbach, 1996).

Overview of Sarstún Motagua approach

Figure 7 shows how Chapters 5 and 6 build on the basic approach in Figure 5. In Chapter 5, I applied the same methodology as described above and in Chapter 4, to a larger dataset derived from respondents from the whole of the Sarstún Motagua region. Then, in addition to the basic methodology presented in Figure 5, I subsequently analysed self reported forest cover change data collected in the questionnaires, and compared this with both the factor scores and stakeholder characteristic groups using univariate ANOVAs, to quantitatively understand how

and what capabilities mediate between values and forest change behaviour (step a, Figure 7). I then validated the results of the univariate ANOVAs with focus group discussions (step b).

Overview of REDD+ decision maker approach

For Chapter 6, I developed a new questionnaire aimed at REDD+ decision makers, but based on the same structure as the one designed for Chapter 4. The design of the questionnaire followed the same method outlined above and in Chapter 4 to elicit shared values and capabilities. In addition to these, I also decided to use the questionnaire to explore attitudes, behavioural intentions and behaviours related specifically to REDD+, using responses to attitude statements (analysed using EFA) (step A, Figure 7), and open questions in the questionnaire (steps B and C). Finally, I returned to Guatemala to conduct follow up interviews with REDD+ decision makers to explore and validate the behaviours that had taken place, the capabilities that I had identified as being relevant to the shared values, and identify which of those were potential barriers to transformational change (step D).

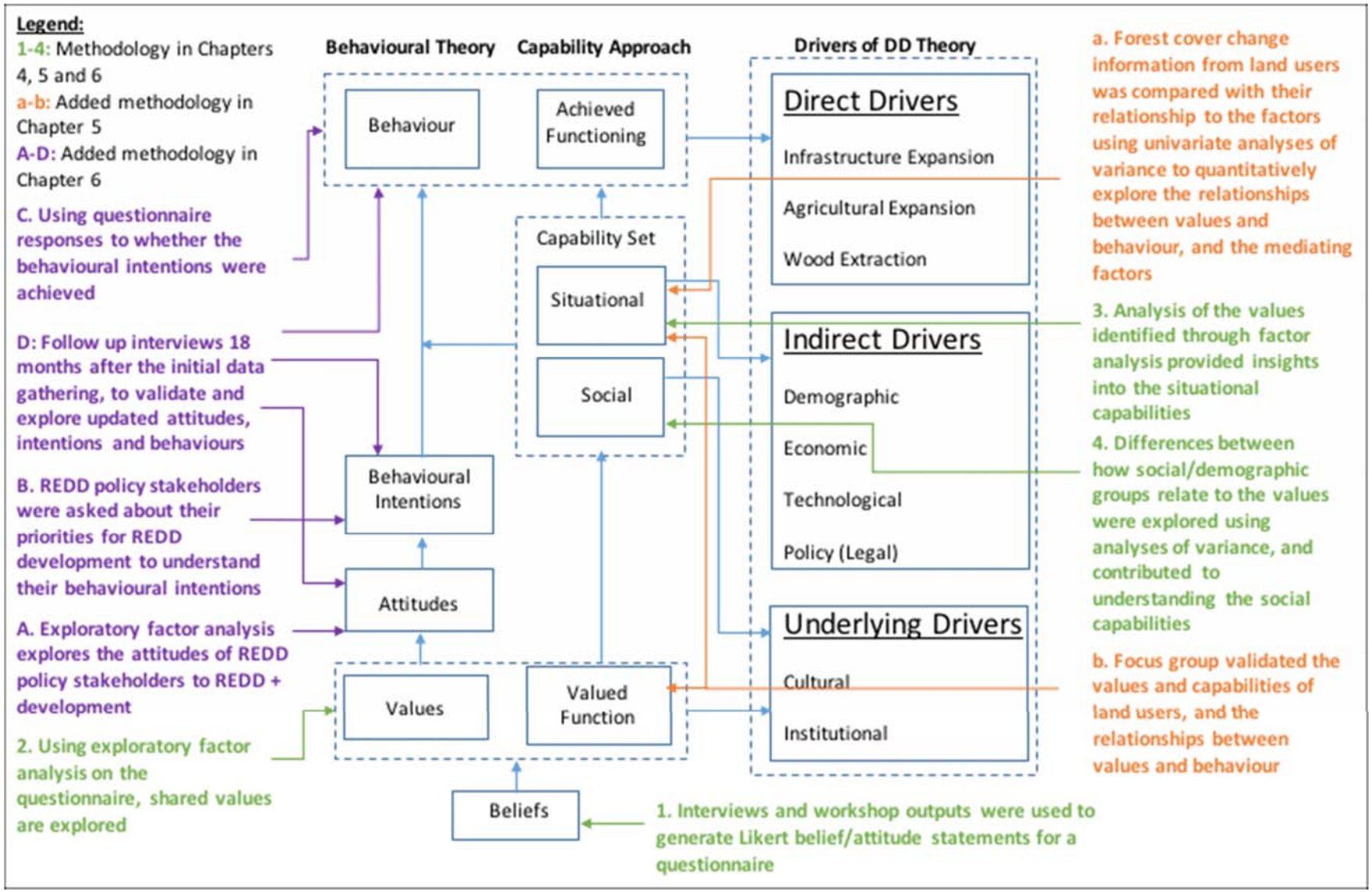

Figure 7: Overview of overall thesis approach

Semi-Structured Interviews

Borg and Gall (1996) note that semi-structured interviews are useful for a more thorough understanding of a respondent's opinion than a questionnaire on its own. Semi-structured interviews were carried out targeting REDD+ decision makers, as a precursor to developing a second questionnaire, and later to validate the results of the EFA analysis of the questionnaire.

Initially, I used a snowball sampling approach because I was not overly familiar with the people, organisations or structures in Guatemala and therefore relied initially on the few contacts I had to help me access the appropriate people (Atkinson and Flint, 2001). However, the involvement with the REDD+ process through the CNCG project provided me with access to other actors in the REDD+ negotiations as my colleagues at Universidad del Valle de Guatemala took me along to almost all of the REDD+ meetings they were involved in. My involvement with their work in country also helped to develop good relationships with other stakeholders, as I was not seen solely as an external researcher who would not contribute or share their research once I had left the country. (In addition to two manuscript submissions, I also wrote two reports for colleagues in Guatemala working on the CNCG project: a report of my initial findings in 2015 and a methodology document in 2016.)

Although I made good connections and was accepted as a part of the REDD+ process by the Guatemalan actors, I wanted to maintain my impartiality as a researcher and ensure that this was clear to all other actors. I believed this was very important in developing trusting relationships that led to in depth interviews with informants for my REDD+ research. Semi-structured interviews are well suited to exploring perceptions and opinions about complex and/or sensitive issues (Barriball and While, 1994), making the approach appropriate for the REDD+ subject matter, which at the time was quite sensitive, even among policy-makers.

Each interview was arranged in person or via email or phone, at which time the interviewee gave their consent to be part of the study. At the beginning of most interviews, the interviewee was asked whether they would consent to the interview being recorded as this is a good way to avoid reporting error (Barriball and While, 1994), however in some circumstances recording was not appropriate (for instance due to the setting and nature of the interview) and therefore only some of the interviews have been digitally recorded. At all interviews hand written notes were taken, which were then promptly written up in electronic format. Often, I would ask for further clarification or exploratory questions about topics that came up which led the conversation in another direction before coming back to the core questions (Hutchinson and Wilson, 1992). The semi-structured format also allowed for a more natural conversation to flow, and gave the interviewee freedom to express themselves how they wished (Denzin, 1973; Oppenheim, 1996). The relaxed nature of the interviews was useful for building relationships with these stakeholders, which was invaluable for maintaining the snowball approach to the interviews and for gaining participation for later data collection stages. More details of the interviews and development of the REDD+ decision maker questionnaire can be found in Chapter 6.

Limitations to the methodology

EFA

The method of factor analysis derives from mathematical and philosophical areas, from the Aristotelian concept of induction (creating something from nothing) through Descartes, from whom comes the ideas of analysis of variables into orthogonal or linear independent factors, to Francis Bacon who believed that an algorithm could inductively discover common factors (Mulaik, 1987). As such, it is based on a set of epistemological assumptions, and has undergone much criticism, as well as misuse (Henson and Roberts, 2006). For instance, the choices made during the statistical analysis are numerous and highly debated in the literature. EFA results are also limited to reflecting the quality of the study design, only able to identify common factors that are described by the inputted measured variables and therefore factors rarely cumulatively account for 100% of variance in the sample. The indeterminacy of factors with respect to the interpretation of common factors is also an important issue, as this process is inductive, often qualitative and not solely based on the variables from which they derive, but a wide range of contextual knowledge and information (Mulaik, 1987). A review of the use of EFA in this thesis can be found in Chapter 7.

Land user questionnaire design

I was not able to be physically present to train my colleagues in the steps necessary for EFA questionnaire development, therefore I managed the process via email and Skype. At one stage in the planning process, there was some confusion over versions of the questionnaire and the penultimate version was not recalled when the error was spotted. This resulted in two slightly different versions of the questionnaire being disseminated, where Qs 9, 10, 12, 20, 22 and 39 were different. These were removed before the statistical analysis. Ideally, all respondents should be answering exactly the same questions, and the specific wording of statements is important for interpretation of the EFA results which relies heavily on the content of the statements.

Gender was also included as the very first question, not at the end of the questionnaire with the other demographic questions. Unfortunately, once I noticed this, it was too late to make a change as the questionnaire had already started to be disseminated. This could have affected the way in which responses were answered, however it was only one of the demographic questions, and Teclaw et al. (2012) suggest that demographic question placement does not have a large affect.

In the REDD+ decision maker questionnaire, one of the questions was wrongly translated, and I did not notice the error until I had received responses. The question was designed to ask what the ‘top priority’ for REDD+ was, but instead asked about the ‘first step’, to which a few respondents then said the first steps had already been completed. Although the first step may not be directly equivalent to a priority, the question still reflected the early development stage of the REDD+ programme at the time of dissemination and I believe it still serves as an adequate proxy for behavioural intentions.

Land user questionnaire delivery

Most of the questionnaires (58%) were delivered by an interviewer in a Mayan language, and for each of these they were translated by a member of the community who could speak both Spanish and the local Mayan language. Often, these interviewers had no prior experience with the questionnaire and were translating and understanding the question at the same time as the respondent. Therefore, it is likely that all translations are slightly different versions with the same overall meaning. Ideally, all respondents answer the exact same question, however the data presented in Chapters 4 and 5 appear robust and have been validated through follow up focus groups.

For almost every statement there were explanations from the interviewers delivering the questionnaire. Ideally, in factor analysis, responses should be 'gut reactions' as it is measuring an individual's personal values/attitudes, so with any explanation by an intermediary there is the added potential to instil bias in the response, as respondents have a tendency to answer in the way they believed is the socially desirable response to the interviewer (Brink 1990). These explanations were needed either due to lack of understanding or the inability for the statement to be directly translated into the respondent's language. This was especially apparent if the questions were double negatives, or contained two different ideas. In practice, the validation phase should identify the statements that are too complex to be included in the questionnaire and provide information on how to improve them, but unfortunately the validation phase carried out as part of the questionnaire design for this thesis (see Chapter 4) did not highlight these issues.

For some questionnaires, the interviewer wrote their participants' answers only as ´strongly agree/disagree´ responses, even if the respondent did not clarify which level of agreement it was. Sometimes, it was clear to the interviewer whether the respondent felt strongly or not, however in some cases it may have been simply to deliver the questionnaire faster. Finally, some interviewers said that they always asked the questions in first person, as most people understood this quicker, even if the question was designed to address an individual's beliefs or evaluations about others, or themselves as part of the community. Unfortunately, the group that I managed to observe in their delivery were one of the last groups, so there was no opportunity to change the method of delivery as a result of my observations.

In the majority of questionnaires, there was little or no data recorded in the location question. This question asked for the town or municipality that the respondent was from, to provide more accurate locational data that could be used when combining the results with other quantitative data sources such as GIS. However, either due to the wording of the question or the lack of training for those delivering the questionnaire (who may have been local park rangers or other senior members of the community) many respondents either left this blank or answered literally 'in the community', without any reference to which community. The complex bureaucratic nature of the collaborating institutions involved, and the lack of records kept by those institutions while delivering the questionnaires meant that following up on the exact locations of the 501 responses was not feasible.

When making another questionnaire for a similar demographic, more attention should be paid to linguistic and cultural nuances and institutional capacity. Ideally, I would have more time to get to know the language and context and develop relationships with a wide number of local and rural institutions, as well as spend more time in country to be able to facilitate the delivery of the questionnaires in more locations. Local institutions helping to deliver the questionnaires are essential to get a representative sample and crucial insights into local practicalities and needs. However, more focus should be put onto training individuals in the questionnaire methodology, while respecting the knowledge and experience of these institutions and their requirements. Although for practical reasons many questionnaires were disseminated by park rangers or senior community figures, improved training and contact with colleagues in Guatemala would have meant that the validation phase could have been administrated more effectively to ensure questions were clear and increased the potential for more and correct information to be passed on to other interviewers in the field.

Focus Groups

The first set of focus groups carried out in the RBSM (discussed in Chapter 4) were both carried out in Spanish, although the majority of the northern focus group were Mayan, and many participants had to have the content translated for them by a peer. Their responses were then translated back into Spanish by their peers and recorded in Spanish by the facilitators. This will have affected the quality of the information I gathered from the focus groups. However, in the second set of focus groups I carried out (discussed in Chapter 5), the Mayan focus groups were carried out fully in the Mayan language, and I was provided with a translator into Spanish. This still meant that there is likely to be some loss of richness and information in this translation process, but the participants were able to speak and discuss freely in their own language, without individual translation, providing a richer overall picture.

In all focus groups, due to the language barriers, I also had limited 'control' over the avenues of discussion down which the focus group was led. I would often ask the faciliators to go back to a point that was raised a while back, and dig deeper into this, but as the discussion may have evolved since then, the answers might not have been as detailed as they might have been if I had been able to lead the discussions myself. However, as I did not get involved as much, the discussion did evolve more naturally from the participants.

I would have liked to conduct more field research in general, however there were two major restrictions to this at the time. The first was the ongoing issue of safety in Guatemala, where it is quite dangerous to travel alone anywhere in the country (no CEAB employees are allowed to travel alone for fieldwork) and getting a trusted individual to take time out of their own work schedule to accompany me was not feasible. The second was the political climate, where both the president and vice-president were arrested during the period of time I was initially working in Guatemala, preceding the general elections, accompanied by mass protests inside and outside of the city. It was common for roads to be blocked for an entire day and cars with government logos on them to be attacked. As a result, my focus groups were cancelled

three times before I managed to get out to do them, and we had to cancel the third due to logistical and time issues.

Semi-structured interviews

The initial phase of semi structured interviews conducted during my second trip to Guatemala were mostly recorded, however, I did not record any of the second phase of interviews on my final trip to Guatemala. This was due to confidentiality issues, and the sensitive nature of the content we were discussing within the interviews. In one case, the interviewee did not want to meet at their place of work for confidentiality issues, and another interviewee specifically asked for some information to be taken out of the final narrative as they felt they might be identifiable. In terms of research ethics, it is important to have recordings of interviews to validate the information provided, however I believe that putting my interviewees at ease by ensuring they feel they are in a safe environment and will not have their trust violated was more important in this instance.

In comparison to the land user focus groups, the quality of information and depth of discussions I was able to have with the REDD+ decision maker interviewees were significantly increased. Some of the interviews were conducted in English, some in Spanish. However, for all interviews, both myself and the interviewee were often able to take our time to discuss issues, with the freedom and patience to get to grips with ideas across languages. Therefore, my understanding of the issues ongoing at this level will be greater than for those at the land user level, influencing the way I interpret and present these issues in the thesis.

Part 3.3: The Context of Guatemala and REDD+

Guatemala as a Case Study

According to Yin (1994), case studies should be used when the research questions are 'how' or 'why' questions, when the researcher has little control over the events or research context and when investigating contemporary phenomenon in real-life contexts. In this thesis, I chose Guatemala as a case study, with two major components: 1) the Sarstún Motagua region where land user views were explored in relation to drivers of DD and 2) REDD+ decision makers, where their views were sought on drivers of DD and barriers to transformational change (TC). These two case studies were chosen to test the conceptual model, as they approach the concept of drivers of DD from two very different angles, and the potential links between barriers to TC on drivers of DD can be explored across the two case studies. The Sarstún Motagua region was also heterogeneous enough to provide different perspectives amongst land users on the drivers of DD, but homogeneous enough to ensure that enough detail could be gathered on shared values and capabilities. The choice of Guatemala as a case study originally emerged from existing connections in the country, the knowledge that there was an ongoing problem with deforestation and a REDD+ programme in the early stages of its development, providing an excellent opportunity to explore both over the course of the next few years.

The broader context of Guatemala and land use

Guatemala is a Central American country with a population of roughly 16 million (OECD iLibrary., 2016), with around 40% of the population identifying as indigenous (INE, 2011). Historically, there have been many conflicts in Guatemala, specifically between indigenous and non-indigenous peoples (Grandin et al., 2011), the consequences of which often still show themselves in modern Guatemalan society (Hale, 2002).

In the Guatemalan National Institute for Statistics report on the 2014 National Survey on Employment and Income (2015), there is a gap between the number of indigenous and non-indigenous people accessing certain work opportunities. Around six times more non-indigenous people in employment have administrative or technical/managerial level jobs and half as many hold positions in the agricultural sector, compared to indigenous people. Indigenous people in employment are three times more likely to be engaged in unpaid work, and their salaries are only 60% that of non-indigenous men, even though on average indigenous men tend to work 3 hours a week more (INE, 2015). The most even distribution of employment is among the rural population (47.5% of jobs go to indigenous people and 52.5% to non-indigenous (INE, 2015)). However, even among these rural communities in Guatemala, there is marked income inequality and limited alternative income opportunities outside of forest related incomes for the poorest and most disadvantaged households (Córdova et al., 2013).

Vakis (2003) also notes the significant levels of discrimination against specifically women and indigenous people that may prevent individuals from accessing (or choosing) certain jobs. Wage differences of up to 56% between Ladino and Mayan employees exist in over half of Guatemalan businesses surveyed by the Association for Research and Social

Studies (ASIES) in Guatemala (2012). The Guatemalan National Survey on Living Conditions (2000) also found that there were 86,000 discouraged workers (those who have stopped searching for jobs or more work because they believe they cannot find one) and of these, 60% were indigenous and 66% were poor.

Loening and Markussen (2003) explored deforestation in Guatemala and found a strong link between poverty and deforestation, specifically linked to the lack of non-environmental employment or assets for the 53% of Guatemalans living in rural areas (INE, 2002). Although open unemployment in Guatemala is low, the poor often work less than 40 hours a week in unattractive jobs, because they cannot afford not to work at all (Vakis, 2003). Sharaunga et al. (2015) also found that lack of alternative income generating opportunities leads to a reliance of poorer communities on natural resources for their livelihoods. In agreement with these results, in a study of the western highlands of Guatemala, Cordova et al. (2013) found that poorer households relied heavily on forests for their incomes (e.g. firewood, timber, leaf litter fertilizer and seeds for sale), with little opportunities for diversification away from natural resource use. For those that do have other incomes, the vast majority are remittances (Córdova et al., 2013; Vakis, 2003), which have been found to have a significant positive effect in enabling families to improve the sustainability of their environmental livelihood practices in eastern Guatemala (Holder and Chase, 2012).

Land tenure is recognised as an enabling mechanism for individuals/families/communities to control and use land how they wish (Bray et al., 2008; Radachowsky et al., 2012), but 'invading' of land (where people move onto and use land that is not legally theirs, a term mostly used when referring to indigenous groups moving onto land) is a common issue across Guatemala causing conflicting land uses (Aguilar-Støen et al., 2014; Clark, 2000; López-Carr, 2012; Zander and Durr, 2011). In Guatemala, the government owns the majority of protected areas, but these are often managed by communities (Córdova et al., 2013; Gibson and Lehoucq, 2003). However, the majority of land in Guatemala is owned by private landowners and the country has one of the most inequitably distributed land ownership patterns in the northern hemisphere (Alonso-Fradejas, 2012; Harten, 2000).

Lack of effective law enforcement in developing countries is a well-known issue, and can have serious implications for the proper use and conservation of natural resources (Andvig and Fjeldstad, 2008). In Guatemala in particular, the legal and justice systems are severely lacking (HRW, 2012), and there have been cases where protected areas status is largely ineffectual due to the insubstantial role of the state in regulating land use in protected areas (Barrett et al., 2001; Bonham et al., 2008; Bruner and Gullison, 2001; Carr, 2008; McCusker and Carr, 2006; Shriar, 2001).

Equal access to public services (e.g. legal assistance) is essential for effective working of government services, their legitimacy and contribution to development goals (Hyden et al., 2003), however, marginal groups are often excluded from accessing opportunities in Guatemala due to market failures and discrimination across heterogeneous populations (Vakis, 2003). Guatemala also suffers from a lack of agricultural technical and financial knowledge and assistance (Vakis, 2003), which can lead to decreased environmental

sustainability and ability to adapt to environmental changes (Eakin and Bojórquez-Tapia, 2011).

Recently, Guatemala has also been in worldwide news due to a major corruption scandal, resulting in the loss of impunity of the president and vice president in 2015 (Andersson, 2017), although some suggest that even with such a high profile attack on corruption, it is still embedded in Guatemalan society and politics (Beltran, 2016; González Chávez, 2017). More broadly, corruption has been shown to cause decreased investment and economic growth (Mauro, 1995) due to ineffective allocation of resources to rent-seeking activities rather than opportunities to create new wealth (Murphy et al. 1991; Kurer, 1991). Corruption has also been shown to lead to increased deforestation as the forestry sector is particularly prone to illegal activities due to its low visibility and low importance in many countries (Koyunen and Yilmaz, 2009).

The context of the case study area for developing the proof of concept, the Sierra de Las Minas Biosphere Reserve, is described in Chapter 4. The case study region of the Sarstún Motagua is described in Chapter 5.

Frameworks for climate change mitigation in Guatemala

The top authority in Guatemala on climate change issues is the National Climate Change Council (CNCC). This is led by the Minister for Environment, and is the main body through which any legal issues related to programmes for mitigating climate change need to go through (MARN, 2013). The main scientific assessor of the CNCC is the Guatemalan System for Climate Change Sciences (SGCCC), which is structured to resemble the Intergovernmental Panel on Climate Change (IPCC) addressing the science of climate change, adaptation and vulnerability and lastly mitigation and reduction of emissions (SGCCC, 2014).

Guatemala has been successfully implementing their Forestry Incentive Programme (funded by the World Bank Forest Investment Programme) projects since 1997 in the form of the incentive schemes for reforestation activities (PINFOR, for private landowners) and PINPEP (for community groups) (INAB, 2010, 1996). PINFOR was designed for private landowners who wanted to gain income through reforestation of their land. Later came PINPEP, which opened up the reforestation scheme to smaller and community landholders, and also encouraged the use of sustainable forestry management practices such as agroforestry. PINFOR was due to expire in 2016, and has been replaced by a new 'Probosques' law due to the success of the original PINFOR scheme where over 360,000 ha of land has been reforested or put under sustainable management schemes, and over 860,000 people have benefitted from payments (INAB, 2016, 2015).

The USAID funded Climate, Nature Communities Guatemala (CNCG) project has five core goals: forests and markets, reduction of deforestation, adaptation to climate change, increasing the technical capacity of environmental organisations and reduction of emissions. These are carried out by a consortium of international and national actors including the Rainforest Alliance (the leaders of the project), The Nature Conservancy, AGEXPORT (Guatemalan Association of Exporters), Foundation for the Defenders of

Nature, Universidad del Valle de Guatemala and the World Wildlife Fund (USAID, 2016). The second goal of the CNCG included activities related to the country's REDD+ (reduction of emissions from deforestation and forest degradation) programme, discussed in more detail below.

Reduction of Emissions from Deforestation and Forest Degradation (REDD+)

The UN-REDD+ (United Nations Reduction of Emissions from Deforestation and Forest Degradation) mechanism is a tool for countries to contribute to climate change mitigation while contributing to sustainable forest management (Pistorius, 2012). The mechanism includes four principal components: the monitoring, reporting and verification (MRV) component, the benefits distribution and safeguards components, and the REDD+ strategy (Maniatis, 2016). Created in 2008, REDD+ was aimed at developing countries to reduce their carbon emissions from deforestation by providing financial incentives to conserve, not exploit, forests (Ghazoul et al., 2010).

Another compulsory aspect within the REDD+ strategy component for states to address if they want to be able to take part in a REDD+ programme is an assessment of drivers of deforestation and forest degradation (DD). Several UNFCCC Conferences of Parties (COP) decisions have also highlighted the importance of drivers and the need for developing countries to address these in their national strategies and action plans (Para 1 of decision 4/CP.15; Para 72 of decision 1/CP.16 and the Warsaw Framework decision on drivers 15/CP.19). In the Verified Carbon Standard (VCS) (O'Sullivan et al., 2015) and Forest Carbon Partnership Facility (FCPF) documentation there is clear reference to the necessity of an understanding of drivers of DD in order to create a successful REDD+ programme, as this understanding will inform the nature of interventions necessary for reducing emissions as part of REDD+. These sources also cite the importance of linking drivers with environmental and social impacts, understanding their scales and locations, linking them with observed forest area change and specific large scale activities and their link to current and past efforts to reduce deforestation and forest degradation. However, although there are set guidelines in place for implementing the safeguards (FCPF, 2011; Peskett and Todd, 2013) and MRV components (e.g. FCPF, 2013; O'Sullivan et al., 2015; USAID and LEAF, 2013), there are no set guidelines for assessing countries' drivers of DD. In Chapter 6, I provide a brief overview of the status of REDD+ in Guatemala.

CHAPTER 4: USING BEHAVIOURAL THEORY AND THE CAPABILITY APPROACH TO UNDERSTAND DRIVERS OF DEFORESTATION IN THE SIERRA DE LAS MINAS BIOSPHERE RESERVE, GUATEMALA

Chapter Summary

Understanding drivers of deforestation is essential for developing any successful intervention to reduce forest degradation or loss, yet there remains relatively little consensus or clarity on how drivers should be identified and classified. In this chapter, I develop a proof of concept for a model that combines social-psychological behavioural theory with the Capability Approach to identify and define drivers of deforestation and forest degradation (DD). Using Likert scale land user responses to belief statements from the Sierra de Las Minas Biosphere Reserve (RBSM) in Guatemala, analysed using exploratory factor analysis and validated with focus group discussions, the model and approach proved to be a useful tool for identifying and understanding drivers of DD, including cultural and institutional drivers that are often complex and difficult to identify.

Methodology

Case Study Area

There has been a significant amount of research conducted in Guatemala on forest cover and land use change (Bilsborrow and Delargy, 1990; Bonham et al., 2008; Bray et al., 2008; Carr, 2004b, 2002; Díaz and Koning, 2015), particularly in the Mayan Biosphere Reserve in Petén. However, there has been very little research conducted elsewhere in the country, including the Sierra de Las Minas Biosphere Reserve (RBSM).

The RBSM is situated to the east of Guatemala, within the Sarstún Motagua region. The RBSM describes 242,642 ha of land to the north east of Guatemala (see Figure 8). Deforestation in the reserve is low overall, with only 2% (6,201 ha) total forest cover loss between 2006 and 2010 (Conte and Maldonado, 2012). However, 25% (1,524 ha) of this deforestation occurred in the nuclear zone, where only scientific research and tourism are legally allowed, so major threats to the reserve's forests still exist.

Fundación Defensores de la Naturaleza (FDN) manages the park, carrying out the technical and administrative duties as outlined by the Board of Directors, which includes members from the FDN, the Council for Protected Areas (CONAP), the five government departments that make up the reserve and community and indigenous groups.

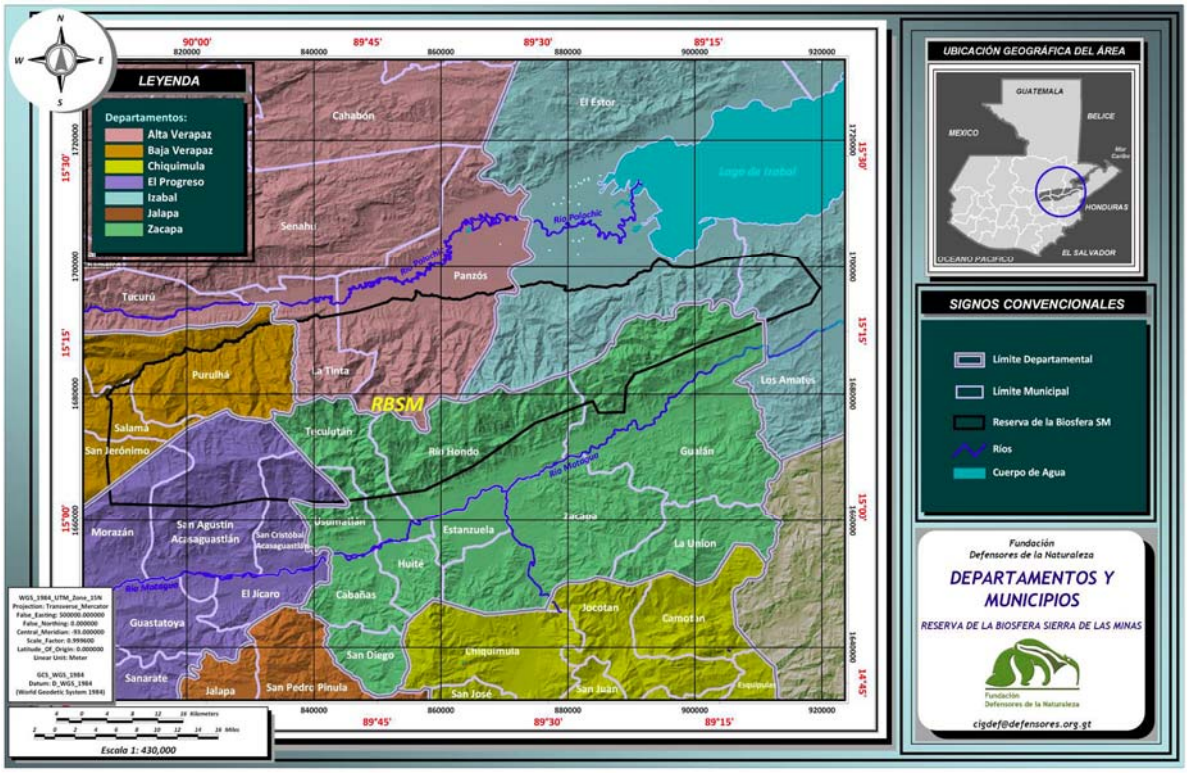

Figure 8: The Sierra de Las Minas Biosphere Reserve (From: FDN (2010), used with permission)

Survey Design

In late 2014, prior to my starting the PhD, Universidad del Valle de Guatemala (UVG) identified key stakeholders involved in land use decision making and actions in the

Sarstún Motaguá region, including individuals from government, academia, community associations, cooperatives, private sector and NGOs. Workshops exploring a range of these actors' perceptions of drivers of deforestation were conducted by UVG and other collaborating institutions.

After the CNCG project partners agreed to use my methodology to identify drivers of DD, they provided me with the raw data from the workshops (which had not yet been analysed) to analyse and use to create my land user questionnaire. I created an Excel spreadsheet with information on drivers, agents and characteristics of agents by location from the raw data provided. Then, using this information and the 2010 Fundación Defensores de la Naturaleza (FDN) management report for the RBSM, I developed around 200 belief statements related to aspects of drivers, agents and their characteristics from the raw data I analysed. I then grouped the belief statements under 19 theme headings (e.g. extreme poverty, short term thinking and planning, profitability etc.). The statements were written with relevance to those who make direct decisions regarding land use, including land owners and those who rent or hold use rights.

The list was sent to collaborators in the UVG and the University of Greenwich, where individuals indicated, using 'traffic light' colouring, which belief statements should and should not be included in the questionnaire. After collating these opinions, the final set of 33 belief statements was chosen for inclusion in the questionnaire.

It was not possible to ensure an even number of statements across every theme, as suggested by Oppenheim (1996) and required for EFA analysis (Fabrigar and Petty, 1999), but smaller themes were included in case they were found to be more important than originally thought (Williams et al., 2012). Statements were worded in order to minimise ambiguity in the participant responses, in order to free up cognitive space (Brislin, 1986; Dillman, 2000). Some questions were then worded negatively e.g. 'I do not' and some positively e.g. 'I do'. This was in order for us to ensure participants' alertness when answering questions, in that their responses were consistent (Leeuw et al., 2008; Lietz, 2008).

A five point Likert scale of ´strongly agree´ to ´strongly disagree´ was chosen for the belief statements, as although the seven point scale is found to be more reliable (Cronbach, 1951), the five point scale is found to be best for absolute judgements (Foddy, 1994). All belief statements were randomly ordered, using a random number generator in Excel, for inclusion in the questionnaire to ensure participant answers were not directly influenced by their answers to other questions (Schuman and Presser, 1996). The key themes headings were also used to help check that belief statements associated with the same theme were not adjacent in the final questionnaire (see Appendix A).

Validation took place with 42 land use decision makers from community associations, cooperatives and NGOs across the Sarstún Motaguá region, facilitated by CNCG member organisations. This phase ensured that the belief statements meant the same to every person (Denzin, 1973) and that the overall survey design was optimal, with appropriate revisions made post validation.

FDN employees gathered 138 face-to-face questionnaire responses from land use decision makers in the RBSM. Sampling was limited to those communities that were engaged in projects with the FDN and were physically accessible. Responses covered all four departments, although most responses were from Alta Verapaz. However, as can be seen from Figure 8, Alta and Baja Verapaz cover more than 50% of the reserve. Over half (58%) of responses were from Mayan individuals whom required translation of the Spanish questionnaire into their Mayan language (majority Q'eqchi).

Statistical Analysis

A well-known method of measuring attitudes and values in the social sciences is exploratory factor analysis (EFA), which uncovers the latent, common underlying constructs of a large number of measured variables (Mulaik, 1987; Norris and Lecavalier, 2010). EFA can be used to discover, indirectly, explanations for variables in the form of yet unmeasured (or unmeasurable) latent, common factors (Mulaik, 1987). In this study, exploratory factor analysis grouped the belief statements into factors, which we interpreted as values. Individual Likert scale belief statement responses were coded numerically from 1 (strongly agree) to 5 (strongly disagree) and inputted to SPSS v.22 as nominal variables for factor analysis.

We then calculated factor scores to identify how relevant respondents felt each value was to them in order to explore differing social perspectives between cultural groups, which we used to identify social capabilities. An analysis of variance was conducted to explore significant differences in factor scores between distinct groups within the reserve. Further details of the factor analysis process, calculation of factor scores and analyses of variance can be found in Appendix B.

Focus Groups

This study used focus group discussions with land use decision makers in the RBSM to validate the interpretation of the factors as shared values. Two focus groups were carried out, one north and one south of the reserve. The north-south divide in the reserve is important both geographically, with the mountain chain running roughly east-west across the reserve, but also in terms of the major differences in the communities north and south of the reserve. In Alta and Baja Verapaz (the departments north of the reserve) 93.4% and 46.7% of the population identify as indigenous respectively, while in Zacapa and El Progreso (south of the reserve) only 0.3% and 0.1% identify as indigenous (INE, 2015). This variation presented an excellent opportunity to explore differences in perspectives between distinct ethnic groups.

The northern focus group (Group N) was held in Purulhá and consisted of 16 farmers and foresters, most of whom were of Mayan decent, several requiring translations from Spanish during the workshop. Two of the participants in this workshop were also probably illiterate, as they signed the attendance sheet with a thumbprint. Most people in the north of the reserve belong to indigenous communities who do not possess their own titles to the land but have rights to use the land. The southern focus group (Group S) was held in Río Hondo where the 34 participants were noticeably wealthier (most spoke Spanish, some even had a little English), and had a wider range of individuals

present from different sectors (cattle ranchers, hydroelectric, farmers and foresters), and around five individuals who worked for the FDN and participated in the initial UVG workshops. The majority of those living in the south are private landowners (FDN, 2010).

Participants were initially asked to offer their thoughts on what 'climate change' and 'deforestation' meant to them and were then asked to explain how these two ideas were connected. This exercise was used as a primer to provide context to the focus groups, and to ensure all participants had the same level of understanding of the context before beginning the factor interpretation exercises. Participants were then separated into smaller groups of five or six people, depending on the number of participants attending the workshop. The groups consisted of people from a range of different sectors.

Each small group was given a list of the belief statements making up one or two of the factors from the final factor analysis solution, with no extra information, and asked to provide a name or description that represented the key idea that connected those belief statements. After each group had finished, they reported their interpretations to the other groups, and a whole group discussion was held.

Once all factors had been discussed, a vote was held on which factors contributed to deforestation. Once the factors that contributed to deforestation had been identified, a vote was held on which single factor caused the most deforestation out of those chosen, where participants could vote on only one factor. Subsequently, the group was then allowed to vote multiple times on what other factors were a significant cause of deforestation, to achieve a ranking of the most to least significant drivers of DD.

The mixture of small group discussion and wider group deliberation ensured that many voices were heard and that the values were understood through the process of debate and dialogue that are important to understanding shared and social values (Kenter et al., 2015).

Results and Discussion

Identifying Land Use Values in the RBSM

Exploratory factor analysis identified six factors (Table 1). These factors have been interpreted below using the belief statements from the factor, an exploration of the relevance of these values to each group by examining their factor scores (Figure 9) and the focus group interpretations.

Final Factor Solution	Factor Loadings					
	1	2	3	4	5	6
Factor 1						
Q36 I need more capacity to engage in good agricultural practices	0.754					
Q25 If people had a better environmental conscience, they would not damage the forest	0.744					
Q37 All of us are responsible for forest loss	0.504					
Q4 I prefer to care for the forest rather than use it for agriculture	0.436					
Q34 Protected areas are necessary for forest conservation	0.398					
Factor 2						
Q38 If there were more opportunities to sell my products I would need to cut down more forest		0.596				
Q28 We need more employment opportunities although this causes more loss of forest		0.536		0.308		
Q35 People should be able to use land that is not theirs		0.505				
Q24 It is more important to make money today than think about the future of the forest		0.488				
Q30 I am **not** against cutting down forest		-0.428				
Q5 I would like to have a different job that is not working in the field		0.383	0.362	0.341		
Factor 3						
Q15 There should be more rules about how people can use the land	0.393		0.623			
Q29 The state makes laws that are important for the environment			0.589			
Q16 There should be compliance with the law to avoid the forest being destroyed		-0.327	0.577			
Factor 4						
Q17 Community organisations are better than government institutions at caring for the forest				0.695		
Q26 The authorities don't have the capacity to confront those who abuse the land	0.365			0.457		
Q21 There are no places nearby where we can make complaints about bad land use practices				0.443		
Q27 We should know who is the owner and who can use the land			0.389	0.425		
Factor 5						
Q14 I don't have other opportunities to make money other than working in the field					0.703	
Q23 The law should permit people to use land how they want					0.514	
Q11 I need to cut down the forest for sustenance		0.418			0.437	
Q13 If there was more infrastructure, there would be less forest					0.333	
Factor 6						
Q3 I can help reduce forest loss						0.627
Q1 It is important to manage natural resources sustainably regardless of time or cost						0.469

Table 1: The final factor solution for the RBSM

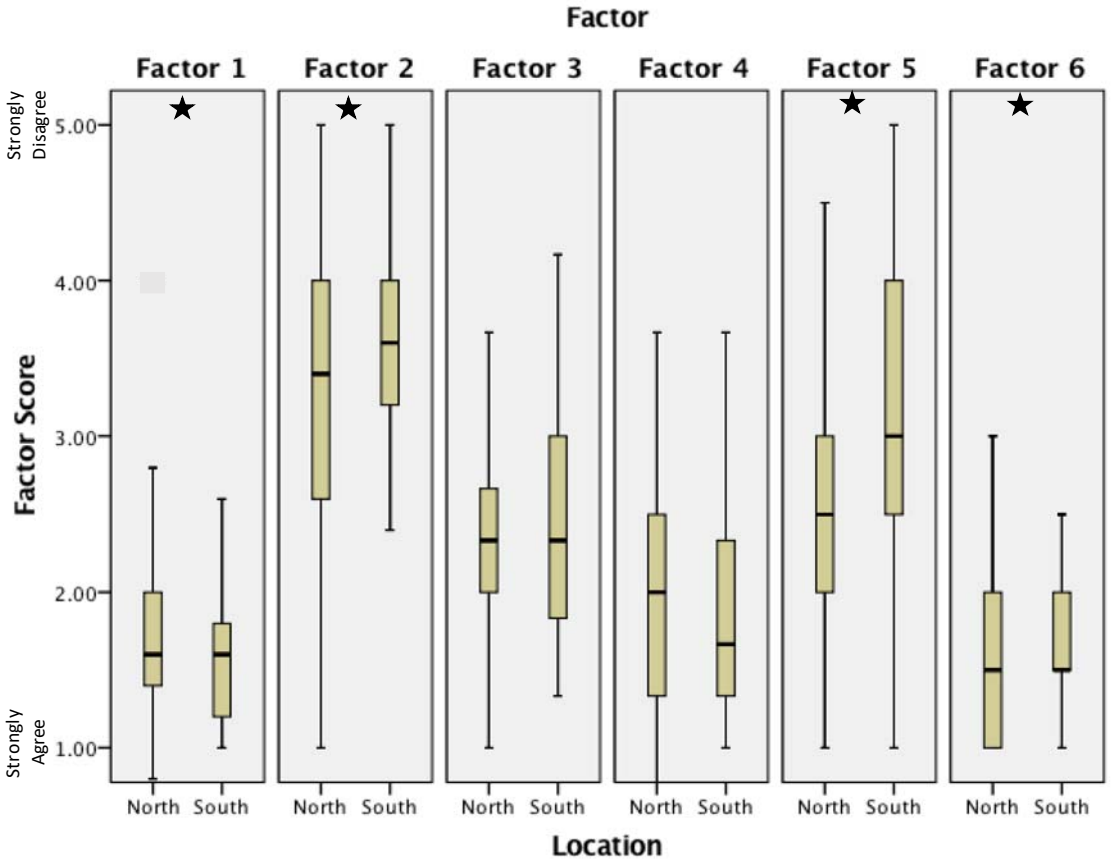

Figure 9: Graphical representation of average factor scores north and south of the reserve (the scale ranges from 1 = strongly agree to 5 = strongly disagree, with 3 = neither agree nor disagree). Stars represent significant differences between group scores.

Focus group discussions on Factor 1

- Group N: interpreted this factor as '*lack of interest in protection and care of natural resources by the government*'. It was believed that the 'public' had environmental conscience, but the state does not provide enough resources to enable them to do anything with this. In addition, the state does not provide adequate education or health systems, adding to the fact that the public cannot engage in effective sustainable land use practices.

- Group S: gave the factor the title '*education and environmental conscience*'. They highlighted in the group discussion that education does not automatically equal environmental conscience, but there should be more education linked to creating an environmental conscience in the younger generation.

Interpretation of Factor 1

The belief statements in this factor (see Table 1) discuss the need to care for the environment through cultivation of an environmental conscience (Q25) and collective responsibility (Q37). The top loading belief statements highlight specifically the lack of

capacity (Q36) and environmental conscience in individuals and the conflict between these capabilities and the wish to engage in pro-environmental behaviours (Q4).

Although similar, the relevance of this factor to each group (see Figure 9) is significantly different ($p<0.05$) (see Appendix A). Both focus groups specifically honed-in on the concept of environmental conscience in this factor, but from two different angles. The mostly Mayan Group N appear to feel that environmental conscience is something they all possess, and it is the 'other' that do not possess the same environmental conscience. Group S believe environmental conscience is something that can be cultivated through education schemes. Group S therefore perceives a lack of education, while Group N perceives a state that does not understand their needs, and as such does not provide them with the capacity they need to act on their environmental conscience. In the context of values, this factor therefore represents the **valuing of environmental conscience**.

Focus group discussions on Factor 2

- Group N: called this '*personal interest affects the sustainability of the RBSM*'. In their discussion, they explained that the greed, corruption, lack of professionalism and ethics of individuals contributes to the unsustainable use of natural resources.

- Group S: interpreted this as '*for the lack of employment in rural areas there is no other opportunity than to cut the forest in order to nourish their families*'. They discussed how the government is not helping the communities enough, and the lack of law enforcement and land tenure for communities/the public. They also cited the increase in population due to a lack of sex education, as well as unemployment, poverty, lack of agricultural capacity, lack of economic development, lack of resources to develop projects (i.e. by FDN) and a lack of follow-up projects or plans for communities.

Interpretation of Factor 2

This factor contains belief statements that relate to resource use and the need to generate income opportunities. The top loading items on this factor suggest a desire for more market and employment opportunities (Qs 38 and 28), and the ability to use resources freely (Q35). The other items expand on this, by indicating making money today is important (Q24) and that cutting down forest is acceptable (Q30), but off-farm opportunities are also desired (Q5).

Both groups appear to attribute the factor to 'others'. Group S refer specifically to 'rural areas', while Group N talk about greed and corruption, which is likely to be aimed at large landowners rather than themselves, mainly Mayan subsistence farmers. The difference in relevance of this value to each group is very significant ($p<0.02$). Group S assign less relative importance to this factor, indicating inequalities between Ladino and Maya leading to low social mobility for Mayans to access alternative economic opportunities. This factor appears to be associated with **valuing economic opportunity**,

as varied and alternative income sources can lead to improved standards of living and more sustainable use of resources (Adeel and Safriel, 2008; Appiah et al., 2009; Córdova et al., 2013; Ellis, 1999).

Focus group discussions on Factor 3

- Group N: interpreted this factor as '*communities organising for the protection of natural resources and compliance with the law*'. They cited issues such as lack of regulations for working on the land, the lack of law enforcement by the state and the need for committees in the RBSM for law enforcement.

- Group S: named this factor *'rules and laws: lack of technical or professional assistance to assess the use and management of the land'*. They discussed how there is no financing or governmental support for effective sustainable development mechanisms for the use and management of the land and that there should be laws established to support this. They also mentioned lack of effective governance and barriers to use of land and natural resources mean that individuals create other means of income that may be unsustainable.

Interpretation of Factor 3

The belief statements in this factor discuss the need for more rules on land use (Q15) and lack of compliance with laws (Q16) surrounding the use and care of the environment, although those laws themselves are good for the environment (Q29).

There is no significant difference in how relevant the groups felt this value was to them. Both groups also discussed very similar themes associated with this value. This factor indicates the **valued function of the rule of law**. The rule of law is a complex concept which can be conceptualised by considering some of the outcomes that it may bring, including accountability, respect for fundamental rights and access to justice (Martinez et al., 2015).

Focus group discussions on Factor 4

- Group N: interpreted this as *'the institutional and community situation for the creation and management of the RBSM and improving the sustainability of the forest'*. In their discussions, they mentioned lack of work in the area and lack of support from the authorities in the form of finances and resources.

- Group S: interpreted this factor as *'lack of government involvement with institutional and community organisations with respect to the environment and generating opportunities'*. They explored this idea more by discussing the lack of employment opportunities in the area, the need to improve environmental projects and the lack of information and capacity available on behalf of the state.

Interpretation of Factor 4

The marker variable, Q17, indicates the idea that there is a lack of trust in government organisations providing the necessary support to manage forests effectively. The other items in the factor go on to elaborate on this initial concept, identifying a lack of authority (Q26), complaints procedures (Q21) and clear tenure (Q27).

Again, there is no significant difference in how relevant the groups felt this factor was to them, and the discussions highlighted largely similar issues. This factor seems to articulate the **valuing of good governance**. UNESCO (2016) conceptualise governance as representing 'the culture and institutional environment in which citizens and stakeholders interact and participate in public affairs', and as such, good governance should enable sustainable human development.

Focus group discussion on Factor 5

- Group N: interpreted this factor as *'we are poor communities without education and therefore we work the land'*. They discussed how there are no laws that are oriented to the sustainable use of the land or alternative methods of management and the lack of study opportunities for this.

- Group S: named this factor *'bad agricultural practices and lack of capacity and land tenure system'*. They suggested that there should be more capacity building with a focus on sustainable management of the environment.

Interpretation of Factor 5

The top loading item, Q14, sets the scene for the factor, identifying the lack of off-farm opportunities available. The other items go on to discuss other limiting factors that prevent access to opportunities, such as restrictive land use regulations (Q23) and the necessity of working farmland for subsistence (Q11).

Group N mention the necessity for them to work the land is due to their levels of poverty and lack of education. They then expand on the land use regulations by explaining that there are no laws (or possibly a lack of education/information about those laws) that allow for the sustainable use of the land. This is the only factor for which either focus group has specifically associated the ideas with themselves (Group N: 'we are poor communities without education…'). The relevance of the value to each group differs highly significantly ($p<.000$). Group N tend to agree with the factor which aligns with the focus group discussion where they indicate a lack of opportunity that is specifically related to them. This hints again at an underlying layer of low social mobility and high inequality associated with Guatemala's Mayan/Ladino divide in this factor. Therefore, this factor appears to discuss the **valuing of equality of opportunity**.

Focus group discussions on Factor 6

- Group N: named this factor *'plan for the sustainable management of natural resources'*, which was deemed clear enough and no further additions were made to the interpretation.

- Group S: named the same factor *'conservation and protection of natural resources by government and community organisations'*. The group then went on to discuss ways in which these institutions work together to conserve the environment, citing the forest incentive programmes. They also then suggested more ways in which they could work together to create a conservation environment, including environmental education, better law enforcement and regulations (for example forest licenses), creation of mechanisms for soil conversation and strengthening of governmental, municipal and community environmental organisations for improved management of natural resources.

Interpretation of Factor 6

Group N focus on sustainable management practices, while Group S discuss conservation efforts. This difference in focus, and the significant difference in agreement ($p<.03$), is possibly related to the difference in livelihoods between the two groups. Group N do not expand on the factor, while Group S mention ongoing initiatives that enable forest conservation, taking a specifically positive approach to identifying what more could be done, rather than identifying issues that hinder conservation currently. Therefore, this value could be conceptualised as **valuing environmental conservation**.

Identifying capabilities and functions as drivers of deforestation

In Figure 10, statements summarising all the behaviours (achieved functions) and 'negative' capabilities associated with each factor, identified from the discussion of the factor interpretations above are listed, following the conceptual model outlined in **Error! Reference source not found.**. The capabilities have been labelled as 'negative' as they present as barriers to achieving participant values. Factor 6 was not included as it is not considered a driver of DD. The negative social capabilities were identified by comparing the different agreements with the factor (Figure 9) and the different focus group interpretations of the factors, particularly apparent in factors 2 and 5.

Achieved Functions	Situational Capabilities	Social Capabilities	Means	Valued Functions
Factor 1 Non-Sustainable Land Use Practices *Factors 2, 3, 4 and 5* Multiple, Competing and Ongoing Uncontrolled Land Uses	*Factors 1 and 5* Insufficient education cultivating environmental conscience *Factors 1, 4 and 5* Lack of technical/financial capacity for good agricultural practices *Factors 2 and 4* Restrictive land/forest use regulations Few economic opportunities *Factor 3* Weak state law enforcement Weak local enforcement of land use regulations	*Factor 1* Different cultural understandings of environmental conscience *Factors 1 and 5* Lack of political will and support for education and care of natural resources *Factor 2* Weak national and international challenges to widespread corruption *Factors 2 and 5* Low social mobility and high inequality *Factor 3* Weak local institutions regulating natural resource use *Factor 4* Weak communication and engagement between the state and communities	*Factors 1 and 3* Protected Areas *Factors 1 and 6* Technological Advancement *Factor 2* Markets *Factors 2, 4 and 5* Employment opportunities *Factors 2, 3, 4 and 5* Land tenure and use laws *Factor 3* Environmental and forest laws *Factors 3 and 4* Land use police and complaints processes *Factor 5* Schools	Factor 1: Environmental Conscience Factor 2: Economic Opportunity Factor 3: The Rule of Law Factor 4: Good Governance Factor 5: Equality of Opportunity

Figure 10: All functions and capabilities for each of the factors that contribute to DD

By linking up the negative social and situational capabilities that are associated with each factor (i.e. the social capabilities for factor 1 are linked to the situational capabilities for factor 1), it was then possible to model the relationships between each tier of driver, as shown in Figure 11. From this model, it is possible to identify the relationships between the different types of drivers.

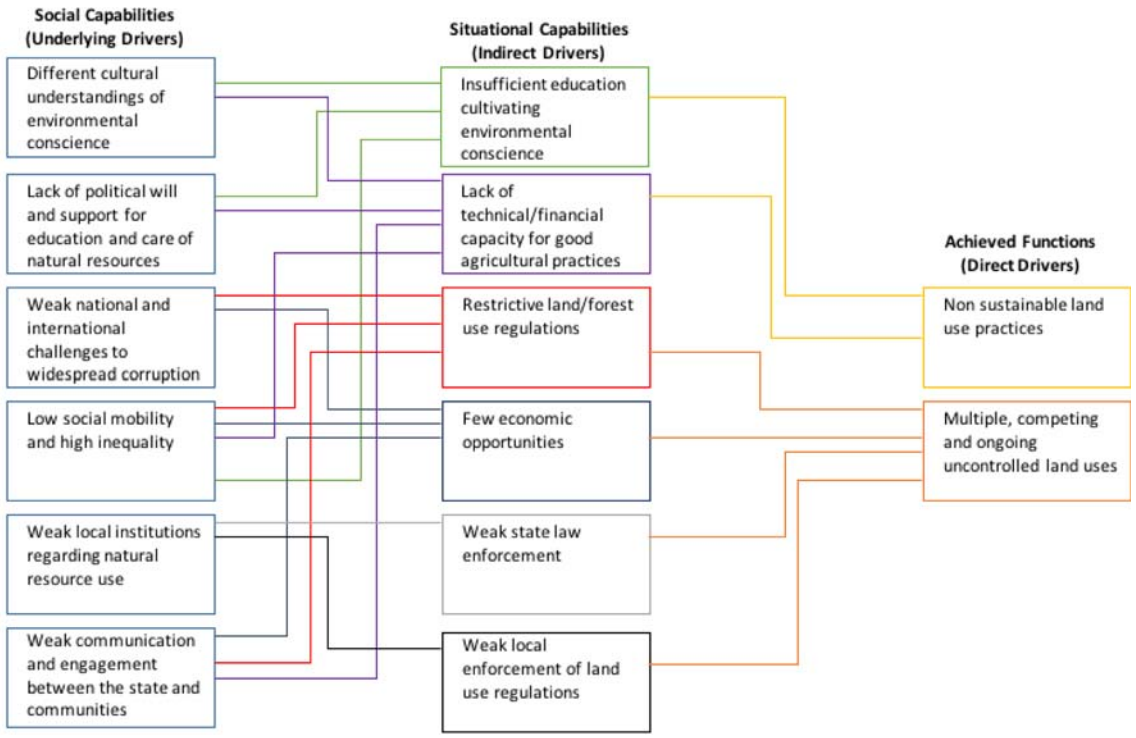

Figure 11: A model of the links between the three tiers of driver

When the focus groups were asked to vote on which factors they believed contributed most and least to DD, both groups voted identically for all rankings. In agreement with the factor interpretations, factor 6: Environmental Conservation, was not deemed a driver of DD by the focus groups, however factor 3: The Rule of Law was also not considered an important driver of DD. As can be seen in Figure 10, there was only one underlying driver associated with factor 3, and the two indirect drivers associated with it had the least linkages to other drivers (Figure 10). In contrast, the drivers associated with factors 1, 2, 4 and 5 were highly interlinked, which may help explain why factor 3 was not considered a major driver of DD by the focus groups.

Discussion

The focus group discussions on the factors clearly indicate that there are many reasons why they believe they cannot achieve the valued functions. In several cases, they clearly outlined that these issues were negatively affecting the environment (e.g. 'for the lack of employment in rural areas there is no other opportunity than to cut the forest in order to nourish their families', factor 2). The discussions of the focus groups were often closely aligned with the content of the factors, which supports the theory behind the Behaviour-Capability-Drivers model where the belief statements reflect situations relevant to stakeholders – the (negative) capabilities – and the factors represent the shared value. These negative capabilities can then be equated to drivers of DD. Therefore in the case of the example of factor 2 above, the value

is related to employment (valuing economic opportunity), but lack of these opportunities (a negative capability) will lead to forest clearing (achieved function/behaviour).

In a study of farmer attitudes towards ecosystem services, Poppenborg and Keollner (Poppenborg and Koellner, 2013) found that higher incomes determined more positive environmental attitudes. Figure 4 shows that the lower income Group N tended to feel that factor 6: Valuing Environmental Conservation was more relevant to them, while the higher income Group S felt that factor 1: Valuing Environmental Conscience was more relevant to them. This may be because Group S feel that they require more environmental conscience in their communities, which could explain their suggestion of greater education on environmental issues. Michel-Guillou and Moser (2006) found that farmer's pro-environmental behaviour is often triggered by the adoption of practices. This duality of willingness and capability was nicely summed up by Gasson and Potter (1988), where they stated that 'any explanation of conservation behaviour needs to take account of both ability to invest and the farmer's interest.' In contrast, Group N feel that they (or 'the public') have enough environmental conscience but they lack the ability to physically plan for conservation due to lack of technological assistance and capacity. Therefore, although both groups felt that both factors 1 and 6 were very relevant to them and therefore would be likely to both have positive attitudes towards environmental issues, it is only through understanding the different capabilities available (or not) to each group that a clearer understanding of potential patterns of land use behaviours can be understood.

In Figure 10, a significant number of (negative) social capabilities, including social norms and institutions, have been identified. However, recognition of institutions and their role in driving environmental change and management of natural resources is still an evolving field (Leach et al., 1999). Yet, Cote and Nightingale (2012) along with others (Parks and Roberts, 2010; Schroeder and Suryanata, 1996) believe that influencing norms, including power relations and values are essential to cultural change, and the dynamics that mediate human-environment relationships. Therefore, in terms of using these drivers of DD in policy and intervention design, taking account of the negative social capabilities (social norms and institutions) is essential.

The results also have useful implications for intervention design, as the study identified 'negative' capabilities that can inhibit the achievement of pro-environmental values and behaviours. As Anderson et al. (2016) notes, decision makers need to know whose values count, and be able to understand the multiplicity of values present across society to inform decisions regarding sustainability. Divergent preferences in values can also have important implications for policy design and alignment of forest values is important for creating socially acceptable forest management systems (Kant and Lee, 2004; Kumar and Kant, 2007; Mcdermott and Ituarte-lima, 2016). To increase the usefulness of the model and approach to policy makers, more research into the quantitative nature of the relationships between the capabilities and behaviours and how they interact in different contexts is necessary to fully understand the implications of differing perspectives across stakeholder groups, and so to develop tailored policies and interventions.

Future work

In the conceptual model, the category of personal conversion factors was not included, which is present in Robeyns' (2003) interpretation of the Capability Approach and provides a further element that can help identify why individuals are not able to achieve their values. The approach also appears to best identify values and social and situational capabilities, but not means or behaviours. Due to practical constraints on the fieldwork and ethical considerations, gathering further data on personal conversion factors and full details of the means available to land users was not possible. However, if more time and resources were available in-country it may be possible to further develop the approach to include these aspects within the study. Similarly, generating more quantitative data would enhance the usefulness of the model and approach to exploring causality related to drivers of DD. For instance, the approach could be usefully combined with GIS data, or the self-reported forest cover change from the questionnaires, to compare factor scores for values with actual forest cover change (explored in Chapter 5).

Several values for participants were identified across the RBSM through exploratory factor analysis, and showed that the belief statements that constituted these factors described barriers to the achievement of those values. Negative social capabilities (or underlying drivers of DD) were then identified by exploring the differences in the perspectives and relevance of the values to different people across the RBSM. Shared values are those values that are shared by, or aligned across, different communities or groups (Stein et al., 1999). According to Klamer (2003), these can be elicited through collation of individual values, suggesting that the results could reflect shared values across the RBSM communities. The differing levels of relevance and perspectives discovered between the groups in the RBSM could also reflect differing orientations towards these shared values, as Eriksson et al. (2015) and Vaske and Donnelly (1999) have found that although people may share values, orientations can vary across cultural groups. Borrie et al. (2002) and Kumar and Kant (2007) also suggest that poor participation in community management programmes can often be down to misalignment of interests and value orientations associated with natural resource use. Understanding the role of these orientations in explaining behaviour could be important for understanding the value-action-gap, and as such, drivers of DD.

Conclusion

I proposed a conceptual model based on social-psychological behavioural theory combined with the Capability Approach to identify, define and classify drivers of DD. I then developed a proof of concept by applying and testing the model with land users in the Sierra de Las Minas Biosphere Reserve in Guatemala. My results suggest the model and approach form a useful tool for identifying and understanding drivers of DD through the identification of social and situational capabilities. However, this proof of concept leaves ample room for more work to be done to explore whether it is possible to identify how shared values and value orientations vary across different groups, and whether this information can be quantified and applied to wider design of policy and other interventions.

CHAPTER 5: EXPLORING THE VALUE-ACTION GAP THROUGH SHARED VALUES, CAPABILITIES AND DEFORESTATION BEHAVIOURS IN THE SARSTÚN MOTAGUA REGION, GUATEMALA

Chapter Summary

Exploring the link between forest values and behaviour is a useful approach to understanding drivers of deforestation and forest degradation (or conservation). Here, I explore the link between shared values and deforestation and forest degradation behaviour. I use the Behaviour-Capability-Drivers model and apply it in the context of the Sarstún Motagua region, Guatemala using a mixed methods approach. My results indicate that different cultural groups (Q'eqchi Maya and Ladinos) act differently depending on how they relate to their shared values and that capabilities and value orientations play important roles in filling the value-action gap. These findings have implications for behavioural theory, providing empirical links between shared values, capabilities and behaviour; as well as for policy makers looking to explore drivers of change at landscape and whole ecosystem levels.

Introduction

Understanding the role of values in informing behavioural outcomes has been a focus in the forest conservation literature in recent years (Berninger and Kneeshaw, 2009; Drescher et al., 2017; Eriksson et al., 2015; Nordlund and Westin, 2010; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2015, 2013). However, it is well-known that values alone do not lead directly to behaviours (Kollmuss and Agyeman, 2002; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2015; Vaske and Donnelly, 1999). This has been termed the value-action gap (Blake, 1999) and understanding what fills this gap remains a challenge.

The relationship between forest values and behaviour has been explored quantitatively (Ní Dhubháin et al., 2007; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2015; Vaske and Donnelly, 1999), although often with a focus on a specific type of value (e.g. forest values, value orientations or individual values) or mediating factor (e.g. attitudes, norms). Shared values have been increasingly noted as important to ecosystem services and landscape level approaches to decision making (Brunetta and Voghera, 2008; Fish et al., 2011; Kenter et al., 2015). As Fish et al. (2011) note "Valuing the contribution that ecosystem services make to human well-being cannot be reduced to individual preferences and motivations alone." (p 1184).

The concept of a set of shared universal human values has been well developed in the literature, but large scale empirical studies also show that preferences for, or orientations towards, these values may differ across cultures (Hofstede, 1980; Rokeach, 1973; Schwartz, 1994; Schwartz et al., 2012). Studies specifically on forest values have similarly found that although people may have similar forest values, value orientations (e.g. ecological vs production) often vary between different cultures and social groups (Eriksson et al., 2015; Vaske and Donnelly, 1999). The differences in these orientations or preferences are often a result of how different cultures and social groups view themselves in relation to other objects and people, so an understanding of these perspectives is important for identifying social and cultural norms that fill the value-action gap and help predict behaviours (Hills, 2002; Kluckhohn and Strodtbeck, 1961). Therefore, to capture the full range of values, actions and mediating factors that may contribute to land use decisions, behaviours, and ultimately change, an approach derived from a shared values perspective that includes a range of values associated with whole landscapes and ecosystems is required.

Understanding the value-action gap is particularly important to designing effective behaviour change interventions (Addison and Pavey, 2017; Nordlund and Westin, 2010; Ramcilovic-Suominen et al., 2012; Sharaunga et al., 2013), as the mediating factors or capabilities are often the enabling or inhibiting factors linked to behaviour. However, finding ways to generate quantitative information on aspects such as social and cultural norms and then consolidating this with other quantitative land use change data remains a challenge for researchers and policy makers alike (Chowdhury, 2006; Huettner et al., 2009; Meyfroidt et al., 2013; Rindfuss et al., 2004).

This study therefore aims to build on the work described in Chapter 4, using the Behaviour-Capability-Drivers model as a conceptual framework through which to investigate the value-action gap. Initially, the same mixed methods approach as in Chapter 4 will be used, then expanded upon by qualifying and quantifying the role of capabilities in mediating between

the shared values of different cultural groups of land users in the Sarstún Motagua region of Guatemala and their self-reported forest cover change behaviours.

Methodology

The Sarstún Motagua Region

The Sarstún Motagua region of Guatemala is situated to the north east of Guatemala, spanning from the city of Guatemala to the Caribbean coast. This region has been categorised as having broadly similar environmental and ecological conditions. Two NGOs, Fundaeco and Fundación Defensores de la Naturaleza (FDN) manage various categories of protected land in this region, together with the National Council for Protected Areas, CONAP. The FDN manages the Sierra de Las Minas Biosphere Reserve (RBSM). Fundaeco manages areas in the department of Izabal, including multiple use zones, municipal parks, hydrological reserves, biotopes and special protected areas. The area to the north of the RBSM is outside of NGO management.

Land access, ownership and management arrangements vary across the region, as do the livelihood activities of the residents. There is also a mix of Ladino (non-indigenous) and Mayan ethnicities throughout the region. The diversity of the land users and the presence of different nature reserves provides an excellent case study to explore the different factors that can mediate between shared values and behaviour.

Methodological Overview

501 land user (including land owners, renters and those with land use rights) questionnaire responses were collected from the Sarstún Motagua region of Guatemala. The questionnaire asked for participants' agreement with belief statements regarding land use issues (generated from qualitative workshop outputs) on a five point Likert scale, with additional open questions and a demographic section (see Appendix A). Responses were gathered by face-to-face interview of land users in mid 2015 by staff from two NGOs (FDN and Fundaeco) and the Universidad del Valle de Guatemala.

The data was analysed by initially following the methodology set out in Chapter 4. The Behaviour-Capability-Drivers model (see Figure 12) provides the conceptual framework for this study. We first carried out exploratory factor analysis (EFA) using the responses to belief statements in SPSS v.22, to identify the common factors (or shared values) associated with land use. The belief statements within each factor provide insights into the situational capabilities associated with each value. Computation of factor scores for analyses of variance (ANOVAs) helps us explore differences in relationships to each value across land user characteristic groups (age, gender, sector, location, ethnicity, cooperative membership and number of children) to provide further insights into social capabilities, and focus group discussions to name the shared values and validate the capabilities.

The dataset used in this study builds on the 138 responses to the same questionnaire analysed in Chapter 4. The larger dataset was considered better for quantitatively exploring relationships between values and actions across land user groups. This study then expands on the methodology in Chapter 4 by analysing self reported forest cover change data collected in the questionnaires, and comparing this with the factor scores using univariate ANOVAs, to

quantitatively understand the relationship between values and behaviour. We then validate the results of the univariate ANOVAs with the focus group discussions (see Figure 12).

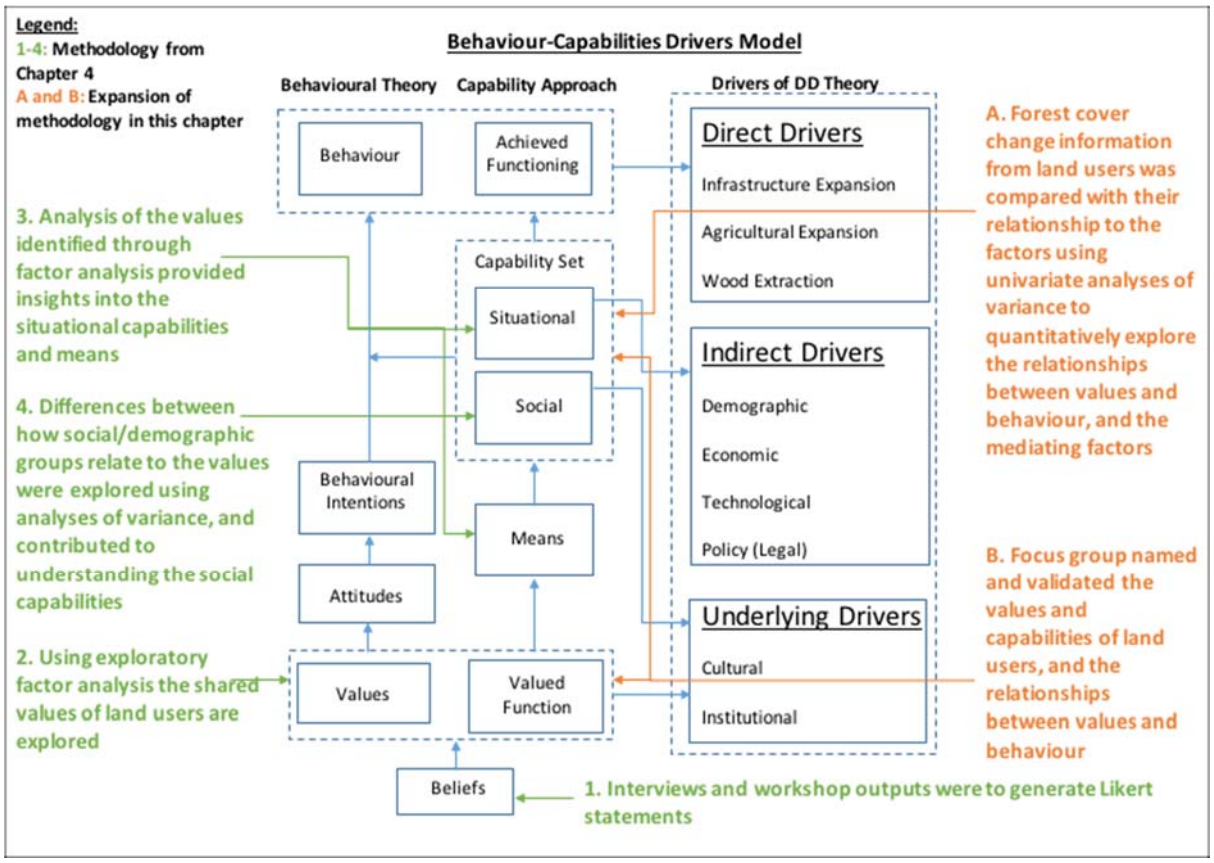

Figure 12: The Behaviour-Capability-Drivers model and methodologies from Chapter 4, and the expanded methodology presented in this chapter.

Forest Cover Change Data

Respondents were asked how much land they owned, how much forested land they had when they acquired their land and how much forested land they had currently. The percentage of their land owned that was forest currently and the percentage of their land that was forest originally was calculated, and the percentage forest change difference between the two was used in the analyses. This approach ensured that large differences in land owned were taken into account and did not affect the results.

A number of cases were excluded: 72 cases because they claimed a larger amount of forested land than the area of land they owned; 8 cases because their land owned was over 1000 ha and this skewed the dataset; and 19 cases because they did not provide sufficient data. Negative forest change values indicate forest loss, while positive changes indicate forest gain. A total of 402 participants responded to all the forest change questions in the questionnaire and used for the further statistical analyses.

Statistical Analysis

Factor scores were initially regressed against forest cover change to identify which of the shared values had a significant effect on forest cover change. The land user characteristic

groups (age, gender, sector, location, ethnicity, coop membership and number of children) were then used to identify some of the mediating contextual factors between values and behaviour. In this study, we conceptualise these contextual factors as capabilities (see Figure 1). These different land user characteristic groups were compared using multiple comparisons with Tukey post-hoc tests, to identify which land user characteristics influence forest cover change.

In order to identify potential significant interactions between the values and the capabilities that may influence forest cover change, the factors and the land user characteristic groups that were found to significantly correlate with forest cover change were entered into a univariate ANOVA and an iterative process of elimination was used to find the significant main effects and interactions. In order to explain the interactions, open answer responses to the question 'why have you maintained this amount of forest' were categorised and compared them with the factor scores and land user characteristic groups using an ANOVA.

Based on the results of the univariate ANOVA and interpretations of the interactions, two further factor analyses were carried out on datasets consisting of Maya and Ladino respondents respectively. These results were used in the focus groups to further explain and validate the interpretations of the full, combined dataset analyses.

Focus Group Discussions

The statistical results indicated a clear difference in how different ethnic groups acted in response to one of the factors from the exploratory factor analysis. To validate and better understand the statistical results, separate focus group discussions were carried out with Maya and Ladino participants. However, there are more than one ethnic group of Maya in the Sarstún Motagua region of Guatemala, so to explore potential similarities and differences between these ethnic sub-groups, focus groups were carried out with two different Maya focus groups (Q'eqchi and Pocomchi).

Three focus groups were carried out close to the RBSM, one Ladino (n = 31), one Q'eqchi Maya (n = 25) and one Pocomchi Maya (n = 27). The choice of location was due to practical reasons: access to communities through the FDN and the clear ethnic diversity across the RBSM (Chapter 4).

The Ladino RBSM focus group was carried out in Spanish. The two Maya focus groups in the RBSM were carried out entirely in the Q'eqchi and Pocomchi languages, with translation to Spanish carried out by FDN facilitators, who also recorded the outputs in written Spanish.

The structure of the focus groups was designed to validate the findings of the statistical analyses:

- Validation of the shared values
    - Participants were asked to separate into five small groups.
    - Each sub-group was given three versions of the same factor: one from the combined analysis, one from the Mayan sub-analysis and one from the Ladino sub-analysis.
    - The sub-groups were asked to choose which factor version they preferred and explain why in a whole group discussion.

- Understanding different perspectives on the shared values
    - Each group was given the list of statements for one of the factors from the EFA analysis (or the list was read out).
    - The sub-groups were asked to discuss the key ideas expressed in the statements, and suggest a name for the factor.
    - The different suggestions and perspectives across all the focus groups were deliberated with the entire focus group, then integrated to help the researchers come up with one final name for the factor.
- Validation of the interaction effect
    - Participants were asked to indicate how strongly they related to the significant factor from the statistical analysis.
    - Participants were asked to volunteer why they related to the factor in this way.
        - In the case of the Ladino group, this resulted in further entire group votes on how many people had de/reforested and why, and a whole group discussion on how many had taken part in incentive schemes and why.
        - For the Mayan group, a follow up one on one interview with a community leader provided deeper insights into some of the reasons why he reforested.

Results

Confirming the presence of shared values across land users in the Sarstún Motagua

Full Combined Dataset Analysis

The exploratory factor analysis (Appendix C) identified five factors from the full, combined dataset (Table 2). The factors were named using the focus group discussions.

Rotated Factor Matrix	Factor					Cronbach's Alpha if Item Deleted
Factor 1	**1**	**2**	**3**	**4**	**5**	**Alpha: .856**
Q35 People should be able to use land that is not theirs	0.856					0.805
Q32 Having a big family is important	0.698					0.828
Q24 It is more important to make money today than think about the future of the forest	0.68					0.837
Q34 Protected areas are not necessary for forest conservation	-0.66	0.341				0.833
Q11 I need to cut down the forest for sustenance	0.636					0.834
Q28 We need more employment opportunities although this causes more loss of forest	0.592					0.85
Factor 2						**Alpha: .516**
Q27 We should know who is the owner and who can use the land		0.534				0.379
Q31 People who live in the forest make little money		0.495				0.393
Q8 I should avoid cutting down forest but I don't know why		0.483				0.472
Factor 3						**Alpha: .467**
Q1 It is important to manage forest resources sustainably regardless of time or cost			0.499			0.383
Q2 If I owned land I would care for it more			0.455			0.366
Q30 I am against cutting down the forest			0.407			0.455
Q21 There are no places nearby where we can make complaints about bad land use practices			0.374			0.389
Factor 4						**Alpha: .618**
Q33 I want to do something good for the forest				0.733		N/A
Q36 I need more capacity to engage in good agricultural practices				0.471	0.347	N/A
Factor 5						**Alpha: .518**
Q15 There should be more rules about how people can use the forest					0.61	N/A
Q29 The state makes laws that are important for the environment					0.435	N/A

Table 2: Five factor solution for the full, combined dataset with factor loadings and Cronbach's alpha if deleted.

Ethnicity Sub-Analyses

The separate Ladino and Mayan exploratory factor analyses produced differing factor structures (Appendices C.1 and C.2). Particularly interesting were the Mayan factor 1 and the Ladino factor 2 (Table 3), which together contained all the statements in the combined analysis factor 1. These three factors were chosen for comparison in the focus groups.

Mayan Factor 1
Q35 People should be able to use land that is not theirs
Q32 Having a big family is important
Q24 Making money today is more important than thinking about the future of the forest
Q11 I need to cut down the forest for sustenance
Ladino Factor 2
Q11 I need to cut down the forest for sustenance
Q38 If there were more opportunities to sell my products I would need to cut down more forest
Q30 I am **not** against cutting down the forest
Q28 We need more employment opportunities although this causes more loss of forest

Table 3: Maya factor 1 and Ladino factor 2 from ethnicity sub-analyses

Focus Group Validation of Shared Values

When asked to choose which factor they associated with/related to most: the combined factor 1, the Mayan factor 1 or the Ladino factor 2; the majority of the Q'eqchi Maya chose the Maya factor 1. All three sub-groups mentioned how having a big family (Q32) negatively impacts the forest. Taking into account that the average number of children per family is 8, their response suggests that they are choosing this factor due to its relevance to their lives: they see first hand how large families negatively affect the environment. All five Pocomchi Maya sub-groups unanimously chose the combined factor 1.

The majority of Ladinos chose the combined factor 1, each stating as their reason their perceived importance of protected areas, as they considered these to improve the environment. According to one of the FDN facilitators, to this group 'protected areas' meant forest plantations, not necessarily reserves such as the RBSM. Around half of the Ladinos in the focus group owned land that they had reforested, but not as part of an incentive scheme, again suggesting that they are identifying with the idea of protected areas due to its relevance to their lives. The other Ladinos chose the Ladino factor 1. Similarly, they discussed how the statements in the factor made them think about all the ways in which they need to avoid deforestation in their communities (e.g. Q28).

None of the Ladinos identified with the Mayan factor 1, and only a few Mayans identified with the Ladino factor 1, confirming that there is a significant difference in the separate values across the two groups. However, several Mayan and Ladino sub-groups chose the combined factor 1, supporting the idea that the combined analysis is likely to represent some form of shared value structure.

Focus Group Naming and Discussion of the Combined Factors

Factor 1:

Factor 1
Q35 People should be able to use land that is not theirs
Q32 Having a big family is important
Q24 It is more important to make money today than think about the future of the forest
Q34 Protected areas are not necessary for forest conservation
Q11 I need to cut down the forest for sustenance
Q28 We need more employment opportunities although this causes more loss of forest

Table 4: Combined factor 1

The Q'eqchi Maya interpreted this factor as 'respect our land and love our forest'. They explained that with no forest there is no life. The Pocomchi Maya focus group's interpretation was 'respect protected areas and private property and find projects to feed families'.

The Ladino group interpreted this factor as 'management and sustainable use of natural and economic resources with wellbeing and social responsibility'. They disagreed with Qs 35, 32 and 24. They also mentioned how they needed to balance necessity with the need to care for the environment, and that improving wellbeing and encouraging social responsibility could be approaches to incentivising people to care for the environment.

We named this factor **'valuing sustainable futures'**. For Ladinos this future is linked to the use of natural and economic resources for the future of the community. The Pocomchi varied slightly on this perspective, as instead of conserving resources for the community, they considered it important to involve the community, and especially children, in conservation practices for the future of the forest and its biodiversity. Q'eqchi Mayans felt it was more about a symbiotic relationship with people and the forest, where the life of each one sustains the other.

Factor 2:

Factor 2
Q27 We should know who is the owner and who can use the land
Q31 People who live in the forest make little money
Q8 I should avoid cutting down forest but I don't know why

Table 5: Combined factor 2

The Q'eqchi interpreted this factor as 'to be conscious of the care of natural resources through the good use of soil' and explained that they believe organic practices are the best. The Pocomchi interpreted this factor as 'God is the owner of the environment and we as humans have the right to use this land. Although we are conscious we will not gain much money, we will gain the conservation of the environment (including flora, fauna and water)'.

The Ladino group interpreted this as 'the importance of natural resources'. They believed they should know who landowners are in order to regulate activities and engage in sustainable management practices to avoid deforestation and obtain better incomes. They also discussed how they needed more resources to help conserve the forests and that people don't understand the importance of the law.

We named this factor **'valuing good governance'**. Both Maya groups focused on aspects of 'stewardship': in the case of the Q'eqchi they considered themselves to be the ones who provide the care, the Pocomchi considered God to be the governor; while the Ladinos considered the law (or municipality) to be responsible for governance. The three perspectives all indicate the importance of governance of good practices, but from different cultural perspectives.

Factor 3:

Factor 3
Q1 It is important to manage forest resources sustainably regardless of time or cost
Q2 If I owned land I would care for it more
Q30 I am against cutting down the forest
Q21 There are no places nearby where we can make complaints about bad land use practices

Table 6: Combined factor 3

The Q'eqchi identified this factor as 'to know love and care for the forest is to know love for life'. They considered that if people don't care for the forest, they don't care for themselves or the future of their children. The Pocomchi discussed this factor as 'promoting the conservation of natural resources of the forest and our land and train land owners in biodiversity conservation, including committees to report bad land use practices'.

The Ladinos interpreted this factor as 'regulation of, and strengthening of institutions and environmental education for conservation of natural resources'. They believed that when people have no environmental conscience they use the land badly, and environmental education could help cultivate an environmental conscience. They also mentioned that they would like offices in each department where they can report bad land uses, as currently it is a complex process to do so.

We named this factor **'valuing environmental conscience'**. Q'eqchi Mayans considered this factor to reflect an intrinsic, symbiotic relationship with the environment and people, highlighting that if people don't care for the forest, they don't care for themselves. The Pocomchi and Ladinos focused on the idea of generating more capacity for good practices such as education and training in conservation and good reporting systems for land abuses. The Ladinos also considered environmental conscience to come from education, not necessarily being intrinsic.

Factor 4:

Factor 4
Q33 I want to do something good for the forest
Q36 I need more capacity to engage in good agricultural practices

Table 7: Combined factor 4

The Q'eqchi interpreted this factor as 'I engage in caring for the forest but also I need more capacity to have a sustainable livelihood'. They said that people needed more environmental education to be able to develop and reforest, that knowledge about the environment equals care for the environment. The Pocomchi interpreted this factor as 'to be prepared for conservation and [good] agricultural practices'. They called for training of children and young people on how to care for the forest by communities and through organisations such as the FDN. The Ladinos interpreted this as 'formation and training through community extension

work in good forest (and agricultural) management practices and alternative production.' They discussed how people need to know more about the environment, but they often don't have enough information to engage in good practices. We named this factor **'valuing environmental conservation'**.

Factor 5:

Factor 5
Q15 There should be more rules about how people can use the forest
Q29 The state makes laws that are important for the environment

Table 8: Combined factor 5

The Q'eqchi interpreted this factor as 'We respect our laws as we love our forests'. They explained that for development to occur in communities they need laws. The Pocomchi interpreted this factor as 'training Pocomchi communities about environmental laws and soil conservation'. The Ladino group interpreted this factor as 'regulation of sustainable farming'. As all of the groups mentioned some sort of respect for the law (whether formal or informal), we named this factor **'valuing the rule of law'**.

Factors and Land User Characteristic Groups that Correlate with Forest Cover Change

All land user characteristics bar number of children varied significantly with at least one of the factors (see Appendix C.3). Sector varied significantly with factors 1 ($p = <.000$), 2 ($p = .04$) and 3 ($p = .005$). Gender varied significantly with factors 1 ($p = <.000$) and 5 ($p = .006$). Age varied significantly with factors 1 ($p = .039$; $R^2 = .011$) and 2 ($p = .004$; $R^2 = .021$). Coop membership varied significantly with factors 1 ($p = <.000$), 3 ($p = <.000$) and 5 ($p = .001$). Location varied significantly with all factors (for factors 1, 2, 3 and 5 $p = <.000$; for factor 5 $p = .001$). Ethnicity varied significantly with factors 1 ($p = <.000$) and 2 ($p = .004$).

Factors 1 ($p = <.000$; $R^2 = .034$) and 5 ($p = .005$; $R^2 = .02$), and ethnicity ($p = .036$), location ($p = <.000$) and number of children ($p = .021$; $R^2 = .015$) were found to significantly correlate with forest cover change (see Appendix C.4).

Factors 1, 5 and ethnicity and location were taken forward for exploring interactions, as they all varied significantly with each other and forest change.

Validating the use of land user characteristic groups to identify capabilities

In the focus group discussion, the Q'eqchi unanimously agreed with the combined factor 1. They were then asked who else, if anyone, would agree or disagree with the combined factor 1. They considered that businesses, those who cultivated oil palm, rubber, made hydroelectric projects or generally lived in the lowlands would disagree with the value. They felt that 'the people', institutions such as the FDN and other cooperatives, aid organisations or the municipality (and 'the law') would agree with this factor. We ran out of time in the Pocomchi session so were unable to carry out this exercise.

The Ladino focus group also unanimously agreed with this factor and when asked who, if anyone, would disagree with this factor their responses were: woodcutters, invaders (and organised invaders), hunters, communities who lack alternative opportunities and income

sources, ranchers, oil palm plantations and mining. According to the statistical analyses, Ladinos tend to disagree more with the combined factor 1 than Mayans (see Figure 2). Similarly, in the Ladino interpretation of the factor 1, the Ladinos clearly discussed how they disagreed (sometimes strongly) with most statements in the factor. Therefore, it appears that although the Ladinos disagree with the belief statements in the factor, their interpretation of the factor ('management and sustainable use of natural resources with wellbeing and social responsibility', a clearly 'positive' idea) reflects the value they wish to achieve. This would then suggest that the belief statements do indeed represent capabilities that enable or inhibit achievement of their values. Furthermore, the agreement with these statements (or capabilities) reflects the extent to which these issues are relevant to participants' lives: the Ladino focus group did not consider most of the statements in the combined factor 1 to be relevant to their lives, while the Mayans did.

Identifying the Mediating Factors Between Values and DD Behaviours

Ethnicity alone was found to have an effect on forest cover change ($p = .01$; $R^2 = .017$). Overall, Ladinos tended to report more negative forest cover change than Mayans. A significant interaction was also found between ethnicity and the combined factor 1 that affected forest cover change (mean forest cover loss Ladino = -17.46%, SE = 6.687; vs Mayan = -2.71%, SE = 2.291; $p = <.000$; $R^2 = .048$) (Figure 13, Appendix C.5).

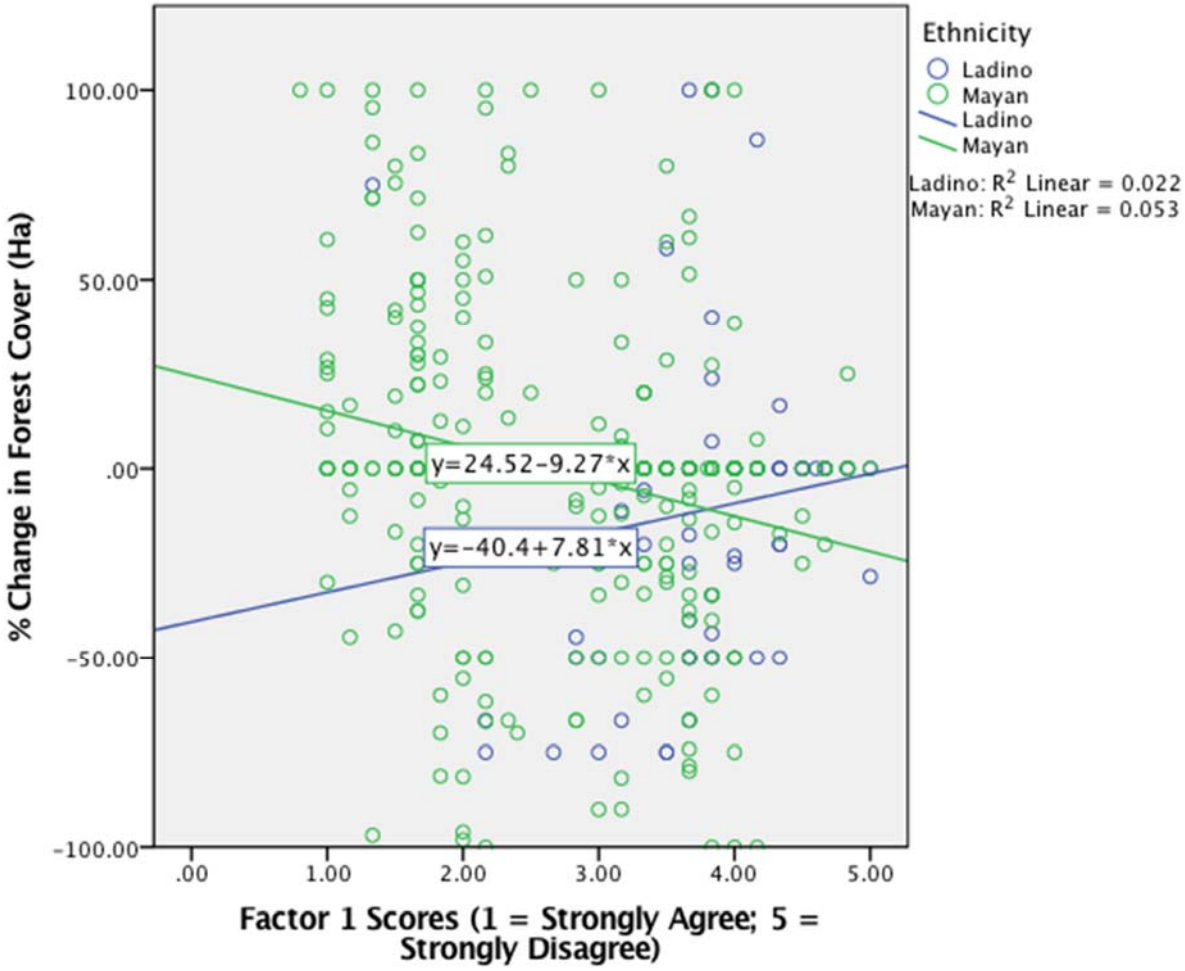

Figure 13: Regression graph showing the Ladino and Mayan combined factor 1 scores against % change in forest cover (Ha), with the interaction effect.

Understanding the interaction between ethnicity, shared values and forest cover change

We found that the reasons provided for keeping forest for Ladinos tended to either be related to conservation of/for the environment (n = 24) or necessity (n = 31). For Mayans, the answers were either about conservation of/for the environment (n = 169) or access to incentive schemes (n = 20).

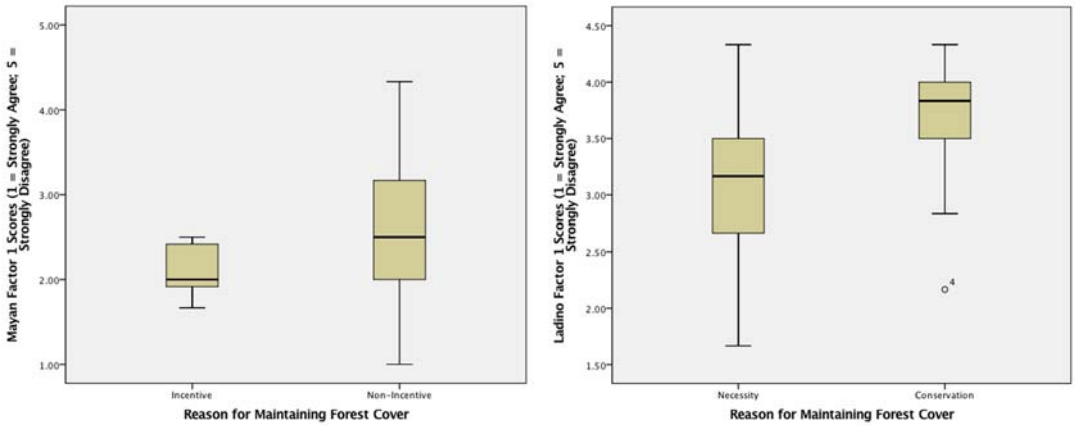

Figure 14: Mayan and Ladino categorised reasons for keeping forest against combined factor 1 scores, respectively.

When comparing responses for all Mayans, there was no significant difference in factor score between those who said conservation versus those who said incentive schemes. However, when the Mayans who also spoke Spanish alongside their indigenous Maya language were removed (n = 62 total, of whom 20 responded to the 'maintaining forest cover' open question), there was a significant difference (p = .004) (Figure 14, Appendix C.6). Mayans tended to agree with the combined factor 1 when they accessed incentive schemes. Figure 2 shows that Mayans who agreed with the combined factor 1 tended towards increased forest cover, the opposite of the Ladinos, suggesting that when they experience necessity they use forest plantations to generate income for survival, instead of deforesting.

There was a significant difference in factor scores between Ladinos who cited necessity, versus conservation (p = <.000) (Figure 14, Appendix C.6). Ladinos tended to agree with the combined factor 1 when they experienced necessity. In Figure 15, Ladinos that agree with combined factor 1 tend towards forest cover loss, suggesting that Ladinos that experience necessity engage in DD activities. Conversely, Ladinos that do not experience necessity may not rely on the forest for survival, and engage in activities that increase forest cover.

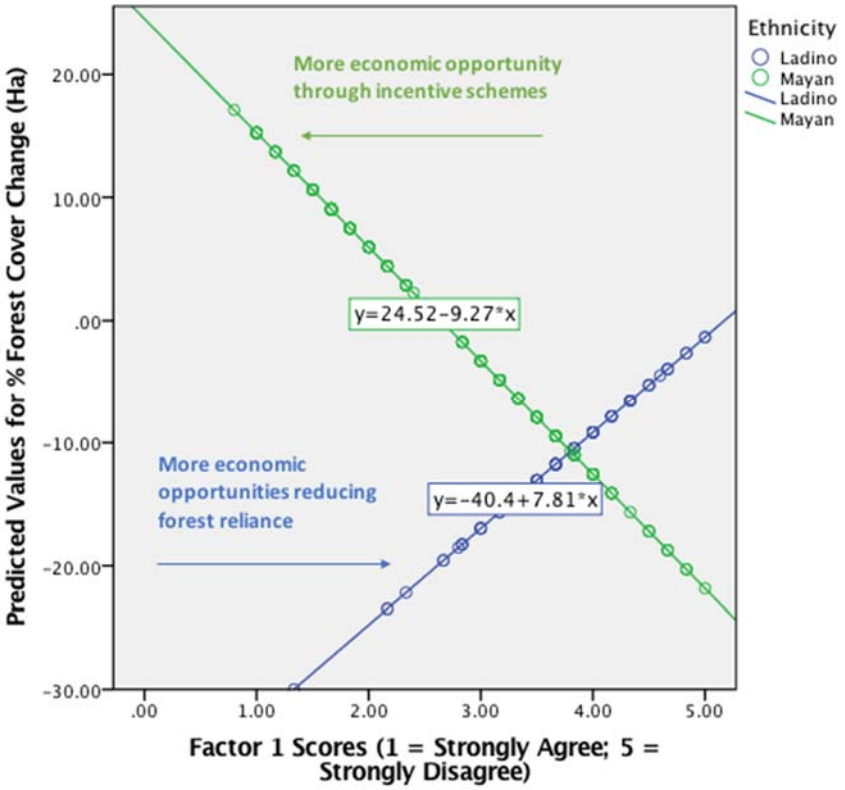

Figure 15: Predicted % change in forest cover (Ha) against combined factor 1 scores, by ethnicity.

Validating the reasons for divergent actions by Ladinos and Maya

In a one-on-one interview with a community leader from the Q'eqchi Maya group, he explained how he had used a government forestry incentive scheme available to private landowners in order to afford to feed his children and find a way to support them growing up,. His children are now in various different professions: teachers, police officers. However, he would prefer that they did not have to leave the community to find work, but it is too hard to survive solely from the farm. His story lends support to our interpretation that access to incentive schemes provides Mayans with an opportunity to make money to survive, while maintaining their preferred lifestyle closely associated with the land and forest.

When Ladino respondents were asked how many had ever engaged in reforestation activities on their own land, 16 out of the 31 said they had, but only four said they had ever accessed any type of financial incentive scheme for reforestation activities. When asked why some of them had chosen to reforest even though they were not receiving financial payments, they responded that they do it purely for the environmental benefits related to conservation of water sources, animals and plants. They also said that they did not trust the government enough to engage in incentive schemes, partly because they considered the government to lack the capacity to run the incentive programmes, and partly because they were afraid to lose their land once the incentive scheme was over (they would be required to continue to pay rent on the forested land which they may not be able to afford without incentive payments). They were then asked how many of them had ever deforested and 15 participants said yes, many of whom also said they had reforested. When asked how many had ever had to deforest due to necessity, only 5 people said yes, one of whom also said they accessed incentive schemes. The Ladino discussion also supports our interpretation that the more

affluent (none of whom have had to deforest out of necessity, such as the participants in the focus group) tend to disagree with most of the statements in the factor, and reforest purely because they care and want to see environmental benefits.

Discussion

Shared values and value orientations

This study provides evidence for shared values being present across land users in the Sarstún Motagua region of Guatemala. Other studies have similarly found that diverse stakeholders may have similar values, but are separated by their orientations within that value (e.g. Eriksson et al., 2015; Vaske and Donnelly, 1999). The different perspectives associated with our shared values suggest the presence of common themes, but different orientations within these themes that is separated by culture. For instance, Q'eqchi Mayans interpreted the combined factor 1 (Valuing Sustainable Futures) as having a more intrinsic relationship to them ('forest as life') while Ladinos considered that the forests and resources should be used or 'forest as opportunity', and the Pocomchi were somewhere in the middle.

Several studies have found that biocentric value orientations (but not anthropocentric orientations) predicted positive attitudes and behavioural intentions towards wildland preservation (e.g. Fulton et al., 1996; Milfont and Duckitt, 2004; Milfont and Gouveia, 2006). In this study, people with both the forest as life (biocentric) and forest as opportunity (anthropocentric) engaged in practices that increased forest cover. In the case of the Q'eqchi, when they experienced necessity, their preference was to find ways to meet their basic needs while maintaining forest cover (e.g. accessing incentive schemes). If they could not access incentive schemes (a negative capability), then it is likely they would be forced to deforest. Conversely, when Ladinos could not meet their more anthropocentric view of a sustainable future value (e.g. with no access to off-farm income opportunities, a negative capability) they used the forest to generate income first, only once they had met their basic needs would they consider conservation practices.

The forest as life versus forest as opportunity orientations appear to explain behavioural intentions for the different cultural groups, and as such present another element that fills the value-action gap (see Figure 1). However, these results show that an understanding of the capabilities available to different groups is important to fully explain real land use behaviours, and as such, the value-action gap.

In socio-psychological theories, value orientations are considered to more tangibly link to attitudes and behavioural intentions, are an expression of basic values (our shared values) and can provide consistency and organisation among the broad spectrum of beliefs, values, attitudes etc. (Fulton et al., 1996; Li et al., 2010; Manfredo et al., 2003; Vaske and Donnelly, 1999). Therefore, these results align with broader theory where value orientations would sit between shared values and behavioural intentions.

Cultural shifts in value orientations

There has been some work exploring the value differences between ethnic and cultural groups, including between the Maya and Ladinos of Guatemala. Le Guen et al. (2013) note the significant value differences between Itza Maya and Ladinos, but observed shifts in Mayan

value systems towards Ladino. In their conclusions, Le Guen et al. paint a picture of a dying culture of Itza Maya, who may be 'subsidising their own cultural extinction' by shifting their values towards the more 'depersonalised' Ladino value orientations.

Mariscal (2014) notes that the Pocomchi and Q'eqchi of Guatemala are very alike in their culture and identify. Therefore, it may be that the Pocomchi in the focus group discussions represent a Mayan group undergoing a value shift towards Ladino value orientations due to their higher interaction with Ladinos and greater proximity to urbanisation. The shifting of values to embrace both conservation and livelihoods values was observed in communities neighbouring La Amistad National Park in Costa Rica by Schelhas and Pfeffer (2005). Therefore, it could be that the Pocomchi have found a working balance between the two value orientations found in this study that allows them to maintain important aspects of their culture while engaging with outside forces.

Capabilities and behaviour

Gender and age

These results indicate that women tended to feel that valuing sustainable futures is more relevant to them than their male counterparts. Women tend to think more about environmental issues than men (Kollmuss and Agyeman, 2002; Pickett-Baker and Ozaki, 2008), and therefore may be more aware of the issues that their children may face (e.g. lack of alternative economic opportunities, lack of secure land tenure). Similarly, these results showed that younger people also tended to feel that sustainable futures was relevant to them, which agrees with results from reviews of determinants of environmental concern and behaviour, where young people were likely to be more concern about the environment (Gifford and Nilsson, 2014; Liere and Dunlap, 1980).

Socio-economic capabilities

Those with higher socio-economic status (using coop membership) found that valuing sustainable futures was more relevant to them. Although at first this seems counter intuitive (as greater relevance of a factor indicates greater relevance of the negative capabilities), the majority of respondents that were members of cooperatives tended to be Mayan (81%), therefore the results of coop membership may be highly skewed by the cultural makeup of the respondents. As the results in Figure 2 indicate, Mayans also tend to find factor 1 more relevant to them. However, the greater relevance of these values (and as such, negative capabilities) to the members of cooperatives does question the role and efficacy of the cooperatives within the area: are the cooperatives effectively addressing the relevant negative capabilities?

Cooperatives have been shown to provide significant positive benefits to participants, particularly in ensuring receipt of higher commodity prices, land access and education (Kolade and Harpham, 2014; Wollni and Zeller, 2007). Yet, Bacon et al. (2008) found that although households connected to Fair Trade cooperatives experienced benefits in education, money saving and infrastructure, food insecurity and low income persisted among members. The inefficiencies of cooperative agriculture compared to private farms has also been noted by Ahn et al. (2012), and is often blamed on bad monitoring or poor incentives. Furthermore, Haight (2007), in exploring whether Fair Trade helps poor in Costa Rica and Guatemala, found

that membership does not provide a long term solution to poverty, suggesting instead that it is the deficient institutional structures of these countries that need to be addressed. Reflecting more localised institutional issues, in a study of coffee cooperatives in Guatemala, Madjidi (2011) found that producers did not know who actually received the price incentives advertised by the cooperatives, and felt that the standards for certification programmes did not reflect cultural differences. The recognition that institutional and cultural issues are important determinants of cooperative efficacy lends support to the conclusions from this chapter, which suggest that addressing negative social capabilities are essential to tackling DD.

Both the rich (commercial/cattle) and poor (subsistence) found that factor 1: valuing sustainable futures was relevant to them, while those with middle incomes (forestry and coffee/cardamom) found it irrelevant. This may be due to the fact that commercial/cattle farmers need substantial areas of land, and therefore restrictive land/forest use regulations could be an issue for them to achieve their goal of a sustainable economic future. However, this is uncertain, as there is evidence to suggest that cattle ranchers have grabbed vast tracts of land in Guatemala (Zander and Durr, 2011), and Clark (Clark, 2000) notes that the ranches themselves may lack full legal status in his case study analysis of land tenure deligitimation in Petén, Guatemala.

For the subsistence farmer respondents, it could be that the negative situational capabilities of lack of secure land tenure, restrictive land use regulations and few alternative economic opportunities mean it is hard for them to find a way to achieve a sustainable future. This would also agree with the results of Clark (2000) and Gould et al. (2006), where a lack of operative legal institutions surrounding land ownership and use leads to Guatemalan subsistence farmers often creating a presence through land 'invasions' and engaging in cultural practices. Therefore, once again, it is clear that although very different groups might share a value, they may have very different value orientations leading to different behavioural intentions, and as such have different capabilities that are relevant to them. Similarly, institutions and differences between cultures are coming across as important aspects associated with land use, and can be seen to underlie issues such as access to land tenure, education or income.

Location capabilities

Lopez-Carr (2004) carried out a study on land use across different cultures in the Petén region of Guatemala, and found that land use practices between Q'eqchi Maya and Ladinos can be similar. In fact, Lopez-Carr suggested that location, not ethnicity, was the driving factor for differences in land use practice. His identification of locational aspects (e.g. lack of market access and rural underdevelopment) fit well with the identification of negative situational capabilities in this study, but he claims that the same intervention approaches (e.g. limiting access to forest land and promoting alternative livelihoods) can be used across both cultures to effectively reduce forest cover change.

These results clearly indicate that the Maya and Ladino groups had different capabilities available to them. The contrast of the Lopez-Carr (2004) results with ours may be due to the immigrant nature of the Q'eqchi in the Petén region, while Alta Verapaz (in the Sarstún Motagua region) is their homeland. As Lopez-Carr notes, the bond between human and

environment appears to be 'sundered' when Q'eqchi move to another region. His results may account for the significant relationships observed between the combined factor 1, forest cover change and location in this study, indicating 'place' can potentially be important, but in this case study ethnicity was of greater importance.

Capabilities in policy and intervention design

The shared value of sustainable futures varies significantly with every demographic group and forest cover change. This suggests that this is an incredibly important shared value, which operates in multiple different ways across stakeholder characteristic groups. Knowing the different value orientations, behavioural intentions and capabilities available to different social and cultural groups is important for effectively targeting intervention design. If DD interventions are designed without taking into account stakeholder group perspectives such as culture, this could exacerbate current land use problems and cultural divides by playing off of existing cultural misunderstandings which are already particularly prevalent in Guatemalan societal history (Hale, 2002). This may then have further negative knock on effects for the environment, creating a further negative social capability (Figure 16).

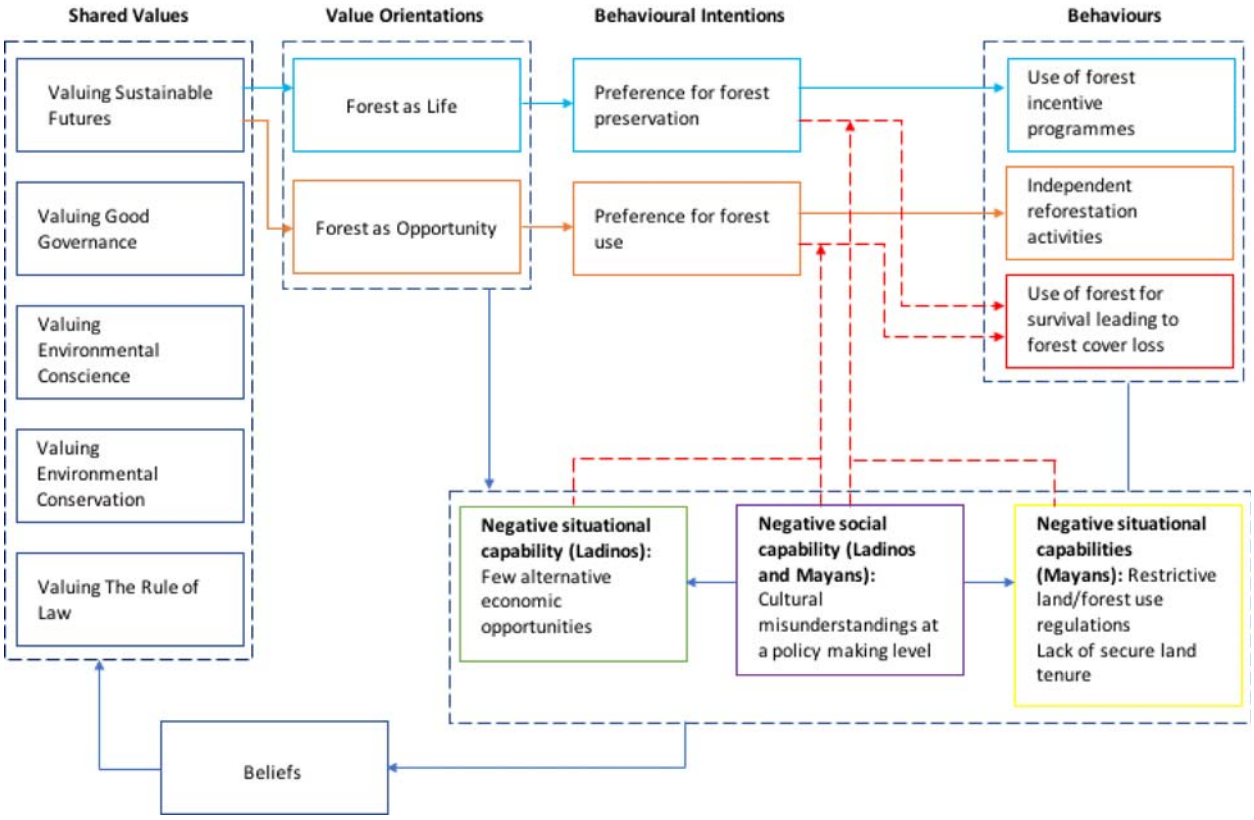

Figure 16: The completed BCD model for Mayan and Ladino land users in the Sarstún Motagua region, showing causal relationships and feedback between shared values, value orientations, behavioural intentions, capabilities and behaviour.

Bayrak and Marafa (2016) noted that interventions which focus on assigning market value to environmental services risk disregarding the complexity of these systems, causing environmental degradation, as well as cultural and social deterioration of indigenous groups who often have more holistic values. The evidence we present here however, suggests that the indigenous Maya group in fact err towards monetary based forest incentive programmes,

emphasising the importance of understanding cultures clearly and strengthening the negative social capability we identified of cultural misunderstandings at a policy making level.

Finally, these cultural implications may also impact policy design when considering cultural relationships to place and the potential impacts this may have on value orientations and capabilities.

Conclusions

These results indicate that land users in the Sarstún Motagua area do have a set of shared values. A number of different capabilities associated with the achievement (or not) of a broad range of actions related to forest cover change were also identified. However, a significant difference in the way in which the two predominantly different cultures (Ladino and Maya) relate to these shared values exists, and how these relationships influence their behaviour. Understanding the nature of these relationships, their causes and behavioural effects, is key to understanding the value-action gap. The results of this study therefore support the theory behind the Behaviour-Capability-Drivers model, where social and situational capabilities mediate between shared values and behaviour. Additionally, value orientations appear to be an important element that appear to determine behavioural intentions, and that an understanding of both value orientations and capabilities is necessary to fill the value-action gap.

Other studies on pro-environmental values and behaviours tended to focus on particular actions, values or mediating factors. Although they provide useful and applicable results, they may be expensive and time consuming for decision makers to carry out or review individually for the range of possible actions and factors that may contribute to land use change. The approach demonstrated in this study could therefore be an extremely useful tool for decision makers working at a landscape/whole ecosystem level to identify factors that may enabling or inhibiting pro-environmental behaviours.

Finding means of quantitatively demonstrating the ways in which different groups of people feel about their shared values, and act in response to them is often difficult. The implications for environmental policy making is that either hyper-localised approaches or a 'one size fits all' approach to policies are often the only options. The shared value approach used here identified a wide range of values and subsequent capabilities that were not limited to a specific type of action/behaviour, but could be explored in depth to elicit capabilities relevant to specific cultural groups.

CHAPTER 6: EXPLORING DRIVERS OF DEFORESTATION AND BARRIERS TO TRANSFORMATIONAL CHANGE USING THE BEHAVIOUR-CAPABILITY-DRIVERS MODEL IN A REDD+ CASE STUDY IN GUATEMALA

Chapter Summary

The UN-REDD+ (Reduction of Emissions from Deforestation and Forest Degradation) mechanism is a tool for countries to contribute to climate change mitigation while contributing to sustainable forest management. In the REDD+ literature, 'transformational change' (TC) refers to '…a specific shift in discourse, power relations, and deliberate actions away from business as usual and toward policy reforms that, in the case of REDD+, tackle the drivers of deforestation and forest degradation' (Di Gregorio et al., 2013, p. 63). Understanding why deforestation and forest degradation (DD) occurs and the conditions that enable or inhibit TC is essential for ensuring sustainable outcomes from tools such as REDD+. However, in practice many drivers of DD and barriers to TC may overlap, but causal relationships between the two are not necessarily considered in literature or practice.

Here I applied the Behaviour-Capability-Drivers (BCD) model and a complementary approach using a statistical data reduction technique and validation of the resulting interpretations with decision maker interviews, to a REDD+ case study in Guatemala and used it to explore both drivers of DD and barriers to TC. The results indicate that drivers of DD and barriers to TC are linked, suggesting that it is necessary for decision makers to jointly take both traditional drivers of DD and 'internal' barriers to TC into account when designing policies and interventions. The BCD model and approach also proved a useful tool for identifying and structuring these issues (which include lack of challenges to embedded power structures, weak corporate regulation and cultural inequalities). However, from a brief review of REDD+ and other interventions in Guatemala and abroad, it seems that the negative social capabilities that act as barriers to TC are not unique, and that these will need to be addressed before countries are likely to use a tool such as the BCD model and approach to critique and improve their design of policy and other interventions for tackling drivers of DD.

Introduction

The UN-REDD+ (Reduction of Emissions from Deforestation and Forest Degradation) mechanism is a tool for countries to contribute to climate change mitigation while contributing to sustainable forest management (Pistorius, 2012). The mechanism includes four principal components: the monitoring, reporting and verification (MRV) component, the benefits distribution and safeguards components, and the REDD+ strategy (Maniatis, 2016).

An understanding of the drivers of deforestation and forest degradation continue to be acknowledged as crucial for the successful design of interventions (Bull et al., 2015; Duinker, 2008; Hosonuma et al., 2012; Méthot et al., 2015; Morales-Barquero et al., 2015; Robiglio et al., 2014; Weatherley-Singh and Gupta, 2015). As such, a compulsory aspect for states to address in REDD+ readiness proposals and strategies is an assessment of drivers of deforestation (Para 1 of decision 4/CP.15; Para 72 of decision 1/CP.16 and the Warsaw Framework decision on drivers 15/CP.19). The REDD+ strategy therefore includes an assessment of the baseline carbon emissions for the country, an assessment of the drivers of deforestation (and, if countries choose, forest degradation), and details of the implementation approaches countries will take to reduce emissions in their project areas.

Many drivers of DD have been identified as falling outside of the forestry sector and include social, cultural and institutional drivers (Culas, 2006; Hosonuma et al., 2012; Kissinger et al., 2012; Leach et al., 1999; May et al., 2011; Salvini et al., 2014; Seemann, 2016). In the previous two chapters, I identified several drivers of DD that related to governance, institutions/social norms and culture for Guatemala's land users. Among these drivers were: lack of political will and support for education and care of natural resources, cultural misunderstandings at a policy making level, weak national and international challenges to widespread corruption, weak local institutions regulating natural resource use and weak communication and engagement between the state and communities. For land users in the Sarstún Motagua region of Guatemala, a combination of these drivers led to DD, but none of those mentioned above are unique only to the land users. Each of these drivers relates to issues at a national and international level, as well as local.

The REDD+ safeguards component is designed to address the various cultural, governance and institutional problems that may occur alongside the implementation of REDD+, undermining the effectiveness of REDD+ in reducing DD, and disadvantaging people who rely on the forest for their livelihoods (Denier et al., 2014). The safeguards include, among others, ensuring transparent and effective forest governance structures, the respect of indigenous people and communities and the full and effective participation of relevant stakeholders (Peskett and Todd, 2013). Other interventions often identify similar issues related to their success. For instance, in Diaz and Koning (2015), differences in local cultures and bureaucratic regulations across locations for a forestry incentive programme in Guatemala were found to affect whether the community members were likely to take part in the incentive programme. In a review of community forestry projects worldwide, Pagdee et al. (2006) also found that in order for these projects to be successful, effective enforcement of rules and regulations, sanctioning, strong leadership and common interests among community members and local authorities needed to be in place. Similarly, in a study of the role of institutions in developing REDD+ safeguards in Mexico, McDermott and Ituarte-Lima (2016) found that 'institutional fit' - the extent to which REDD+ policies and interventions 'fit' with current institutional

structures - is an important determinant of how these policies and interventions are developed: the decisions were constrained by the rules and priorities of existing institutions in the country. A brief comparison of the drivers of DD identified in the previous chapters (e.g. cultural misunderstandings at a policy level, weak national and international challenges to widespread corruption) compared with the REDD+ safeguards and intervention conditions for success, suggests that many overlap.

Understanding the potential risks associated with the development and implementation of the REDD+ programme has been an increasing focus in the academic literature in recent years (e.g. Atela et al., 2015; Larson and Petkova, 2011; Loft et al., 2017; Mustalahti et al., 2017; Ribot and Larson, 2012; Sheng et al., 2017, 2016; Twongyirwe et al., 2015). 'Transformational change' refers to '…a specific shift in discourse, power relations, and deliberate actions away from business as usual and toward policy reforms that, in the case of REDD+, tackle the drivers of deforestation and forest degradation' (Di Gregorio et al., 2013, p. 63). Understanding the conditions that enable or inhibit transformational change is essential for ensuring sustainable outcomes from tools such as REDD+. Although the barriers to transformational change describe processes that act mainly within the decision making arena, the concept is very similar to the safeguards component of REDD+ strategies, and the barriers themselves are highly comparable with both the safeguards components and drivers of DD I identified from land users. Understanding barriers to TC and safeguard components as potential drivers of DD (i.e. not only as aspects which need to be considered to ensure the successful design of an intervention or no additional negative effects of REDD+), could mean that more effective interventions could be designed in the first place, and important causal relationships between the issues are not overlooked.

There is no official framework from the UNFCCC associated with identifying REDD+ safeguards issues, meaning that not only do countries have to come up with their own approach to identifying drivers of DD, they also have to generate their own framework for assessing the safeguards required (Korwin et al., 2016), which in itself may present a barrier to TC. In the academic literature, frameworks do exist to 'unpack' safeguards (Arhin, 2014) and structure barriers to transformational change such as the Discourse Analysis Framework (Bäckstrand and Lövbrand, 2006) and the 4Is Framework (Brockhaus and Angelsen, 2012), among others (e.g. Brockhaus et al., 2014; Larmour, 2011), but use of overlapping terminology and lack of a clear approach to applying the frameworks, as well as their abstraction from the concept of drivers of DD, are limitations to their successful application in practice.

The Behaviour-Capability-Drivers (BCD) model combined socio-psychological theory with the Capability Approach in a conceptual framework to understand and categorise drivers of deforestation and forest degradation (DD) and has been successfully applied to identify multiple cultural and institutional drivers that may act on a range of levels (e.g. from local to political to international). Therefore, I decided to test whether the BCD model can be used to identify both drivers of DD and barriers to transformational change, using Guatemala's REDD+ programme as a case study.

Overview

This chapter is split into three parts. This overview section introduces the overall problem and aim, the case study context and an overview of the methodological approach for the next two parts. Each part will have a short summary, and each phase of the methodology will be described in detail in the relevant part. Parts 6.1 and 6.2 then go on to present the results and conclusions with reference to the development of a proof of concept, validation of the initial results and usefulness of the model and approach in practice. At the end of Parts 6.1 and 6.2 there will be a brief discussion.

Methodological Approach for Parts 1 and 2

Phase 1 of fieldwork began in 2015. This was a scoping phase, designed to broadly understand the actors and REDD+ process in Guatemala. In Phase 2, a questionnaire was designed as a result of interviews from Phase 1, as this was considered the most efficient way to gather broad information from all the actors involved in the process. I decided to explore both values related to land use and sustainable development and attitudes specifically towards REDD+, as I hoped this would provide me with more specific information related to potential barriers to transformational change related to the REDD+ process. I analysed the results of the questionnaire to elicit values, attitudes, intentions and behaviours in Phase 3 (see Figure 17). This completes Part 1.

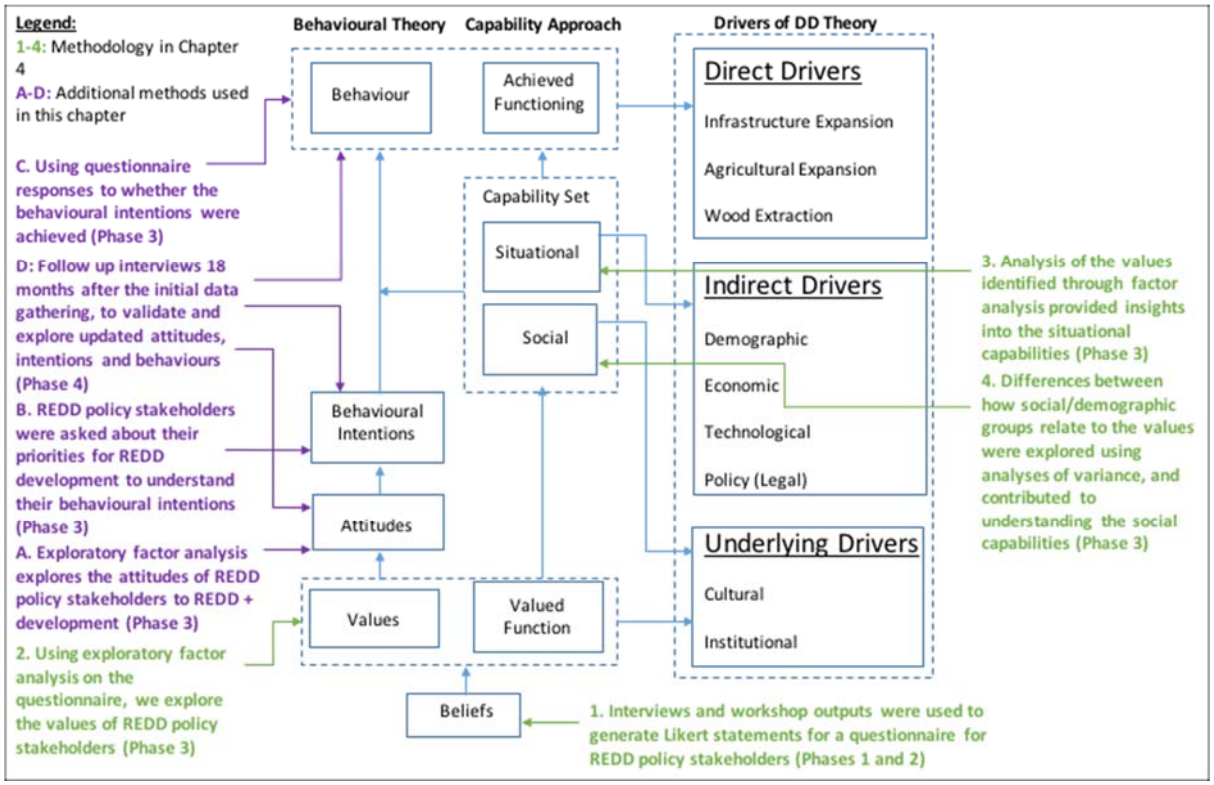

Figure 17: The BCD model with the methodology from Chapter 4 used in this study (1-4 in green), and the additional methods applied as part of this study (A-D in purple).

In Part 2, to validate the results from Phase 3, I returned to Guatemala in 2017 for Phase 4 (18 months after the end of the initial fieldwork), to conduct further interviews with REDD+ decision makers to explore the behaviours that had taken place. Using the interview data from Phase 4, I developed a narrative timeline of events, with specific relation to a 'mini case

study event' that I identified from the interviews as dominating the REDD+ process in 2016/17. Examining detailed accounts of this process from multiple actors helped validate the statistical results from Phase 3 by identifying actual behaviours that occurred after Phase 1 fieldwork. I also identified updated attitudes and behavioural intentions related to the 'mini case study event' which I applied to the BCD model.

Guatemala's REDD+ Programme

In 2008, Guatemala submitted its first REDD+ R-PIN (Readiness Plan Idea Note). In 2011, it submitted its first draft R-PP (Readiness Preparation Package), and in 2014 Guatemala completed their ER-PIN (Emissions Reduction Programme Idea Note). In 2013, Guatemala received US$3.8m in readiness funds from the Forest Carbon Partnership Facility (The REDD Desk, 2013).

The R-PIN, R-PP, ER-PIN and R-Packages should contain the reference emissions levels, REDD+ strategy and monitoring system proposals, with outlines of how the country is progressing. The R- documents are all readiness related activities, supported by the Forest Carbon Partnership Facility's (FCPF) Readiness Fund. The ER-PIN is supported by the FCPF's Carbon Fund.

The R-Package, expected to be submitted for Guatemala in 2017, is the precursor to countries moving into the 2nd stage of REDD+ (implementation). The final stage of REDD+ is payments for emissions reductions.

Part 6.1: Developing a Proof of Concept for Applying the Behaviour-Capability-Drivers Model to Guatemala's REDD+ Programme

The aim of this part is to develop a proof of concept for identifying drivers of DD from a Guatemalan REDD+ decision maker perspective using the BCD model and methodology, initially piloted in Chapter 4.

Methodology

Phase 1: Semi-structured scoping interviews with REDD+ decision makers

A scoping study with 23 respondents was carried out in the summer of 2015 to understand the actors and REDD+ process. Those formally involved in REDD+ negotiations and planning were contacted from a list provided by Guatemala's Ministry for Environment and Natural Resources (MARN). I sent an email to the 59 people on the list asking for an interview, and interviewed the 17 that responded. The 17 interviewees covered all areas of REDD+ negotiations and development: governance (3), finance (1), MRV (3), Safeguards (4), Implementation (3), with another three listed only as cooperating organisations. The actors came from government (5), international organisations (5), NGOs (5) and academia (2). A further six interviews were carried out with people whom I identified as important to development and enforcement of forest policy in Guatemala, but who were not directly associated with REDD+ negotiations and planning. I chose to interview these people to get a broader perspective on REDD+ from the policy making level. Two were from government, two from NGOs, one from academia and one from the private sector.

Each interview was semi-structured, with the following questions used to guide the discussions:

- What do you do/describe yourself as doing in your work?
- How do you decide on the projects and activities you work on?
- How do you engage with landowners and/or labourers?
- What are your key policies and strategies related to REDD+ fields? *(e.g. forests, social development, land tenure, agriculture, natural resources, education and employment)*
- Is REDD+ a good idea for Guatemala?

Phase 2: Values and attitudes questionnaire development

A Likert scale preference questionnaire was chosen as a survey tool as it has been shown to be an effective way of eliciting values and attitudes (see Chapter 4).

Using the information gathered from Phase 1 interviews, I developed a long list of belief statements on land use and sustainable development value and attitude statements towards REDD+, grouped under theme headings. The statements were written with relevance to those who make direct decisions regarding REDD+. The list was sent to collaborators in Universidad del Valle de Guatemala (UVG), the National Institute of Forests (INAB) and the United Nations Development Programme (UNDP) in Guatemala. Using 'traffic light' colouring, the collaborators indicated which statements should and should not be included in the questionnaire. After collating these opinions, final sets of 24 attitude statements on REDD+,

and 23 belief statements on natural resource values were included in the questionnaire. A five point Likert scale of ´strongly agree´ to ´strongly disagree´ was chosen for the belief and attitude statements. All belief statements were randomly ordered, using a random number generator in Excel.

The questionnaire was put into Survey Monkey and sent to an email list of 59 individuals involved with the design and implementation of REDD+ in the country, as well as an additional 6 people tangentially associated with environmental and land use policies in Guatemala (see Appendix D). 59 responded out of the 65.

Phase 3: Statistical analysis

Eliciting values, capabilities and attitudes

I analysed the Phase 2 questionnaire data by initially following the methodology set out in Chapter 4 to identify the values, attitudes, behavioural intentions and behaviours of REDD+ decision makers. The Behaviour-Capability-Drivers model (see Figure 1) provides the conceptual framework for this study. I first carried out exploratory factor analysis (EFA) using the responses to belief statements in SPSS v.22, to identify the common factors (or shared values) associated with land use and sustainable development. The belief statements within each factor provide insights into the situational capabilities associated with each value. Computation of factor scores for analyses of variance (ANOVAs) helped me explore differences in relationships to each value across decision maker characteristic groups (sector, level, region, gender) to provide further insights into social capabilities.

The same statistical methodology was used to identify both the shared values (using responses to belief statements in questionnaire section two) and attitudes (using responses to the attitude statements in questionnaire section one). The shared values and attitudes were named after collaborative discussions between myself and my supervisors. The names of the shared values were validated through discussions with colleagues at UVG.

Validating attitudes and identifying behavioural intentions and actions

The questionnaire was arranged into four sections where section one was focussed on attitudes to REDD+, section two explored natural resource values, section three asked several open questions about drivers of DD and REDD+, and section four asked demographic questions.

In section three, respondents were asked ‘In your opinion, what is the biggest cause of deforestation in Guatemala?’, followed by ‘What policies do you consider to be important for reducing DD in Guatemala?’. The responses to these open questions were used to validate the capabilities identified from the shared value statistical analysis. The question ‘Are you content with REDD+ development so far?’ (measured on a scale where 1 was not content and 10 was content) was used to validate the attitudes from the statistical analyses. The question ‘What should be the first step for REDD+ in Guatemala?’ was used to identify the behavioural intentions of the respondents. I then used a follow up question of ‘Is this priority being reflected in actual REDD+ discussions?’ to provide an indication of whether the behavioural intentions were translating into actual behaviours.

Results

Values associated with land use and sustainable development

Rotated Factor Matrix
Valuing Participation and Engagement
Q6 If more people understood the environment there would be less deforestation
Q22 Relationships between NGOs and communities are important for conserving forests
Q15 Culture determines how people use the forest
Q14 Population growth is causing more land to be used
Q18 Family planning is an important part of sustainable development
Q21 For many people in Guatemala, forest resources are the only viable option for survival
Valuing Political and Economic Equity
Q17 Companies have the greatest capacity to deforest
Q16 There is a lack of capacity to confront companies who are abusing the land
Q8 As access to markets to improves, there is more incentive to deforest
Q4 If there were less conflicts over resources there would be more conservation
Valuing Good Governance
Q5 We need better management of our organisations
Q23 Good healthcare is necessary to help people access better lifestyles
Q9 Many families are not aware of schemes they could take part in
Q1 People who own their land are more likely to protect the trees
Q10 The state relies on help from NGOs to produce environmental projects
Valuing Economic Investment
Q11 Guatemalans need immediate solutions, not long term investment
Q12 If there was more investment in economic progess there would be less pressure on natural resources
Q3 There needs to be more control over how communities use the land
Q20 Sustainable management practices are difficult and expensive to impelement

Table 9: DD+ decision maker values associated with land use and sustainable development.

Table 9 shows the factor structure for REDD+ decision maker values associated with land use and sustainable development. A significant difference in agreement (interpreted as relevance of the factors to the stakeholders) was found between academia and private sector for factor 2: Valuing Political and Economic Equity ($p = .012$), where academia felt this factor was particularly relevant to them, and the private sector did not (Appendix E).

Capabilities associated with land use and sustainable development values

The capabilities in Figure 18 were derived from the analysis and interpretation of the values.

Valued Functions

Factor 1: Participation/Engagement
Factor 2: Political and Economic Equity
Factor 3: Good Governance
Factor 4: Economic Investment

Situational Capabilities

Factor 1
Lack of effective family planning
Lack of environmental education/understanding
Factor 2
Lack of corporate regulation
Resource conflicts
Factors 2 and 4
Lack of law enforcement capacity
Factors 2 and 3
Uneven land tenure distribution
Factor 3
Insufficient investment in basic services
Lack of effective information systems
Lack of effective communication between state and NGOs
Factor 4
Lack of varied employment opportunities
Inefficient sustainable management schemes
Lack of immediate investment in livelihoods

Social Capabilities

Factors 1 and 4
Cultural misunderstandings
Factors 1 and 2
Cultural inequalities
Factor 2
Lack of challenges to embedded power structures
Factor 3
Embedded ineffective organisational management practices

Figure 18: Values and capabilities identified from the belief statements within each factor, and elicited from the significant differences observed in factor 2.

Are the negative capabilities reflected in participants' perspectives on drivers of DD?
53 people responded to the open question about the biggest cause of deforestation in Guatemala, their responses are presented in Table 10.

Response	No. of Responses
Monoculture/Agroindustries/Cattle Ranching (inc. oil palm, sugar cane, rubber and 'narcoganaderia')	27
Illegal Logging	4
Subsistence Agriculture	2
Changes in soil use	3
Social/institutional issues	3
Multiple causes	14
Total	53

Table 10: Number of responses to the open question 'What is the biggest cause of deforestation in Guatemala?' by category.

The majority of respondents (n = 27) mentioned monoculture and agroindustries (e.g. oil palm, sugar cane, rubber etc.) and cattle ranching. Those that mentioned cattle ranching would also sometimes mention narcoganaderia: narcotics dealers who launder money through cattle ranching (Devine, 2014). Others (n = 9) mentioned illegal logging, subsistence agriculture and 'changes in soil use'. Three people mentioned social or institutional issues:

> *"The system. The agrarian structure and inequality in resource distribution."*

> *"Exclusion, disorganisation, illiteracy, poverty, subsistence agriculture. In addition, the agroindustries are disrespectful of the judicial and natural ecological laws and the abuse of resources, especially water for irrigation, the zones for sustainable hydrological recharge go unrecognised."*

> *"The lack of conscience, regulation and extensive monoculture plantations."*

The majority of respondents discussed what can be classed as 'direct drivers', while only three discussed any underlying drivers. A number of people also discussed multiple causes within their response, indicating that although underlying drivers are not often identified, there is an acknowledgement of the interactions between different drivers:

> *"It depends on the region, but the biggest cause in general is the increase in cattle ranching, the lack of employment and increase in family size."*

> *"The monoculture businesses, perverse incentives, narcoganaderia, invasions into the protected areas by people who (in theory) have no land."*

> *"Population increase and the advance of the agricultural frontier by smallholdings and big businesses, typically for oil palm."*

> *"Lack of opportunities and the advance of the agricultural frontier by big businesses for permanent monoculture."*

When asked about the policies they felt were important to reducing DD in Guatemala, 52 participants responded (see Table 11), 22 of which mentioned multiple, interlinking policies that were required:

"Payments for environmental services, restoration of important hydrological recharge zones, commercial reforestation incentives that are accessible in multiple use zones, combat corruption."

"Land tenure, technologies for farming to maximise productivity, family planning, education."

"Education and capacity building, forestry extension work, support for access to incentives, creation of new sources of work, alternative energy sources for cooking."

"Forest law, rural development policies, climate change adaptation and mitigation policies, energy policies, a registry for projects for emissions reductions, land tenure policies, national indigenous and intercultural policies, policies on human settlement in protected areas, policies on economic competitiveness."

Several respondents (n = 18) mentioned only protected areas and forest laws. Forest law included general forestry incentives, as well as Guatemala's national forest incentive programmes. Others mentioned water, agroecological, illegal logging and law enforcement policies (n = 8). Two respondents mentioned broader issues that related to tackling underlying drivers e.g. the state or international funding issues:

"Strengthening the state: reducing discretion and impunity."

"It is more than policies, it is the financial mechanisms to be able to implement these policies."

Response	No. of Responses
Protected areas and forest law	18
Water, agroecological, illegal logging and law	8
Broader issues	2
Multiple policies	22
Don't know	2
Total	52

Table 11: Number of responses to the open question 'What policies are important to reducing deforestation in Guatemala?' by category.

Most of the responses shown in Table 10 and Table 11 focused on 'direct drivers', and addressing specific land uses. However, several respondents discussed multiple causes or policies, where they linked the direct drivers to other indirect and underlying drivers. The indirect drivers match some of the negative situational capabilities identified in Figure 18, and the few mentions of social or institutional issues also match those shown in Figure 18.

Attitudes associated with REDD+ in Guatemala

Rotated Factor Matrix
Discontentment with the overall process of REDD+ negotiations and development
Q18 There is no clarity on what REDD+ mechanism is the best for the country
Q21 There are important national actors who are not currently involved in REDD +
Q22 Not all voices are heard equally in national REDD+ discussions
Q11 The proposed REDD+ mechanism is too complex to be implemented effectively
Q4 It is difficult to coordinate between all the actors present in REDD+ nationally
Q5 Until the land tenure problem in Guatemala is solved, REDD+ cannot work
Optimism about the potential for REDD+ to provide positive benefits to the environment in Guatemala
Q19 REDD+ contributes to the improvement of national forest management
Q9 Money from REDD+ is essential for strengthening conservation efforts in the country
Q13 REDD+ is a great negotiating tool for Guatemala internationally
Q14 People believe REDD+ is the solution to all the country's environmental problems
Q23 REDD+ is one mechanism among many in Guatemala that exists to help meet environmental goals
Q8 REDD+ has enabled discussion between actors in a way that has not happened before
Negative attitude towards REDD+ and its financial viability
Q3 I do not understand where the money for REDD+ is coming from
Q2 REDD+ competes with other similar environmental programmes
Positive attitude towards the results of REDD+ benefitting communities
Q12 Communities should receive carbon credits directly
Q7 The price of carbon needs to be higher than the cost of using the natural resources
Negative attitude towards the alignment and integration of REDD+ in Guatemala
Q17 We need other solutions to deforestation that are not based only on carbon credits
Q20 It is necessary to align REDD+ objectives at a national level
Q15 REDD+ should be better integrated with national programmes that already exist, like the Development Strategy

Table 12: REDD+ decision maker attitudes associated with REDD+ in Guatemala.

Table 12 shows REDD+ decision maker attitudes associated with REDD+ in Guatemala. A significant difference in agreement (or relevance of the factors) was found between community associations and private sector stakeholders for factor 4: a positive attitude towards the results of REDD+ benefitting communities ($p = .029$), where community association stakeholders found it particularly relevant, and the private sector did not (Appendix F).

Are respondents content with the REDD+ process in Guatemala?

31 out of 54 participants reported a score of 6 or above regarding their contentment with the overall REDD+ development process (where 1 was not content and 10 was content). For those who responded with a 6 or higher, when asked to elaborate on their answers, they nevertheless reported misgivings about the process ('created under false expectations', 'in spite of much confusion and misunderstandings'), but overall the outlook was positive for the potential benefits it could bring the country (and already has brought the country) in terms of participation and capacity. In general, there was a feeling that the process was good considering the number of complex circumstances surrounding REDD+ and its development in Guatemala.

For the 12 respondents that answered a mid-point of 5, their responses tended to focus either on the complexity of REDD+, the lack of participation or the fact that the process is incomplete. Of the other 11 that scored 1-4 on their level of contentment (indicating that they were unhappy with REDD+ development) they quoted issues to do with the lack of

participation and negotiation, the length and time of the process, and the lack of real actions (e.g. 'all talk, no action').

The overall outlook shown through the responses to this question validate the attitudes from the analysis. Although there is contentment and some optimism in many responses, there are issues highlighted even among those who are overall happy with the REDD+ process.

Identifying behavioural intentions through REDD+ priorities

Participants were asked in an open question what they think the first step for developing REDD+ in Guatemala should be. 52 participants responded. The responses were categorised based on the themes of the five attitudes (see Table 12).

25 responses discussed participation, negotiation and development of REDD+. Respondents spoke specifically about involving and consulting actors directly from projects and community associations, improving communication within the government in order for them to take a more responsible role in REDD+ development and the need for free, prior and informed consent mechanisms. One respondent specifically mentioned that given the cultural diversity in Guatemala, and the general distrust in the governing institutions, it is essential to improve communication between all actors at different levels. They went on to say that if this communication breaks down, it doesn't matter about the advances in other areas (e.g. MRV), as the whole process will break down. Another respondent mentioned how international organisations should not impose their agendas on the national REDD+ process, and allow for internal negotiations to flow.

Another 10 respondents mentioned aligning REDD+ with existing strategies. They mentioned the need to strengthen the legal and institutional aspects of REDD+, to generate and align policies and strategies so they work at a national level, strengthening management platforms and improving the capacity of the government to take responsibility at a national level for their implementation, without the help of international organisations. Four respondents then discussed the benefit distribution system. Respondents discussed the need to inform the population about the REDD+ programme and create a mechanism for benefit distribution that ensures they reach the people who actually manage the forest. A further 13 respondents mentioned other issues not related to the REDD+ attitudes such as the MRV or drivers of DD. The final 3 respondents said that they did not understand the question.

Are participant priorities being reflected in actions?

Participants were also asked whether they believed their priorities were being reflected in REDD+ discussions. 100% of those who answered the open question also answered this question. 50% of those who said participation, negotiation and development of REDD+ was a priority believed it was being reflected in reality, while 30% said it was not being reflected in reality, the remaining 20% said they were not sure. For those that said it was being achieved, some noted that there are 'many discrepancies among actors', and although there are strong discussions there is still no actual strategy. Those who said it was not being achieved reiterated that the participatory processes were not fully inclusive, that it was purely a process full of 'technocrats' with a lack of identification of relevant actors, little involvement of communities, and actors being in disagreement or confused about the purpose of REDD+.

55% of those who mentioned aligning REDD+ with existing mechanisms as a priority said it was being achieved, and 45% said it was not. Those who said it was being achieved mentioned that although there are discussions about alignment and integration, many of them stay at the discussions stage and do not move forward to concrete actions. Those who considered the priority was not being met mentioned lack of effective participation and preoccupation with developing other priorities (e.g. the benefits distribution mechanisms).

One of those who mentioned the benefit distribution system said they believed their priority was not being achieved. One said they did believe it was being achieved, and three said they were not sure. All of the comments mentioned that there had been much discussion on the issue, but either that this was not followed through, or that the discussion stages still seem to be ongoing.

Do the capabilities explain the behaviours?

Only around half of respondents feel that any of the priorities (behavioural intentions) are being achieved, and the final behaviours (from the participant responses about whether their priorities are being reflected in actions) do not necessarily align with the intentions/priorities. In Figure 19 below, the shared values, attitudes, behavioural intentions and behaviours are displayed, along with the capabilities from Figure 18. The model shows how capabilities identified from the values related to the different priorities (behavioural intentions) can be seen to create barriers to the achievement of those intentions/priorities.

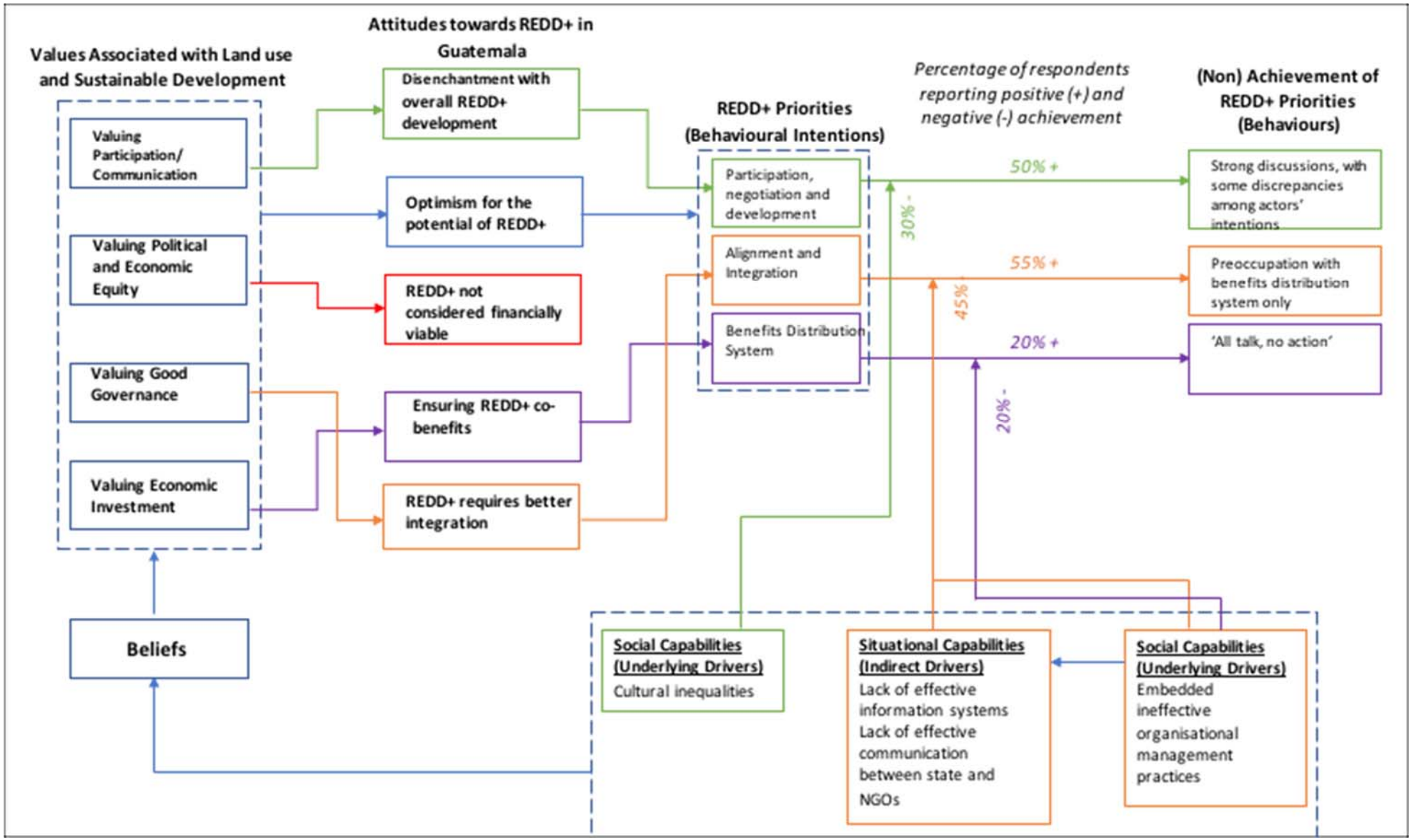

Figure 19: Values, attitudes, intentions in the BCD model with negative social and situational capabilities from Figure 2 to explain the end behaviours.

Discussion

The results of this part confirm that the BCD model and approach can be used to elicit shared values and capabilities from REDD+ decision makers. The majority of responses to the questions used to validate the shared values and capabilities discussed issues that affected land users directly (e.g. lack of effective family planning, environmental education and varied employment opportunities), which can be conceptually applied to identification of drivers of DD.

In the subsequent sections of this chapter, more attention was paid to the REDD+ negotiations among decision makers. The attitudes and the open responses regarding the priorities for REDD+, and whether they are being achieved or not identified that there were four negative capabilities that specifically affected the success of the REDD+ negotiations. These negative capabilities were identified from the decision maker shared values (Figure 2) but not specifically identified as drivers of DD by the decision makers in the open questions. Only one respondent to the question on causes of DD mentioned 'The state' and two respondents to the question on policies to address DD mentioned aspects that could act at the decision maker level ('Strengthening the state' and 'It is more than policies…mechanisms to implement the policies.'). Yet it is clear from the nature of the four negative capabilities (inc. cultural inequalities, lack of communication between state and NGOs) that there will be negative impacts for land users as a result of these barriers to transformational decision making.

By failing to acknowledge the role that their actions, as decision makers, have on driving DD at the land user level, they are reducing the possibilities for effective policies and interventions to be developed. As such, it seems that there is a need for more work to be done to better understand how these decision maker capabilities can act as barriers to transformational change, and to explore whether the BCD model and approach presents a way to identify and structure them.

Part 6.2: Guatemala's REDD+ Programme 18 months on: Validating the values, behaviours and capabilities

This part explores Guatemala's REDD+ progress 18 months on from the situation explored in Part 6.1. The aim of this part is to validate the results of Part 6.1 and explore how capabilities differ across REDD+ decision makers with different stakeholder characteristics.

Methodology

The methodological phases described in detail in this part begin at Phase 4 of the Figure 17 methodological diagram in the introduction to this chapter.

Phase 4: Follow-up semi-structured interviews with REDD+ decision makers

In early 2017, I returned to Guatemala to explore the progress of REDD+ 18 months on. I planned the interviews to contain structured open questions followed by deeper questioning on behaviours, attitudes and intentions associated with REDD+. As values are considered to be stable over time, I did not aim to explore these in more depth. The open structure questions were:

1. What do you do/describe yourself as doing in your work?
2. Can you describe the progress of REDD+ negotiations and planning over the past 18 months?
3. What are your current priorities for REDD+ in Guatemala?
4. Is REDD+ a good idea for Guatemala?

Question 1 was used only when I had not interviewed the REDD+ decision maker before, otherwise this question was skipped. Question 2 was used to identify and validate the behaviours/actions that had occurred since Phase 1. I also used this question to explore some of the key events in the intervening 18 months and identified a 'mini case study event' of the REDD+ process, which had altered the attitudes, intentions and created new behaviours in comparison to 2015. Through the mini case study I then sought to identify updated behavioural intentions and behaviours. Within the responses to interview question 2, respondents also often reported on the development of the R-Package. I used question 3 to clarify the behavioural intentions explored in question 2. Question 4 was used to identify updated attitudes to REDD+.

I interviewed 12 people from academia (3), government (3), international organisations (3), private sector (1) and NGOs (2) formally involved in REDD+ negotiations and planning. Six of these people were also interviewed in Phase 1.

Development of a narrative timeline

From Phase 4, I identified a clear mini case study which dominated the content of several interviews. In order to preserve the richness of the 2017 interview data and accurately identify the BCD model elements, I decided to present the events of the mini case study as a chronological narrative. I then asked a trusted colleague at UVG to check the narrative timeline for accuracy and confidentiality.

Application of results to the BCD model

I used the narrative timeline and critique of the R-Package development to identify any 'updated' attitudes and intentions in relation to this event. These were compared and aligned with the values and capabilities identified from the 2015 data, then added to the BCD model.

Results

Mini-Case Study: Signing of the Letter of Intent for potential purchase of emission reductions

The Letter of Intent (LOI) is a letter provided by the World Bank for a country to sign in order to allow that country to move into the final payments phase of REDD+ (the first phase being readiness and the second being implementation). The LOI presents a precursor to the negotiation of an Emissions Reductions Payment Agreement (ERPA) which allows for the formal sale of carbon credits.

The LOI was originally meant to be signed by March 2016. The National Institute of Forests (INAB), a government arm, was the original intended signatory, however, INAB declined as they considered it to be too risky. The National Procurator General (PGN) for Guatemala therefore received written concerns from all the government ministries involved in the development of REDD+ (The National Council for Protected Areas (CONAP), INAB, the Ministries for Environment and Agriculture – MARN and MAGA respectively – collectively referred to as the Interinstitutional Coordination Group – the GCI), assessed the legal situation and concluded that the only government ministry legally able to sign the LOI was the Ministry of Public Finance (MinFin). However, this decision came too late and so caused the first delay in the signing of the LOI. Guatemala was then given a six month extension to sign. However, at this time the government fell apart (due to the presidential and vice-presidential arrests for corruption (see Andersson, 2017; García and Toscano, 2017)) and an interim government took charge from September 2015 to January 2016, during which time no progress was made on any aspect of REDD+.

An international organisation informant said that the GCI had lost its leadership during the change in government. As the lead institution in the REDD+ process in Guatemala, MARN hosts the role of REDD+ coordinator for the country. However, during 2016, MARN lost two consecutive REDD+ coordinators. In March 2017, the position remained vacant and the MARN project staff had declined from six people to one. According to government informants, the REDD+ coordinators left due to the lack of communication from the international organisations to the government about the REDD+ process, creating an uneven balance of power between the two.

In order to recover leadership, according to an international organisation informant, the GCI organisations needed to be strengthened, and dialogues between the government and NGOs needed to be recovered. They called the relationships between the government and NGOs a 'convenience marriage', in the sense that both needed each other and needed to engage in dialogue in order to move forward. However, they noted the difficulties in facilitating this process in 2015/16 due to the change in government, leading to the 'same problems over and

over' according to a government informant, and 'erosion of institutional memory', according to a private sector informant.

The Ministry of Public Finance in Guatemala was generally considered by informants to have the greatest knowledge and capacity to take on the role of signatory for the LOI. One private sector informant said that the stronger institutional capacity of MinFin could even lead to a more cohesive national strategy for REDD+, removing the 'nonsense of territoriality' between actors involved in REDD+. An international organisation informant discussed how the involvement of MinFin was beneficial for the overall economy, that although people might not be able to see it yet, involving MinFin with REDD+ has already resulted in the new budget including a section on improving employment opportunities in the forestry sector.

In May 2016, Guatemala was required to present a mid-term report on REDD+ to the Forest Carbon Partnership Facility (FCPF) in Washington, USA. The FCPF awarded Guatemala a further US$5m in funds for developing further REDD+ readiness activities due to their significant progress. The US$5m in funds went to an international organisation to be distributed to Guatemalan organisations involved in the REDD+ process. 50% of these funds were earmarked for INAB. According to a government informant, the money had to be handled by the international organisation for transparency reasons, a result of the corruption scandal in Guatemala. According to a government informant, by December 2016, INAB had not received any of the funds. The government informant and an international organisation informant said that still not all of the initial US$3.8m awarded to Guatemala in 2011 for readiness activities had been disbursed, and continues to be held by another international organisation. According to government informants, the majority of these funds had gone into workshops and consultants' salaries but rarely did this translate into progress on the REDD+ strategy, as one of the government informants noted that the consultancies get paid even if the results do not meet the requirements of the contract, calling them a 'waste of time'.

By September 2016, no signature for the LOI was forthcoming, as the government parties still had many concerns over the content of the LOI. According to one international organisation informant, the government was treating the LOI as a contract, not as a declaration of intent, but by the time the government realised this distinction, the six month extension was over. Guatemala was then granted another six month extension, to the end of March 2017.

The concerns raised with respect to the LOI centred around financial risks in investing in the generation of carbon credits without solid guarantees of whether these credits will be accepted by the FCPF, how much they will sell for and to whom. The LOI also calls for an exclusivity period, where no negotiations regarding dealing or sale of carbon credits can take place within two years of the signing of the LOI. Additionally, the LOI stipulates that if the FCPF Carbon Fund (which holds the funding for payment for carbon credits, provided primarily by developed countries) does not hold enough funds to cover the payment obligations under the ERPA, the FCPF 'will not have any liability whatsoever'. Similarly, if any of the participants contributing to the Carbon Fund decide to withdraw from negotiations, the LOI will immediately terminate. Finally, any conflicts that may arise as a result of activities occurring in relation to the sale of carbon credits as part of this agreement have to be settled under English Law, in English.

According to informants in academia, government and international organisations, the issue of exclusivity is particularly problematic for NGOs that have already begun negotiating carbon credit prices on other markets. Concerns of NGOs included the fact that they believed they could get a 'better deal' outside of REDD+. Because of this, NGOs that privately own land in Guatemala have begun carbon price negotiations as part of the voluntary Verified Carbon Standard (VCS) programme, and even signed other ERPA agreements. However, according to informants the volume of credits generated from the privately owned land is not enough, as the NGOs want to use the credits to cover running costs of their organisations.

In some cases, according to government and international organisation informants, this has led to NGOs making agreements with private landowners over rights to carbon credits sold (through a VCS scheme or REDD+). This could potentially put any credits generated as part of a national REDD+ scheme at risk of being doubly counted, and invalidate the LOI or ERPA. Additionally, according to an NGO informant, although they broadly considered the signing of the LOI in their interests in order to generate payments for credits, they do not consider developing a REDD+ project in all of their areas to be 'attractive'. For instance, in one of their areas, there is not enough overall deforestation to generate significant amounts of avoided emissions credits and partnerships with local private landowners near to this site would not work, as the majority of these holdings are small and scattered and not enough to make a REDD+ project area. However, all informants agree that without the participation of the NGOs, the organisations on which the government relies to manage the majority of protected land in Guatemala, there will be no REDD+.

Between May and October 2016, relationships between the government, NGOs and international organisations deteriorated, as a result of conflicts over the integration of the World Bank funded Forest Investment Programme (FIP) initiatives and REDD+. Guatemala had been successfully implementing FIP projects since 1997 in the form of the incentive schemes for reforestation activities PINFOR (for private landowners) and PINPEP (for community groups). According to a government informant, INAB, the organisation in charge of FIP, tried to separate the FIP programmes from REDD+ in order to create an environmental 'fail safe' for the country if REDD+ did not succeed. In October 2016, key members of INAB and CONAP did not attend a REDD+ meeting to present on the FIP programme. According to academia and government informants, this caused anger amongst other NGOs and international organisations as they perceived the government to be deliberately stalling the process of REDD+. According to an international organisation informant in March 2017 however, they have been engaged in a 'very participatory process' with the government to generate a linked REDD+ and FIP investment plan, reportedly worth US$24m in FIP resources alone.

Between September 2016 and December 2016, the University of San Carlos (USAC) in Guatemala raised another concern with the PGN over the rights to use and manage carbon credits on REDD+ project land. USAC manages land that CONAP (the state) owns. In the 2013 Climate Change Law (CC Law) for Guatemala, it states in Article 22 (related to projects selling carbon credits) that: 'Individual or legal personnel and the state, who are owners or legally possess land or property in which the projects are carried out, may be owners of the projects.' USAC sought clarification on this paragraph in Article 22, as it is unclear whether they, as managers of the land or the state, as legal owners, have rights to the carbon credits generated

from projects such as REDD+. The PGN however could not provide an answer, and referred the case to the National Council on Climate Change (CNCC).

In December 2016, USAC, along with NGOs, presented their case relating to the CC Law to the CNCC, which was rejected by the Minister for Environment (who leads the CNCC) due to lack of information, but USAC and the NGOs were invited to present the case again in March 2017. According to government and academia informants, the involvement of the CNCC could spell disaster for REDD+, as not only are higher level government ministers and politicians likely to have changed during the change in government, resulting in a lack of knowledge on issues such as REDD+, political involvement often brings with it more risks of corruption in the REDD+ process. Although the actors involved in the REDD+ process understand that the government needs to take charge of the process and that political interest in its success could drive REDD+ forward, in this case it appears to be stalling the process.

The issues associated with the CC Law, passed in 2013, were threefold. First, was the issue related to the ownership of credits, discussed above. Second, was another paragraph in Article 22 relating to the responsibility of MARN to create a 'Registry of Projects for the Removal or Reduction of Greenhouse Gases, for the procedures of disclosure, promotion, registration, validation, monitoring and verification of projects' within 18 months of Article 22 entering into force in December 2013. As of March 2017, no progress had been made on this point, creating a 'legal void' according to an academia informant. Finally, Article 24 of the CC Law establishes the National Climate Change Fund for Guatemala, into which payment for emissions reductions should be paid. Article 25 of the CC Law then states that at least 80% of total resources in the National Climate Change Fund must go towards 'risk management, vulnerability and adaptation'. At the time of writing of the CC Law however, none of the actors involved appeared to notice the conflicts with REDD+, as the development of the initial Emissions Reduction Programme Idea Note was still in its infancy.

According to a government informant, the state will get the money from all carbon credits generated on land it owns, which will be redistributed to the GCI organisations. In their opinion, the money should be given back to the same area it came from: the same organisations that generated them and into more of the same activities (i.e. mitigation). This was the agreement designed by CONAP with GuateCarbon in 2015, a pilot REDD+ project in the north of Guatemala, however it did not align with the CC Law legal requirements.

An international organisation informant noted that some NGOs have been attempting to negotiate with the government to obtain ownership rights to more state land. However, even if they gained ownership rights, they would still only gain full rights to carbon credits if the CC Law and management agreements were clarified. In the case of GuateCarbon, the contract signed between them, the umbrella association for community concessions in the area, and CONAP, gives GuateCarbon the rights to 'natural resources' in the area. 'Natural resources' includes things like wood and non-forest products but not carbon rights. If the term was modified to 'environmental services', however, this would include rights to carbon (as well as scenic beauty, water, tourism etc.). However, the government remain silent on changes to the contract and refuse to sell land to the NGOs. Government, international organisation and NGO informants also mentioned how some of the NGOs and an international organisation have been working to try to change the CC Law. However, the international organisation

informant stated that the government neither suggests nor rejects proposals to amend the CC Law issues.

The new national payments for environmental services law in Guatemala is called Probosques. The Probosques law replaces the successful PINFOR scheme run by INAB. A major change from PINFOR to Probosques is the inclusion of 'environmental services' in the law, however, rights to carbon are not specifically stated as included within the law. According to a government informant, there was a conflict originally between PINFOR and REDD+, due to the fact that REDD+ is credit based and PINFOR activity based, meaning alignment and integration of REDD+ with existing laws would be difficult. Now, according to an NGO informant, although Probosques is still activity based, the inclusion of incentive payments for carbon 'services' aligns with the concept of REDD+, but now presents the risk of double counting for any landowners wishing to take part in both programmes.

By all accounts, relationships between key actors involved in REDD+ had soured significantly following the involvement of the CNCC. According to an international organisation informant, the GCI feels 'stabbed in the back' by NGOs, and as such refuses to engage with them. According to government informants however, the bad blood between all of the actors involved in REDD+ negotiations only exists within the sphere of REDD+: the same organisations work well together, even currently, on all other areas.

In March 2017, prior to the upcoming CNCC meeting, actors in academia tried to host a meeting to bring the government and actors from NGOs (those organisations who manage state land and whose role would be the implementation of proposed REDD+ projects) and the GCI together, and come to an agreement on how to proceed. Representatives from NGOs and international organisations confirmed attendance, but members of the GCI said last minute that no one was available that day to attend. Notably, the GCI showed no interest in rescheduling or sending other delegates. The academia hosts then decided to cancel the meeting and were saddened that the effort taken to get the actors convened had fallen through at the last minute.

In response to this event, one government informant was pleased that the GCI were finally 'taking control' of the process, although they admitted that internally, the government was facing turmoil. Firstly, the informant did not believe that INAB should be a part of REDD+, as this would likely encourage landowners away from the national PES schemes and as such more money would move away from INAB and towards MARN. Secondly, the government informant noted that although REDD+ is being sold as an inter-institutional programme, there are 'huge gaps' among the GCI as MARN, the leader of the process and focal point for events, is not involved in activities related to forests on the ground. The Minister for Environment is often the sole member of the GCI invited to meetings on REDD+, but their lack of knowledge about the process and lack of communication between the GCI institutions means that little knowledge is ever transferred. Another government informant said that the GCI is 'scared' of signing the LOI and that this is detrimental to the whole process. They also considered the GCI to hold no power at all in REDD+, that the private interests of NGOs and the limited input from international organisations meant to be facilitating the process is stopping progress in the signing of the LOI.

Towards the end of March 2017, an NGO informant said that an informal meeting had been held to discuss the signing of the LOI. Only one actor present raised their hand to offer to sign the document, a member of the private sector.

In the REDD+ negotiations, the private sector has not taken a large role, though not through lack of trying. According to an international organisation informant, the private sector is considered an 'outsider' in the process, especially since the government refuse to talk to the private sector. A private sector informant said that they are 'not welcome' in the conservation arena in Guatemala, and as such the other actors are not able to access the knowledge and resources that the private sector has to offer. An academia informant said that the private sector stakeholders have their own proposals for REDD+, but that they are unsure whether these would work with their perception of 'real REDD+'. A private sector informant elaborated on their proposals, discussing how they want to develop a unique approach to REDD+ where there are clear non-carbon benefits generated from carbon credit funds by investing them in cultural tourism, and forming a sustainable social enterprise programme. An international organisation informant noted that although the private sector does include large companies who own sugar cane, oil palm and the 'narcoganaderia' (cattle ranching, which is known as a major narcotics money laundering route in Guatemala) and as such control significant wealth, power and use of natural resources in Guatemala, it also includes small community cooperatives, who are then by extension being shut out of the REDD+ process.

At the end of March 2017, the follow up CNCC meeting was held and then, despite all the conflicts and reservations expressed by many actors, on the 28th of April 2017, the LOI was finally signed by Hector Estrada, the Minister for Public Finance in Guatemala. Before the signing, a government informant said that the government is only 'saving face': the government should finish the REDD+ strategy, sign the LOI and then stop, as REDD+ will only bring further conflict. An international organisation informant said that they can still pull out, and without REDD+ Guatemala can still access the Green Development Fund, but expressed concern at what will happen when Guatemala begins the REDD+ consultation process with the communities, raising expectations related to REDD+.

According to several informants, NGOs and the government don't have the real power. It is the international organisations that hold the power and impose their agendas. In noting the determination of international organisations in advancing REDD+, an academia informant said 'If REDD+ fails, [International organisation] fails'. However, in the words of a government informant: 'the business is not REDD+, it is the Green Climate Fund, FIP, [Int. orgs.] want to access this money…they don't care about raising expectations in communities'. The same informant concluded: '[International organisation] are like a mini-Mafia. They already know REDD is dead.'

R-Package Progress

The R-Package was meant to be delivered to the FCPF in September 2015, but limited progress meant that this was delayed to June 2017. According to an international organisation informant, roughly only 30% of the overall strategy is complete in early 2017. Academia and government informants reported several delays in the development of the technical aspects of the strategy, due to lack of capacity and half of the technicians quitting the project during 2016. By all accounts, the reference emissions levels is the only part of the strategy actually

completed. However, according to an academia informant, some of the figures in the reference emissions levels were rejected by NGOs, as the number of credits to be generated was less than the NGOs had expected. An international organisation informant said that Guatemala needs to hurry up with the R-Package as if they haven't used the money by October 2017, they may need to return the readiness funding. Government and international organisation informants said that lots of different organisations are working on different parts of the strategy, so there is a lot being produced, but also duplication of efforts due to lack of effective communication between these organisations.

Several informants mentioned the significant lack of progress, and even the dropping entirely, of the drivers of deforestation and forest degradation (DD) component of the R-Package. According to a government informant, this signifies the lack of real investment in environmental issues from the organisations involved, and that if they do not include this information they will be in a 'garbage in, garbage out' situation where the problem of DD cannot be addressed due to lack of good information. Academia, international organisation and government informants suggested that the drivers analysis has been dropped because the identification of actors and drivers of DD could undermine the current power structures. However, Guatemala is the only country involved in REDD+ to have linked gender to all of the REDD+ components, investing a significant amount of resources in producing a detailed strategy and report.

The safeguards component, which involves the 'socialisation' of REDD+ with community consultations has only recently begun to be developed, however the actual consultations are still not underway. This has caused concern among actors, as a government informant notes that 'communities have the power', as without community (or NGO) support, there is unlikely to be a successful national REDD+ programme. However, a private sector informant disagreed, saying that communities are the 'darlings' of the projects, suggesting that REDD+ should integrate a wider set of actors to make it sustainable. Another government informant was sceptical of the safeguards process, as they believed the members of the Social and Environmental Safeguards committee were not 'legitimate' actors because they did not honestly represent indigenous communities.

Can the 2015 behaviours be validated using the 2017 data?

The three behavioural outcomes I identified as being ongoing/likely from the 2015 data appear to be validated by the 2017 interviews:

- The REDD+ process had been described as being 'technocratic' and lacking participation, the actors involved were confused and disagreed on the purpose of REDD+. From the 2017 interviews, the situation appears to have worsened. The actors involved in the process are mostly limited to NGOs, government and international organisations, with little to no participation by community organisations or private sector at this level (such as through stakeholder consultations, as it is the land users who will implement the activities to reduce carbon emissions and as such should be involved in discussions about how to distribute the resulting payments). Additionally, likely due to the lack of full participation of all actors, the different actors seem confused about the intentions of others, which causes conflict within the REDD+ negotiations process.

- Related to the alignment and integration priority from 2015, respondents believed that non-achievement of this priority was related to a preoccupation with other aspects of REDD+ development, with several specifically mentioning the benefits distribution mechanism taking priority. The 2017 focus on the LOI, which allows Guatemala to move to the payments phase of REDD+, confirms this preoccupation.
- Finally, the priority of the benefits distribution system was not being fully achieved in 2015 due to discussions not moving forward to actions, and the 2017 interviews lend further information and support to this situation.

Is REDD+ a good idea for Guatemala?

The responses to this interview question were used to explore the attitudes to REDD+ in 2017, and have been discussed below by sector.

One academia informant called the process 'very disappointing for all', saying that 'people thought REDD+ would totally fail' when talking about discussions they had relating to the LOI. The same informant, however, said that they wanted to still have faith in the REDD+ process, but that their faith was waning. They said that if they were to maintain their faith in the process the 'rules of the game need to be obeyed', but that currently REDD+ is too risky. Another academia informant suggested that local market schemes (for instance, voluntary carbon trading between communities/organisations/private sector at a national level) had better chances of reducing DD than REDD+, and mentioned that meetings were currently ongoing to explore capacities for this route. Local schemes could be implemented on shorter timescales than REDD+, involve communities or municipalities directly, opening the process up to local landowners which REDD+ cannot do. The attitude expressed by academia is disenchantment with the international processes and programmes.

Government informants said that REDD+ as a concept is a good idea, but in practice it doesn't work. They believed that international organisations use developing countries as 'experiments' for these programmes and as a route to accessing funds. One government informant's belief was that Guatemala needed to keep to what they have that is successful, such as the FIP schemes. The government attitude is that they have better approaches to forest management and conservation than REDD+ and the international organisations.

An international organisation informant believed that REDD+ was useful, but 'not the answer to all their prayers'. They believed that emissions reductions should not be the priority for countries like Guatemala, that care for the forest and reduction of DD was more important. Another international organisation informant said that REDD+ is a good idea if it can be aligned with other policy and institutional frameworks such as FIP, but if this is not possible REDD+ will not work. However, they added that they considered REDD+ to have had positive impacts in terms of how the concept of 'forests' has entered into other policies since REDD+ was introduced into the country and that the success of REDD+ should not only be measured in terms of its economic benefit. The international organisations have the attitude that REDD+ should be aligned with other international (and national) programmes.

An NGO informant described REDD+ as 'a private process', i.e. not a fully participatory process. They considered the global aspect of REDD+ a bad concept, as it allows big businesses to continue to pollute because they are buying carbon offsets. They also believe that the FIP

programmes are a better use of time and resources. NGOs attitudes appear to be that there are better options than REDD+, but gathering from their stances from the broader interview data, they do not trust in the government's national management approaches.

A private sector informant commented that 'the forest itself is hard to make sustainable, no matter what you do it doesn't pay off'. This concept of sustainability was very important to them, but they did not see REDD+ as a sustainable option as the international donors are looking for finite commitments, not to provide ongoing support - stating regarding funding of the monitoring and reduction of DD activities: 'the carbon is sold once, where is the [rest of the] money coming from?'. They believed that the country needed to think beyond immediate financial gains or they will 'always be a beggar'. This question of sustainable financing was the basis for their push to involve the private sector in the sustainable management of resources, as they have the resources and know-how to aid the other actors, but those actors continually give them the 'run around'. The attitude of the private sector is that REDD+ as an idea is unsustainable.

The attitudes of the different actors can be seen to be similar to those from 2015, covering themes such as disenchantment with the overall process and alignment and integration. However, the attitudes are overall more negative in 2017 compared to 2015 and lack the optimism that was present in 2015, although fewer decision makers were interviewed in 2017.

Have the negative capabilities from 2015 been addressed?

Below, the negative capabilities identified from 2015 are discussed in light of the 2017 data.

- **Lack of effective information systems:** The mechanisms in place for disseminating information to different actors do not appear to exist or to work in practice. There is also a continued lack of information and capacity available in terms of designing the strategy.
- **Lack of effective communication between state and NGOs:** Not only has this capability not been addressed, it appears to have worsened significantly.
- **Embedded ineffective organisational management practices:** The systems in process that lead to ineffective information and communication systems do not appear to be fully circumstantial, the ineffectual practices that occur as a result of events such as the presidential arrests were also apparent before this event, and continue to persist.
- **Cultural inequalities:** There is still a clear lack of engagement of the communities or indigenous population, meaning their voices are not being heard and cannot shape REDD+ policy. A knock on effect of the exclusion of the private sector from REDD+ discussions is that some community cooperatives classed as 'private sector' are also being excluded from REDD+ negotiations. Unlike the bigger corporations and elite families in the private sector, communities and indigenous groups are not cultural elite and do not have access to the same wealth, resources or social status, and cannot necessarily afford to be excluded from potentially important discussions that relate to their livelihoods.

It therefore appears that all of the negative capabilities present in 2015 continue to persist into 2017.

Are there new negative capabilities present in 2017?

Taking from the original values and capabilities table developed in 2015 (Figure 2), there are three additional negative situational capabilities and two negative social capabilities that relate to the issues highlighted from the 2017 data.

- **Lack of corporate regulation:** MARN has so far failed to make any headway in generating a registry of businesses and organisations that can trade in carbon credits, meaning that these organisations are independently trading on the voluntary VCS, risking invalidating the LOI and double counting of REDD+ credits.
- **Resource conflicts:** NGOs and the government are locked in conflicts over who can claim ownership of the 'environmental services' that relate to carbon stocks.
- **Uneven land tenure distribution:** The state owns significant amounts of protected land in Guatemala, which is a key reason for why the NGOs wish to obtain more land/carbon ownership rights from them, or from the smaller landowners. However the scattered distribution of private land ownership means that this is often not an effective approach.
- **Lack of challenges to embedded power structures:** The private sector includes some of the very large families, corporations and land holders in Guatemala. Instead of challenging these power structures, other actors exclude the private sector from the REDD+ negotiation process and avoid regulating their activities (see lack of corporate regulation), even though they will have a significant effect on land use.

What are the priorities (or behavioural intentions) for REDD+ in 2017?

From the data gathered in 2017, it is clear that both participation, negotiation and development and alignment and integration are still priorities for all actors involved in the REDD+ development process.

The benefit distribution system priority is also clearly still a major issue, as this relates very closely to the signing of the LOI. The Value of Political and Economic Equity (see Figure 3) now appears to interact with the intentions and behaviours quite significantly. However, it is clear that although all actors seem to want the LOI signed and wish to benefit from the funds that would be generated through REDD+ payments, how the actors wish to use these funds differs.

In Chapter 5, I demonstrated that the use of the BCD model and approach could identify and structure how Mayas and Ladinos had different ideas of how and when the forest should be used: as forest as life or as forest as opportunity; which I interpreted as differing value orientations. In this chapter, the issue of how and where different actors believe funds should be used may also reflect differing value orientations. In this case, the value orientations are likely to be specifically related to Valuing Political and Economic Equity, as this factor contains the majority of the relevant capabilities (see Figure 2). As such, these orientations will inform the intentions, specifically those related to the benefit distribution system.

Each of the main actors involved in the LOI narrative (government, NGOs and international organisations) appear to have differing value orientations:

- The government wish to use the funds to go into a central pot (the National Climate Change Fund) which will be redistributed to GCI members and used in a range of

activities related to climate change adaptation and mitigation. I will call this orientation **centralised**.

- NGOs (and community associations such as those involved with GuateCarbon) want to use the money to cover their running costs in order to help them continue to be involved in localised projects. I will call this value orientation **localised**.
- The International Organisations want to use the funds to enhance the country's capacity to be involved in REDD+ and other international programmes for climate change mitigation. I will call this orientation **globalised**.

To whom do the negative capabilities apply?

The different value orientations will then mean that the capabilities identified as relevant to the end behaviours are likely going to differ in relevance for each actor. Specifically, I focus on the negative capabilities associated with Valuing Political and Economic Equity, as this is the factor with the associated value orientations.

The negative social capabilities will have potential negative implications for all actors involved. Excluding communities due to cultural inequalities and lack of challenges to other actors in the private sector will risk communities refusing to engage with REDD+ projects, and resource and power struggles between other actors and the private sector. Existing conflicts between actors may then be exacerbated, potentially resulting in REDD+ having negative impacts on the environment and livelihoods.

In addition to the above, lack of corporate regulation, resource conflicts and uneven land tenure distribution affect international organisations, NGOs, community associations and private sector, but the government less so. Each of these negative situational capabilities would work against NGOs or communities accessing rights to credits or being able to sell them, and all would hinder international organisations as they would stall the REDD+ process. However, each of these can be considered positive capabilities for the government as they maintain the status quo: without a registry of who can buy and sell credits no other legal entity can, and without allowing other organisations to own protected land the government can ensure they have the rights to any funds generated.

The updated BCD model

The BCD model in Figure 20 displays the same values as those identified from the questionnaire data gathered in 2015, but the attitudes, intentions and behaviours have evolved from the behaviours identified in 2015. This aligns with the fact that none of the negative capabilities identified from the 2015 data appear to have been addressed, and therefore the intentions and behaviours related to these must still be present. Notably, Figure 20 shows that the values, orientations and intentions of the actors are all 'good'. The context of Guatemala, specifically the negative social capabilities present, means that actors can take advantage of certain systems (i.e. those defined by the negative capabilities: weak corporate regulation, corruption as an 'accepted' practice in the lack of challenges to power structures etc.) in order to achieve their agendas. By themselves, these may not necessarily exacerbate DD, but they do maintain the status quo and the associated negative situational capabilities. Together, these actors and their agendas also conflict and compete, forming yet another negative capability.

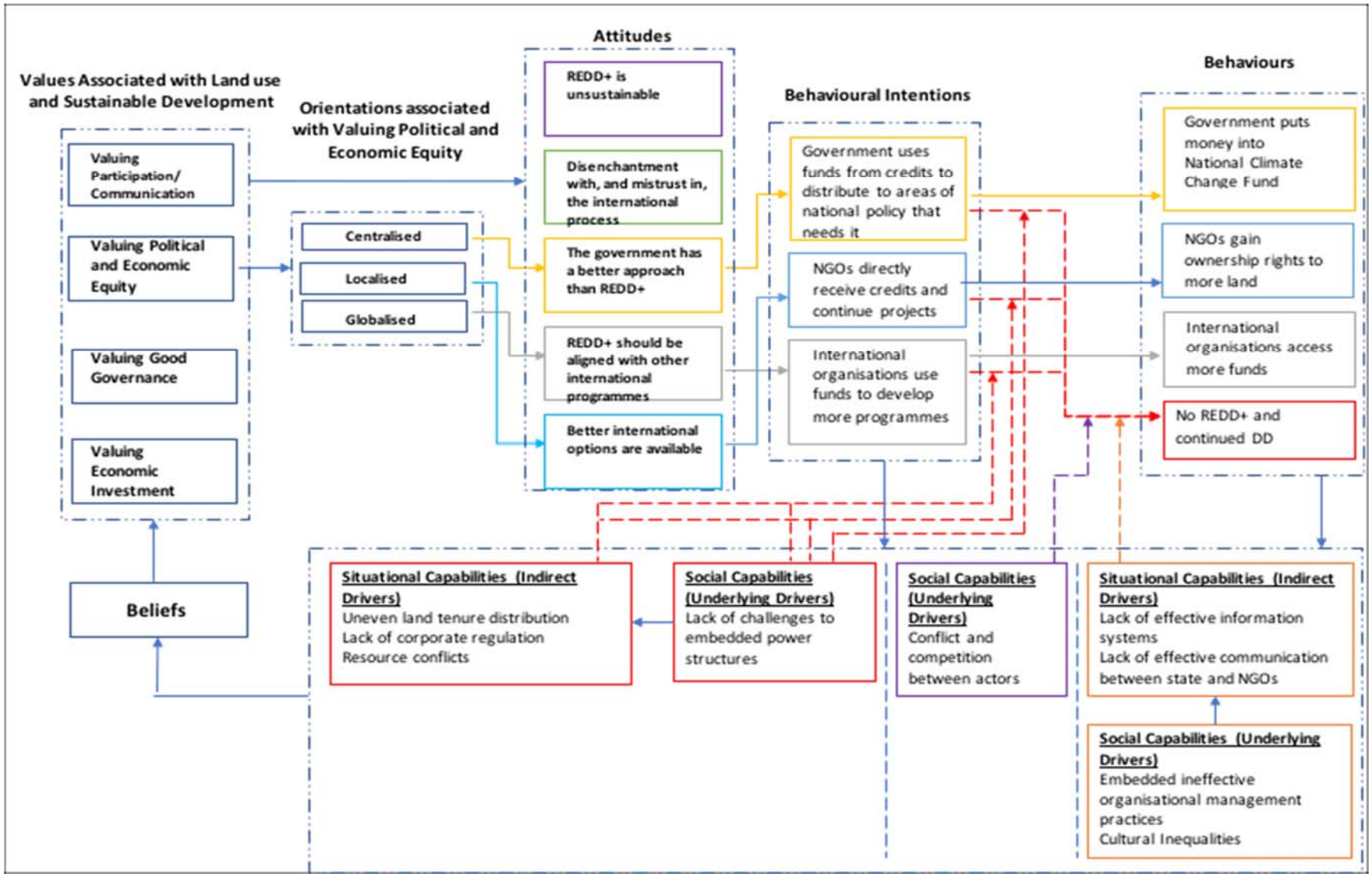

Figure 20: Values, attitudes, intentions in the BCD model with negative social and situational capabilities from Figure 2 to explain the end behaviour

Discussion

Has the BCD model and approach identified and structured both drivers of DD and barriers to transformational change?

Figure 20 shows that there are multiple negative capabilities associated with the development of the REDD+ process in Guatemala, which can be considered as barriers to transformational change. In Part 1, the BCD model and approach also identified negative capabilities that were not identified as acting within the REDD+ negotiations, but are likely to act more at the land user level (e.g. lack of effective family planning, environmental education and varied employment opportunities). This suggests that the BCD model and approach has successfully identified and structured both drivers of DD and barriers to TC.

In order to understand fully how these drivers of DD and barriers to TC are linked, it is necessary to combine the results from the RBSM (Chapter 4), Sarstún Motagua (Chapter 5) and REDD+ decision makers (this chapter). I will present this discussion in Chapter 7.

Other countries' experiences with REDD+

In a review of the realities of REDD+ implementation across 13 countries, Loft et al. (2017) concluded that "REDD+ policies in all countries studied are at high risk of ineffectiveness, inequity and inefficiency." (p44). Brockhaus et al. (2014) also noted that implementation of REDD+ is at risk of being dominated by 'business as usual' practices.

In Part 6.1, I found that one of the behavioural outcomes was confusion and disagreement on the purpose of REDD+, and from 2017, I saw that conflict and competition between actors was a negative social capability affecting the negotiations for REDD+. In Tanzania, Kweka et al. (2015) found that the aims of REDD+ were also being subsumed by other well-funded donor interests and initiatives. The conflict and competition between actors also relates to our findings where excluding certain groups from decision making processes due to cultural inequalities was influencing the REDD+ negotiations.

Similarly, in Brazil (Borner et al., 2010) and Vietnam (Pham et al., 2012), the majority of forested land is owned by large scale landowners or the state respectively, meaning that payments for reduction of carbon emissions will often go to these large actors, potentially leading to an increase in the inequity of payments and land distribution (also another issue I identified in this chapter). In this way, Loft et al. (2017) note that sometimes designing 'efficient' emissions reduction mechanisms that target actors that cause the most deforestation can increase inequalities. Inequalities have also been exacerbated through the non-inclusive REDD+ decision making processes in Cameroon, which resulted in reinforcing the historical marginalisation of indigenous groups and women (Assembe-Mvondo et al., 2015; Dkamela et al., 2014).

In relation to Figure 20, I discussed how each of the actors' values and intentions were often 'good', but competing intentions can lead to decision makers taking advantage of negative capabilities to produce inequitable outcomes. Similarly, Chomba et al. (2016) summarised the implications of their results of exploring the REDD+ process in Kenya: "By illustrating how current, well-intended, REDD+ efforts inadvertently come to entrench a long process of

dispossession of marginalized people, I call attention to the pivotal importance that historical context plays in discussions of equity and social safeguards related to implementing REDD+ initiatives and related policy." (p202). As well as agreeing with our results on barriers to TC in REDD+, the results from Chomba et al. (2016) reflect our conclusions from the Sarstún Motagua data in Chapter 5, where I discussed the role of path dependencies due to historical social and cultural events (e.g. cultural inequalities and misunderstandings) leading to cycles of bad policy and other intervention design; and further cultural inequalities and misunderstandings.

In several assessments of REDD+ negotiations it has been identified that decision making processes are captured by predominantly governments, international donors and agencies and private sector actors, with little involvement of indigenous groups and other local people (Babon and Gowae, 2013; Mpoyi et al., 2013; Müller et al., 2014). In a situation very similar to Guatemala, REDD+ policies in Nepal were found to be influenced by a 'triad' of government agencies, international actors and powerful civil society organisations (Paudel et al., 2013). In a review of REDD+ readiness activities by Cerbu et al. (2011), governments made up the majority of actors involved in REDD+ negotiations, with NGOs a close second, then international organisations and finally, the private sector. The effects of this uneven distribution of decision making involvement can be seen, as in Cameroon, by indigenous actors having limited opportunities and capacity to access benefits (Pham et al., 2013).

Elicitation of 'carbon rights', related to land tenure issues, has also been identified by Loft et al. (2015), leading to competing claims by stakeholders, as seen in Cameroon (Dkamela, 2011), Peru (Wieland, 2013) and Vietnam (Loft et al., 2015) as well as in my results. Dkamela (2011) and Indrarto et al. (2012) also found that there was a high risk of illegal appropriation of use rights for gaining carbon credits in Cameroon and Indonesia, countries with high levels of corruption. Corruption as a result of REDD+ (or the potential for it) has also been discussed by several authors (Brown, 2010; Larmour, 2011; Sheng et al., 2016; Tacconi et al., 2009).

My results also suggest that unreliable international financing arrangements and distribution was a problem for REDD+ development in Guatemala, which was also a finding for Sunderlin et al. (2014), who suggested that insufficient or unreliable international funding for REDD+ has been a major obstacle to REDD+ implementation. In a study of REDD+ in South West Uganda, Twongyiwe et al. (2015) found that civil society organisations were considered the best organisations to handle the REDD+ funds, as the government had limited credibility, in a situation similar to Guatemala.

In almost all countries reviewed, Loft et al. (2017) found that there is a lack of leadership by the central government with respect to REDD+. They found that this leads to unstable power relations and poor coordination between ministries. In a review of multilevel governance challenges for REDD+, Ravikumar et al. (2015) (and others e.g. Dkamela, 2011)) also found that poor inter- and intra-sectoral communication continually undermined REDD+ coordination processes, similar to the ineffective communication systems and processes between the state and non-state actors I have seen in Guatemala.

As Guatemala is a late starter to the REDD+ process, it could be expected that they have learnt from other countries about the potential pitfalls in its negotiation and development, but it is

clear from my results that this is not the case. As many of the same issues have been encountered by other countries involved in REDD+, this suggests that the REDD+ mechanism itself is open to failure. In fact, in the case of Guatemala, I have seen that the presence of REDD+ seems to have had a negative effect on relationships among actors, which, according to some key informants, is not experienced to the same extent in other fields of national negotiation and discussion.

In response to these repeated findings on the negative experiences of negotiation and implementation of REDD+ across the world, some authors (e.g. Cabello and Gilbertson, 2012; Loft et al., 2017) have suggested that REDD+ as a mechanism (and the FCPF (Dooley et al., 2011; IEG, 2012)) should be reviewed, as it appears fundamentally unsuited to the contexts for which it has been designed, a conclusion which my data supports.

Comparing REDD+ with other approaches to climate change mitigation

Is REDD+ any better or worse than other similar mechanisms for mitigating climate change?

The Clean Development Mechanism (CDM) was set up by the United Nations Framework Convention on Climate Change as part of the Kyoto Protocol and is often considered a successful forerunner to REDD+ (Lederer, 2011). Within the CDM, there appear to be similar problems to REDD+, for instance the fact that there is often a trade off between environmental aims and cost effective generation of carbon credits (Lövbrand et al., 2009). This has led to some authors to suggest that the mechanism should be abandoned as it will not solve the underlying problems (Lohmann, 2009). Similarly, the negotiation process for the CDM has been criticised for appearing transparent, but in reality excluding key actors and as such it has not been delivering effective local benefits (Boyd et al., 2009; Lövbrand et al., 2009). Elite capture has also been highlighted as a potential issue for the CDM, where private agents validate projects (Lund, 2010).

Although there are several similarities between the CDM and REDD+, there are important differences in how and where they work, which likely accounts for the broadly cited success of the CDM. Firstly, forestry projects make up less than 1% of activities under the CDM due to the associated high costs and administrative problems (Thomas et al., 2010), and secondly, the majority of CDM countries are successful emerging economies where low cost emissions reduction opportunities could be developed (unlike for REDD+) (Grubb et al., 2011). However, the CDM does provide lessons for REDD+, especially in the sense that the CDM has been re-regulated many times (Lederer, 2011), and therefore, so may REDD+.

Payments for Ecosystem Services (PES) schemes are designed to encourage land users to adopt conservation or restoration practices for ecosystems in return for economic incentives (Engel et al., 2008; Van Hecken et al., 2015). PES is often criticised for its market-based approach to conserving ecosystem services, an approach which has been developed and pushed onto many countries by large multinational organisations (often based in the 'global north') (Büscher, 2012; Ervine, 2010). This argument has also been highlighted within the REDD+ literature (Cabello and Gilbertson, 2012; Holmgren, 2013; Nielsen, 2014), as well as within the key informant perspectives from this chapter. Also similar to REDD+, PES mechanisms have been criticised as their transactions are thought to conceal deeper power structures and lead to increased inequality (Van Hecken et al., 2015), where Ervine (2010)

suggests that this can lead to increased competition for control over resources. For instance, Rodríguez-de-Francisco and Budds (2015) found that community based PES schemes in Columbia reinforced existing cultural inequalities within the community due to unequal distribution of land and power between community members, all issues identified as common with the REDD+ context in Guatemala.

Integrated Conservation and Development Projects (ICDPs) have been extremely popular approaches to environmental conservation for the past few decades (McShane and Wells, 2004), but their popularity has waned with the rise of more global approaches such as REDD+. Like REDD+ however, ICDPs have been criticised for not having clear and well defined goals (Robinson and Redford, 2004), and discourses about ICDPs have often centred around 'win-win' discourses without acknowledging the necessary trade offs (Sunderland et al., 2007), an issue identified in several REDD+ discourses (Di Gregorio et al., 2013). Lack of collaborative decision making and involvement of all relevant stakeholders has also been a pitfall for ICDPs (Blom et al., 2010), similar to REDD+ in Guatemala and globally.

From a brief review of these similar interventions, it appears that the issues identified as part of the REDD+ mechanism are not unique to REDD+. This suggests that any conclusions or recommendations I can make on how to identify and tackle these negative capabilities can also be applicable to a variety of other policies, interventions, tools or mechanisms.

Does the BCD model and approach provide a useful practical tool for decision makers?

Identification of the complex social and cultural drivers of DD (and barriers to TC) is one of the challenges for assessments of drivers of DD (Kissinger et al., 2012). I have shown that the BCD model and approach has been successfully applied to identify linked situational and social drivers of DD and barriers to TC. Furthermore, these drivers are often the hardest to quantify and link to land use outcomes such as forest cover change (Hosonuma et al., 2012). I generated quantitative data on the shared values in the form of factor scores and linked them with percentage forest cover change. As discussed in Chapters 4 and 5, this approach could be expanded upon and combined with improved location and landscape level GIS data for larger scale assessments of drivers of DD and their relationship to land use change.

However, the results in this chapter have highlighted the lack of priority status assigned to uncovering drivers of DD as part of the R-Package development. Instead, the focus has been almost entirely on the benefits distribution system. The feedback from key informants also raised the issue of potentially challenging the status quo and whether assessments of drivers of DD are placed at a low priority due to this negative social capability. Therefore, the very barriers to transformational change that are identified in my results appear to be the barriers stopping assessments of drivers of DD happening. This effectively puts any efforts of reducing DD or achieving transformational change at a standstill, as such rendering the BCD model and approach less useful at a practical application level. This has been called a 'stagnated pattern' by Termeer et al. (2013).

The limited focus on creating transformational change in REDD+ processes, or 'stagnation' is, however, not unique to Guatemala, as Rakatama et al. (2016) found in a review of the costs

and benefits of REDD+, concluding that the rarity of consideration of the costs associated with reforming governance and ensuring transparency and legitimacy in REDD+ development is problematic. Similarly, Caplow et al. (2011) and Paudel et al. (2015) also found that evaluations of REDD+ were often 'afterthoughts' and that these evaluations often lacked rigour and good experimental design, meaning that even the identification of barriers to transformational change often identified at this stage was compromised.

What can be done to tackle these negative capabilities?

Although there has been recognition of the issues associated with barriers to TC in the REDD+ process globally, there remains little detailed exploration of the issues and few real policy approaches developed to tackle them (Bofin et al., 2011).

The fall of the government of Guatemala in 2015 caused many problems for the development of REDD+, and undoubtedly to other sectors in Guatemala. The fall was in part due to the intervention of the UN-backed International Commission Against Impunity in Guatemala (CICIG). The CICIG investigation has been hailed as a success (Andersson, 2017; García and Toscano, 2017), however, some have argued that even with the CICIG intervention, corruption is still likely to occur due to the ties between the current government, prosecuted military officers and traditional power structures (González Chávez, 2017) and the entrenchment of criminal structures in the state (Beltran, 2016). This thesis does not begin to explore the power structures that act at the highest levels in Guatemala. The scale of the problem of embedded power structures goes very deep in Guatemala (Briscoe and Pellecer, 2010; Gavigan, 2009), and as such their interests will shape many decisions which will influence REDD+ decision makers and land users identified in this thesis. However, this does not mean that there are not still options for challenging these power structures.

García and Toscano (2017) argue that corruption is a problem that has to be tackled from many sides and by many different actors, noting that the success of the CICIG investigations was down to several factors: external influence (i.e. CICIG), non-traditional communication methods and a participative and informed public. Garnica (2016) also discussed whether the events of 2015 indicated a 'social awakening', concluding that although there is evidence to show that there was some form of awakening in 2015, there remains a hole in public memory of Guatemala's historical events relating to human rights issues, which needs filling in order to ensure momentum in tackling these issues. Therefore, multiple complementary options for tackling corruption and the other barriers to TC need to be found to complement actions such as those through CICIG to ensure their sustainability.

Hauser (2016) and Fischer (2016) noted that a fundamental change in perceptions, attitudes and values is necessary for transformational change in REDD+. Expecting countries to tackle these highly complex drivers and interactions at the social and cultural level may be a large expectation, but drawing attention to them as important issues that are clearly linked with land user capabilities and drivers of DD is an important step towards those countries eventually managing to generate enough awareness and capacity to address these issues. In agreement with this suggestion, Huynh and Keenan (2017) posited the solution to the stagnated policy processes is to 'revitalise' the policy process, first by bringing decision makers' attention to the causes and patterns of these stagnated patterns. Then, space will be created to form a new 'middle ground' for actors to generate new ideas through social

learning processes. In a case study of REDD+ in Papua New Guinea, Babon et al. (2014) discussed results which attest to the real-world workability of this idea, where they found beliefs associated with transformational change were becoming more popular, forming greater and more powerful coalitions for transformational change, which in turn was influencing the policy preferences of decision makers.

Tacconi et al. (2009) have noted that tackling issues such as corruption are beyond the scope of REDD+, and tackling corruption in countries with high levels of corruption (which is many) is likely to be ineffective. However, taking a view that goes beyond the short term or immediate impacts of interventions to tackle these negative capabilities is an important aspect. For instance, increasing transparency has important implications for corrupt practices and challenging the status quo, as well as education and participation among decision makers. With greater access to information and bureaucratic processes, actors can increase their knowledge of the system, providing further benefits to their ability to actively participate in other decision making processes and hold others to account (Kolstad and Wiig, 2009). Loft et al. (2017) also suggest that focusing payments for reducing emissions on actors that have continually sustainably managed the forests could bring about more equal payments distribution systems, although the trade-off would be that there may be less efficient reduction of emissions. However, I would argue that this trade off would only be an issue in the short term, as this approach would reduce the negative social capabilities by challenging the status quo, increasing the likelihood for transformational change and sustainability in the long term.

Conclusions

In Part 2, I successfully validated the behavioural outcome results from the 2015 data, where a technocratic process and preoccupation with the benefits distribution system - yet little actual progress - characterised the situation of REDD+ from September 2015 to March 2017.

The results from Part 2 focused primarily on the 'internal' decision making process and capabilities associated with REDD+, and when compared with the results from Part 1, supports the conclusion that the BCD model and approach can identify drivers of DD and barriers to TC, and the links between them. The BCD model and approach therefore provides a useful practical tool for decision makers designing policies and other interventions, enabling them to explore and structure drivers of DD from different perspectives, and how they are linked. However, from a brief review of REDD+ and other interventions in Guatemala and abroad, it seems that the negative social capabilities that act as barriers to transformational change (such as lack of challenges to embedded power structures, weak corporate regulation and cultural inequalities) are not unique, and that these will need to be addressed before countries are likely to use a tool such as the BCD to improve their policy and intervention design.

Tackling these negative capabilities should involve a long-term, holistic approach that goes beyond REDD+ (or similar policies, interventions, tools or mechanisms for mitigating climate change) and immediate or localised changes. Investment in interventions that encourage social learning, cultivation of shared beliefs and values, and an understanding of the barriers to transformational change that characterise the policy making process are important steps towards sustainable, transformative change.

CHAPTER 7: DISCUSSION AND CONCLUSION: DRIVERS, INTERACTIONS AND IMPLICATIONS FOR THE BEHAVIOUR-CAPABILITY-DRIVERS MODEL AND APPROACH

Chapter Summary

In Chapter 6, I identified a number of negative capabilities that acted at the REDD+ decision maker level as barriers to transformational change, as well as some negative capabilities that would act directly at the land user level. In order to understand fully how these drivers of DD and barriers to TC are linked, and therefore to what extent barriers to TC should also be considered as drivers of DD, it is necessary to combine the results from the RBSM (Chapter 4), Sarstún Motagua (Chapter 5) and REDD+ decision makers (Chapter 6). In this chapter, I will first discuss how different drivers can be linked using the combined results from the previous chapters. I will then broaden the discussion to the implications of my results on wider behavioural theory, linking back to the original conceptual model developed in Chapter 2, before concluding the thesis.

Driver interactions across land users and decision makers

In each chapter, a number of negative social and situational capabilities were identified from each shared value. Figure 21 displays the negative capabilities identified from the results chapters. In each chapter, a number of negative social and situational capabilities were identified from each shared value. The negative social and situational capabilities from each value have been connected using a single line in Figure 21. The negative capabilities connected with an arrow are those that have been shown to have causal relationships, for example those from Chapter 5 relating to Ladino and Mayan behaviours, and those in Chapter 6, Part 2 related to REDD+ decision maker capabilities.

In Figure 21, we can see that in the REDD+ decision makers' causal diagram, the negative social capability of cultural misunderstandings was identified by decision makers as leading to lack of varied employment opportunities and inefficient sustainable management schemes. In the Sarstún Motagua chapter, we can also see that the negative social capability of cultural misunderstandings at the policy making level can lead to policies that lead to few alternative economic opportunities (a particular issue for Ladinos) and restrictive land/forest use regulations and lack of secure land tenure (a particular issue for Mayans). These results suggest that decision makers are aware that culture is an important determinant in how people use land in Guatemala, however it is unclear to what extent decision makers apply this understanding to policy and intervention design.

In the RBSM land user diagram in Figure 21, weak national and international challenges to corruption is linked to restrictive land/forest use regulations and few economic opportunities. For the REDD+ decision makers, lack of challenges to embedded power structures leads to lack of corporate regulation, resource conflicts, lack of law enforcement capacity and uneven land tenure distribution. The majority of land in Guatemala is owned by private companies, and resource conflicts often occur between indigenous communities and these larger private sector actors (Zander and Durr, 2011). Although in Chapter 6 the decision makers were mostly discussing the uneven land tenure distribution among government and NGOs, the broader issue of uneven land distribution and resource conflicts can combine to create potential restrictive environments for land users, who may suffer from lack of secure land tenure and resort to 'invasions' (Clark, 2000), thus linking the negative social capability of lack of challenges to corruption across land users and decision makers.

Both the Sarstún Motagua and RBSM land user analyses highlighted the same links between low social mobility and high inequality and few alternative economic opportunities, restrictive land/forest use regulations, lack of information and technical/financial capacity for good agricultural practices and land use and lack of environmental education. The REDD+ decision makers did acknowledge the links between cultural inequalities, resource conflicts and uneven land tenure distribution, but they did not identify any links between cultural inequalities and employment or education. Once again, when it comes to understanding cultural differences, it is unclear to what extent REDD+ decision makers take these into account, especially outside of the forestry and land use sector.

In the REDD+ decision maker diagram, the negative social capability of embedded ineffective organisational management practices is linked to the negative situational capability of lack of effective communication between state and NGOs. In the RBSM diagram, weak

communication and engagement between the state and communities has also been identified, but as a negative social capability, which leads to the negative situational capabilities of few economic opportunities, lack of technical/financial capacity for good agricultural practices and lack of environmental education. There are subtle nuances in how these negative capabilities play out in the RBSM land user and REDD+ decision maker context which can help to understand how they link together. For the RBSM land users, they perceive that they have little communication with the state, that the state does not provide them with enough resources, but they also have little trust in the state's ability to manage the land in comparison to communities (see Chapter 4). However, from the decision maker's point of view, the key communication lines to communities are through NGOs, and it is the systems at the decision making level that render this ineffective. The decision makers did also link the negative social capability of ineffective organisational management practices to insufficient investment in basic services and lack of effective information systems, which does suggest that they do understand that the problems within the decision making processes have impacts on land users (and outside of the forestry sector), but there also appears to be a disconnect between all actors regarding what lines of communication should be (or are) open.

In Chapter 6, the lack of acknowledgement of the similarities and implications of the links between barriers to transformational change and drivers of DD was introduced. By looking at all three case studies, it is possible to see connections (some causal) that act across decision makers and land users, supporting the idea that what goes on 'inside' the decision making arena does indeed affect land users, and their behaviours.

These combined results also strengthen the conclusions from Chapter 6, Part 2, where it was apparent that in order to tackle the drivers of DD, it is necessary to address the negative social capabilities that act at all levels – from the highest levels of the decision making process to the land user community levels. Challenging embedded power structures and ensuring that an understanding of cultural differences is carried through into policy and intervention design in and outside of the forestry sector, in particular, appears to be important for tackling DD. As discussed in Chapter 6, Part 2, investing in interventions that encourage social learning and cultivation of shared beliefs and values could be useful for achieving this cultural awareness.

The fact that the two 'weak communication' negative capabilities from the decision makers and RBSM land users have been categorised as social and situational respectively, also highlights the importance of perspective on the issue. From the point of view of the RBSM land users, it is not possible to understand that 'the system' is flawed from the decision maker perspective, and so it makes sense to categorise weak communication lines as a negative social capability. However, when it is understood that there are normative failings within the organisational management systems at the decision making level, it is clear that this is a negative social capability which will then affect the situational capability of ineffective communication between actors/sectors. Therefore, recognising that the negative capabilities that act at the decision maker level are also drivers of DD is incredibly important to tackling DD.

This discussion therefore supports the theory of the BCD model where negative social capabilities influence situational capabilities. The implications on behavioural theory are discussed in more detail in the next section.

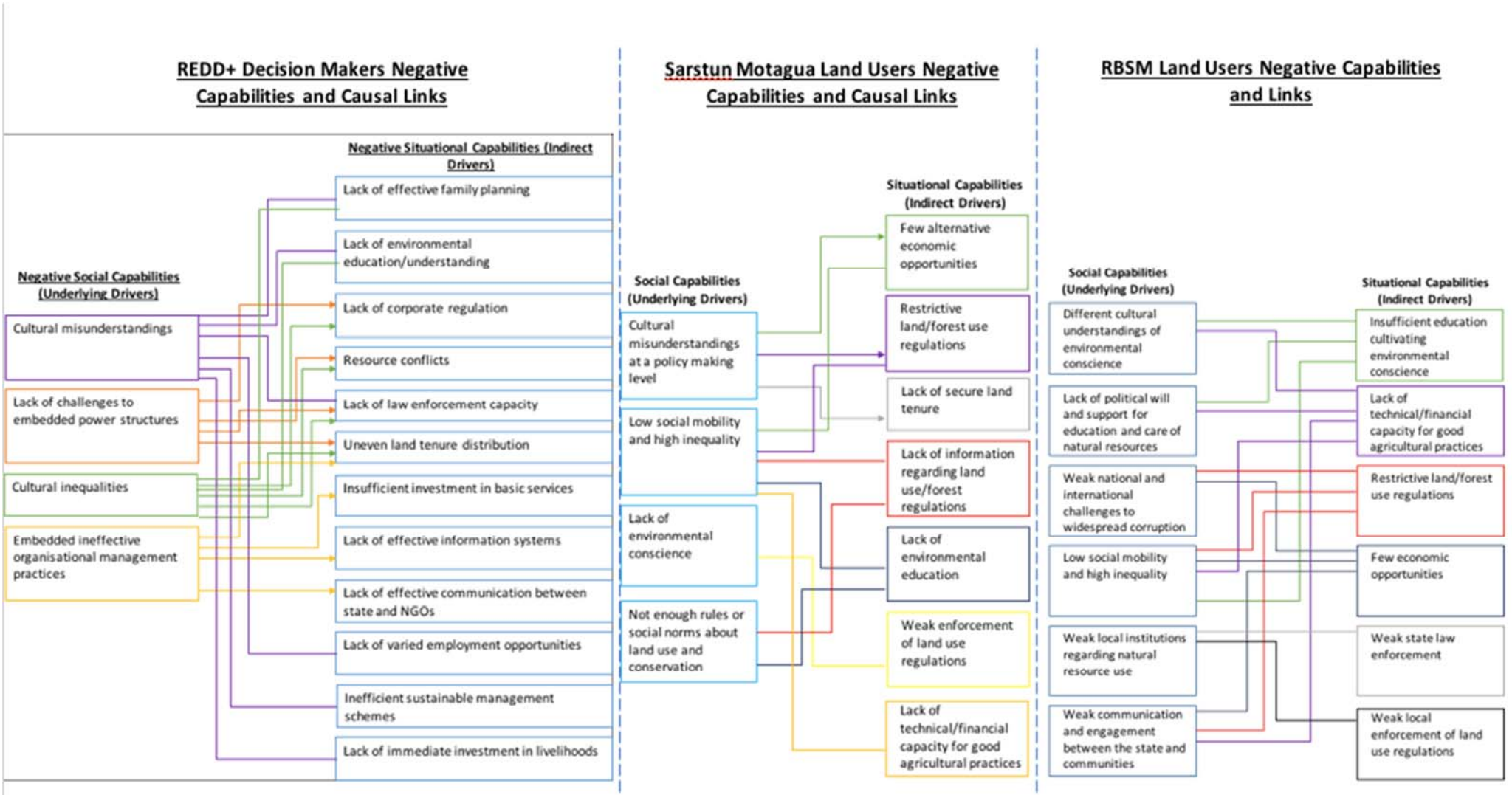

Figure 21: Map of all negative capabilities identified from Chapters 4 (RBSM land users), 5 (Sarstún Motagua land users) and 6 (REDD+ decision makers), by linking the negative social and situational capabilities per factor.

Reviewing the Behaviour-Capability-Drivers Model

Figure 22 shows a revised Behaviour-Capability-Drivers (BCD) model, based on the combined results from this thesis. The blue boxes and arrows represent factors and causal links that are common to broader socio-psychological behavioural theory that I included in the original BCD model, while the green boxes and arrows represent factors that I added to socio-psychological theory to develop the BCD model (i.e. shared values and capabilities) (see Chapter 2). The yellow boxes and arrows in Figure 22 represent factors and links that were uncovered through the results from this thesis.

Chapters 4 and 6, Part 1 both provided proof of concepts for the BCD model and its application to case studies to identify and structure drivers of DD (and barriers to transformational change). Chapter 5 and Chapter 6, Part 2 elaborated on these initial results, strengthening the basis for the theory behind the BCD model in terms of the use and importance of shared values and capabilities for understanding behaviours.

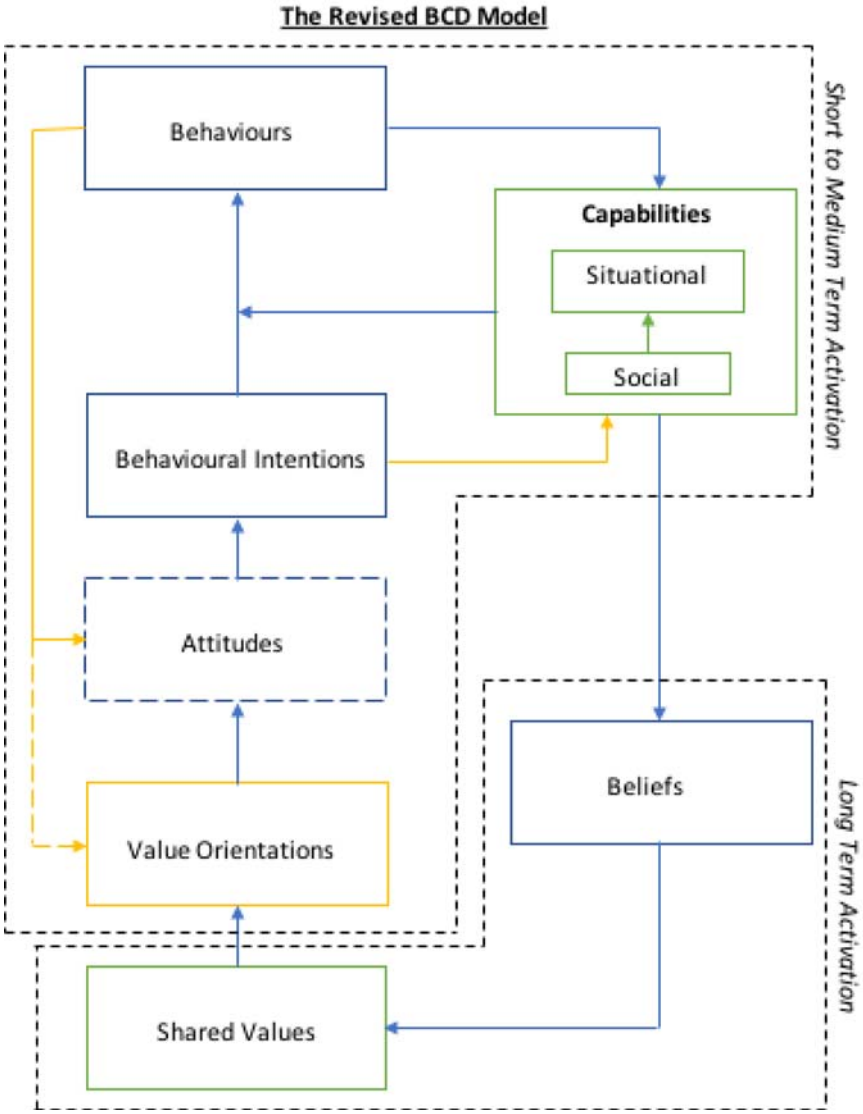

Figure 22: A revised version of the Behaviour-Capability-Drivers model based on the combined results from this thesis

Revisions to the original BCD model

Value orientations

Results from Chapter 5 indicated that capabilities become relevant to actors depending on their behavioural intentions. However, in order to understand the intentions, there needs to be an understanding of the value orientations for different actors, which can be derived from the shared values. Chapter 6, Part 2 validated this result, identifying value orientations associated with a certain shared value that were particular to a situation that had arisen as part of the REDD+ development process. These orientations related to specific attitudes and intentions, and changed which capabilities were relevant to different actors.

According to Fulton et al. (1996), values (in the case of the BCD, shared values) underlie value orientations, which more directly affect attitudes and behavioural intentions. Vaske and Donnely (1999) and Manfredo and Fulton (1997) also found that attitudes mediate the relationship between value orientations and intentions. Therefore, in Figure 2, arrows have been added to show how value orientations are derived from shared values and influence behavioural intentions (through attitudes), then behavioural intentions influence the capabilities relevant or available to actors.

Attitudes

The attitudes box in Figure 22 has been made dotted. Attitudes mediate the relationship between value orientations and behavioural intentions. In Chapter 6, Parts 1 and 2, attitudes towards the REDD+ process were identified which clearly fitted with the rest of the information in the model. However, Chapters 4 and 5 did not explore attitudes, yet accurately identified value orientations, behavioural intentions and the link to behaviours with the inclusion of capabilities. These results indicated that to understand the capabilities available to different actors, it is the behavioural intentions that appear to be the most important.

Poppenborg and Koellner (2013) explored whether attitudes towards ecosystem services could determine land use practices (behaviours) in South Korea. They found that in some cases, attitudes could accurately predict behaviours but that in the majority of cases, financial capabilities determined actors' final land use behaviours. Their results support those of other authors that suggest attitudes can predict behavioural intentions, but other factors (or capabilities as we have conceptualised them in the BCD model), often determine the end behaviours.

'Activation' of attitudes and value orientations

As mentioned above, Chapter 6, Part 2 explored a revised set of attitudes and intentions related to REDD+ that arose in response to specific behaviours that had been identified in Chapter 6, Part 1, and had evolved into a change in circumstances – or rather a focus on the Letter of Intent and the benefits distribution system for REDD+. These behaviours, or focus, appear to have 'activated' specific attitudes and value orientations associated with a shared value most closely related to the circumstances, which were not apparent in Chapter 6, Part 1. The term 'activated' has been used here, as it has been used in a similar context in the Norm Activation Model (Schwartz, 1977) to

describe the process by which norms (considered to be present at all times in the cognitive process) start to exert significant influence within a situation.

Value orientations are thought to contribute to the action dependent on its relevance to said action and its importance to the actor (Manfredo and Fulton, 1997; Schwartz, 1994; Shalom H Schwartz, 1992; Tetlock, 1986), and have since been found to change in relation to external circumstances such as increases in commercial forestry (Berninger and Kneeshaw, 2009), or in response to changing levels of education (Sharaunga et al., 2015). Milfont and Duckitt (2004) and Milfont and Gouevia (2006) also explored the impact of different value orientations on predicting behaviour, and found that specific orientations predict specific attitudes and behaviours – e.g. preservation value orientations could only predict ecological behaviour, while utilisation value orientations could not. These results align with ours, where value orientations associated with different shared values may be 'activated' depending on the circumstances (or behaviours) in question, and relate specifically to the current external circumstances and behaviours.

Therefore, new arrows have been added to Figure 22 linking behaviours directly to attitudes and value orientations. As attitudes are known to be specific to certain behaviours (Li et al., 2010), the arrow between behaviours and attitudes is solid. However, the arrow linking behaviours to value orientations is dotted, as the results from Chapter 6, Part 1 suggest that if all actors' shared values and intentions are aligned, understanding specific orientations is not necessary for understanding final behaviours.

Short to medium term feedback cycle

Chapter 6, Part 2 demonstrated the short to medium term feedback cycle present between behaviours, value orientations, (attitudes), behavioural intentions and capabilities, where all had altered somewhat within a period of 18 months in response to changing circumstances. The shared values were still relevant, in agreement with the literature that states that shared values are stable over longer periods of time (Ajzen, 1991; Schwartz, 2001; Stern et al., 1999), while attitudes and behavioural intentions reflect 'snap-shots' of time (Beedell and Rehman, 2000). Although no specific timescale was explicitly stated in their study, results from Schelhas and Pfeffer (2010) also suggest that it takes time for external circumstances or information to influence beliefs and become genuinely integrated as values. In their study of communities' values associated with neighbouring national parks in Costa Rica and Honduras in response to exposure to conservation programmes, Schelhas and Pfeffer (2010) found that although there are shifts in people's value discourses, they were often formulaic and not fully integrated as values. However, as people began to connect their own experiences with the programmes, more genuine integration could be seen. Therefore, Figure 22 shows two dotted black boxes, one with the short to medium term activated factors included (top) and the other with the long term activated components (bottom, including shared values and beliefs).

Means

In the initial proof of concept for the BCD model and approach in Chapter 4, I attempted to identify means (from Robeyns' Capability Approach) as part of the approach. In

Robeyns' conceptualisation of the Capability Approach (2005, 2003), the means needed to undergo 'conversion' before their effects as capabilities can be understood. Therefore, the means by themselves are not adequate for understanding how actors can achieve their values, and only make sense in the context of capabilities. In Chapter 4, means were briefly explored to see whether their identification could provide a richer context to the capabilities. However, a lack of an appropriate approach due to practical constraints meant that this added little to my understanding of the capabilities. The results from subsequent chapters have suggested that an understanding of 'negative capabilities' alongside shared values, value orientations and behavioural intentions, without the means, is adequate for understanding end behaviours. Therefore, as I did not actively explore means in two of the three case studies, and the model works well without them, they are not included in Figure 22.

Reviewing the Behaviour-Capability-Drivers Approach

Often models or methodologies for identifying and structuring drivers of DD are developed in isolation, ultimately causing problems for effective policy and intervention design. Although it was not possible to test the use of the model and approach by policy makers, I discuss below some lessons from my application of the model that may contribute to its potential further use.

Exploratory factor analysis (EFA), worked well within the overall approach to help identify shared values and attitudes, as well as providing a method of translating this information into quantitative data (in the form of factor scores). There will always be 'lost' richness of data if EFA is used, especially from the initial interviews and workshops that were used to generate the initial data used to create the belief/attitude statements. However, this loss can be seen as part of a trade-off where richness of a limited dataset is sacrificed for the availability of a much larger dataset that can be used for further analysis – exploring significant differences between stakeholder characteristics groups and comparing with forest cover change data. I tried to account for the 'lost' information from qualitative sources by validating the EFA results using focus groups/follow up interviews, which also built a detailed picture of the decision making processes of land users and decision makers in Guatemala.

In Chapter 5, I demonstrated how the approach can generate linked quantitative data on the shared values and forest cover change that provided insights into how different cultural groups act in relation to a shared value. Unfortunately, due to problems with the questionnaire design and dissemination, I was unable to gather accurate location data in the questionnaire, which would have been useful for linking the shared value factor scores to actual forest cover change data for the area (other than just self-reported). However, Chapter 6 does provide a useful proof of concept for how this could work in the future, with improved survey design and dissemination that was more explicit about the type of location data required.

Chapter 6, Part 2 demonstrated how the model and approach could be applied to 'updated' circumstances and provide useful information about the different behavioural intentions and capabilities available to actors using only a set of interviews with key informants. This could be useful and quick for decision makers who want to know

whether their intervention has been effective, without having to redo the entire methodology. However, this would only work within certain timescales, as eventually shared values will change. I explored circumstances 18 months apart, and found that behavioural intentions and capabilities had changed, however none of the previous negative capabilities had been addressed. According to the theory behind the BCD model, the capabilities would need to be addressed for any changes to actually occur at the belief and values level (see above and Chapter 2). Therefore, the shared values are likely to be accurate until the capabilities are addressed, and in accordance with the results of Schelhas and Pfeffer (2010), even after the capabilities are addressed, it may still be a while until these changes are fully integrated into shared values. Therefore, understanding the interactions between the factors within the model and the timescales at which they work is an extremely useful guide for decision makers who wish to use this model and approach to inform and evaluate their decisions.

In terms of 'do-ability' of the approach, particularly for countries with limited capacity, the biggest hurdles for carrying out this approach are probably in the survey design and statistical analysis phases. My experience with developing the survey with colleagues in Guatemala highlighted that the needs of a survey for EFA purposes were slightly different that for other surveys, and that more involved guidance was needed to ensure the survey was designed in a way that would enable reliable EFA analysis (see Chapter 3). For the statistical analysis, although SPSS is a relatively easy programme to acquire and use (even for statistics novices), some training is useful, particularly for the complex process of EFA and the univariate analyses used to explore the relationships between forest cover change behaviours and shared values in Chapter 5.

CONCLUSIONS

The aim of this thesis was to deepen current understanding of drivers of deforestation and forest degradation (DD) by developing a conceptual model for understanding and structuring these drivers from a socio-psychological behavioural perspective. The thesis was guided by three research questions, which are discussed in more detail below.

RQ1. How do land users' shared values inform our understanding of capabilities related to land use?

Identifying the need to come up with a more structured approach to understanding drivers of DD, Geist and Lambin (2001) developed one of the most popular models of drivers of DD in recent years, an important inclusion of theirs being behavioural components in their model. Subsequently, Swim and Clayton (2011) expanded on the potential for behavioural science contributions to more broadly understanding drivers of anthropocentric climate change. However, as Meyfroidt (2015) highlighted, although there have been advances in modelling efforts, descriptions and contextual explanations of why DD occurs, there has been limited progress in theory development and generalisations, a situation that could largely be due to the lack of consistency in terminology and approaches.

In socio-psychological behavioural theory, the value-action gap was filled with social norms and perceived behavioural control, but the nature and process of their influence on behavioural intentions and behaviour was largely unclear. In the Capability Approach,

Robeyns (2005) created a clear conceptual link between the valued function and the achieved functioning through the process of conversion to form a capability set, which aligns closely with Blake's (1999) situational constraints to achieving a behaviour which included social norms and other economic, demographic and political contexts.

Shared values have been increasingly noted as important to ecosystem services and landscape level approaches to decision making (Brunetta and Voghera, 2008; Fish et al., 2011; Kenter et al., 2015). However, as Kenter et al. (2015) pointed out, the use of 'shared', 'social' and 'shared social' value terms in the literature remain ambiguous. As such, the explicit exploration of shared values with respect to land use behaviour studies is limited.

Therefore, the model I developed described how beliefs about the world around us create shared values, which in turn influence attitudes and behavioural intentions, however, these behavioural intentions will only be achieved if the right capability set is available to us. Our capability set includes tangible situational capabilities, which are often also underlain by more intangible social capabilities. These capabilities are reflections of external circumstances in the world, and also influence the creation of beliefs. Ensuring we have the right capability set can therefore help us to achieve our shared values and further influence the nature of our shared values, attitudes and behavioural intentions.

In Chapter 4 I then applied the model in the case study location of the Sierra de Las Minas Biosphere Reserve (RBSM) in Guatemala. Using exploratory factor analysis I was able to elicit land users' shared values and the negative situational capabilities associated with these. Comparing the relevance of each shared value to different stakeholder groups from north and south of the reserve, I was able to identify negative social capabilities related to each value. I then successfully validated the values and capabilities, and confirm that they relate to land use, using focus groups with land users from north and south of the reserve. These results confirmed that shared values could be used to elicit land user capabilities, and provided a basis for answering RQ2, linking capabilities to DD behaviour.

RQ2. How do land users' capabilities contribute to DD behaviour?

The Cultural Capital Framework (Knott et al., 2008) describes the behaviour change process using six key steps: 1) Values and attitudes are developed from beliefs and evaluations about the world; 2) These form behavioural intentions with regard to more specific actions; 3) The resulting behaviour is influenced by the intention but also external factors; 4) Over time, the end behaviours will pass into social norms; 5) People will form beliefs and evaluate these actions and norms, which will become part of their values and attitudes; 6) The cycle starts again.

In the BCD model, the behaviour change process also begins with changing beliefs and evaluations about the world, which could then alter behavioural intentions to be 'good' (e.g. environmentally friendly). However, even if behavioural intentions are 'good', they may not be achievable due to the capabilities available (or not) to an individual. This means that the capabilities also need to be altered to ensure that individuals can achieve

their behavioural intentions. In the BCD model, capabilities are factors, events or situations that are occurring in the world, which will influence behaviours and beliefs. Therefore, in order to influence both behavioural intentions and behaviour, the right capability set needs to be available. As such, the capabilities also represent underlying and indirect drivers of DD in the BCD model.

Using data from the Sarstún Motagua region of Guatemala in Chapter 5, I identified land users' shared values and capabilities, then compared the relevance of the values to stakeholders with stakeholder characteristics (to help identify the different capabilities) and their self-reported forest cover change data (as a proxy for behaviour). I was able to find a significant relationship between ethnicity (to explore culture), the shared value of sustainable futures, and forest cover change. The results suggested that different cultures act differently depending on their value orientation associated with their shared value. This was validated with three focus groups with participants from different Mayan and Ladino cultures. Therefore, I was able to quantitatively and qualitatively show how stakeholder capabilities contribute to DD behaviour, and relate them to drivers of DD.

RQ3. Do decision maker capabilities related to DD constitute barriers to transformational change?

'Transformational change' refers to '…a specific shift in discourse, power relations, and deliberate actions away from business as usual' (Di Gregorio et al., 2013, p. 63). Studies of the impact of interventions (e.g. those summarised by Duchelle and Jagger (2014)) discuss how enabling and inhibiting conditions can affect the efficacy of DD interventions, for instance, how institutional arrangements within the policy process can have an effect on the outcomes of land use policy or intervention design (Somorin et al., 2013). Although the barriers to transformational change describe processes that act mainly within the decision making arena, arguably the processes that go on 'inside' the policy making process will affect the efficacy of interventions, and therefore resulting land uses, making it important to consider their potential role as drivers of DD.

I explored REDD+ in more detail in Chapter 6, where I used Guatemala's REDD+ programme as a linked case study in which to apply the BCD model to explore REDD+ decision makers' shared values, as well as attitudes to the REDD+ programme. I also elicited their behavioural intentions and behaviours related to REDD+ negotiations, then validated these in follow up interviews, where I also identified a set of value orientations associated with one of the original REDD+ decision maker shared values. The negative capabilities elicited from the shared values of these stakeholders not only identified issues similar to those from land users, but also issues that work at and within the decision making arena – as barriers to transformational change.

In Chapter 7, I compared the negative capabilities identified from all land users and the REDD+ decision makers, in order to explore the structure of the capabilities across land users and decision makers. I found that there are some negative capabilities that influence the decision making process (as barriers to transformational change), but these also filter down to have impacts at the land user level, and act in combination with other drivers of DD.

The results and discussions in Chapters 6 and 7 confirmed that decision maker capabilities related to DD, do constitute barriers to transformational change. However, although decision makers acknowledge the existence of barriers to transformational change, I found that those same decision makers do not tend to acknowledge their role as drivers of DD. This conceptual connection is important for understanding how tackling issues at high decision making levels is also essential for tackling DD as a whole.

Towards a better understanding of drivers of deforestation

The aim of this thesis was to deepen the understanding drivers of DD, and I believe that this thesis has contributed the conceptualisation and structuring of drivers of DD, crucially through: 1) incorporating capabilities into a behavioural approach to structure and understand different types of drivers and their interactions, especially social and cultural drivers, and 2) the inclusion of barriers to transformational change that act at a higher decision making level, within the conceptualisation of drivers of DD.

The development and application of the BCD model indicated that an appropriate approach to conceptualising and structuring drivers of DD was essential for exploring the wide range of drivers of DD that act at multiple levels. It was through this structured understanding that it was possible to identify the negative social capabilities that underlie negative situational capabilities. It is therefore these negative social capabilities that need to be tackled first in order to reduce DD, although tackling these negative social capabilities will require long term investment and that they cannot be addressed only at the land user or decision maker level, as their very nature means that they pervade all aspects of society.

Although there have been many authors that have identified the role of institutions or corruption as drivers of DD (e.g. Díaz and Koning, 2015; Leach et al., 1999), and those who identify barriers to transformational change (Brockhaus et al., 2014; Di Gregorio et al., 2013), few have made the conceptual links between the processes that occur within the decision making arena and drivers of DD. Therefore, as I have demonstrated in this thesis, I believe we need to encourage continued development of theories and conceptualisations of DD that push the boundaries of current understanding to raise awareness of the diverse and interconnected drivers of DD.

But who decides what capabilities, values or value orientations are ‘right’? Anderson et al. (2016) noted the importance of understanding whose values count when making social decisions, discussing how an understanding of the full range of possible values is important to decision making. In exploring shared and social values, Kenter et al. (2015) also highlighted the importance of shared values for decision making and the need for significantly more research into the use of shared values in environmental spheres and the development of legitimate and usable approaches and decision making. Therefore, in addition to encouraging further drivers of DD theory development, building further on the elicitation of shared values for informing environmental decision making, as demonstrated in this thesis, could be a useful way of ensuring legitimate decision making processes.

However, no matter how good the conceptual model is at identifying drivers of DD – and informing intervention design to tackle these drivers – it will have limited value unless those using it (i.e. decision makers) have the capabilities to do so; i.e. they are not constrained by other negative capabilities (e.g. particularly negative social capabilities like corruption, ineffective institutional processes or the consequences of inequalities).

This raises the question: why would decision makers choose to use this (or a similar) tool to identify underlying social drivers of DD, if it implicates their (inter)actions as drivers? In effect, this forms a sort of 'Catch 22' for effectively tackling DD: DD cannot be effectively dealt with unless the full range of drivers, especially the underlying social drivers, are known; and yet those underlying social drivers will not be identified unless those in control of the process are willing to accept responsibility – and more importantly – challenges to their power. Therefore, the real challenge to be addressed is possibly less about 'what' the drivers are and rather 'how' might decision makers enable the process of transformational change. As the authors of Our Common Future (WCED, 1987, p. 9) put it: "Painful choices have to be made. Thus, in the final analysis, sustainable development must rest on political will."

In considering the question 'Will REDD+ work?', Visseren-Hamakers et al. (2012) stressed the need for interdisciplinary research to distill lessons from current research, support current actors in their decision making and cope with the inherent heterogeneity and complexity in issues associated with REDD+, such as understanding drivers of DD. However, the solution is unlikely to derive from academia. Garnica (2016) noted that there was a hole in public memory regarding past human rights issues in Guatemala, suggesting that continued communication of historical events and knowledge could be a crucial route to tackling of these negative social norms. Similarly, in the case of the recent Guatemalan presidential arrests, the actions that helped spur the movement forward were driven by the participation of the public through unconventional media and through mass protest actions (García and Toscano, 2017).

In support of passing the new Probosques law, there were public protests in Guatemala (Santa Eulalia, 2017), suggesting that there is enough public interest in environmental issues to generate social movements. The public support of such an intervention also suggests that there are possibilities for positive environmental steps that can be taken in the short term that benefit the environment and the people. But the research presented in this thesis also highlights the medium term issues that might befall interventions such as Probosques: the conflicts between government and international organisations over the independence of such a law from REDD+. And so, addressing these underlying organisational and value conflicts is essential to ensure the long term success of interventions.

Not all change needs to be radical, and transformations can occur in 'ordinary times' (Moschella, 2015). Some major international organisations such as the International Monetary Fund have undergone incremental transformational changes over time, through layering of policies or slow ideational change (Chwieroth, 2014). For REDD+, this could mean its re-regulation (Lederer, 2011), or revitalisation by bringing decision

makers' attention to the issues at hand and creating a new space for social learning practices (Huynh and Keenan, 2017), a process which has begun to see some progress in Papua New Guinea (Babon et al., 2014). In the words of Moschella (2015), "successive adjustments over time…may in fact allow for a gradual release of pressure, thereby preventing the impending explosion."

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APPENDICES

Appendix A: Land User Questionnaire

[Collaborators' logos]

Introduction

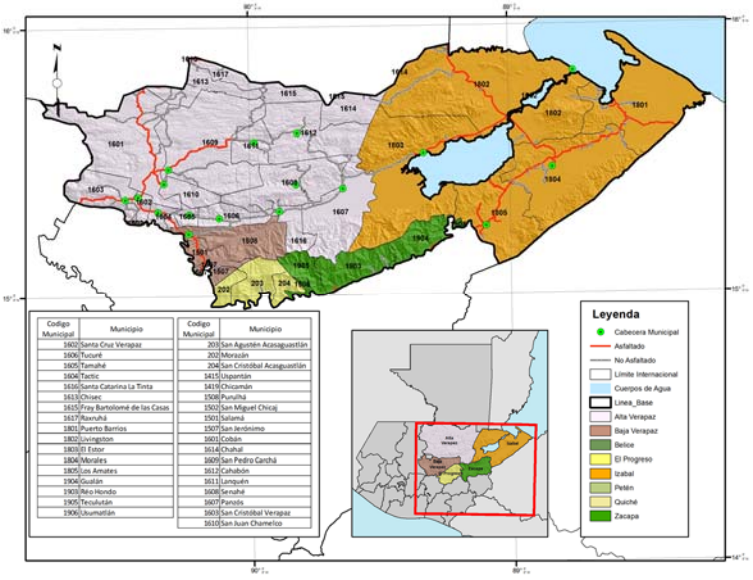
Good day/afternoon/evening, we are students from UVG in the department of anthropology. Currently we are coordinating the delivery of a study with the University of Greenwich in England, and at the local level we are being supported by the Foundation for the Defenders of Nature, Fundaeco and the Rainforest Alliance (Alliance for Forests).

This objective of this study is the understand better how the land is used in zones within the Sarstún Motagua (see map below).

We require you to tell us a little about your work and the land where you live, using a short questionnaire, and you may ask any questions at any time. This study also serves to improve policies for the environment and development.

None of the information and data that you share with us will be used outside of this study.

[Contact information]



Section 1:

ID:

Location (department, municipality, community):

Gender (M/F)

Interviewer:

Date:

Question	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
Q1 It is important to manage forest resources sustainably regardless of time or cost					
Q2 If I owned land I would care for it more					
Q3 I can help reduce forest loss					
Q4 I prefer to care for the forest than use it for agriculture					
Q5 I want to have a job that is different that is not working in the field					
Q6 The government do not always help us manage the forest					
Q7 Only those who own land should be able to use it how they wish					
Q8 I should avoid cutting down forest but I don't know why					
Q9 It doesn't matter if forest is lost, I need to feed my family					
Q10 We are all responsible for forest loss					
Q11 I need to cut down the forest for sustenance					
Q12 I understand that forest loss damages my community					
Q13 If there was more infrastructure, there would be less forest					
Q14 I don't have other opportunities to make money other than working in the field					
Q15 There should be more rules about how people can use the forest					
Q16 There should be compliance with the law to avoid the forest being destroyed					
Q17 Community organisations are bettwe than government institutions at caring for the forest					
Q18 Not all of us can help reduce forest loss					
Q19 I want my children to study to have other work opportunities					
Q20 My family's land is not sufficient so I have to find more land					
Q21 There are no places nearby where we can make complaints about bad land use practices					
Q22 We need better management of community organisations to improve the environment					
Q23 The law should permit people to use land how they want					
Q24 It is more important to make money today than think about the future of the forest					
Q25 If people had a better environmental conscience they would not damage the forest					
Q26 The authorities don't have the capacity to confront those who abuse the land					
Q27 We should know who is the owner and who can use the land					
Q28 We need more employment opportunities although this causes more loss of forest					
Q29 The state makes laws that are important for the environment					
Q30 I am against cutting down the forest					
Q31 People who live in the forest make little money					
Q32 Having a big family is important					
Q33 I want to do something good for the forest					
Q34 Protected areas are not necessary for forest conservation					
Q35 People should be able to use land that is not theirs					
Q36 I need more capacity to engage in good agricultural practices					
Q37 All of us are responsible for forest loss					
Q38 If there were more opportunities to sell my products I would need to cut down more forest					
Q39 Cattle ranching generates economic benefits for the forest					

Section 2:

What situation best describes your relationship to the land? Please choose one:

- I own land
- I am an owner and rent my land out
- I rent land for work
- I possess a certificate of use from the municipality
- I have use rights
- I am a labourer
- Other

Where is your land parcel?

What changes has the forest experienced in the past 10 years?

Section 3:

For those who own land, rent land or have use rights, please answer questions in this section. For labourers, please proceed to Section 4.

What sector do you work in? Please choose one:

- Subsistence agriculture
- Commerical agriculture
- Cattle ranching
- Coffee/cardamom
- Agroindustry (oil palm, rubber)
- Forestry sector (forest management, reforestation, other)
- Mining or hydroelectric
- Other

Are you a member of a community association?

- Yes
- No

Which?

How much land do you own/rent/have rights to?

How much of this land is forested?

How much forest was on the land when you first acquired it?

Why have you maintained this amount of forest?

Section 4:

For labourers.

What sector do you work in?

- Labouring for smallholders
- Labouring for commercial farms
- Cattle ranching
- Coffee/cardamom
- Agroindustry (oil palm, rubber)
- Forestry sector
- Mining or hydroelectric

What have you worked in for the past 10 years?

How many times have you found it necessary to cut down trees?

What has influenced your decision to accept work?

Section 5:

For everyone.

Please indicate your ethnicity:

- Mestizo (Ladino)
- Maya (Q'eqchi, Kaqchiquel, Mam, Quiche)
- Garifuna
- Xinca

How old are you?

How many children do you have?

Do you have any comments?

Appendix B: Exploratory Factor Analysis from the Sierra de Las Minas Biosphere Reserve

Exploratory Factor Analysis

First, the distribution of responses for each belief statement was explored, to identify any questions which might affect the principal axis factoring (PAF) analyses. Questions 1, 2, 3, 16, 19, 30, 33 and 34 were identified as having very skewed distributions. The first iteration of PAF on the dataset yielded a Keiser-Meyer-Olkin (KMO) value of .634, a Bartlett's test of sphericity value of .000 indicating the data's suitability for factor analysis. There were 27 out of 33 high communalities (>.3) and 11 factors with an eigenvalue >1, explaining 64% of variance.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.634
Bartlett's Test of Sphericity	Approx. Chi-Square	1135.597
	df	528
	Sig.	0

Table 1: KMO and Bartlett's Test of Sphericity for raw data

Total Variance Explained			
Factor	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	4.303	13.041	13.041
2	3.317	10.052	23.093
3	2.346	7.108	30.201
4	1.887	5.718	35.919
5	1.637	4.96	40.879
6	1.528	4.63	45.509
7	1.367	4.141	49.65
8	1.34	4.06	53.71
9	1.258	3.811	57.522
10	1.154	3.497	61.019
11	1.045	3.168	64.187

Table 2: Eigenvalues and Variance Explained for raw data

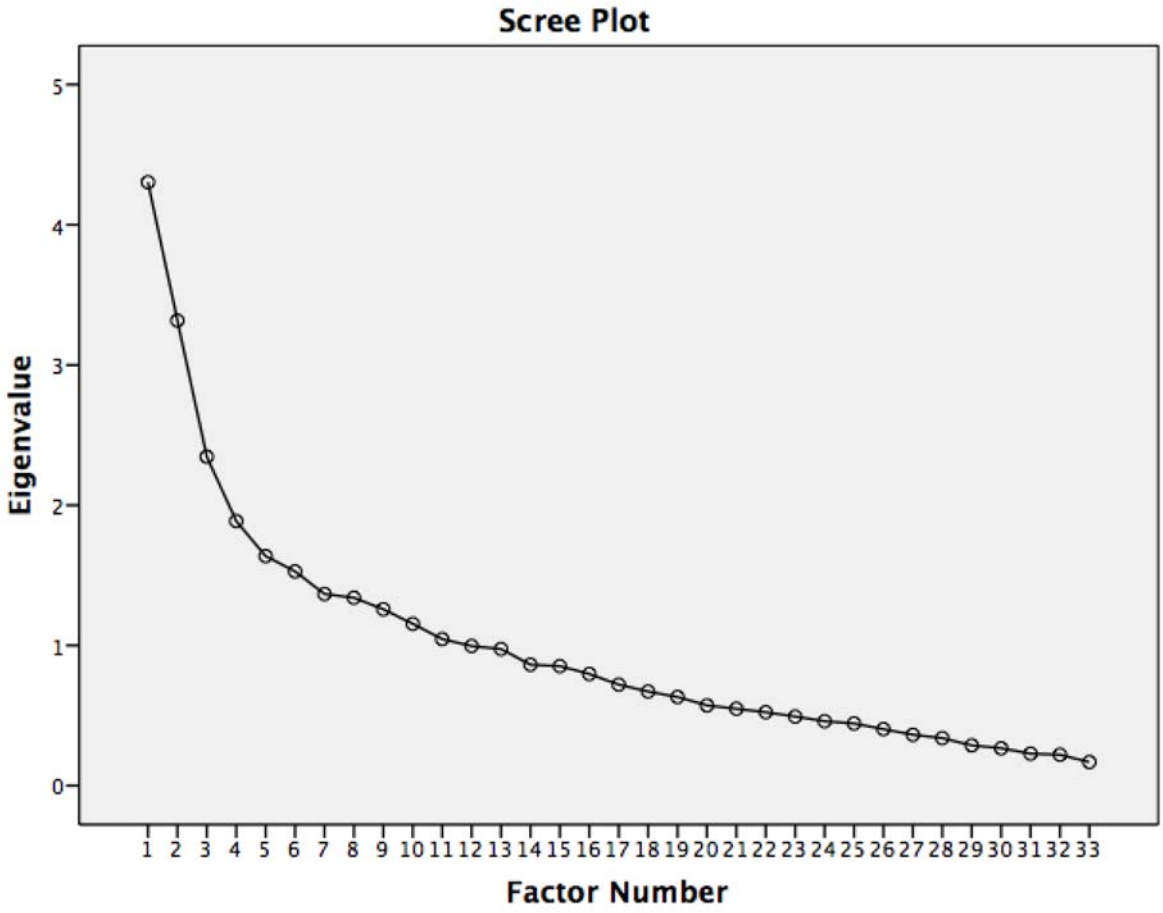


Figure 1: Scree plot for raw data

Having confirmed the dataset's suitability for factor analysis, examination of the scree plot indicated that the 4, 5, 6 and 7 factor solutions should be chosen for initial extraction. The 4 factor solution was immediately discarded as the factors were very large, and the other solutions were clearly statistically stronger. The first two iterations of the 7 factor solution produced one factor with only one belief statement loading onto it, while the third iteration produced one factor with no loadings of over .47. Therefore, the 5 and 6 factor solutions were considered statistically strongest.

	1st Extraction				Final extraction		
	4 Factor	5 Factor	6 Factor	7 Factor	5 Factor	6 Factor	7 Factor
KMO	0.634	0.634	0.634	0.634	0.658	0.658	0.658
Variance explained (cumulative)	35%	40%	45%	49%	46%	50%	55%
Communalities (>.3)	27	27	27	27	25	25	25
Total statements	33	33	33	33	28	28	28
Total significant statements (>.3)	29	28	29	33	28	28	28
Non-loading statements	4	5	4	0	0	0	0
Cross-loading statements	4	8	6	9	8	12	10
Low-loading statements	0	0	1	1	0	0	0
Marker variables	0	0	0	2	1	3	2

Table 3: Factor extractions from initial extraction to final extraction

Item	5 Factor Evolution				
	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
KMO	0.634	0.639	0.644	0.652	0.658
Variance explained (cumulative)	40%	42%	44%	45%	46%
Communalities (>.3)	27	28	27	26	25
Total statements	33	31	30	29	28
Total significant statements (>.3)	28	28	28	27	28
Non-loading statements	5	3	2	2	0
Cross-loading statements	8	7	6	10	8
Low-loading statements	0	0	0	0	0
Marker variables	1	0	0	1	1

Table 4: Evolution of 5 factor extractions

Item	6 Factor Evolution				
	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
KMO	0.634	0.639	0.644	0.652	0.658
Variance explained (cumulative)	45%	47%	48%	49%	50%
Communalities (>.3)	27	28	27	26	25
Total statements	33	31	30	29	28
Total significant statements (>.3)	29	30	30	28	28
Non-loading statements	4	1	0	1	0
Cross-loading statements	6	9	7	6	12
Low-loading statements	1	1	1	2	0
Marker variables	1	0	1	0	3

Table 5: Evolution of the 6 factor solutions

Questions 19, 2, 32, 31 and 7 were deleted during the analytical process as their removal improved the stability of the factor solutions. In order to choose between the two final, most stable solutions, colleagues from UVG and FDN discussed the meanings of each factor in depth, and the final 6 factor solution was chosen as it was felt that it brought out more clarity than the 5 factor solution, where ideas were more clustered into less factors. This 6 factor solution was used by the focus groups for interpretation.

The Cronbach's alpha test was carried out on each factor for the chosen 6 factor solution. The results for each factor are shown below, indicating that the removal of Qs 33, 8, 6, 18 and 13 improves the internal reliability of the factors.

Statements	Cronbach's Alpha if Item Deleted
Factor 1	**Alpha: .727**
Q36 I need more capacity to engage in good agricultural practices	0.612
Q25 If people had a better environmental conscience, they would not damage the forest	0.646
Q37 All of us are responasible for forest loss	0.681
Q4 I prefer to care for the forest rather than use it for agriculture	0.715
Q34 Protected areas are necessary for forest conservation	0.714
Q33 I want to do something good for the forest	0.738
Factor 2	**Alpha: .682**
Q38 If there were more opportunities to sell my products I would need to cut down more forest	0.601
Q35 People should be able to use land that is not theirs	0.637
Q24 It is more important to make money today than think about the future of the forest	0.613
Q28 We need more employment opportunities although this causes more loss of forest	0.64
Q11 I need to cut down the forest for sustenance	0.666
Q8 I should avoid cutting down forest but I don't know why	0.69
Q30 I am against cutting fown the forest	0.677
Factor 3	**Alpha: .654**
Q17 Community organisations are better than government institutions at caring for the forest	0.614
Q26 The authorities don't have the capacity to confront those who abuse the land	0.589
Q27 We should know who is the owner and who can use the land	0.6
Q21 There are no places nearby where we can make complaints about bad land use practices	0.6
Q5 I would like to have a different job that is not working in the field	0.607
Factor 4	**Alpha: .438**
Q3 I can help reduce forest loss	0.283
Q1 It is important to manage natural resources sustainably regardless of time or cost	0.29
Q6 Government organisations don't help us manage the forest	0.496
Factor 5	**Alpha: .649**
Q15 There should be more rules about how people can use the land	0.403
Q29 The state makes laws that are important for the environment	0.627
Q16 There should be compliance with the law to avoid the forest being destroyed	0.581
Factor 6	**Alpha: .472**
Q14 I don't have other opportunities to make money other than working in the field	0.344
Q23 The law should permit people to use land how they want	0.251
Q18 Not everyone can help reduce forest loss	0.484

Table 6: Results of Cronbach's Alpha test on each of the 6 factors in the chosen solution

After the removal of these belief statements, the 6th iteration produced a much more stable solution, shown in

Item	Final
KMO	0.669
Variance explained (cumulative)	55%
Communalities (>.3)	19
Total statements	24
Total significant statements (>.3)	24
Non-loading statements	0
Cross-loading statements	7
Low-loading statements (<.32)	0
Marker variables	0

Table 7: Key statistics for full factor solution

Rotated Factor Matrix Post-Cronbach's	Factor					
	1	2	3	4	5	6
Q36 I need more capacity to engage in good agricultural practices	0.754					
Q25 If people had a better environmental conscience, they would not damage the forest	0.744					
Q37 All of us are responasible for forest loss	0.504					
Q4 I prefer to care for the forest rather than use it for agriculture	0.436					
Q34 Protected areas are necessary for forest conservation	0.398					
Q38 If there were more opportunities to sell my products I would need to cut down more forest		0.596				
Q28 We need more employment opportunities although this causes more loss of forest		0.539		0.308		
Q35 People should be able to use land that is not theirs		0.505				
Q24 It is more important to make money today than think about the future of the forest		0.488				
Q30 I am against cutting fown the forest		-0.428				
Q5 I would like to have a different job that is not working in the field		0.383	0.362	0.341		
Q15 There should be more rules about how people can use the land	0.393		0.623			
Q29 The state makes laws that are important for the environment			0.589			
Q16 There should be compliance with the law to avoid the forest being destroyed		-0.327	0.577			
Q17 Community organisations are better than government institutions at caring for the forest				0.695		
Q26 The authorities don't have the capacity to confront those who abuse the land	0.365			0.457		
Q21 There are no places nearby where we can make complaints about bad land use practices			0.389	0.443		
Q27 We should know who is the owner and who can use the land				0.425		
Q14 I don't have other opportunities to make money other than working in the field					0.703	
Q23 The law should permit people to use land how they want					0.514	
Q11 I need to cut down the forest for sustenance		0.418			0.437	
Q13 If there was more infrastructure, there would be less forest					0.333	
Q3 I can help reduce forest loss						0.627
Q1 It is important to manage natural resources sustainably regardless of time or cost						0.469

Table 8: Final factor solution used for further analysis

Table 9: Comparison between focus group interpreted solution and post-Cronbach's solution

Final Factor Structure	Pre-Cronbach's Factor Structure (used by Focus Groups)
Factor 1	(Factor 1)
Q36 I need more capacity to engage in good agricultural practices	Q36 I need more capacity to engage in good agricultural practices
Q25 If people had a better environmental conscience, they would not damage the forest	Q25 If people had a better environmental conscience, they would not damage the forest
Q37 All of us are responsible for forest loss	Q37 All of us are responsible for forest loss
Q4 I prefer to care for the forest rather than use it for agriculture	Q4 I prefer to care for the forest rather than use it for agriculture
Q34 Protected areas are necessary for forest conservation	Q34 Protected areas are necessary for forest conservation
	Q33 I want to do something good for the forest
Factor 2	(Factor 2)
Q38 If there were more opportunities to sell my products I would need to cut down more forest	Q38 If there were more opportunities to sell my products I would need to cut down more forest
Q28 We need more employment opportunities although this causes more loss of forest	Q35 People should be able to use land that is not theirs
Q35 People should be able to use land that is not theirs	Q24 It is more important to make money today than think about the future of the forest
Q24 It is more important to make money today than think about the future of the forest	Q28 We need more employment opportunities although this causes more loss of forest
Q30 I am not against cutting fown the forest	Q11 I need to cut down the forest for sustenance
Q5 I would like to have a different job that is not working in the field	Q8 I should avoid cutting down forest but I don't know why
	Q30 I am against cutting fown the forest
Factor 3	(Factor 5)
Q15 There should be more rules about how people can use the land	Q15 There should be more rules about how people can use the land
Q29 The state makes laws that are important for the environment	Q29 The state makes laws that are important for the environment
Q16 There should be compliance with the law to avoid the forest being destroyed	Q16 There should be compliance with the law to avoid the forest being destroyed
Factor 4	(Factor 3)
Q17 Community organisations are better than government institutions at caring for the forest	Q17 Community organisations are better than government institutions at caring for the forest
Q26 The authorities don't have the capacity to confront those who abuse the land	Q26 The authorities don't have the capacity to confront those who abuse the land
Q21 There are no places nearby where we can make complaints about bad land use practices	Q27 We should know who is the owner and who can use the land
Q27 We should know who is the owner and who can use the land	Q21 There are no places nearby where we can make complaints about bad land use practices
	Q5 I would like to have a different job that is not working in the field
Factor 5	(Factor 6)
Q14 I don't have other opportunities to make money other than working in the field	Q14 I don't have other opportunities to make money other than working in the field
Q23 The law should permit people to use land how they want	Q23 The law should permit people to use land how they want
Q11 I need to cut down the forest for sustenance	Q18 Not everyone can help reduce forest loss
Q13 If there was more infrastructure, there would be less forest	Q13 If there was more infrastructure, there would be less forest
Factor 6	(Factor 4)
Q3 I can help reduce forest loss	Q3 I can help reduce forest loss
Q1 It is important to manage natural resources sustainably regardless of time or cost	Q1 It is important to manage natural resources sustainably regardless of time or cost
	Q6 Government organisations don't help us manage the forest

ANOVA						
		Sum of Sq	df	Mean Square	F	Sig.
Factor 1	Between Groups	1.673	1	1.673	3.989	0.048
	Within Groups	53.688	128	0.419		
	Total	55.361	129			
Factor 2	Between Groups	4.082	1	4.082	6.521	0.012
	Within Groups	80.135	128	0.626		
	Total	84.217	129			
Factor 3	Between Groups	0.057	1	0.057	0.13	0.719
	Within Groups	56.432	128	0.441		
	Total	56.489	129			
Factor 4	Between Groups	0.389	1	0.389	0.609	0.436
	Within Groups	81.696	128	0.638		
	Total	82.085	129			
Factor 5	Between Groups	14.957	1	14.957	18.4	0
	Within Groups	104.045	128	0.813		
	Total	119.002	129			
Factor 6	Between Groups	0.992	1	0.992	4.419	0.037
	Within Groups	28.74	128	0.225		
	Total	29.733	129			

Table 10: SPSS ANOVA output for groups north and south of the reserve

Appendix C: Exploratory factor analysis of the Sarstún Motagua combined dataset

The entire dataset comprises 501 cases, whose responses to 39 belief statements were analysed using exploratory factor analysis in SPSS v.22. A stable 5 factor solution of 20 statements was arrived at using varimax rotation and pairwise deletion.

Item	Initial Extraction	1st Extraction			Final extraction
		5 Factor	6 Factor	7 factor	5 Factor
KMO	0.81	0.81	0.81	0.81	0.846
Variance explained (cumulative)	57%	40%	44%	48%	58%
Communalities (>.3)	25	14	17	18	11
Total statements	33	33	33	33	17
Total significant statements (>.3)	N/A	27	26	30	17
Non-loading statements	N/A	6	7	3	0
Cross-loading statements	N/A	3	4	4	2
Low-loading statements (<.32)	N/A	2	1	1	0
Marker variables	N/A	0	0	2	1

Table 1: Initial extraction, first extraction and final extraction for full, combined factor analysis

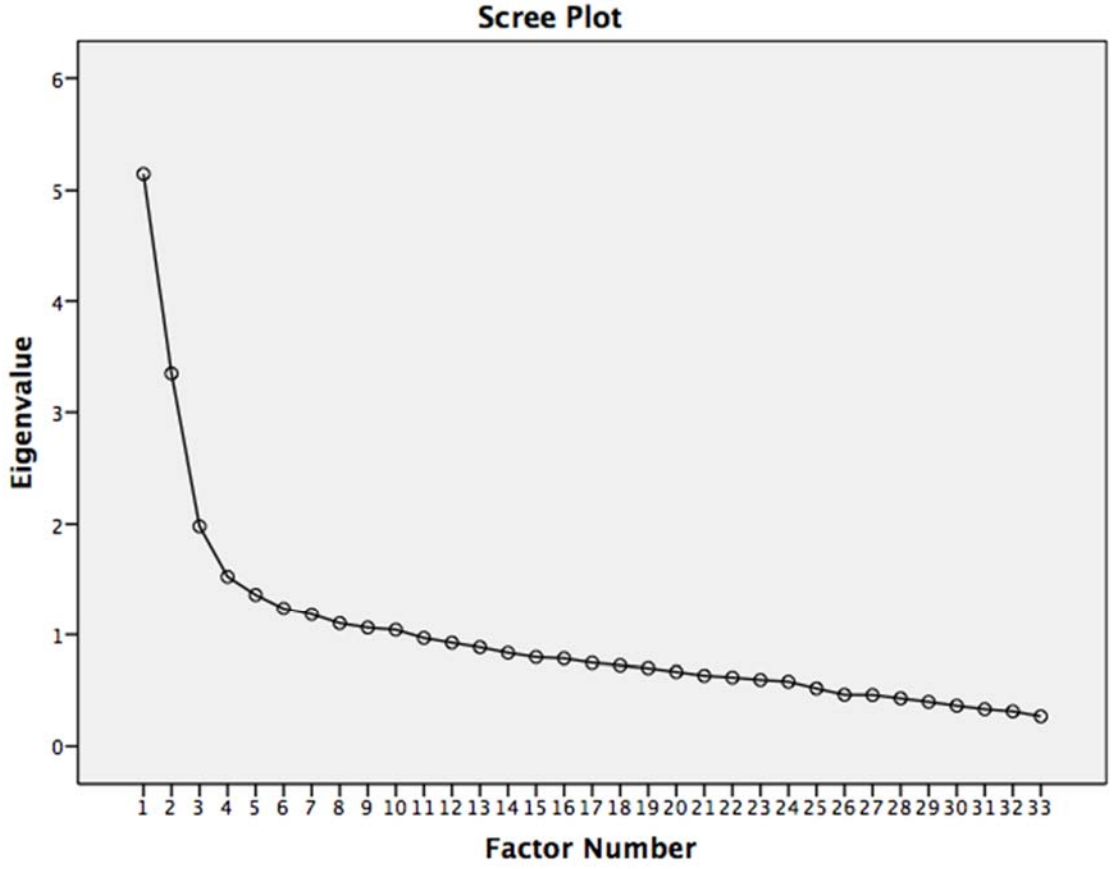


Figure 1: Scree plot for full, combined analysis

Item	4 factor Evolution		3 factor Evolutiuon	
	1st Iteration	2nd Iteration	1st Iteration	2nd Iteration
KMO	0.851	0.846	0.851	0.846
Variance explained (cumulative)	50%	53%	44%	47%
Communalities (>.3)	13	11	11	10
Total statements	20	17	19	17
Total significant statements (>.3)	20	17	18	17
Non-loading statements	0	0	1	0
Cross-loading statements	4	2	4	2
Low-loading statements (<.32)	1	0	0	0
Marker variables	1	0	0	0
Factors with <2 statements	0	0	0	0

Item	5 Factor Evolution					
	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration	6th Iteration
KMO	0.81	0.824	0.827	0.837	0.851	0.846
Variance explained (cumulative)	40%	45%	46%	51%	55%	58%
Communalities (>.3)	14	14	14	13	15	11
Total statements	33	28	26	22	20	17
Total significant statements (>.3)	27	26	23	22	20	17
Non-loading statements	6	2	3	0	0	0
Cross-loading statements	3	5	6	6	2	2
Low-loading statements (<.32)	2	1	1	1	1	0
Marker variables	0	0	0	0	2	1
Factors with <2 statements	0	0	1	2	0	0

Item	6 Factor Evolution				
	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
KMO	0.81	0.824	0.827	0.837	0.851
Variance explained (cumulative)	44%	49%	50%	55%	59%
Communalities (>.3)	17	15	16	15	13
Total statements	33	28	26	22	20
Total significant statements (>.3)	26	25	23	22	20
Non-loading statements	7	3	3	0	0
Cross-loading statements	4	5	6	6	6
Low-loading statements (<.32)	1	1	0	1	0
Marker variables	0	1	1	0	2
Factors with <2 statements	0	0	1	2	1

Item	7 Factor Evolution			
	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration
KMO	0.81	0.824	0.827	0.837
Variance explained (cumulative)	48%	52%	54%	59%
Communalities (>.3)	18	18	18	17
Total statements	33	28	26	22
Total significant statements (>.3)	30	26	25	21
Non-loading statements	3	2	1	1
Cross-loading statements	4	4	4	6
Low-loading statements (<.32)	1	1	1	0
Marker variables	2	3	1	2
Factors with <2 statements	0	0	1	1

Tables 2-5: Evolution of factor solutions for combined analysis and Cronbach's alpha test results

The 7 factor solution was discarded early on due to solutions producing factors with only one statement, meaning interpretation of the factor is not possible. The 6 factor solutions were discarded for the same reason. As more statements were discarded in the analysis, smaller factor solutions were extracted.

It may be noted that the KMO value of the final solution is lower than that of the penultimate solution. A Cronbach's alpha test was carried out on the four factor solution (KMO = .851), but indicated that the removal of Q25 would increase the internal reliability of a factor. The penultimate 5 factor solution (KMO = .851), also had Q25 low loading below .32. Therefore, Q25 was removed and the subsequent 3, 4 and 5 factor solutions explored. The 3 factor solution grouped many belief statements together in a way that was conceptually confusing, and explained <50% variance. The 4 factor solution was an improvement, and Cronbach's alpha tests indicated it was stable. However, the 5 factor solution had a marker variable, which was also one of the statements subsumed into a larger factor in the 4 factor solution. Therefore, I considered this to be indicative of an important, separate, idea that was worth bringing out with the 5 factor solution.

For further reliability checks on the solution, the solution was run using listwise deletion, direct oblimin rotation, maximum likelihood extraction and a split dataset with 50% of cases included. The listwise solution was identical in structure to the pairwise solution. The maximum likelihood and 50% split dataset solutions were almost identical, with the only difference being Qs 21 and 33 cross loading onto two factors, one of which was the factor in the original pairwise solution. The difference in the loadings of these belief statements across the 'original' solution versus the reliability test solutions was minimal (.005 for Q21 and .05 for Q33). Therefore, the pairwise deletion PAF extraction solution presented here was considered stable and reliable for interpretation and further analysis.

Appendix C.1: Ladino factor analysis

Item	Initial Extraction	Final extraction 6 Factor
KMO	0.596	0.6
Variance explained (cumulative)	69%	53%
Communalities (>.3)	31	16
Total statements	33	25
Total significant statements (>.3)	N/A	25
Non-loading statements	N/A	0
Cross-loading statements	N/A	4
Low-loading statements (<.32)	N/A	0
Marker variables	N/A	0
Factors with <2 statements	N/A	0

Table 7: Initial extraction for Ladino analysis

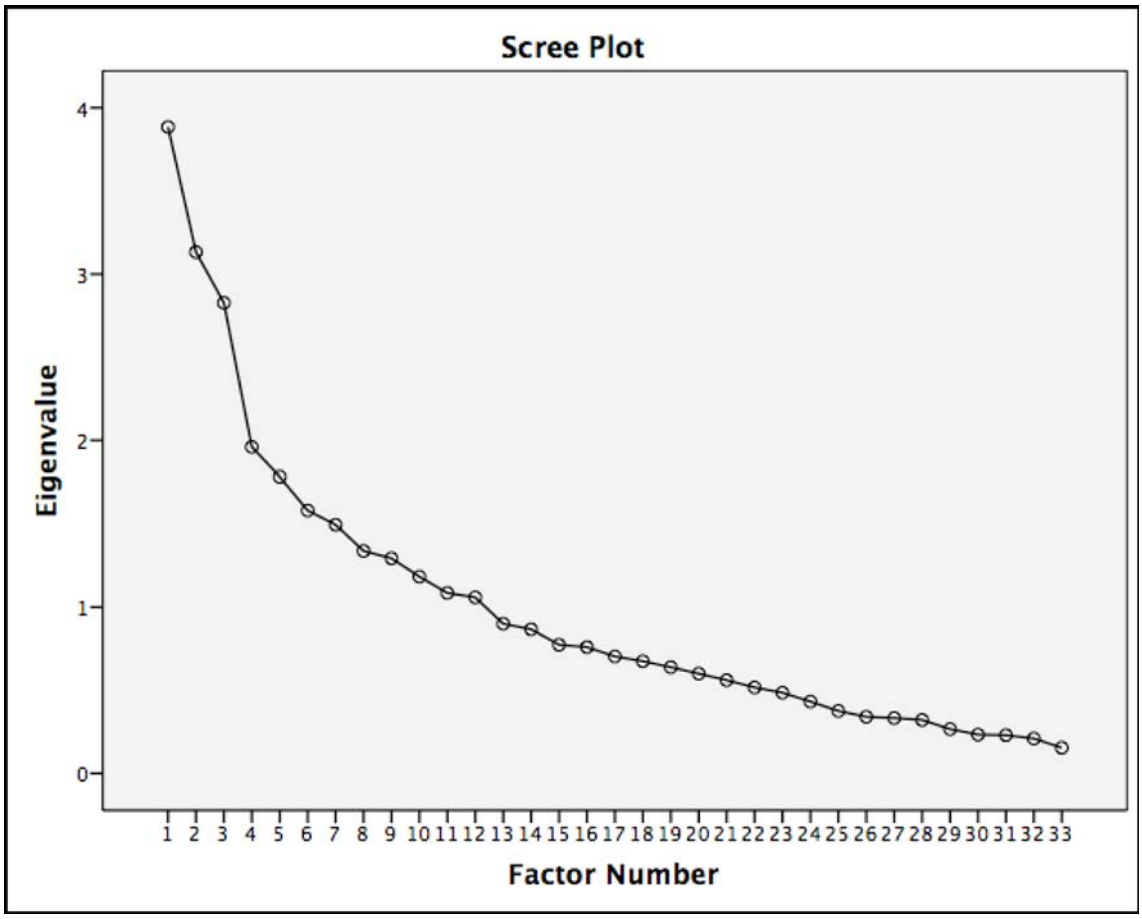


Figure 2: Scree plot for Ladino sub-analysis

Item	3 Factor	4 Factor Evolution			7 Factor
	1st	1st	2nd	3rd	1st
KMO	0.596	0.596	0.601	0.61	0.61
Variance explained (cumulative)	29%	36%	38%	40%	57%
Communalities (>.3)	31	31	18	13	18
Total statements	33	33	30	28	27
Total significant statements (>.3)	26	27	29	29	27
Non-loading statements	7	6	1	0	0
Cross-loading statements	4	4	5	5	10
Low-loading statements (<.32)	2	1	2	4	0
Marker variables	0	0	0	0	0
Factors with <2 statements	0	0	0	0	1

Item	5 Factor Evolution			
	1st	2nd	3rd	4th
KMO	0.596	0.601	0.61	0.61
Variance explained (cumulative)	41%	44%	46%	47%
Communalities (>.3)	31	18	13	18
Total statements	33	30	28	27
Total significant statements (>.3)	28	30	27	27
Non-loading statements	5	0	1	0
Cross-loading statements	4	5	6	8
Low-loading statements (<.32)	2	3	1	1
Marker variables	0	0	0	0
Factors with <2 statements	0	0	0	0

Item	6 Factor Evolution				
	1st	2nd	3rd	4th	5th
KMO	0.596	0.601	0.61	0.61	0.6
Variance explained (cumulative)	46%	49%	51%	52%	53%
Communalities (>.3)	31	18	13	18	16
Total statements	33	30	28	27	25
Total significant statements (>.3)	31	29	28	27	25
Non-loading statements	2	1	0	0	0
Cross-loading statements	5	6	10	8	4
Low-loading statements (<.32)	2	0	3	1	0
Marker variables	0	0	0	0	0
Factors with <2 statements	0	0	0	0	0

Tables 8-10: Evolution of factor solutions for Ladino sub-analysis

The initial extraction produced a KMO of .596, indicating it is factorable. Examination of the scree plot indicated that between 3 and 6 factors were likely to be the best solutions. Using pairwise deletion, varimax rotation and principal axis factoring, 3, 4, 5 and 6 factor solutions were extracted initially. The 3 factor solution initially produced very large factors, extremely low variance explained and many non-loading statements, so was discarded. The variance explained by the 4 factor solution did not improve significantly after three iterations, so was discarded. The 5 factor solution did not reach a minimum of 50% of variance explained after 4 iterations, and a 7 factor solution produced a factor with only one statement loading onto it, so the second KMO .610 6 factor solution was carried forward to the reliability testing phase using Cronbach's alpha. The alpha test indicated that removal of Qs 8 and 35 would improve the internal reliability of the solution, the 6 factor solution was run again with these removed. The resulting 6 factor solution was very good.

Rotated Factor Matrix	Factor						Cronbach's alpha if item deleted
Factor 1	**1**	**2**	**3**	**4**	**5**	**6**	**Alpha: .685**
Q16 There should be compliance with the law to avoid the forest being destroyed	0.733						0.606
Q18 Not everyone can help reduce forest loss	0.603						0.648
Q5 I would like to have a different job that is not working in the field	0.57	0.409					0.639
Q34 Protected areas are necessary for forest conservation	0.553						0.616
Q14 I **do** have other opportunities to make money other than working in the field	-0.52					0.493	0.667
Q6 Government organisations don't help us manage the forest	0.353						0.685
Factor 2							**Alpha: .671**
Q11 I need to cut down the forest for sustenance		0.764					0.566
Q38 If there were more opportunities to sell my products I would need to cut down more forest		0.61					0.58
Q30 I am **not** against cutting down the forest		-0.5					0.638
Q28 We need more employment opportunities although this causes more loss of forest		0.484		0.403	-0.362		0.625
Factor 3							**Alpha: .605**
Q29 The state makes laws that are important for the environment			0.668				0.497
Q7 Only those who own/have use rights to land should be able to use it how they wish			0.509				0.556
Q25 If people had a better environmental conscience, they would not damage the forest			0.47				0.534
Q37 All of us are responsible for forest loss			0.415				0.553
Factor 4							**Alpha: .582**
Q26 The authorities don't have the capacity to confront those who abuse the land				0.504			0.522
Q17 Community organisations are better than government institutions at caring for the forest				0.477			0.54
Q27 We should know who is the owner and who can use the land				0.471		0.358	0.495
Q21 There are no places nearby where we can make complaints about bad land use practices				0.415			0.536
Q3 I can help reduce forest loss				0.344			0.573
Q15 There should be more rules about how people can use the land				0.332			0.548
Factor 5							**Alpha: .734**
Q36 I need more capacity to engage in good agricultural practices					0.712		N/A
Q33 I want to do something good for the forest					0.678		N/A
Factor 6							**Alpha: .39**
Q19 I want my children to study to have various other opportunities other than working in the field						0.458	0.173
Q13 If there was more infrastructure, there would be less forest						0.396	0.355
Q2 If I was the owner of my land I would care more						0.384	0.382

Table 11: Final factor solution for Ladino sub-analaysis

Appendix C.2: Mayan Factor Analysis

Item	Initial Extraction	Final extraction 5 Factor
KMO	0.778	0.74
Variance explained (cumulative)	59%	58%
Communalities (>.3)	16	11
Total statements	N/A	17
Total significant statements (>.3)	N/A	17
Non-loading statements	N/A	0
Cross-loading statements	N/A	0
Low-loading statements (<.32)	N/A	0
Marker variables	N/A	1
Factors with <2 statements	N/A	0

Table 12: Initial extraction for Mayan sub-analysis

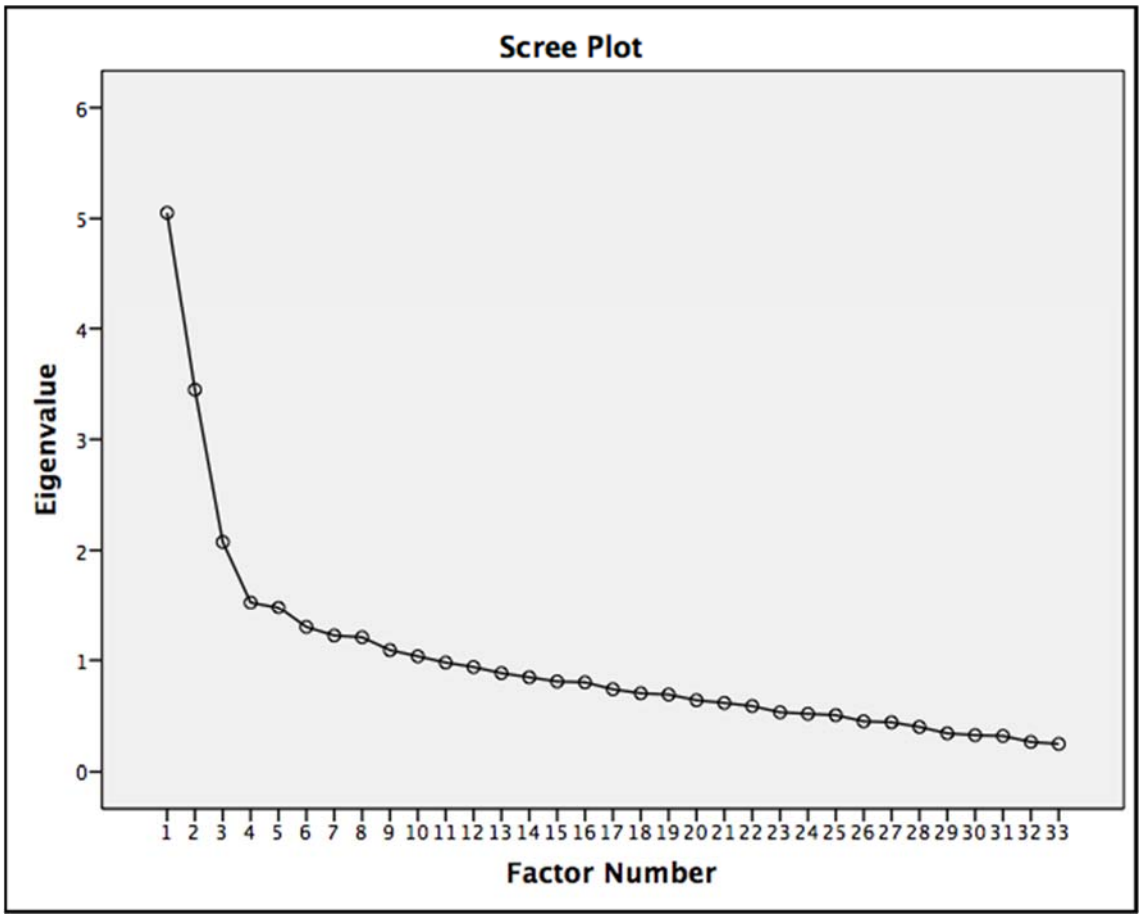


Figure 3: Scree plot for Mayan sub-analysis

Item	4 Factor Evolution				
	1st	2nd	3rd	4th	5th
KMO	0.778	0.8	0.805	0.805	0.746
Variance explained (cumulative)	37%	42%	45%	46%	50%
Communalities (>.3)	16	14	14	13	9
Total statements	33	27	25	24	18
Total significant statements (>.3)	23	23	22	23	17
Non-loading statements	10	4	3	1	1
Cross-loading statements	5	4	4	4	1
Low-loading statements (<.32)	2	1	0	0	1
Marker variables	1	0	0	0	0
Factors with <2 statements	0	0	0	0	0

Item	5 Factor Evolution					
	1st	2nd	3rd	4th	5th	6th
KMO	0.778	0.8	0.805	0.805	0.746	0.74
Variance explained (cumulative)	41%	48%	50%	51%	57%	58%
Communalities (>.3)	16	14	14	13	9	11
Total statements	33	27	25	24	18	17
Total significant statements (>.3)	26	25	25	24	18	17
Non-loading statements	7	2	0	0	0	0
Cross-loading statements	4	4	4	4	0	0
Low-loading statements (<.32)	1	0	1	0	0	0
Marker variables	1	0	1	1	2	1
Factors with <2 statements	0	0	0	0	0	0

Item	6 Factor			
	1st	2nd	3rd	4th
KMO	0.805	0.805	0.746	0.74
Variance explained (cumulative)	56%	59%	62%	64%
Communalities (>.3)	13	13	9	11
Total statements	24	20	18	17
Total significant statements (>.3)	24	20	18	17
Non-loading statements	0	0	0	0
Cross-loading statements	4	1	1	0
Low-loading statements (<.32)	0	0	1	0
Marker variables	2	3	2	1
Factors with <2 statements	0	0	1	1

Tables 13-15: Evolution of factor solutions for Mayan sub-analysis

The initial extraction produced a KMO of .778, indicating it is factorable. Examination of the scree plot indicated that 4 or 5 factors were likely to be the best solutions. Using pairwise deletion, varimax rotation and principal axis factoring, 4 and 5 factor solutions were extracted initially. The 4 factor solution took several iterations to reach a suitable level of variance explained, but continued to provide large and complex factors that were difficult to interpret, so the 4 factor solution was eventually discarded. Cronbach's alpha was carried out on each of the 5 and 6 factor solutions to test for internal reliability. The Cronbach's alpha indicated that Qs 34, 28 and 26 should be deleted to improve reliability. The 5 and 6 factor solutions were run again then tested again using Cronbach's alpha, where Q15 was found to increase internal reliability if removed. The solutions were run again and the 6 factor solution was found to have one factor with only one statement loading onto it for the second time, so was discarded. The Cronbach's alpha indicated good internal reliability for the 5 factor solution with a KMO of .74. This solution was then tested further for reliability using a 50% split dataset test, listwise deletion and direct oblimin rotation respectively. Each iteration of the same solution using the different deletion and extraction methods produced an identical solution, indicating good stability.

Rotated Factor Matrix	**Factor**					**Conbach's alpha if item deleted**
Factor 1	**1**	**2**	**3**	**4**	**5**	**Alpha: .838**
Q35 People should be able to use land that is not theirs	0.818					0.771
Q32 Having a big family is important	0.766					0.782
Q24 Making money today is more important than thinking about the future of the forest	0.731					0.807
Q11 I need to cut down the forest for sustenance	0.685					0.818
Factor 2						**Alpha: .582**
Q31 People living in the forest make little money		0.562				0.493
Q27 We should know who owns and who can use the land		0.555				0.497
Q8 I avoid cutting the forest but I do not know why		0.425				0.535
Q38 If there is more opportunity to sell my products, I need to cut more wood		0.417				0.577
Q23 The law should allow people to use the land as they wish		0.389				0.557
Q4 I prefer to care for the forest rather than use it for agriculture		0.353				0.557
Factor 3						**Alpha.673**
Q33 I want to do something good for the forest			0.766			N/A
Q36 I need more capacity to engage in good agricultural practices			0.642			N/A
Factor 4						**Alpha: .545**
Q2 If I was the owner of my land I would care more				0.636		0.481
Q3 I can help reduce forest loss				0.495		0.307
Q1 It is important to practice good management of natural resources even it it costs money and time				0.435		0.53
Factor 5						**Alpha: .347**
Q5 I would like to have a different job that is not working in the field					0.663	N/A
Q30 I am **not** against cutting down the forest					-0.441	N/A

Table 16: Final factor solution for Mayan sub-group

Appendix C.3: Exploring stakeholder characteristic groups and how they vary with the factors

What stakeholder characteristics can be explored?

Ownership status was removed as a variable as almost 50% of respondents (n = 247) did not respond to this question. Those that did answer largely indicated they were owners of the land (n = 191), with only 20 respondents identifying as renting land and 36 as having use rights. This skewed sample, as well as the low overall sample size in comparison to the other characteristics measured meant that ownership was removed from the analyses as comparisons were likely to be biased and invalid.

The low response rate for ownership is likely due to the question placement and wording. Section 2 of the questionnaire asked respondent to identify the nature of their relationship to the land (i.e. owner, renter, use rights or labourer). Section 3 asked all respondents who were either owners, renters or had use rights to land to describe their sector and cooperative membership status and the amount of current and historical forested land they own/use. Section 4 asked those without ownership or use rights to describe their sector and cooperative membership status, and asked questions about where they had worked in the past decade. Often respondents tended to skip Section 2 and go straight to Section 3, as <1% of respondents (n= 29) identified themselves explicitly as labourers (i.e. without ownership, not renting or holding use rights). For the 219 respondents who did not answer the ownership question, it is also not possible to explicitly state whether they were owners, renters or holding use rights, as Section 3 was designed for all of those to answer.

Group Descriptives	Ladino	Mayan	Subsistence	Commercial/Cattle Ranchers	Coffee/ Cardamom	Forestry	FDN	Fundaeco	UVG	Women	Men	Landowners	Rent	Land Use Rights	Coop Member	Coop Non-Member
Ladino	**120**	0	76	19	5	5	53	66	1	37	83	77	9	22	42	69
Mayan	0	**312**	164	7	80	25	60	123	129	136	170	130	10	14	204	114
Subsistence	76	164	**265**	0	0	0	67	158	40	109	152	132	16	26	107	152
Commercial/Cattle Ranchers	19	7	0	**32**	0	0	15	12	5	10	20	18	0	5	10	21
Coffee/Cardamom	5	80	0	0	**99**	0	32	2	65	35	63	15	1	3	84	15
Forestry	5	25	0	0	0	**39**	7	1	31	16	23	7	0	0	31	5
FDN	53	60	67	15	32	7	**136**	0	0	7	125	66	5	10	82	49
Fundaeco	66	123	158	12	2	1	0	**195**	0	103	91	125	15	26	53	130
UVG	1	129	40	5	65	31	0	0	**164**	84	78	0	0	0	117	35
Women	37	136	109	10	35	16	7	103	84	**195**	0	69	8	11	88	88
Men	83	170	152	20	63	23	125	91	78	0	**294**	118	12	25	159	124
Landowners	77	130	132	18	15	7	66	125	0	69	118	**191**	0	0	70	109
Rent	9	10	16	0	1	0	5	15	0	8	12	0	**20**	0	7	12
Land Use Rights	22	14	26	5	3	0	10	26	0	11	25	0	0	**36**	12	24
Coop Member	42	204	107	10	84	31	82	53	117	88	159	70	7	12	**252**	0
Coop Non-Member	69	114	152	21	15	5	49	130	35	88	124	109	12	24	0	**214**

Table 17: Descriptives for all land user characteristic groups

The above table breaks down all the responses into the characteristics measured, showing the potential for overlap between groups. The individual categorised characteristics (all excluding age and number of children) identified in the questionnaire are likely to overlap. Therefore, we used a correspondence analysis to explore similarities between these different groups and make a decision whether some groups were worth combining into one larger group for further analyses.

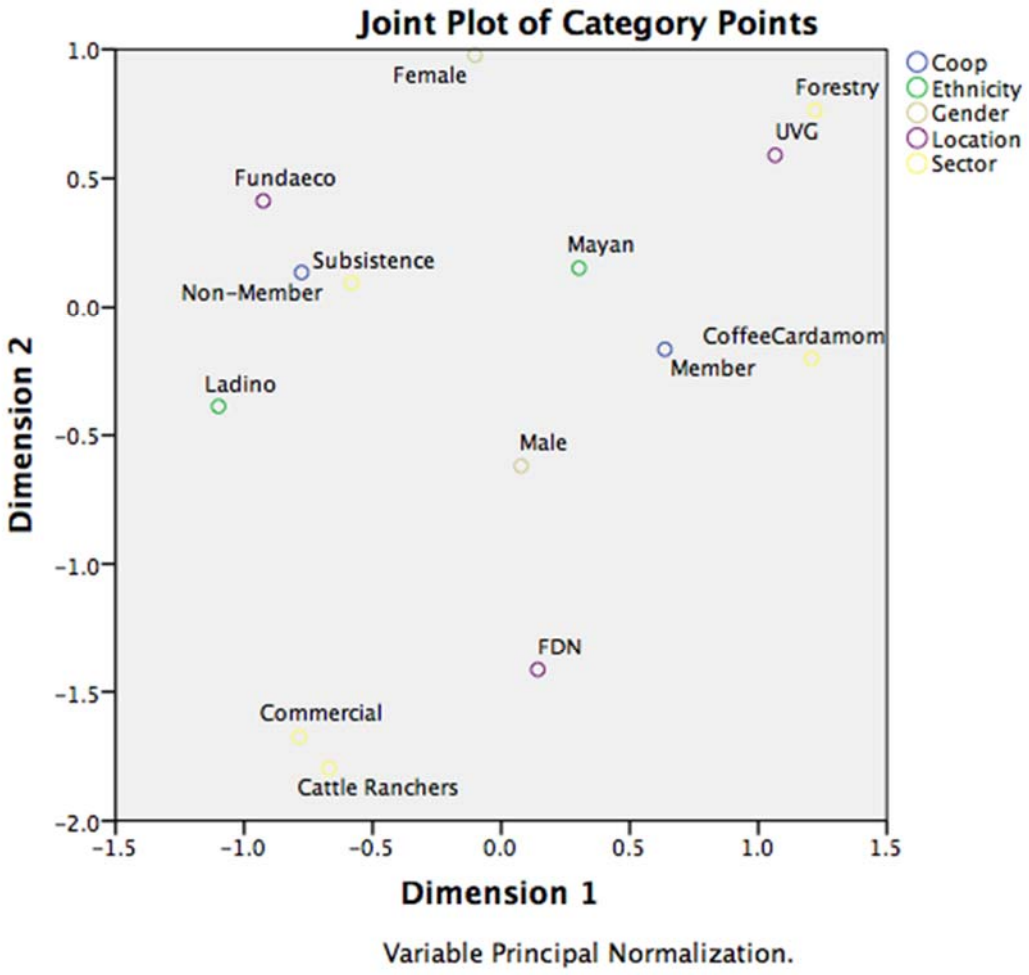


Figure 4: Joint plot of category points

Discrimination Measures			
	Dimension		Mean
	1	2	
Location	0.737	0.694	0.715
Coop	0.477	0.023	0.25
Ethnicity	0.316	0.049	0.182
Gender	0.008	0.602	0.305
Sector	0.642	0.218	0.43
Active Total	2.181	1.585	1.883

Table 20: Discrimination measures

The correspondence analysis indicated that cattle ranchers and commercial farmers may be very similar, and it made sense to combine these two sub-groups as they were very small sample sizes individually. Other than these two, there did not seem to be an obvious reason to restructure the other groups, so it was decided to leave them as they were.

Descriptive statistics for age and number of children are shown below. There are no individuals with zero children included as in the coding process zero was a missing value, and the results could not be separated from those who reported having no children versus those who did not respond to the question.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	396	17	86	42.3687	13.04599
Valid N (listwise)	396				

Table 18: Descriptive statistics for age

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Children	358	1	15	4.757	2.52598
Valid N (listwise)	358				

Table 19: Descriptive statistics for number of children

Location

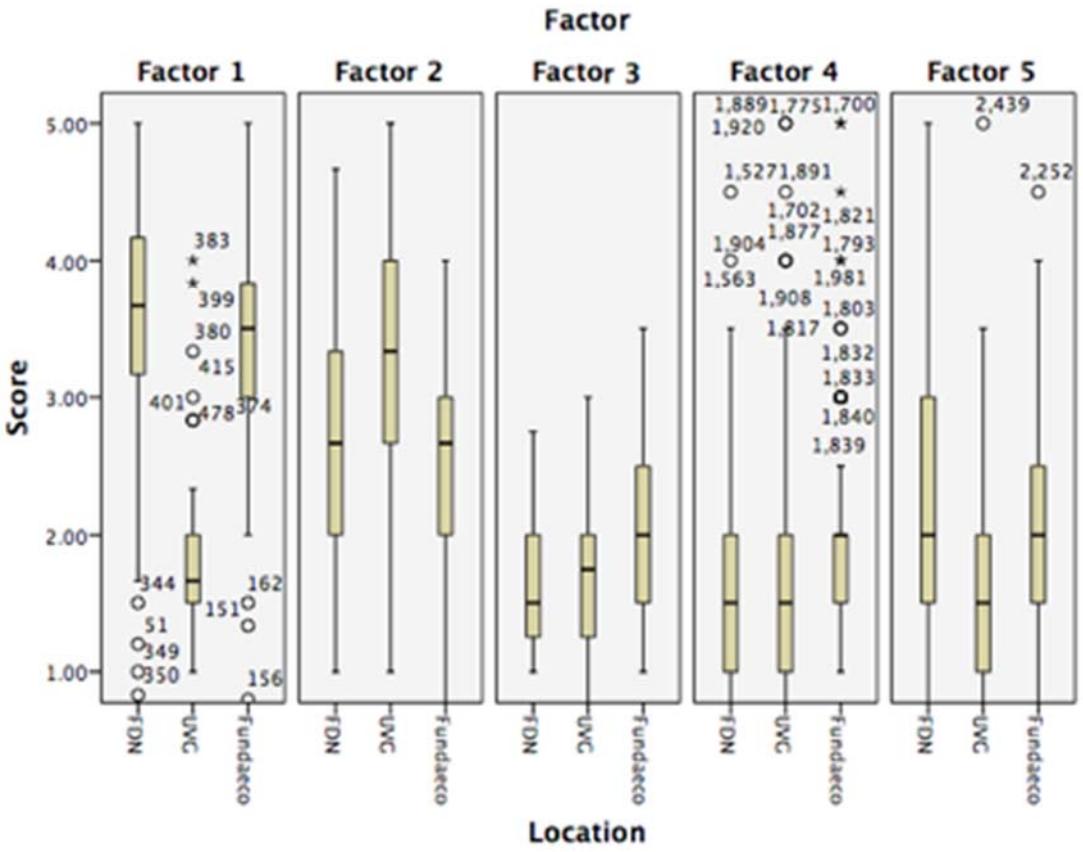


Figure 5: Boxplot of Locations against factor scores

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
FS1	Between Groups	287.999	2	143.999	394.548	0
	Within Groups	145.624	399	0.365		
	Total	433.623	401			
FS2	Between Groups	51.84	2	25.92	44.133	0
	Within Groups	234.338	399	0.587		
	Total	286.178	401			
FS3	Between Groups	8.594	2	4.297	16.474	0
	Within Groups	104.07	399	0.261		
	Total	112.664	401			
FS4	Between Groups	8.342	2	4.171	7.387	0.001
	Within Groups	223.621	396	0.565		
	Total	231.964	398			
FS5	Between Groups	21.427	2	10.713	18	0
	Within Groups	237.472	399	0.595		
	Total	258.899	401			

Table 21: ANOVA of locations against factors

Multiple Comparisons							
Tukey HSD							
Dependent Variab	(I) Location	(J) Location	Mean Differe	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FS1	FDN	UVG	1.96646*	0.07938	0	1.7797	2.1532
		Fundaeco	.30589*	0.07601	0	0.1271	0.4847
	UVG	FDN	-1.96646*	0.07938	0	-2.1532	-1.7797
		Fundaeco	-1.66057*	0.07016	0	-1.8256	-1.4955
	Fundaeco	FDN	-.30589*	0.07601	0	-0.4847	-0.1271
		UVG	1.66057*	0.07016	0	1.4955	1.8256
FS2	FDN	UVG	-.63945*	0.1007	0	-0.8764	-0.4025
		Fundaeco	0.17446	0.09642	0.168	-0.0524	0.4013
	UVG	FDN	.63945*	0.1007	0	0.4025	0.8764
		Fundaeco	.81391*	0.089	0	0.6045	1.0233
	Fundaeco	FDN	-0.17446	0.09642	0.168	-0.4013	0.0524
		UVG	-.81391*	0.089	0	-1.0233	-0.6045
FS3	FDN	UVG	-0.04042	0.05711	0.819	-0.1983	0.1175
		Fundaeco	-.31827*	0.05425	0	-0.4694	-0.1671
	UVG	FDN	0.04042	0.05711	0.819	-0.1175	0.1983
		Fundaeco	-.27785*	0.05931	0	-0.4174	-0.1383
	Fundaeco	FDN	.31827*	0.05425	0	0.1671	0.4694
		UVG	.27785*	0.05931	0	0.1383	0.4174
FS4	FDN	UVG	-0.13526	0.09918	0.361	-0.3686	0.0981
		Fundaeco	-.35140*	0.09494	0.001	-0.5747	-0.128
	UVG	FDN	0.13526	0.09918	0.361	-0.0981	0.3686
		Fundaeco	-.21613*	0.08757	0.037	-0.4221	-0.0101
	Fundaeco	FDN	.35140*	0.09494	0.001	0.128	0.5747
		UVG	.21613*	0.08757	0.037	0.0101	0.4221
FS5	FDN	UVG	.57390*	0.10137	0	0.3354	0.8124
		Fundaeco	0.17051	0.09706	0.186	-0.0578	0.3988
	UVG	FDN	-.57390*	0.10137	0	-0.8124	-0.3354
		Fundaeco	-.40339*	0.08959	0	-0.6142	-0.1926
	Fundaeco	FDN	-0.17051	0.09706	0.186	-0.3988	0.0578
		UVG	.40339*	0.08959	0	0.1926	0.6142
* The mean difference is significant at the 0.05 level.							

Table 22: Tukey post-hoc tests of locations vs factors

Sector

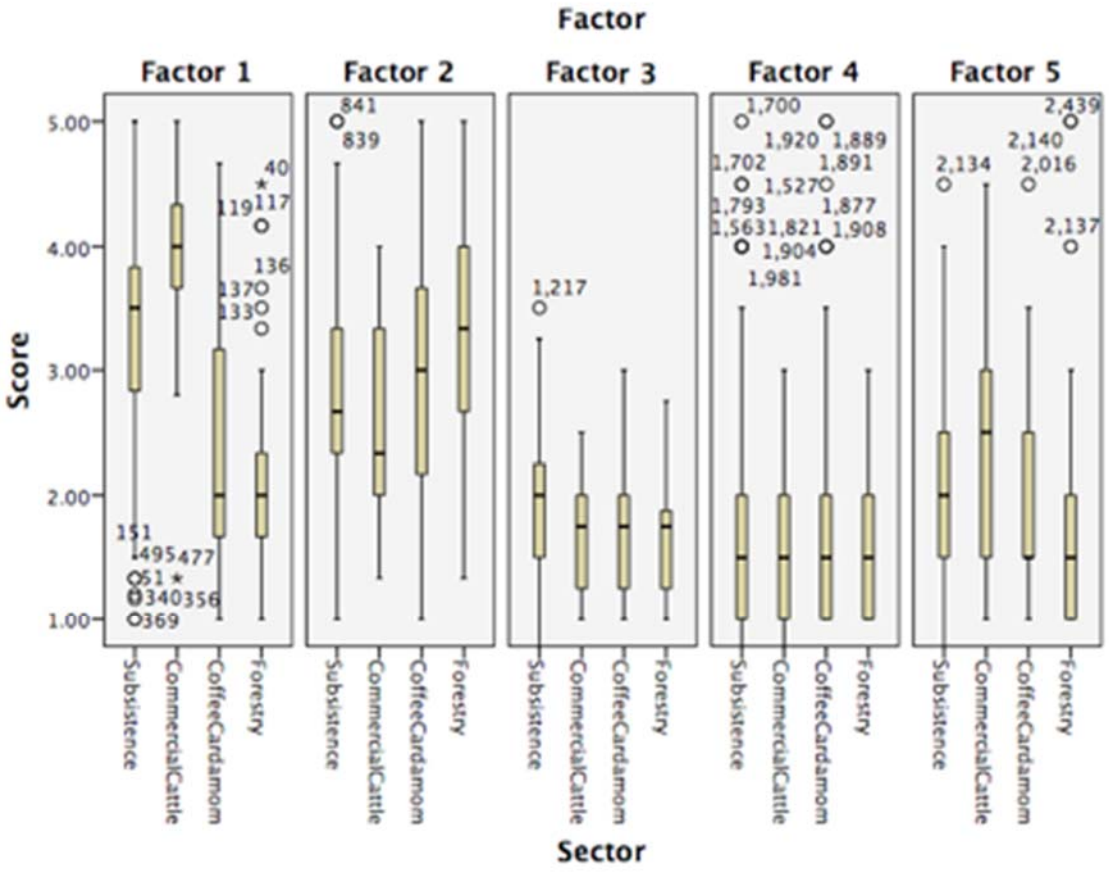


Figure 6: Boxplot of sector vs factors

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
FS1	Between Groups	77.593	3	25.864	30.301	0
	Within Groups	304.729	357	0.854		
	Total	382.322	360			
FS2	Between Groups	5.623	3	1.874	2.808	0.04
	Within Groups	238.297	357	0.667		
	Total	243.921	360			
FS3	Between Groups	3.507	3	1.169	4.318	0.005
	Within Groups	96.648	357	0.271		
	Total	100.154	360			
FS4	Between Groups	3.889	3	1.296	2.218	0.086
	Within Groups	206.886	354	0.584		
	Total	210.774	357			
FS5	Between Groups	4.894	3	1.631	2.585	0.053
	Within Groups	225.351	357	0.631		
	Total	230.245	360			

Table 23: ANOVA of sectors against factors

Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) NewSector	(J) NewSector	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FS1	Subsistence	Commercial/Cattle	-0.36164	0.2065	0.299	-0.8947	0.1714
		CoffeeCardamom	.90152*	0.11545	0	0.6035	1.1995
		Forestry	1.05856*	0.18831	0	0.5725	1.5446
	Commercial/Cattle	Subsistence	0.36164	0.2065	0.299	-0.1714	0.8947
		CoffeeCardamom	1.26316*	0.21973	0	0.686	1.8403
		Forestry	1.42020*	0.26536	0	0.7353	2.1051
	CoffeeCardamom	Subsistence	-.90152*	0.11545	0	-1.1995	-0.6035
		Commercial/Cattle	-1.26316*	0.21973	0	-1.8303	-0.696
		Forestry	0.15704	0.20273	0.866	-0.3662	0.6803
	Forestry	Subsistence	-1.05856*	0.18831	0	-1.5446	-0.5725
		Commercial/Cattle	-1.42020*	0.26536	0	-2.1051	-0.7353
		CoffeeCardamom	-0.15704	0.20273	0.866	-0.6803	0.3662
FS2	Subsistence	Commercial/Cattle	0.21171	0.18261	0.653	-0.2596	0.6831
		CoffeeCardamom	-0.16236	0.1021	0.385	-0.4259	0.1012
		Forestry	-0.35002	0.16652	0.154	-0.7798	0.0798
	Commercial/Cattle	Subsistence	-0.21171	0.18261	0.653	-0.6831	0.2596
		CoffeeCardamom	-0.37407	0.19431	0.219	-0.8756	0.1275
		Forestry	-0.56173	0.23466	0.08	-1.1674	0.044
	CoffeeCardamom	Subsistence	0.16236	0.1021	0.385	-0.1012	0.4259
		Commercial/Cattle	0.37407	0.19431	0.219	-0.1275	0.8756
		Forestry	-0.18765	0.17927	0.722	-0.6504	0.2751
	Forestry	Subsistence	0.35002	0.16652	0.154	-0.0798	0.7798
		Commercial/Cattle	0.56173	0.23466	0.08	-0.044	1.1674
		CoffeeCardamom	0.18765	0.17927	0.722	-0.2751	0.6504
FS3	Subsistence	Commercial/Cattle	0.24529	0.1163	0.152	-0.0549	0.5455
		CoffeeCardamom	.17635*	0.06502	0.035	0.0085	0.3442
		Forestry	0.23561	0.10605	0.119	-0.0381	0.5093
	Commercial/Cattle	Subsistence	-0.24529	0.1163	0.152	-0.5455	0.0549
		CoffeeCardamom	-0.06894	0.12375	0.945	-0.3884	0.2505
		Forestry	-0.00968	0.14944	1	-0.3954	0.376
	CoffeeCardamom	Subsistence	-.17635*	0.06502	0.035	-0.3442	-0.0085
		Commercial/Cattle	0.06894	0.12375	0.945	-0.2505	0.3884
		Forestry	0.05926	0.11417	0.954	-0.2354	0.354
	Forestry	Subsistence	-0.23561	0.10605	0.119	-0.5093	0.0381
		Commercial/Cattle	0.00968	0.14944	1	-0.376	0.3954
		CoffeeCardamom	-0.05926	0.11417	0.954	-0.354	0.2354
FS4	Subsistence	Commercial/Cattle	0.34318	0.17094	0.187	-0.0981	0.7844
		CoffeeCardamom	0.17464	0.09604	0.266	-0.0733	0.4225
		Forestry	0.158	0.15589	0.742	-0.2444	0.5604
	Commercial/Cattle	Subsistence	-0.34318	0.17094	0.187	-0.7844	0.0981
		CoffeeCardamom	-0.16854	0.18202	0.791	-0.6384	0.3013
		Forestry	-0.18519	0.21957	0.834	-0.7519	0.3816
	CoffeeCardamom	Subsistence	-0.17464	0.09604	0.266	-0.4225	0.0733
		Commercial/Cattle	0.16854	0.18202	0.791	-0.3013	0.6384
		Forestry	-0.01665	0.16796	1	-0.4502	0.4169
	Forestry	Subsistence	-0.158	0.15589	0.742	-0.5604	0.2444
		Commercial/Cattle	0.18519	0.21957	0.834	-0.3816	0.7519
		CoffeeCardamom	0.01665	0.16796	1	-0.4169	0.4502
FS5	Subsistence	Commercial/Cattle	-0.29545	0.17758	0.345	-0.7538	0.1629
		CoffeeCardamom	0.18333	0.09928	0.253	-0.0729	0.4396
		Forestry	0.12963	0.16193	0.854	-0.2883	0.5476
	Commercial/Cattle	Subsistence	0.29545	0.17758	0.345	-0.1629	0.7538
		CoffeeCardamom	0.47879	0.18896	0.057	-0.009	0.9665
		Forestry	0.42508	0.22819	0.246	-0.1639	1.0141
	CoffeeCardamom	Subsistence	-0.18333	0.09928	0.253	-0.4396	0.0729
		Commercial/Cattle	-0.47879	0.18896	0.057	-0.9665	0.009
		Forestry	-0.0537	0.17434	0.99	-0.5037	0.3963
	Forestry	Subsistence	-0.12963	0.16193	0.854	-0.5476	0.2883
		Commercial/Cattle	-0.42508	0.22819	0.246	-1.0141	0.1639
		CoffeeCardamom	0.0537	0.17434	0.99	-0.3963	0.5037
* The mean difference is significant at the 0.05 level.							

Table 24: Tukey post-hoc tests of sectors vs factors

Cooperative Membership

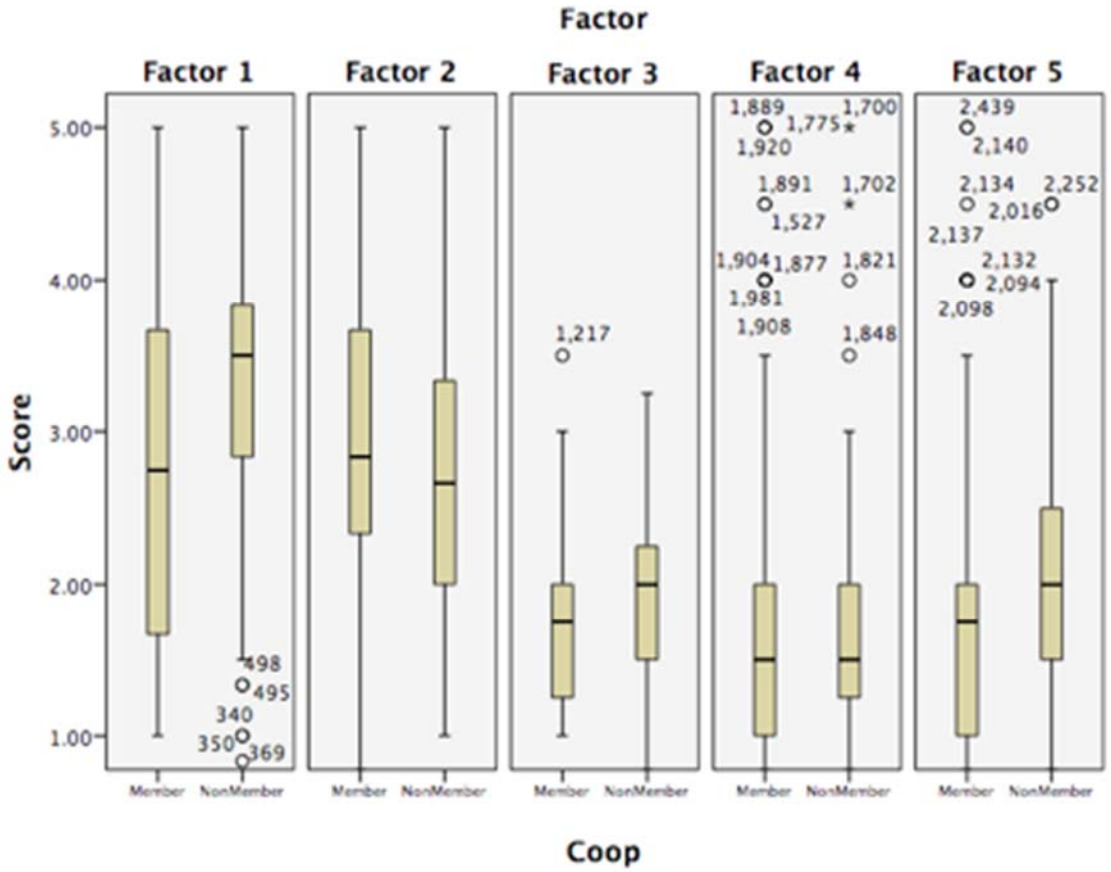


Figure 7: Boxplot of cooperative/non-cooperative vs factors

ANOVA						
		Sum of Square	df	Mean Square	F	Sig.
FS1	Between Groups	30.406	1	30.406	30.503	0
	Within Groups	383.766	385	0.997		
	Total	414.171	386			
FS2	Between Groups	0.542	1	0.542	0.779	0.378
	Within Groups	267.841	385	0.696		
	Total	268.382	386			
FS3	Between Groups	3.621	1	3.621	13.423	0
	Within Groups	103.853	385	0.27		
	Total	107.474	386			
FS4	Between Groups	1.525	1	1.525	2.706	0.101
	Within Groups	215.308	382	0.564		
	Total	216.833	383			
FS5	Between Groups	7.724	1	7.724	12.282	0.001
	Within Groups	242.122	385	0.629		
	Total	249.846	386			

Table 25: ANOVA of cooperative/non-cooperative vs factors

Ethnicity

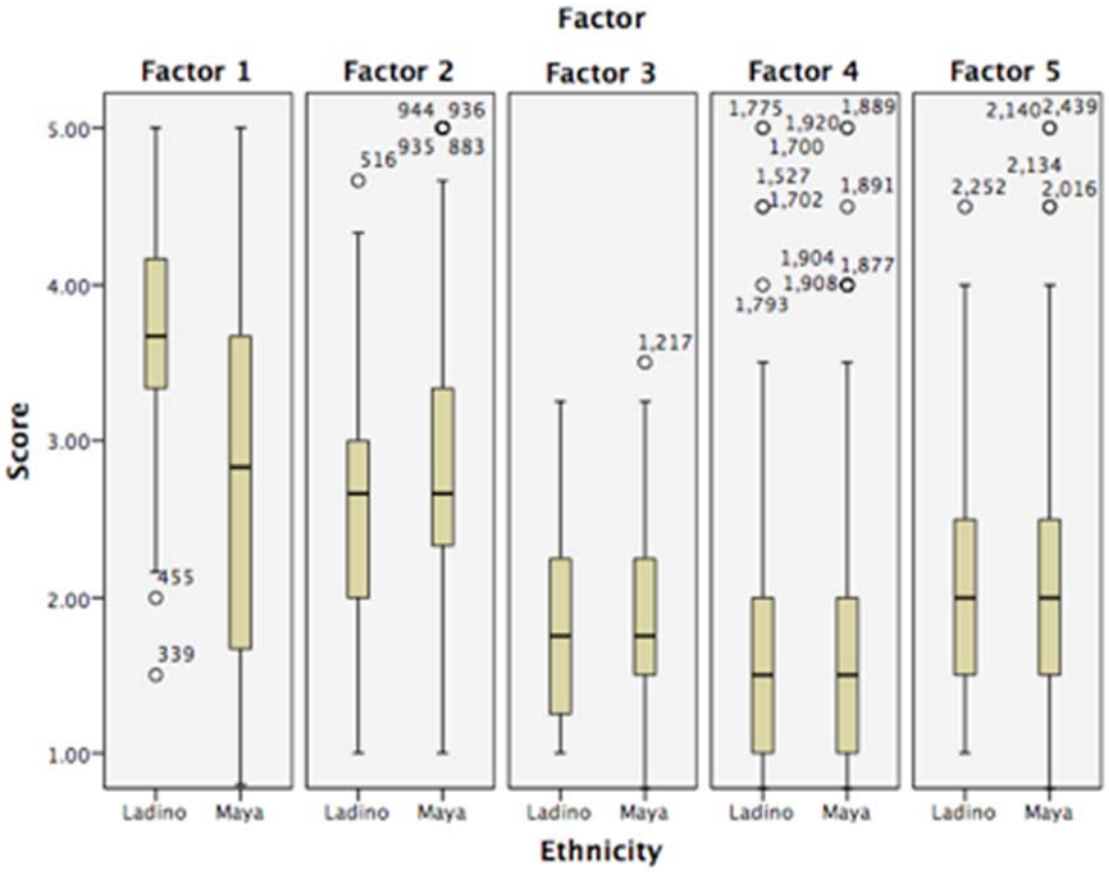


Figure 8: Boxplot of ethnicity vs factors

ANOVA						
		Sum of Square	df	Mean Square	F	Sig.
FS1	Between Grou	65.124	1	65.124	70.655	0
	Within Groups	356.705	387	0.922		
	Total	421.829	388			
FS2	Between Grou	5.902	1	5.902	8.587	0.004
	Within Groups	266.003	387	0.687		
	Total	271.905	388			
FS3	Between Grou	0.007	1	0.007	0.024	0.878
	Within Groups	111.45	387	0.288		
	Total	111.457	388			
FS4	Between Grou	0.124	1	0.124	0.211	0.646
	Within Groups	224.494	384	0.585		
	Total	224.617	385			
FS5	Between Grou	1.765	1	1.765	2.731	0.099
	Within Groups	250.197	387	0.647		
	Total	251.963	388			

Table 26: ANOVA of ethnicity vs factors

Gender

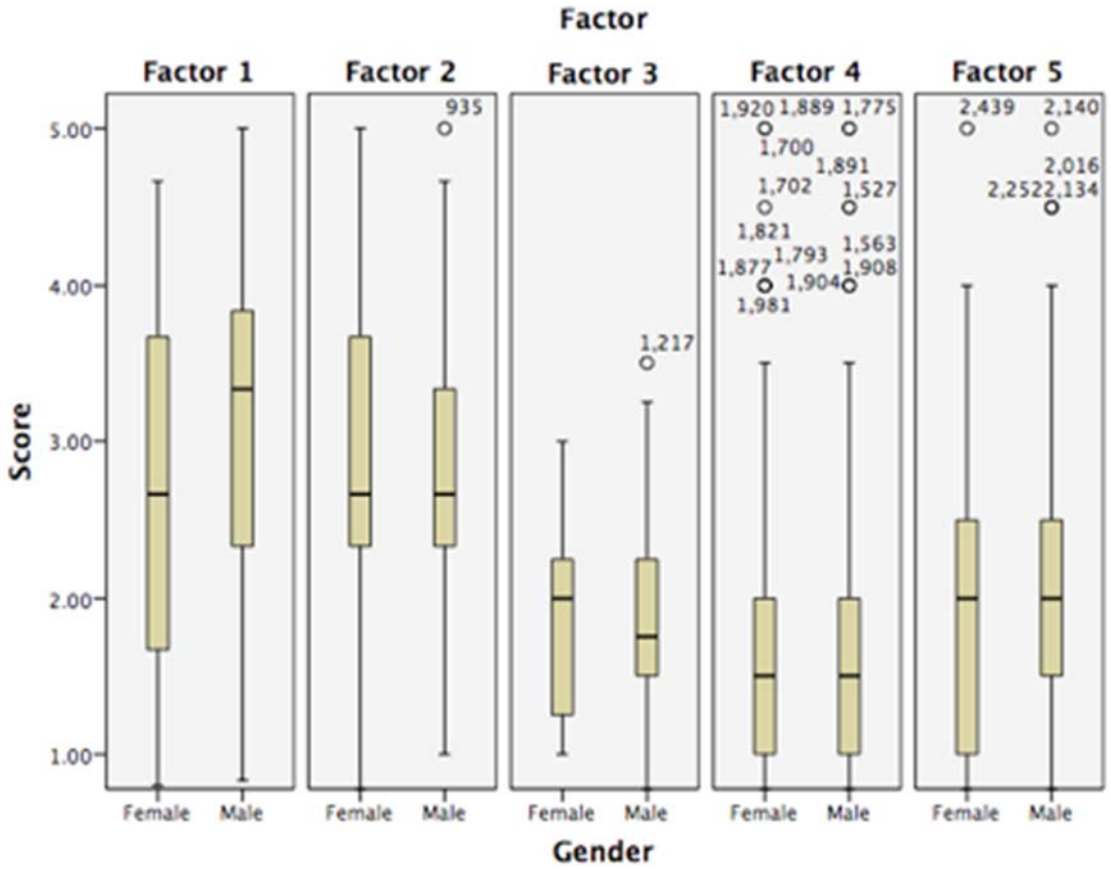


Figure 9: Boxplot of gender vs factors

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
FS1	Between Groups	23.578	1	23.578	22.908	0
	Within Groups	405.512	394	1.029		
	Total	429.089	395			
FS2	Between Groups	0.146	1	0.146	0.204	0.652
	Within Groups	282.928	394	0.718		
	Total	283.074	395			
FS3	Between Groups	0.135	1	0.135	0.479	0.489
	Within Groups	110.661	394	0.281		
	Total	110.795	395			
FS4	Between Groups	0.889	1	0.889	1.517	0.219
	Within Groups	229.26	391	0.586		
	Total	230.149	392			
FS5	Between Groups	4.787	1	4.787	7.593	0.006
	Within Groups	248.402	394	0.63		

Table 27: ANOVA of factors vs gender

Age

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.104a	0.011	0.008	1.03918
a Predictors: (Constant), Age				

Table 28: Model summary of age vs factor 1

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.582	0.178		14.535	0
	Age	0.008	0.004	0.104	2.075	0.039
a Dependent Variable: FS1						

Table 29: Coefficients of age vs factor 1

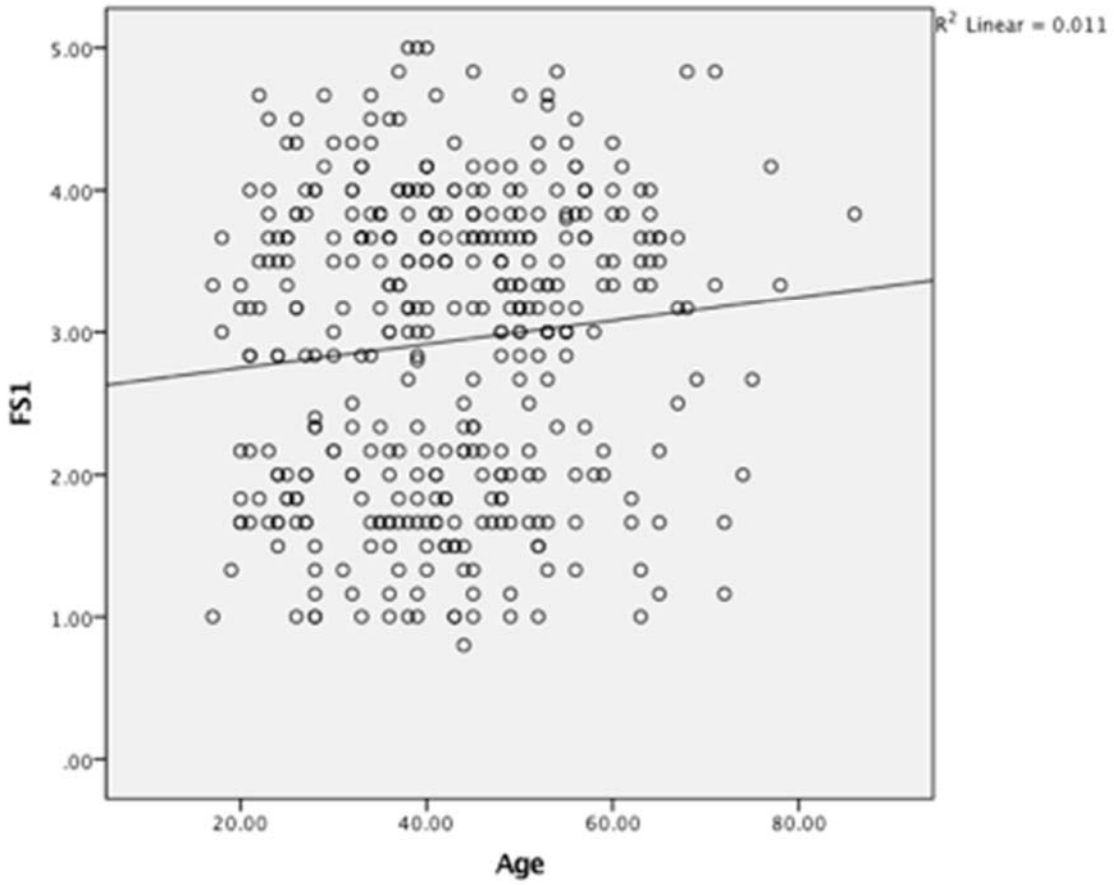


Figure 10: Graphical regression of age against factor 1

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.144a	0.021	0.018	0.84006
a Predictors: (Constant), Age				

Table 30: Model summary of age against factor 2

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.21	0.144		22.353	0
	Age	-0.009	0.003	-0.144	-2.893	0.004
a Dependent Variable: FS2						

Table 31: Coefficients of age against factor 2

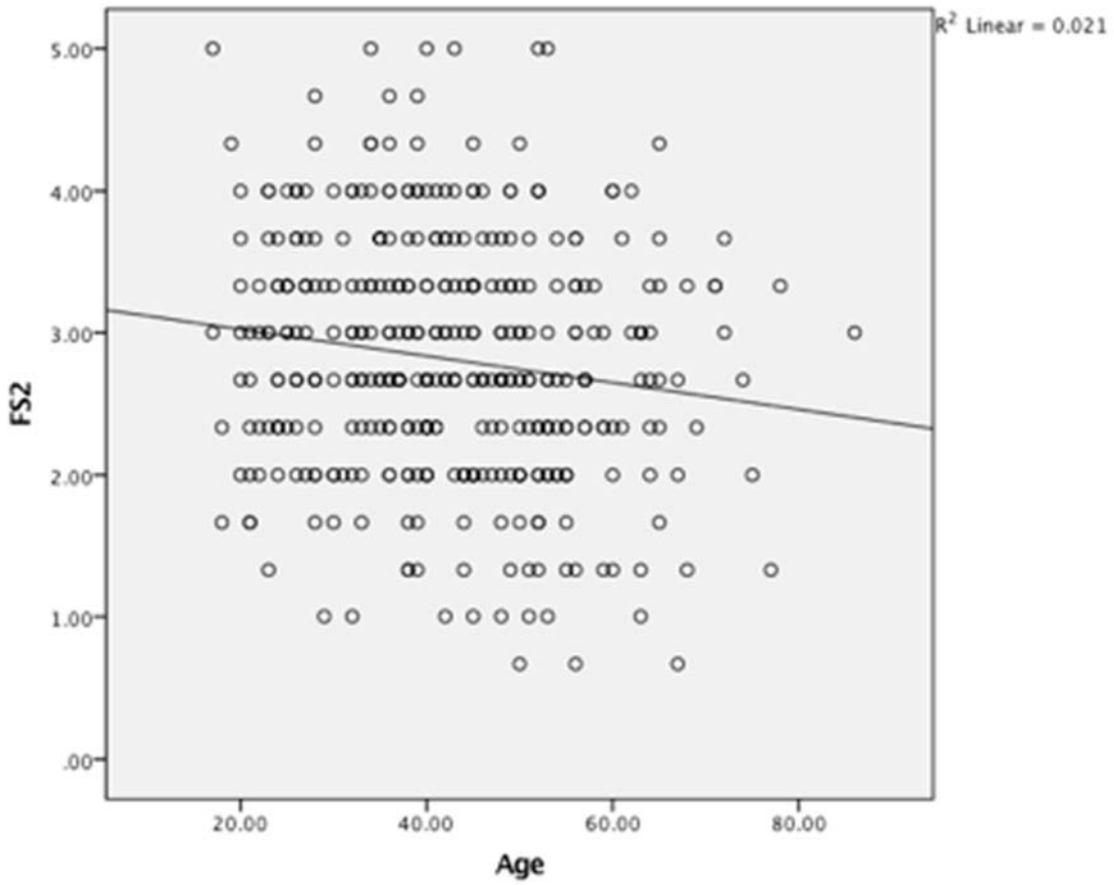


Figure 11: Graphical regression of age against factor 2

Appendix C.4: Forest cover change against stakeholder characteristic groups

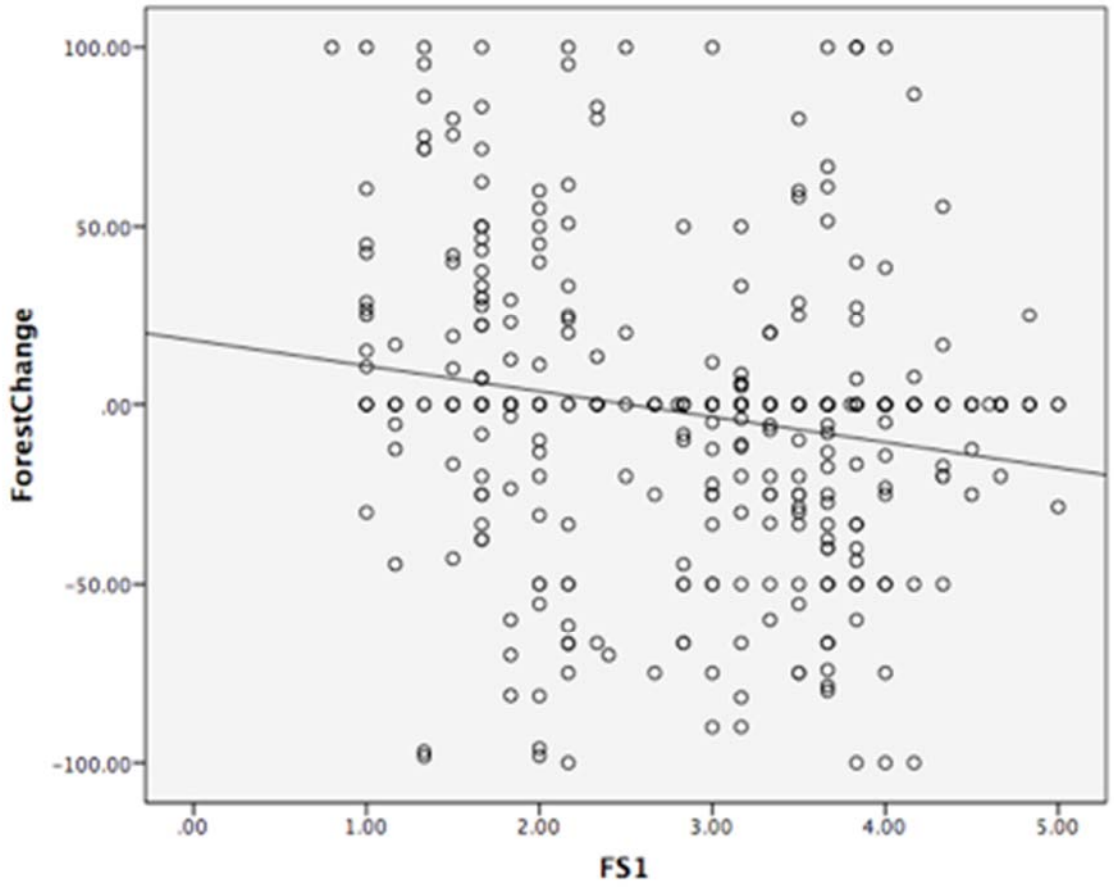


Figure 12: Graphical regression of factor 1 against % forest cover change

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.184a	0.034	0.032	39.52654
a Predictors: (Constant), FS1				

Table 32: Model summary of factor 1 against % forest cover change

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.882	5.925		3.018	0.003
	FS1	-7.116	1.898	-0.184	-3.749	0
a Dependent Variable: ForestChange						

Table 33: Coefficients of factor 1 against % forest cover change

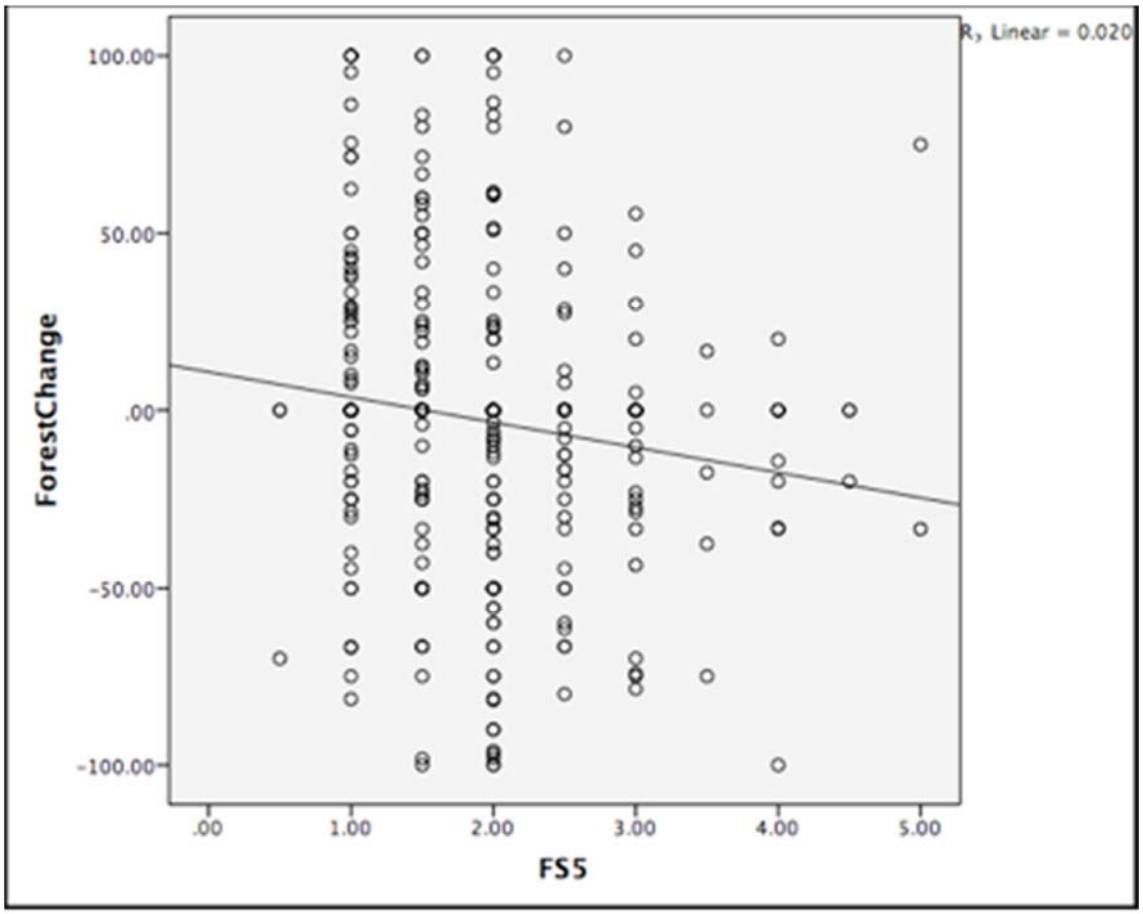


Figure 13: Graphical regression of factor 5 against % forest cover change

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.141a	0.02	0.017	39.81203
a Predictors: (Constant), FS5				

Table 34: Model summary of factor 2 against % forest cover change

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.728	5.227		2.053	0.041
	FS5	-7.058	2.474	-0.141	-2.853	0.005
a Dependent Variable: ForestChange						

Table 35: Coefficients of factor 2 against % forest cover change

Location

Multiple Comparisons						
Dependent Variable: ForestChange						
Tukey HSD						
(I) Location	(J) Location	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
FDN	UVG	-15.6267*	5.13171	0.007	-27.699	-3.5544
	Fundaeco	6.8899	4.91328	0.341	-4.6685	18.4484
UVG	FDN	15.6267*	5.13171	0.007	3.5544	27.699
	Fundaeco	22.5166*	4.53537	0	11.8472	33.1861
Fundaeco	FDN	-6.8899	4.91328	0.341	-18.4484	4.6685
	UVG	-22.5166*	4.53537	0	-33.1861	-11.8472
Based on observed means.						
The error term is Mean Square(Error) = 1525.164.						
* The mean difference is significant at the						

Table 36: Tukey post-hoc tests of location against % forest cover change

Report			
ForestChange			
Location	Mean	N	Std. Deviation
FDN	-5.4271	102	34.78807
UVG	10.1996	134	44.62063
Fundaeco	-12.3171	166	36.63964
Total	-3.0633	402	40.16477

Table 37: Means of locations against % forest cover change

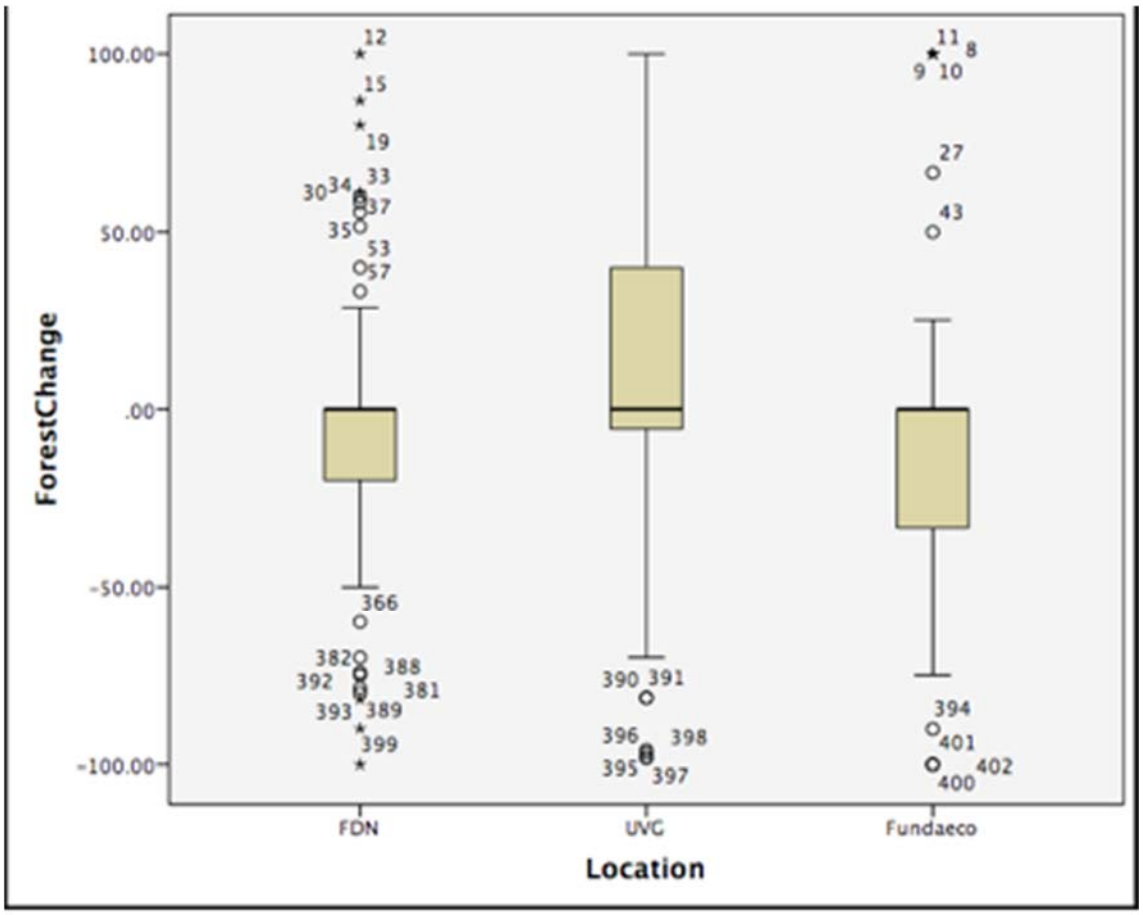


Figure 14: Boxplot of location against % forest cover change

Ethnicity

ANOVA					
ForestChange					
Ethnicity	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7174.962	1	7174.962	4.447	0.036
Within Groups	624457.461	387	1613.585		
Total	631632.423	388			

Table 38: ANOVA of ethnicity against % forest cover change

Report			
ForestChange			
Ethnicity	Mean	N	Std. Deviation
Ladino	-11.2739	82	36.16238
Mayan	-0.7444	307	41.16491
Total	-2.964	389	40.34747

Table 39: Means of ethnicity against % forest cover change

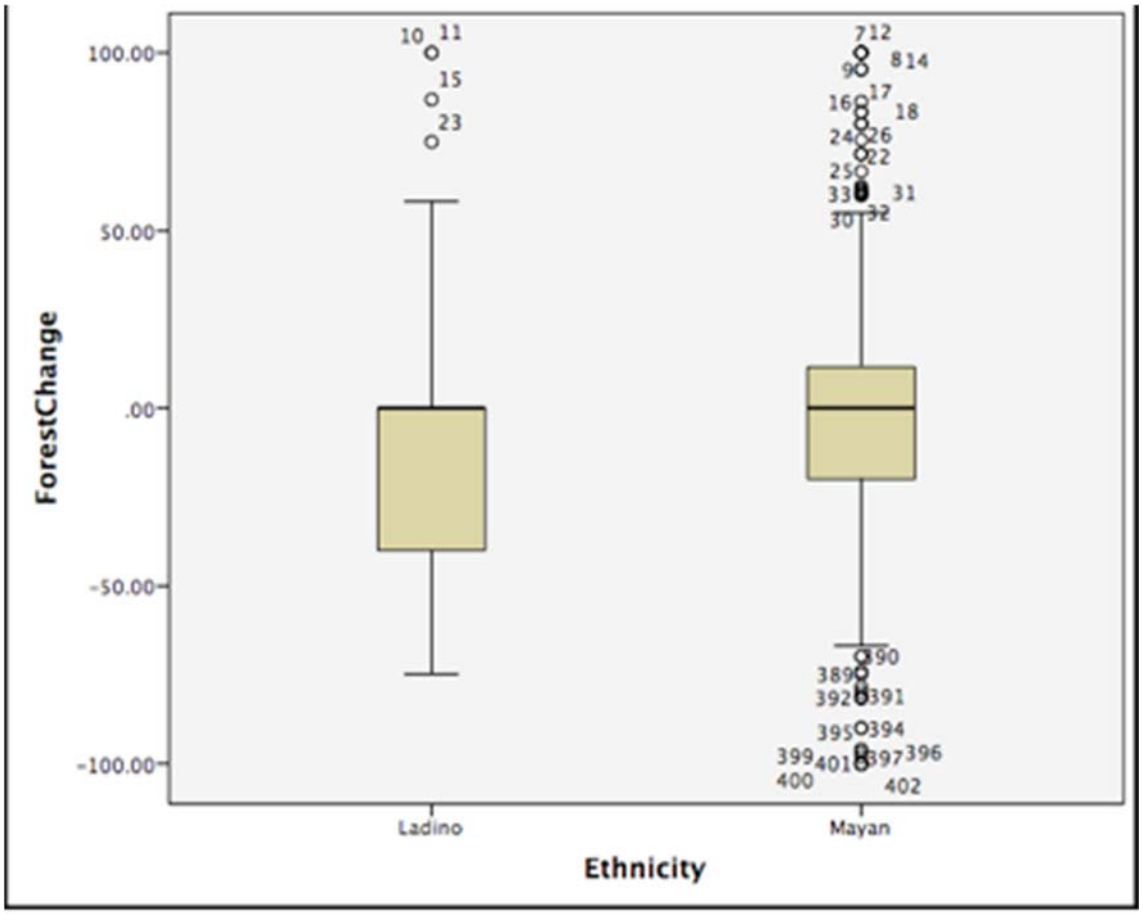


Figure 15: Boxplot of ethnicity against % forest cover change

Number of Children

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.122a	0.015	0.012	39.98779
a Predictors: (Constant), Children				

Table 40: Model summary of number of children against % forest cover change

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-12.818	4.511		-2.841	0.005
	Children	1.945	0.838	0.122	2.322	0.021
a Dependent Variable: Forestchange						

Table 41: Coefficients of number of children against % forest cover change

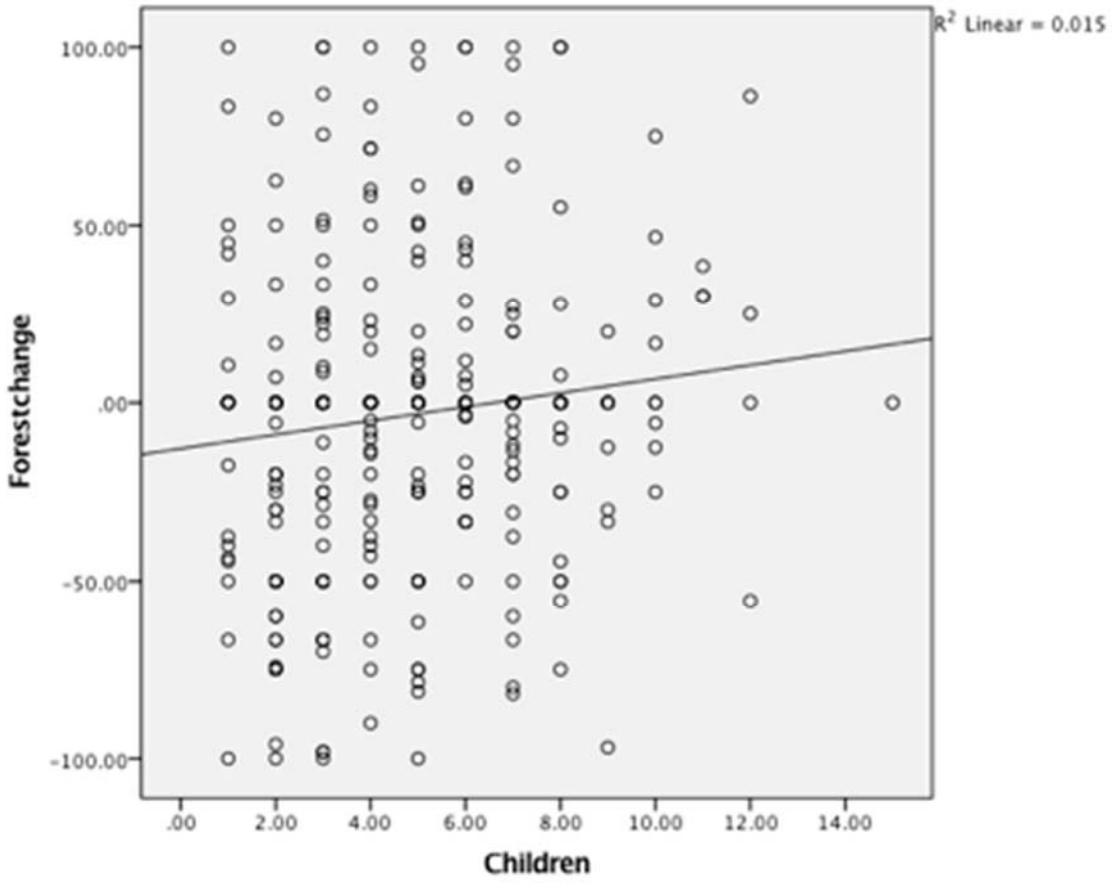


Figure 16: Boxplot of number of children against % forest cover change

Appendix C.5: Univariate analyses of variance

Tests of Between-Subjects Effects						
Dependent Variable: ForestChange						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	36899.340a	3	12299.78	7.962	0	0.058
Intercept	614.564	1	614.564	0.398	0.529	0.001
Ethnicity * FS1	29724.378	2	14862.189	9.621	0	0.048
Ethnicity	10274.183	1	10274.183	6.651	0.01	0.017
Error	594733.083	385	1544.761			
Total	635049.826	389				
Corrected Total	631632.423	388				
a R Squared = .058 (Adjusted R Squared = .051)						

Table 42: Final univariate ANOVA

Ethnicity				
Dependent Variable: ForestChange				
Ethnicity	Mean	Std. Error	95% Confidence Interval	
Lower Bound	Upper Bound			
Ladino	-17.458[a]	6.687	-30.605	-4.311
Mayan	-2.705[a]	2.291	-7.209	1.799
a. Covariates appearing in the model are evaluated at the following values: FS1 = 2.9368.				

Table 43: Means for ethnicity

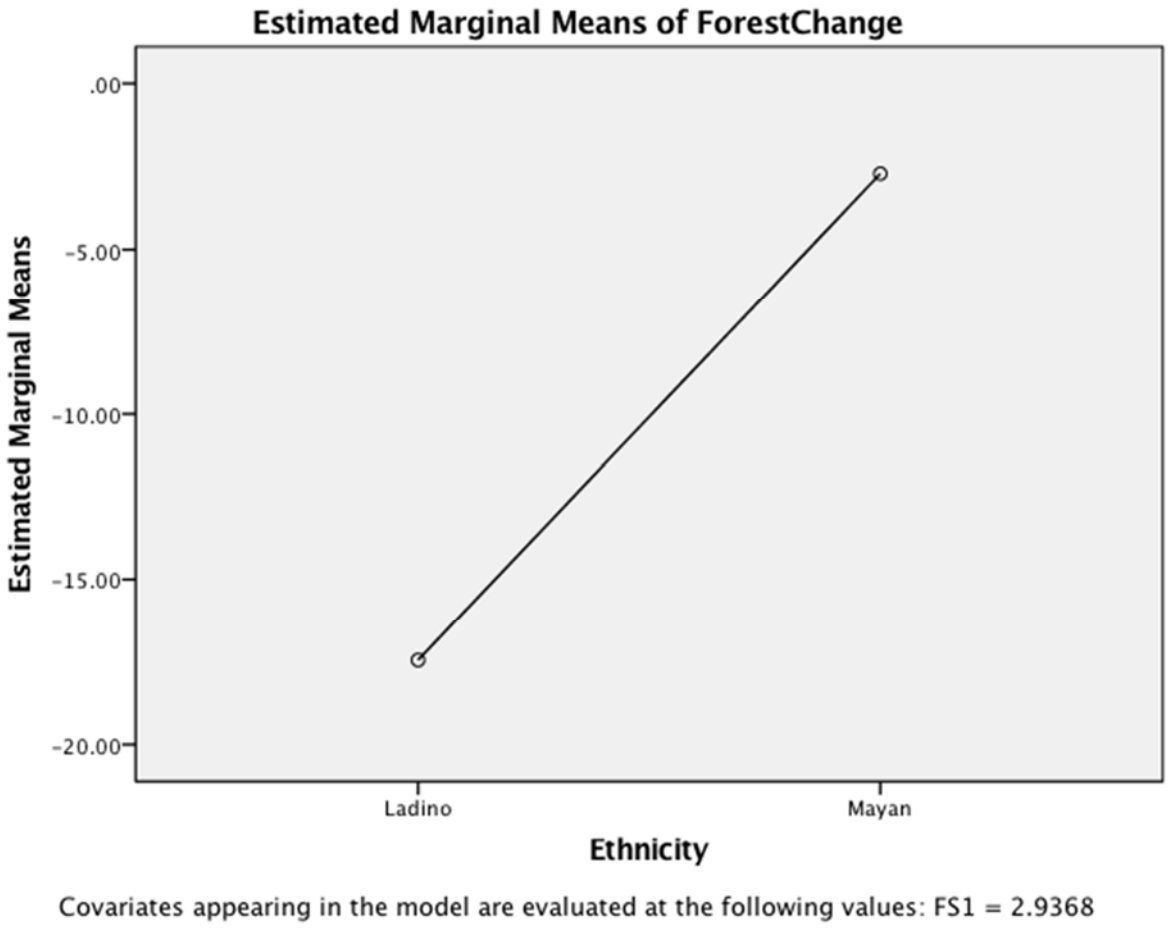


Figure 17: Estimated marginal means of forest change

Appendix C.6: Reasons for maintaining forest cover

ANOVA					
Factor Score 1					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.47	1	4.47	14.054	0
Within Groups	16.856	53	0.318		
Total	21.325	54			

Table 44: Ladino factor score against reasons for maintaining forest cover ANOVA

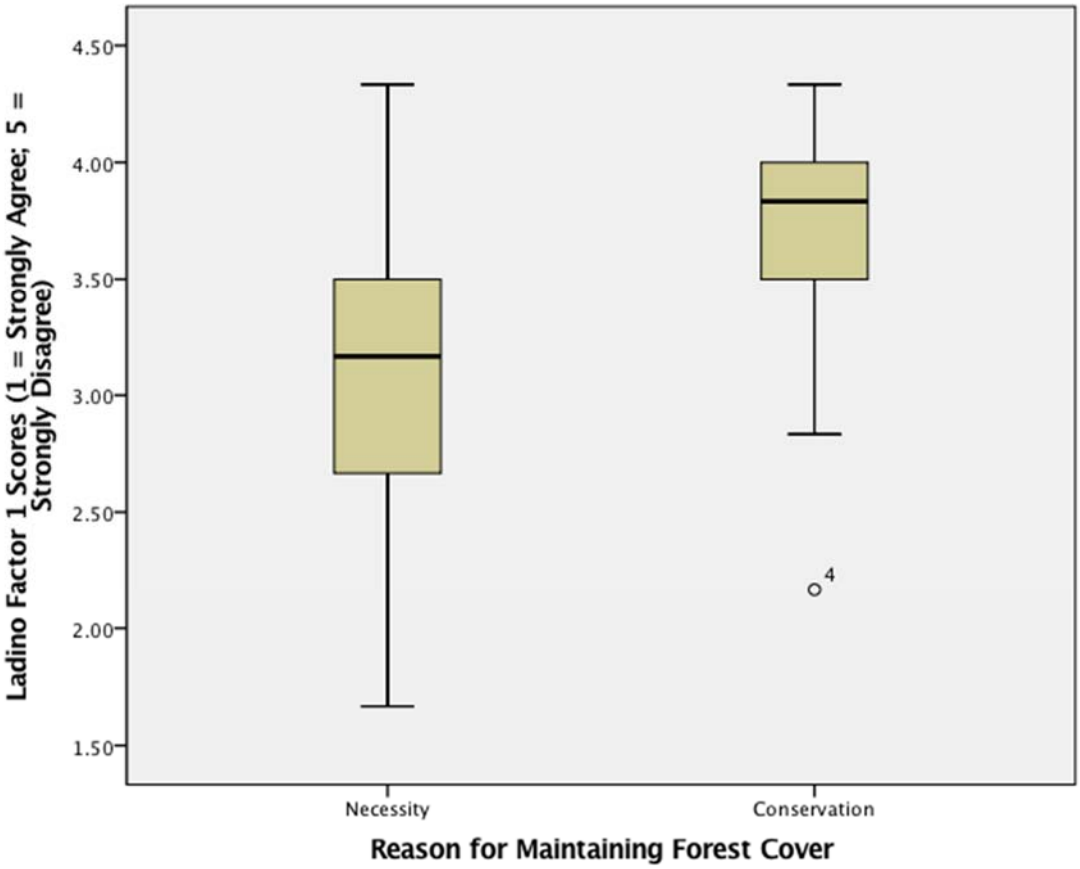


Figure 18: Ladino boxplot of reasons for maintaining forest cover against factor 1 scores

ANOVA					
FS1Maya					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.248	1	4.248	8.732	0.004
Within Groups	89.51	184	0.486		
Total	93.758	185			

Table 45: Mayan factor score against reasons for maintaining forest cover ANOVA

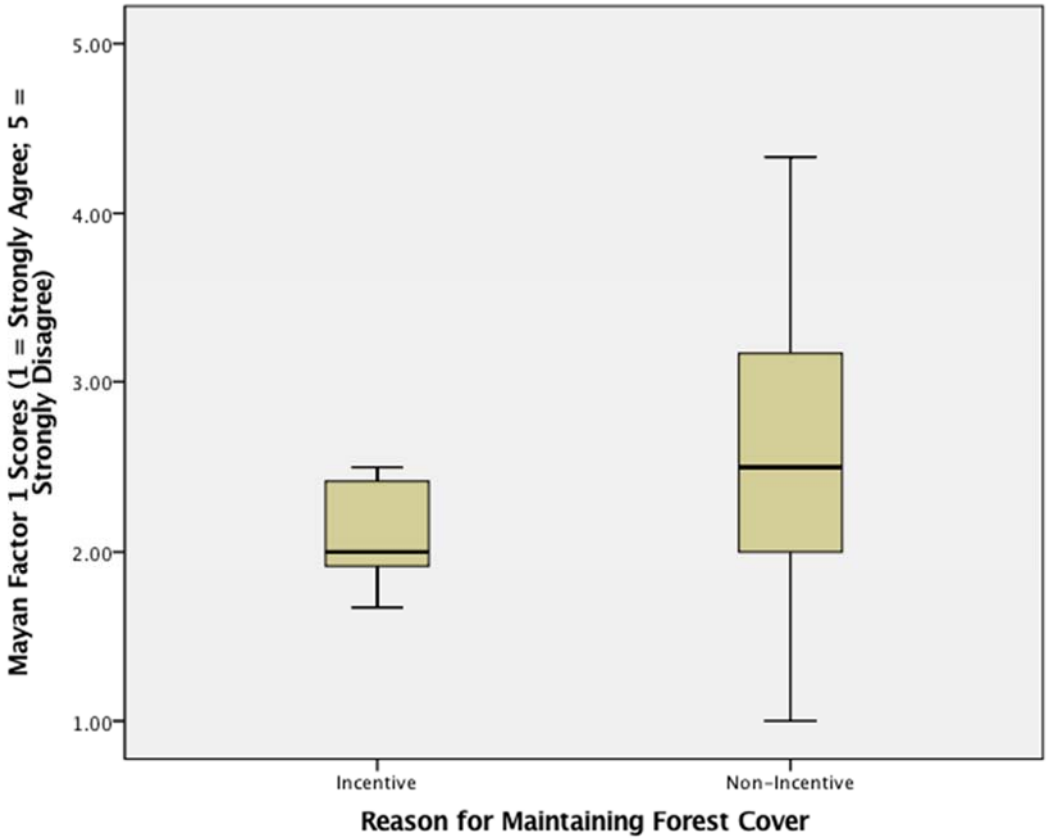


Figure 19: Mayan boxplot of reasons for maintaining forest cover against factor 1 scores

Appendix D: REDD+ decision maker questionnaire

Attitudes to REDD+ and drivers of deforestation in Guatemala

Good day/afternoon/evening, I am a student at the University of Greenwich in England, currently studying at the Centre for Environment and Biodiversity Studies (CEAB) at the Universidad del Valle de Guatemala.

The objective of this questionnaire is to improve understanding of the drivers of deforestation and the attitudes towards the process of development of REDD+.

At the same time, this study is also serving to generate ideas to contribute to environmental and development policies in Guatemala.

I would like to emphasise that all the information and data you provide in this questionnaire will not be used for or shared outwith this investigation.

If you have any questions about this study please contact:

[Contact details]

Section 1: Attitudes to REDD+

Attitude statements	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
Communities should receive carbon credits directly					
The benefit distribution system is too complex					
The price of carbon needs to be higher than the cost of using the natural resources					
Not all voices are heard equally in national REDD discussions					
There are important national actors who are not currently involved in REDD					
It is difficult to coordinate between all the actors present in REDD nationally					
REDD mechanisms are too complex to be implemented effectively					
No one is clear on what REDD mechanism is the best for the country					
People believe REDD is the solution to all our country's problems					
REDD is one mechanism among many to help the country meet environmental goals					
REDD is a threat to current environmental projects in the country					
We need to align our aims for REDD at a national level					
We need other solutions to deforestation that are not based on carbon credits					
Most Guatemalans cannot afford to invest in forests and wait for carbon payments					
Until the land tenure problem in Guatemala is solved, REDD cannot work					
The state does not engage in effective participatory processes					
REDD is a great bargaining tool for Guatemala internationally					
REDD has brought people together in a way that has not happened before					
REDD will bring about positive changes in national forest management					
The bureaucratic system in Guatemala adds to REDD complexity					
Guatemala does not have the technical capacity to produce the data required to implement REDD					
I do not understand where the money for REDD is coming from					
REDD should be better integrated with different national programmes like LEDS					
Money from REDD is essential for ensuring conservation efforts continue					

Section 2: Drivers of deforestation

Belief statements	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree	
People who own their land are more likely to protect the trees						
If more people understood the environment there would be less deforestation						
If there was more investment in economic progess there would be less pressure on natural resources						
For many people in Guatemala, forest resources are the only viable option for survival						
Guatemalans need immediate solutions, not long term investment						
Culture determines how people use the forest						
Relationships between NGOs and communities are important for conserving forests						
There needs to be more control over how communities use the land						
There is a lack of capacity to confront companies who are abusing the land						
Environmental policies often contradict each other						
Sustainable management practices are difficult and expensive to impelement						
The time between investment and payment in reforestation schemes is too long						
Many families are not aware of schemes they could take part in						
The state does not posess enough resources to develop effective environmental projects						
The state relies on help from NGOs to produce environmental projects						
If there were less conflicts over resources there would be more conservation						
Companies have the greatest capacity to deforest						
Subsistence farming is an important cause of deforestation in Guatemala						
As access to markets to improves, there is more incentive to deforest						
We need better management of our organisations						
Family planning is an important part of sustainable development						
Good healthcare is necessary to help people access better lifestyles						
Population growth is causing more intensive land use practices						

Section 3:

What does ‘deforestation’ mean to you?

What does ‘drivers of deforestation’ mean to you?

Is REDD+ a good idea for Guatemala?

- Yes
- No
- Don’t Know

Why?

In your opinion, what is the primary cause of deforestation in Guatemala?

What policies do you consider important to reducing deforestation in Guatemala?

Are you happy with the development of REDD+ at the moment?
1 2 3 4 5 6 7 8 9 10 (Where 1 is ‘not content’ and 10 is ‘content’)
Why?

What should be the first step for REDD+ in Guatemala?

Is this priority being reflected in REDD+ discussions in the country?

- Yes

- No
- Don’t Know

Why?

Section 4:

What sector do you work in?

- NGO
- Government
- Private Sector
- International Organisation
- Academia
- Community Association

Which organization do you work for?

At what level does this organization operate?

- Local
- Regional
- National
- International

Where do you work (e.g. region, department, municipality)?

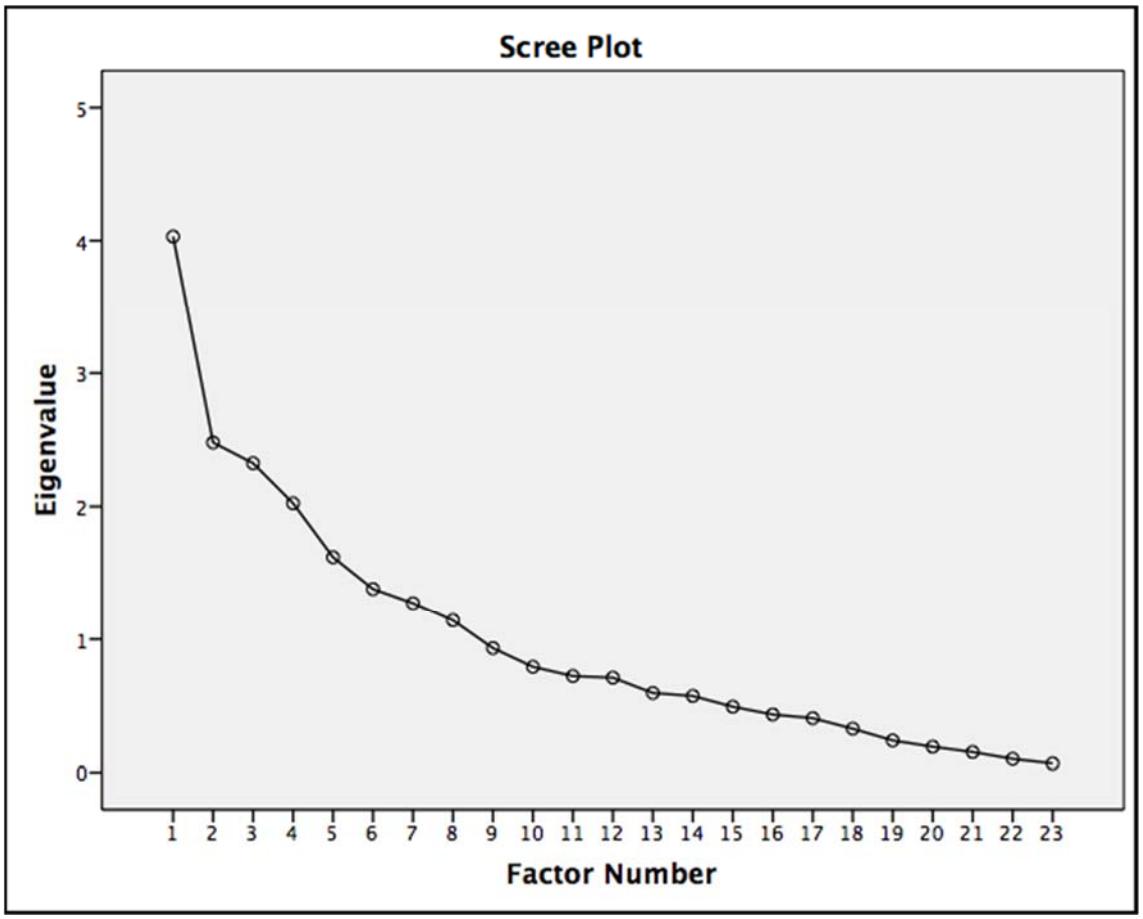
Gender

- Male
- Female

Comments?

Appendix E: REDD+ Strategy Design Stakeholders' Values Associated with Land Use and Sustainable Development

Item	First extraction	Final extraction 4 factor
KMO	0.447	0.505
Variance explained (cumulative)	66%	58%
Communalities (>.3)	23	16
Total statements	23	19
Total significant statements (>.3)	N/A	19
Non-loading statements	N/A	0
Cross-loading statements	N/A	8
Low-loading statements (<.32)	N/A	0
Marker variables	N/A	1
Factors with <2 statements	N/A	0



Item	2 factor	3 factor	
	1st Iteration	1st Iteration	2nd Iteration
KMO	0.447	0.447	0.508
Variance explained (cumulative)	28%	38%	42%
Communalities (>.3)	23	23	14
Total statements	23	23	20
Total significant statements (>.3)	16	20	19
Non-loading statements	7	3	1
Cross-loading statements	3	4	4
Low-loading statements (<.32)	1	2	1
Marker variables	0	0	1
Factors with <2 statements	0	0	0

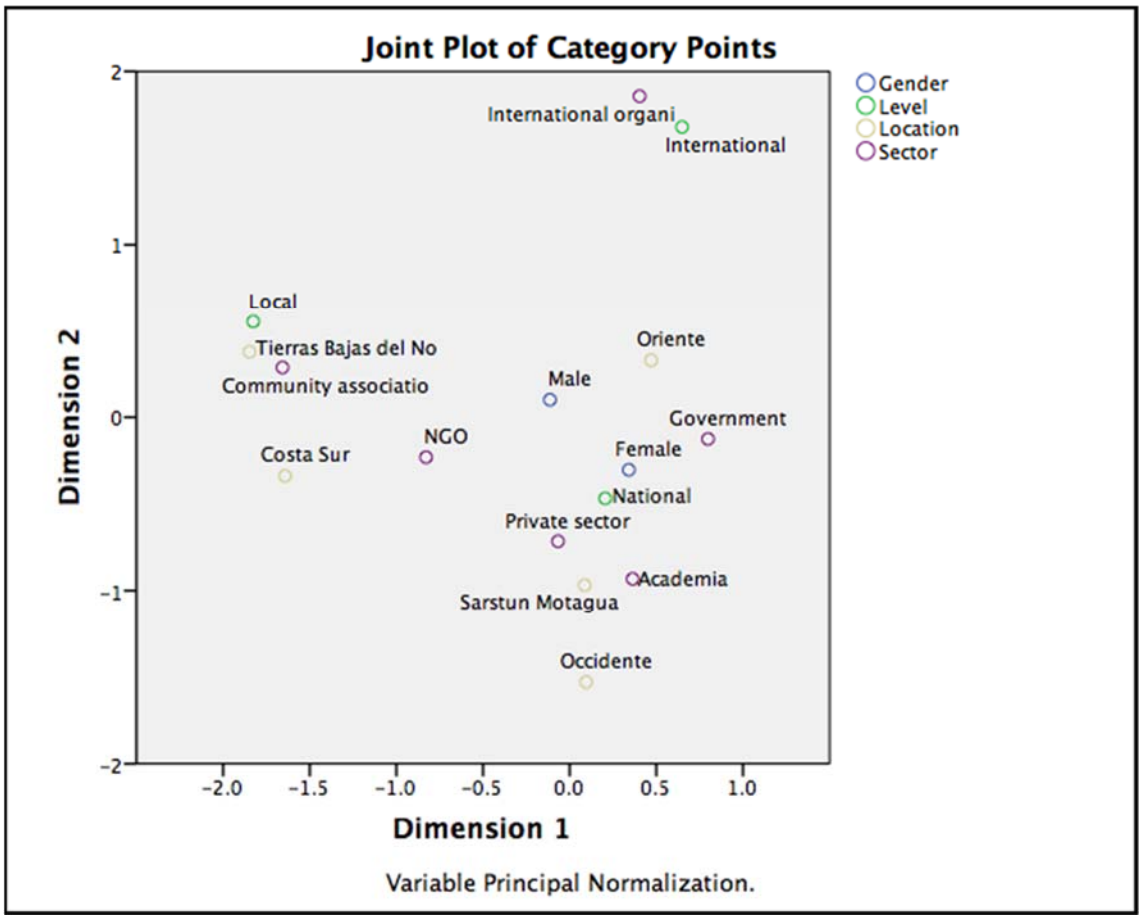
Item	4 factor			5 factor		
	1st Iteration	2nd Iteration	3rd Iteration	1st Iteration	2nd Iteration	3rd Iteration
KMO	0.447	0.508	0.505	0.447	0.508	0.505
Variance explained (cumulative)	47%	51%	58%	54%	58%	60%
Communalities (>.3)	23	14	16	23	14	16
Total statements	23	20	19	23	20	19
Total significant statements (>.3)	21	19	19	23	20	19
Non-loading statements	2	1	0	0	0	0
Cross-loading statements	6	8	8	8	9	7
Low-loading statements (<.32)	1	0	0	0	0	0
Marker variables	1	1	1	1	2	0
Factors with <2 statements	0	0	0	0	0	1

The sample size is n = 59. The initial extraction produced a KMO of .447, indicating it is factorable after a few iterations (where the KMO is likely to reach .5). Examination of the scree plot indicated that between 2 and 5 factors were likely to be the best solutions. Using varimax rotation and principal axis factoring, 2, 3, 4 and 5 factor solutions were extracted initially. There were no missing cases. The 2 factor solution explained very little variance and produced many non-loading statements, so was discarded. The 3 factor solution also explained very little variance, so was discarded after the second iteration. The 2nd iteration of the 5 factor solution produced a very nice solution, however when this was checked using direct oblimin rotation, the solution failed to converge, indicating it may not be stable. The 3rd iteration of the 4 and 5 factor solutions lowered the KMO slightly, and the 5 factor solution produced one factor with only one statement loading onto it. However, the 4 factor solution in this iteration looked very good, with a significant jump in variance explained. This solution was checked using maximum likelihood extraction, and was found to be stable. The solution was then checked using Cronbach's alpha. The alpha test indicated that removal of Qs 8 and 3 would improve the internal reliability of the solution, however the solution was run with removing each individually and together, and either the KMO was lowered significantly or the solution failed to converge. Therefore, Qs 3 and 8 were retained and the 3rd iteration 4 factor solution was chosen as the final solution.

Rotated Factor Matrix	Factor				Cronbach's Alpha if Item Deleted
	1	2	3	4	
Factor 1					**Alpha: 0.699**
Q6 If more people understood the environment there would be less deforestation	0.642				0.638
Q22 Relationships between NGOs and communities are important for conserving forests	0.565	0.515			0.643
Q15 Culture determines how people use the forest	0.558				0.652
Q14 Population growth is causing more land to be used	0.553				0.65
Q18 Family planning is an important part of sustainable development	0.423				0.68
Q21 For many people in Guatemala, forest resources are the only viable option for survival	0.391			-0.336	0.687
Factor 2					**Alpha: 0.737**
Q17 Companies have the greatest capacity to deforest		0.82			0.602
Q16 There is a lack of capacity to confront companies who are abusing the land		0.726	0.476		0.666
Q8 As access to markets to improves, there is more incentive to deforest		0.537			0.749
Q4 If there were less conflicts over resources there would be more conservation	0.327	0.513			0.697
Factor 3					**Alpha: 0.606**
Q5 We need better management of our organisations	0.376		0.602		0.51
Q23 Good healthcare is necessary to help people access better lifestyles			0.554		0.535
Q9 Many families are not aware of schemes they could take part in			0.51		0.575
Q1 People who own their land are more likely to protect the trees			0.476	0.341	0.538
Q10 The state relies on help from NGOs to produce environmental projects			0.418		0.605
Factor 4					**Alpha: 0.577**
Q11 Guatemalans need immediate solutions, not long term investment				0.831	0.331
Q12 If there was more investment in economic progess there would be less pressure on natural resources			0.384	0.514	0.492
Q3 There needs to be more control over how communities use the land	0.374			0.394	0.59
Q20 Sustainable management practices are difficult and expensive to impelement				0.368	0.568

Exploring the perspectives on the values associated with land use and sustainable development

What are the primary participant characteristics to compare?



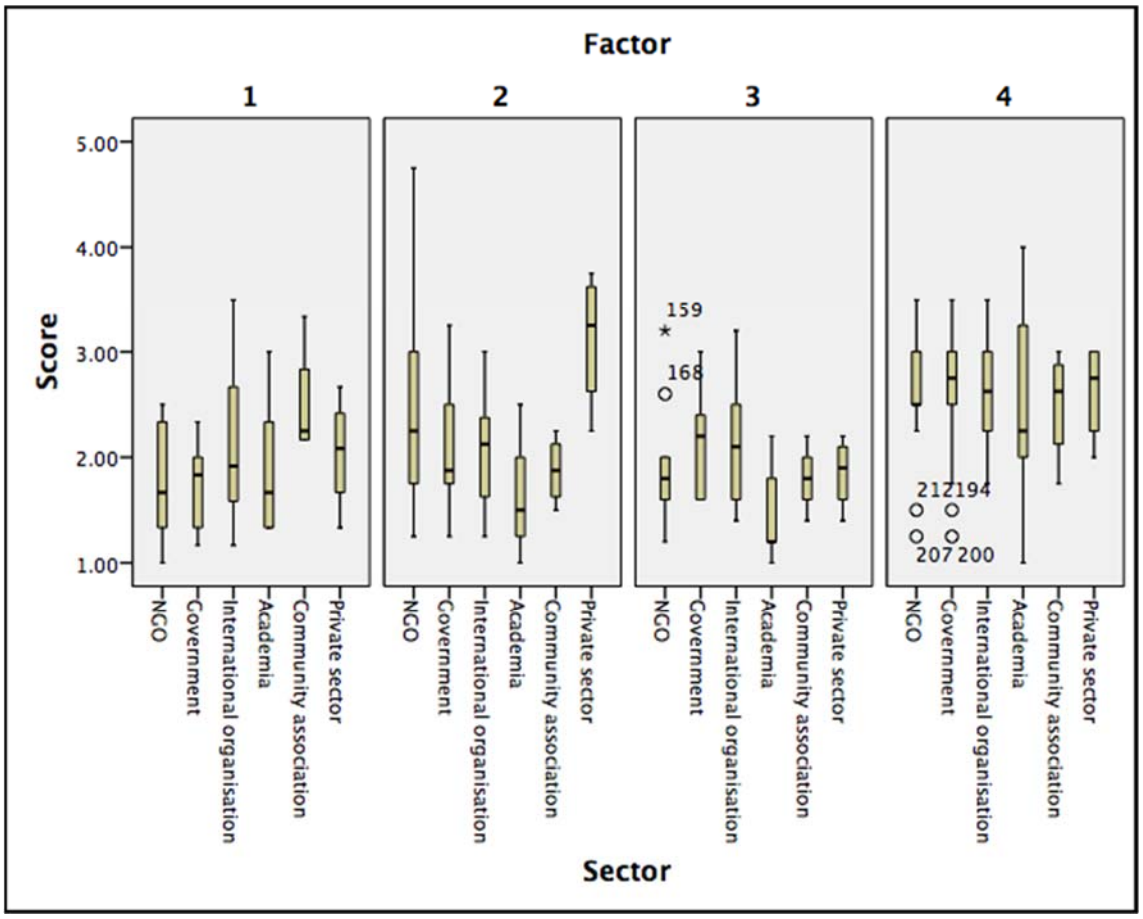
Discrimination Measures			
	Dimension		Mean
	1	2	
Sector	0.603	0.744	0.673
Level	0.544	0.631	0.587
Location	0.687	0.342	0.515
Gender	0.039	0.031	0.035
Active Total	1.872	1.747	1.81
% of Variance	46.81	43.686	45.248

Using a correspondence analysis, the four major participant characteristics measured in the questionnaire were compared: sector (e.g. government, academia), location (based on the five REDD+ regions), level (e.g. local, national) and gender. From an examination of the correspondence analysis, international organisations and international level are very similar, as were local level and community associations, so 'Level' was discarded as 'Sector' appeared to account for the differences between local, national and international levels.

What are the different perspectives on land use and sustainable development associated with these values?

Each selection of participant characteristics was submitted to an ANOVA (with Tukey post-hoc tests if appropriate) to explore whether there were significant differences in agreement with each factor between the different groups. Only the comparison between sectors produced a significant result.

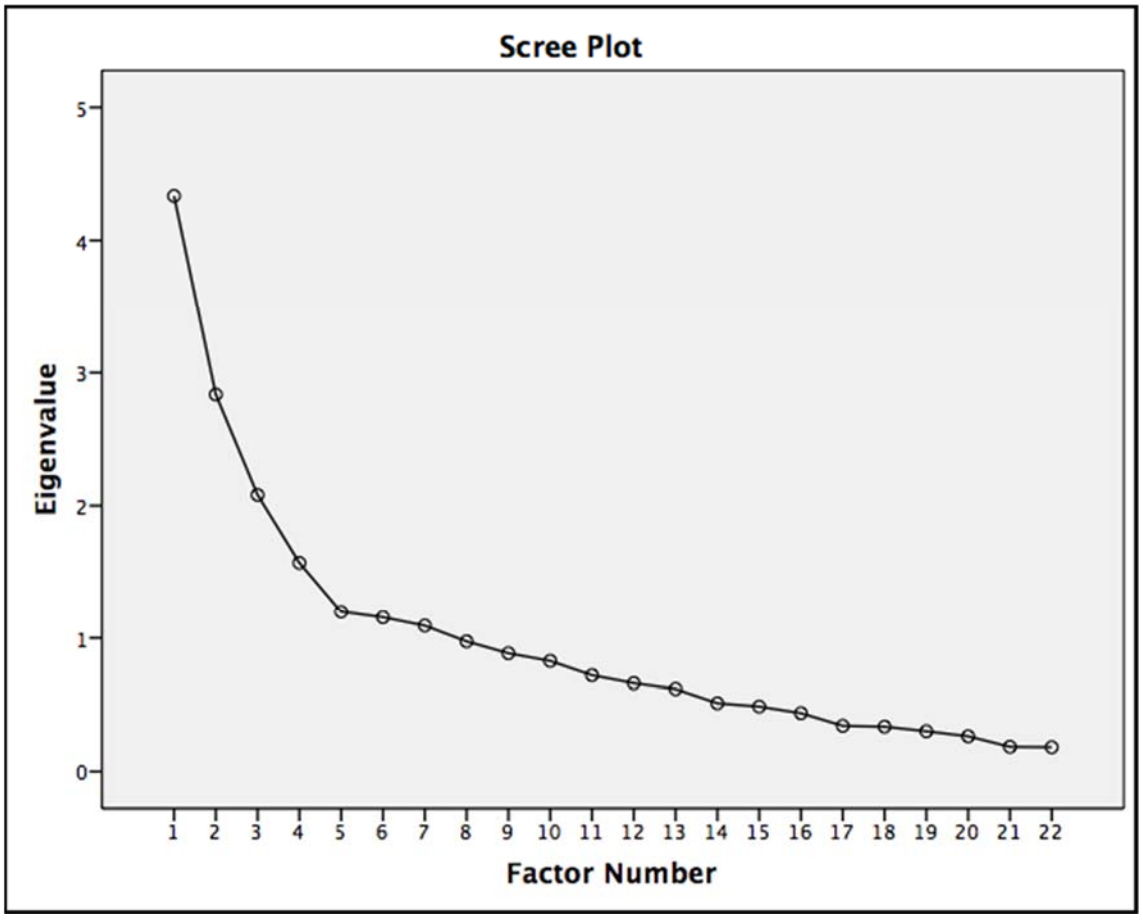
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
FS1	Between Groups	2.611	5	0.522	1.667	0.162
	Within Groups	14.412	46	0.313		
	Total	17.023	51			
FS2	Between Groups	6.878	5	1.376	3.007	0.02
	Within Groups	21.04	46	0.457		
	Total	27.918	51			
FS3	Between Groups	2.745	5	0.549	2.353	0.055
	Within Groups	10.735	46	0.233		
	Total	13.48	51			
FS4	Between Groups	0.138	5	0.028	0.061	0.997
	Within Groups	20.938	46	0.455		
	Total	21.077	51			



Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) Sector	(J) Sector	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FS2	NGO	Government	0.33104	0.26049	0.799	-0.4434	1.1055
		International organisation	0.32212	0.30391	0.894	-0.5814	1.2257
		Academia	0.69017	0.29327	0.194	-0.1818	1.5621
		Community association	0.50962	0.3867	0.774	-0.6401	1.6593
		Private sector	-0.74038	0.3867	0.407	-1.8901	0.4093
	Government	NGO	-0.33104	0.26049	0.799	-1.1055	0.4434
		International organisation	-0.00893	0.29974	1	-0.9001	0.8823
		Academia	0.35913	0.28895	0.813	-0.5	1.2182
		Community association	0.17857	0.38343	0.997	-0.9614	1.3186
		Private sector	-1.07143	0.38343	0.076	-2.2114	0.0686
	International organisation	NGO	-0.32212	0.30391	0.894	-1.2257	0.5814
		Government	0.00893	0.29974	1	-0.8823	0.9001
		Academia	0.36806	0.32863	0.871	-0.609	1.3451
		Community association	0.1875	0.41415	0.997	-1.0438	1.4188
		Private sector	-1.0625	0.41415	0.127	-2.2938	0.1688
	Academia	NGO	-0.69017	0.29327	0.194	-1.5621	0.1818
		Government	-0.35913	0.28895	0.813	-1.2182	0.5
		International organisation	-0.36806	0.32863	0.871	-1.3451	0.609
		Community association	-0.18056	0.40641	0.998	-1.3889	1.0278
		Private sector	-1.43056*	0.40641	0.012	-2.6389	-0.2222
	Community association	NGO	-0.50962	0.3867	0.774	-1.6593	0.6401
		Government	-0.17857	0.38343	0.997	-1.3186	0.9614
		International organisation	-0.1875	0.41415	0.997	-1.4188	1.0438
		Academia	0.18056	0.40641	0.998	-1.0278	1.3889
		Private sector	-1.25	0.47822	0.114	-2.6718	0.1718
	Private sector	NGO	0.74038	0.3867	0.407	-0.4093	1.8901
		Government	1.07143	0.38343	0.076	-0.0686	2.2114
		International organisation	1.0625	0.41415	0.127	-0.1688	2.2938
		Academia	1.43056*	0.40641	0.012	0.2222	2.6389
		Community association	1.25	0.47822	0.114	-0.1718	2.6718

Appendix F: REDD+ Strategy Design Stakeholders' Attitudes to REDD+ in Guatemala

Item	First extraction	Final extraction 5 Factor
KMO	0.641	0.666
Variance explained (cumulative)	71%	59%
Communalities (>.3)	24	15
Total statements	24	19
Total significant statements (>.3)	N/A	19
Non-loading statements	N/A	0
Cross-loading statements	N/A	3
Low-loading statements (<.32)	N/A	0
Marker variables	N/A	1
Factors with <2 statements	N/A	0



Item	3 Factor	6 Factor	
	1st Extraction	1st Extraction	2nd Extraction
KMO	0.641	0.641	0.654
Variance explained (cumulative)	41%	58%	59%
Communalities (>.3)	24	24	20
Total statements	24	24	23
Total significant statements (>.3)	21	24	23
Non-loading statements	3	0	0
Cross-loading statements	6	6	5
Low-loading statements (<.32)	1	1	0
Marker variables	0	1	1
Factors with <2 statements	0	1	2

Item	4 Factor				
	1st Extraction	2nd Extraction	3rd Extraction	4th Extraction	5th Extraction
KMO	0.641	0.654	0.643	0.667	0.671
Variance explained (cumulative)	46%	49%	49%	50%	50%
Communalities (>.3)	24	20	16	17	17
Total statements	24	23	22	22	21
Total significant statements (>.3)	23	23	22	22	21
Non-loading statements	1	0	0	0	0
Cross-loading statements	9	7	7	6	7
Low-loading statements (<.32)	2	0	0	0	0
Marker variables	1	0	0	0	0
Factors with <2 statements	0	0	0	0	0

Item	5 Factor					
	1st Extraction	2nd Extraction	3rd Extraction	4th Extraction	5th Extraction	6th Extraction
KMO	0.641	0.654	0.643	0.667	0.671	0.666
Variance explained (cumulative)	53%	54%	55%	56%	56%	59%
Communalities (>.3)	24	20	16	17	17	15
Total statements	24	23	22	22	21	19
Total significant statements (>.3)	24	22	22	22	21	19
Non-loading statements	0	1	0	0	0	0
Cross-loading statements	10	5	9	8	7	3
Low-loading statements (<.32)	0	0	0	1	0	0
Marker variables	0	2	0	3	1	1
Factors with <2 statements	1	0	0	0	0	0

The initial extraction produced a KMO of .641, indicating it is factorable. Examination of the scree plot indicated that between 3 and 6 factors were likely to be the best solutions. Using varimax rotation and principal axis factoring, 3, 4, 5 and 6 factor solutions were extracted initially. There were no missing cases. The 3 factor solution explained very little variance and produced very large factors, so was discarded. The 6 factor solution contained factors with only one statement loading onto them, so was discarded after the second iteration.

In the 3rd iteration of the 4 and 5 factor solutions, Q13 was removed as it loaded onto several factors, but this did not improve the solution, so it was re-added. Then, Q14 was removed for a similar reason, but again did not improve the solution significantly. Q24 was then removed as it loaded onto different factors with each iteration. Its removal improved the solution slightly, so

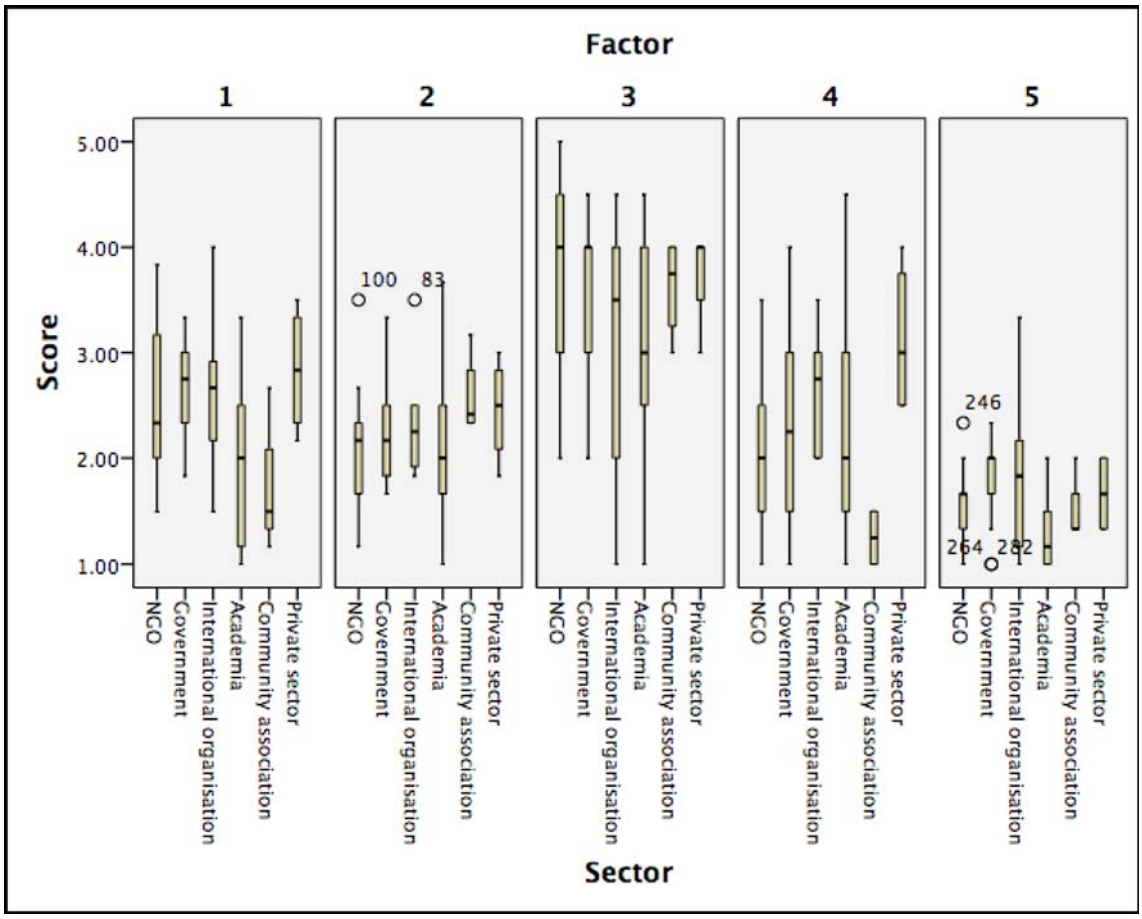
I moved on to the reliability testing phase. Using the Cronbach's alpha test on the 5th iteration of the 5 factor solution (as the first factor in the 4 factor solutions were consistently very large and hard to interpret), Qs 6, 10 and 16 were found to increase alpha if removed. A new solution was extracted with these questions removed, which provided a good, stable solution which was found to be internally reliable after testing using Cronbach's alpha.

Rotated Factor Matrix	Factor					Cronbach's Alpha if item deleted
Factor 1	**1**	**2**	**3**	**4**	**5**	**Alpha: .79**
Q18 There is no clarity on what REDD+ mechanism is the best for the country	0.752					0.73
Q21 There are important national actors who are not currently involved in REDD +	0.679					0.762
Q22 Not all voices are heard equally in national REDD+ discussions	0.617					0.749
Q11 The proposed REDD+ mechanism is too complex to be implemented effectively	0.608		0.322			0.754
Q4 It is difficult to coordinate between all the actors present in REDD+ nationally	0.557					0.772
Q5 Until the land tenure problem in Guatemala is solved, REDD+ cannot work	0.443					0.782
Factor 2						**Alpha: .698**
Q19 REDD+ contributes to the improvement of national forest management		0.721				0.612
Q9 Money from REDD+ is essential for strengthening conservation efforts in the country		0.695				0.627
Q13 REDD+ is a great negotiating tool for Guatemala internationally		0.545	-0.3			0.653
Q14 People believe REDD+ is the solution to all the country's environmental problems		0.452				0.681
Q23 REDD+ is one mechanism among many in Guatemala that exists to help meet environmental goals		0.419				0.674
Q8 REDD+ has enabled discussion between actors in a way that has not happened before		0.409				0.696
Factor 3						**Alpha: .725**
Q3 I do not understand where the money for REDD+ is coming from			0.796			N/A
Q2 REDD+ competes with other similar environmental programmes			0.606			N/A
Factor 4						**Alpha: .498**
Q12 Communities should receive carbon credits directly				0.923		N/A
Q7 The price of carbon needs to be higher than the cost of using the natural resources				0.339		N/A
Factor 5						**Alpha: .593**
Q17 We need other solutions to deforestation that are not based only on carbon credits					0.6	0.561
Q20 It is necessary to align REDD+ objectives at a national level	0.372				0.501	0.407

Exploring the strength of the attitudes to REDD+

Sector

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
FS1	Between Groups	5.633	5	1.127	2.419	0.051
	Within Groups	21.425	46	0.466		
	Total	27.058	51			
FS2	Between Groups	1.086	5	0.217	0.627	0.68
	Within Groups	15.939	46	0.347		
	Total	17.026	51			
FS3	Between Groups	4.357	5	0.871	0.898	0.491
	Within Groups	44.658	46	0.971		
	Total	49.014	51			
FS4	Between Groups	8.843	5	1.769	2.55	0.041
	Within Groups	31.902	46	0.694		
	Total	40.745	51			
FS5	Between Groups	2.247	5	0.449	1.954	0.104
	Within Groups	10.579	46	0.23		
	Total	12.827	51			



Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) Sector	(J) Sector	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FS4	NGO	Government	-0.28297	0.32076	0.949	-1.2366	0.6707
		International organisation	-0.58654	0.37422	0.624	-1.6992	0.5261
		Academia	-0.18376	0.36112	0.996	-1.2574	0.8899
		Community association	0.78846	0.47616	0.567	-0.6272	2.2042
		Private sector	-1.08654	0.47616	0.222	-2.5022	0.3292
	Government	NGO	0.28297	0.32076	0.949	-0.6707	1.2366
		International organisation	-0.30357	0.36909	0.962	-1.4009	0.7938
		Academia	0.09921	0.3558	1	-0.9587	1.1571
		Community association	1.07143	0.47214	0.227	-0.3323	2.4752
		Private sector	-0.80357	0.47214	0.538	-2.2073	0.6002
	International organisation	NGO	0.58654	0.37422	0.624	-0.5261	1.6992
		Government	0.30357	0.36909	0.962	-0.7938	1.4009
		Academia	0.40278	0.40466	0.917	-0.8003	1.6059
		Community association	1.375	0.50997	0.096	-0.1412	2.8912
		Private sector	-0.5	0.50997	0.922	-2.0162	1.0162
	Academia	NGO	0.18376	0.36112	0.996	-0.8899	1.2574
		Government	-0.09921	0.3558	1	-1.1571	0.9587
		International organisation	-0.40278	0.40466	0.917	-1.6059	0.8003
		Community association	0.97222	0.50044	0.39	-0.5157	2.4601
		Private sector	-0.90278	0.50044	0.473	-2.3907	0.5851
	Community association	NGO	-0.78846	0.47616	0.567	-2.2042	0.6272
		Government	-1.07143	0.47214	0.227	-2.4752	0.3323
		International organisation	-1.375	0.50997	0.096	-2.8912	0.1412
		Academia	-0.97222	0.50044	0.39	-2.4601	0.5157
		Private sector	-1.87500*	0.58887	0.029	-3.6258	-0.1242
	Private sector	NGO	1.08654	0.47616	0.222	-0.3292	2.5022
		Government	0.80357	0.47214	0.538	-0.6002	2.2073
		International organisation	0.5	0.50997	0.922	-1.0162	2.0162
		Academia	0.90278	0.50044	0.473	-0.5851	2.3907
		Community association	1.87500*	0.58887	0.029	0.1242	3.6258
* The mean difference is significant at the 0.05 level.							