

**How does protected area governance affect access to
ecosystem services and local livelihoods?**

Insights from Madagascar

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The candidate confirms that the work submitted is his/her own, except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

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PhD publications

Parts of this thesis have been published in the following:

Chapter 2: Ward, C., Holmes, G. & Stringer, L. (2017) Perceived barriers to and drivers of community participation in protected area governance.

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Chapter 3: Ward, C., Stringer, L. & Holmes, G. (under review) Changing governance, changing inequalities: protected area co-management and access to ecosystem services. *Ecosystem Services*

Chapter 4: Ward, C., Stringer, L., & Holmes, G. (in prep) Protected area co-management, equity and perceived livelihood impacts.

I am lead author on the above articles. They all originate from my PhD research meaning I designed the research questions, methodology; as well as collected and analysed the data. These articles were co-authored with my supervisors whose role was in the recommendation of revisions and edits to manuscripts.

Rationale for thesis by alternative format

This thesis explores the links between protected area governance processes, access to ecosystem services and livelihood impacts. It takes a mixed methods approach incorporating frameworks and methods from different disciplines. Each research objective is framed around a different framework, requiring rationalisation and grounding within the relevant literature, which has been better achieved within three academic papers than a traditional thesis format.

The thesis consists of an introductory chapter, setting out the context and rationale for the research, placing it within the wide literature, outlining the overarching research strategy and contributions to the fields of study, rationalising the mixed methods approach, and detailing the data collection and case study selection. The three empirical chapters are the three papers listed below. Paper 1 explores who is participating in protected area governance, why, what they perceive the benefits and costs to be, and how those are distributed. Paper 2 investigates how protected area co-management impacts local access to protected areas and how access is distributed within and between local communities. Paper 3 takes a livelihoods approach to understand how protected area co-management leads to different local impacts and how those impacts are distributed within and between communities. The three results chapters are followed by a discussion and conclusion that brings together insights from the three papers, and highlights challenges found for protected area co-management to meet its aims of improved equity and reducing local costs of protected areas. The final chapter also reflects on the research approach, limitations of the thesis and possible future research directions.

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Abstract

A global shift towards local community involvement in protected area (PA) governance and co-management has aimed to improve conservation-related equity by reducing costs and their uneven distribution, alongside meeting conservation aims. Co-managed PAs are more likely to achieve socio-economic and biological goals than other governance-types, yet this is not always the case. In order to improve PA-related equity, we need to understand why involvement of local communities in PA governance may not always meet its aims.

This thesis explores the links between PA governance processes, access to ecosystem services and livelihood impacts. Integrating The Theory of Planned Behaviour model, IPBES framework, theory of access and Sustainable Livelihoods Framework, it takes a mixed methods approach, drawing on village focus groups, semi-structured interviews and household questionnaires. The case study is a PA in Eastern Madagascar, co-managed by a national NGO and 10 local community associations.

Local community participation in governance associations was limited by miscommunication, perceived to have limited benefits and high costs, and these were unevenly distributed within and between communities.

Respondents considered provisioning ecosystem services most important, but access was unevenly distributed and shaped by institutions and social identity. Perceived livelihood impacts were also distributed unevenly and the main drivers of this were restricting forest access and establishment of local community associations.

This research demonstrates that involvement of local communities in co-managed protected areas does not necessarily reduce local costs, or improve their distribution. Findings from this study have useful and important implications for PA-related equity and meeting Aichi Target 11: (1) incorporating local cultural and social values; (2) ensuring meaningful local participation in decision making; (3) recognition of short-term costs and (4)

mixed-methods approaches are vital in order to obtain a better picture of who is winning and losing out from conservation interventions and to inform solutions towards improved equity.

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List of acronyms and abbreviations

- AIC – Akaike Information Criteria
- CAMPFIRE - Community Areas Management Programme for Indigenous Resources
- CBD - Convention of Biological Diversity
- CBNRM - Community Based Natural Resource Management
- DFID – Department for International Development
- ES - Ecosystem Service
- FG - Focus Group
- IPBES - Intergovernmental Panel on Biodiversity and Ecosystem Services
- IUCN - International Union for Conservation of Nature
- MA - Millennium Ecosystem Assessment
- MBG - Missouri Botanical Gardens
- MSL – Material Style of Life
- MV - Madagasikara Voakajy
- NEAP – National Environmental Action Plan
- NGO - Non Governmental Organisation
- PA - Protected Area
- PCA – Principle Component Analysis
- RCT - Randomised Control Trial
- SDG - Sustainable Development Goal
- SLF - Sustainable Livelihoods Framework
- TPB - The Theory of Planned Behaviour
- UK - United Kingdom
- UNDP – United Nations Development Programme
- UNEP – United Nations Environment Programme
- VOI - Vondron'Olona Ifotony (Malagasy local community association)
- WCMC – World Conservation Monitoring Centre
- WDPA – World Database on Protected Areas

Chapter 1 Introduction, Research Design and Methodology

1.1 Introduction

This thesis explores the links between protected area (PA) co-management, access to ecosystem services (ES) and livelihood impacts. Over the last few decades movement towards a 'do no harm' or 'local benefits' approach to conservation has led to a governance shift. This has seen an increase in community involvement, supporting implementation of recent international conservation policies (CBD and UNEP, 2010; Conservation Initiative on Human Rights, 2014). The shift has taken place for both moral and instrumental reasons, with a wealth of evidence showing that the costs of conservation interventions are borne by local communities, and that a more equitable approach is more likely to achieve conservation goals (Schreckenberg et al., 2016; Oldekop et al., 2016). A good example of this being enshrined in policy targets is the Aichi target 11¹, which aims to not only increase global PA coverage, but also to ensure these are managed 'equitably' (CBD and UNEP, 2010).

The shift in governance from state managed PAs towards co-management and community involvement has aimed to conserve biodiversity whilst reducing costs for local communities, yet there is mixed evidence to show whether it is meeting these aims (Dressler et al., 2010; Roe et al., 2012). We need to understand how and why this approach may or may not be playing out as intended, in order to meet targets of providing socio-economic benefits and reducing costs of conservation to local communities. This thesis aims to fill this research gap by exploring the role of protected area governance in determining livelihood outcomes via a focus on access to

¹ The Aichi Biodiversity Targets form part of the Strategic Plan for Biodiversity 2011-2020, formed by the Convention on Biological Diversity (CBD). They consist of 20 targets aiming to safeguard biodiversity and the benefits it provides to people (CBD and UNEP, 2010).

ecosystem services, and identifying how associated benefits and costs are distributed between different groups within communities.

Section 1.2 provides the context for the research by situating this thesis in the relevant wider academic debate, and setting out the justification for it. Section 1.3 provides the thesis aims and objectives. Section 1.4 describes the research strategy, providing an overview of research design and overarching methodological approach. The contribution of this thesis to advancing knowledge is highlighted in Section 1.5, and Section 1.6 provides an overview of the remaining thesis structure and content of Chapters 2, 3, 4 and 5. Chapters 2-4 are in the form of three results papers, the first of which has been published, the second of which has been revised and resubmitted following peer review, with the third paper ready to submit at the time of writing.

1.2 Research context and rationale

Research in this thesis draws from different literatures, spanning conservation social science, development and environmental justice. There is significant theoretical and empirical overlap between these areas, therefore an interdisciplinary approach provides multiple perspectives on the research subject and advances dialogues between these disciplines. By bringing these fields together, it is possible to explore the wider drivers of PA co-management, theorise why it may improve PA-related equity, and understand what factors are important in understanding whether PA co-management fulfils its aims.

The thesis also takes a critical approach to these topics, challenging some of their assumptions and highlighting limitations. The following sections critically analyse this literature and identify the research gaps which the findings from this thesis fill.

1.2.1 Equity and conservation

Evidence has increasingly shown the costs of conservation interventions to local and indigenous communities (West et al., 2006; Pullin et al., 2013; Mckinnon et al., 2016). In response various commitments in conservation

have been made to ‘at the very least do no harm’, and in some cases provide benefits for local communities (CBD and UNEP, 2010; Conservation Initiative on Human Rights, 2014). Equity broadly refers to “*the fair or just treatment of individuals or groups*” (Law et al., 2017: 4). Equity can be divided into three dimensions: distribution (how costs and benefits are distributed between different actors), recognition (acknowledging and accepting the legitimacy of rights, values, interests and priorities of different actors and respecting their human dignity) and procedure (enabling inclusive and effective participation of all relevant actors in affairs that concern them) (McDermott et al., 2013; Schreckenberg et al., 2016; Dawson et al., 2017). Awareness of equity in conservation has increased for two main reasons: (i) instrumental reasons, whereby an equitable approach is more likely to achieve conservation aims; and (ii) moral reasons, because taking an equitable approach is considered the ‘right’ thing to do (Schreckenberg et al., 2016). Yet, there is also conflicting evidence showing that conservation goals can be achieved despite taking an ‘inequitable’ approach, particularly relating to displacement or forced evictions for PA establishment (Brockington and Igoe, 2006). Most assessments of equitable outcomes in conservation have focussed on investigating the costs and benefits of various conservation interventions, i.e. the distribution dimension of equity, with less focus on recognition and procedure (Schreckenberg et al., 2010; de Lange et al., 2015). Recently there have been a few studies applying equity frameworks to conservation interventions, including PAs (Dawson et al., 2017) and payments for ecosystem services (McDermott et al., 2013). These studies have shown many complexities in assessing conservation-related equity, including contextual differences in what is considered to be equitable and for whom (Martin et al., 2014).

The equity approach in conservation draws on the environmental justice literature, particularly in the case of the three dimensions, yet has chosen to use the term ‘equity’ rather than ‘justice’. This follows the language used in the CBD and the Sustainable Development Goals (SDGs; Schreckenberg et al., 2016). Justice, fairness and equity all imply “*fair treatment or due reward*” (Schroeder & Pisupati, 2010: 13), yet justice tends to focus more on recognising and respecting rights defined by national and international laws

(McDermott et al., 2013), whereas equity focuses more on recognising balancing the rights and interests of different stakeholders (Franks, 2015). Access to justice, i.e. being able to raise grievances, is included in the procedural dimension of equity (McDermott et al., 2013).

Research gaps and justification of thesis

It is clear from the literature briefly reviewed above that more evidence is needed to help shape an understanding of what equitable conservation looks like, how it can be achieved and how we measure progress towards it. Each of the results chapters can provide lessons on whether PA co-management can lead to equitable outcomes and why or why not. Chapter 2 considers local community participation in PA governance, and perceived costs and benefits of participation, and findings show challenges for all three dimensions of equity. Chapter 3 assesses access to ES and relates this to PA governance processes. Findings have important outcomes relating to distribution and procedural equity. Chapter 4 investigates livelihood impacts of PA co-management and relates these to formal and informal governance processes. Finally Chapter 5 brings the thesis findings together to provide policy recommendations relating to improving equity within PA co-management.

1.2.2 Protected areas

An example of equity being included in conservation targets is found in Aichi Target 11, which aims not only to increase PA coverage by 2020 but also to ensure effective and equitable management of these (CBD and UNEP, 2010). IUCN defines a PA as “*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*”. PAs are divided into six management categories, ranging from strictly protected through to sustainable use areas (Borrini-Feyerabend et al., 2012; Table 1-1).

**Table 1-1: IUCN PA management categories and associated definitions
(Borrini-Feyerabend et al., 2012)**

Management category	Definition
Ia Strict nature reserve	Strictly protected for biodiversity and also possible geological/geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values
Ib Wilderness area	Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition
II National park	Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities
III Natural Monument or feature	Areas set aside to protect a specific natural monument, which can be a landform, sea mount marine cavern geological feature such as cave, or a living feature such as an ancient grove
IV Habitat/species management area	Areas to protect particular species or habitat, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category
V Protected landscape or seascape	Where the interaction of people and nature over time has produced a distinct character with significant

	ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values
VI Protected areas with sustainable use of natural resources	Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims

In 2003, PA governance was recognised as “*central to the conservation of PAs throughout the world*” (WCPA, 2004: 257) at the Durban World Parks Congress. Since then there has been increasing recognition that PA management is only part of the story, including the introduction of IUCN governance categories (Table 1-2). There is no universally accepted definition of governance, but it can be described as a synthesising theme that brings together many different topics, ranging from agency structure to decision making (Dearden and Bennett, 2005; Jordan et al., 2005). Governance and management are often used interchangeably throughout the literature, but it is important to differentiate between them. In reference to PAs Graham et al (2003, p. 2) define it as “*the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decision are taken and how stakeholders have their say*”. Simplistically, governance refers to who decides what the objectives of a protected area are, how decisions are made, who holds the power, authority and responsibility and how they are held accountable. Management refers to the means and actions taken to achieve those objectives (Borrini-Feyerabend et al., 2012). This thesis will focus on co-managed or shared governance PAs (Section 1.2.3).

The IUCN management and governance categories have been criticised for several reasons. Firstly the categories may not fully represent existing or newly established PAs. For example Gardner (2011) found that although newly established multiple-use PAs in Madagascar were listed as Category V. Yet this category assumes that human interactions with the environment are positive, whereas in these PAs multiple-use was set up to allow a transition between current unsustainable use of natural resources and future uses. Secondly, the discrete IUCN governance and management categories do not consider differences between formal (such as laws, legislations and agreements) and informal (such as customary and informal rules and regulations) governance processes (Borrini-Feyerabend et al., 2012). Informal processes are often not recognised by governments and therefore lie outside of the IUCN system. Ignoring pre-existing norms may alienate local communities (Waylen et al., 2010; Bennett and Dearden, 2014). For example 'fadys' in Madagascar are a system of informal institutions which make certain behaviours taboo. They are considered very important in Malagasy culture, but in the past scientists have undermined their existence leading to a backlash against conservation interventions. Villagers were observed killing a radio-collared sifaka (*Propithecus edwardsi*), which is normally *fady* to kill, in order to express their anger to park officials after being excluded from an area of forest (Jones et al., 2008). Conversely, poor understanding of local institutions can lead to incorrect assumptions that they will provide species protection. For example, although *fadys* in Madagascar have been highlighted as a key reason for low prevalence of bush meat compared to other countries, research in North East Madagascar has shown that most *fadys* are too localised to provide any real species protection (Golden and Comaroff, 2015b).

Table 1-2: A summary of governance types and critiques (Borrini-Feyerabend et al., 2012; Macura et al., 2013)

Governance Type	Definition	Critiques
1. Government	Government protected areas are owned and managed by a centralised governmental agency (ministry or park agency reporting directly to the government) that enforces decisions, has authority, responsibility and accountability for management	Unequal distribution of rights, power and benefits, therefore creating social conflicts (Coad and Campbell, 2008)
2. Shared	Co-managed or multi-stakeholder protected areas exist where a governmental agency and other stakeholders, such as local/indigenous communities that depend on the area culturally or for their livelihoods share power and responsibility to make and enforce decisions.	Lack of biodiversity promotion and protection (Terborgh, 2004) In some cases the communities are not as involved in governance processes as claimed (Virah-Sawmy et al., 2014)
3. Private	Private protected areas exist where private landowners, individuals, NGOs and other organisations make and enforce decisions, have control and/or ownership over resources	There are questions about the long-term security of privately owned areas (Adams and Hutton, 2014)
4. Indigenous peoples and local communities	Protected areas where the management authority and responsibility rest with indigenous peoples and/or local communities through various forms of customary or legal, formal or informal,	Some concerns about a lack of biodiversity protection (Eklund and Cabeza, 2017) In some cases local communities or indigenous populations

 institutions or rules

 do not have the funds or capacity to manage these areas (Macura et al., 2015)

PAs are one of the most commonly used conservation tools (Juffe-Bignoli et al., 2014), yet their impacts on local communities remain contentious (Holmes and Brockington, 2012; Oldekop et al., 2016; Molina-murillo et al., 2016). Generally, it is agreed that PAs provide global benefits, whilst the costs are often incurred locally. Global benefits include: species and habitat conservation - on average species within PAs are maintaining or increasing their population levels (Geldmann et al., 2013; Barnes et al., 2016); ecosystem service protection, for example Brazilian PAs contain 56% of Brazil's forest carbon contributing reducing global carbon emissions (Soares-Filho et al., 2010); and provision of tourism destinations, for example nature-related tourism to PAs increased globally from 1992-2006 (Balmford et al., 2009). Local costs include: displacement- it is estimated that conservation-displacement has impacted 10-20 million people, although there have been very few studies published so it is difficult to know the true number (Agrawal and Redford, 2009); and ES restrictions, for example, establishment of Ranomafana PA in Madagascar, restricted access to provisioning ES, negatively impacting local households and increasing their vulnerability to poor harvests or other 'shocks' (Kari and Korhonen-Kurki, 2013). Even locally, costs and benefits are distributed unevenly, often with the poorest and most marginalised bearing the greatest costs (Martin et al., 2013).

In an attempt to improve PA-related equity (for both moral and instrumental reasons), there have been various changes in PA management and governance approaches and in the measurement of their success. PA management has shifted from a 'fences and fines' approach towards involvement of local communities (see sections 1.2.2 and 1.2.3), although there are also some opposing calls for a 'back to the barriers' strict protection approach (Brechtin et al., 2002; Hutton et al., 2005a) and increasingly militarised approaches towards the illegal wildlife trade and

poaching (Duffy, 2014; Duffy, 2016). Overall, however, PAs are now expected to achieve both biological and socio-economic goals.

Research gaps and justification of thesis

Various targets and indicators have been suggested to measure progress towards more equitable PAs (Schreckenberget al., 2016; Zafra-Calvo et al., 2017), although some have argued that equity is too context dependent to be easily measured by widely applicable indicators (Dawson et al., 2017). In this thesis, I argue that before we generate indicators to measure progress towards PA-related equity, we need to understand the processes which lead towards equitable or inequitable outcomes. The following three chapters each take an in-depth look into how co-management governance processes impact upon PA-related benefits and costs and their distribution within and between communities. These findings provide useful lessons in the fine-scale processes of PA co-management that can impact upon the achievement of successful and equitable outcomes.

1.2.3 Protected area co-management

One of the outcomes of greater consideration of conservation equity, has been a global shift in PA governance, from purely state-managed areas towards involving local communities, NGOs and private entities (Berkes, 2010). One aspect of this has been an increase in co-management approaches, there is no universally accepted definition of co-management, and many definitions do not consider the many layers of complexity (Berkes, 2010). Generally it refers to the sharing of power, responsibility, decision making and enforcement between two or more stakeholder groups (Berkes, 2010; Borrini-Feyerabend et al., 2012). Often this is between state and other non-state actors, such as NGOs, local communities or private companies (Carlsson and Berkes, 2005; Berkes, 2010; Borrini-Feyerabend et al., 2012).

Co-management falls under the 'shared governance' IUCN categorisation (Table 1-2), yet IUCN also acknowledge that this definition covers a wide range of potential relationships between stakeholder groups (Borrini-Feyerabend et al., 2012). At one end of the spectrum there may be one group or party with overall decision-making power and other groups are consulted and kept informed, however truly shared governance approaches

will enable multiple stakeholder groups to jointly make decisions (Borrini-Feyerabend et al., 2012). It is important to note that shared governance structures do not necessarily lead to co-management structures (Lyver et al., 2014).

Co-management approaches tend to be dynamic and constantly evolving, as it can take a long period of time for sufficient trust to build up between stakeholder groups (Berkes, 2017; Ayers et al., 2017). Incorporating lessons learnt over time and collaborating with stakeholders to find solutions can enable co-management approaches to become adaptive (Berkes, 2017). In the case study in this thesis, local community associations are involved in both governance and management structures, and I refer to this approach as co-management throughout.

This shift in governance has in part aimed to reduce the local costs of PAs and to even out distribution of local benefits and costs i.e. improve equity. PA co-management (particularly involving local communities) offers many opportunities to improve on all three equity dimensions (summarised in Table 1-3). Overall, research suggests co-managed PAs are more likely to meet both biological and socio-economic goals than other governance type, but this is not always the case (Oldekop et al., 2016). Co-managed PAs that are more likely to meet their aims share certain characteristics, including empowerment of local populations, improved cultural benefits and decreased local livelihood costs suggesting that attention to equity can improve PA effectiveness (Persha et al., 2011; Oldekop et al., 2016).

**Table 1-3: Equity dimensions and how they relate to co-management
(adapted from Schreckenberg et al., 2016; Zafra-Calvo et al., 2017)**

Equity dimension	Relation to local community participation in PA co-management
Distribution	Communities are involved in distribution of any PA-related benefits or compensation for PA-related costs
Recognition	Local stakeholder groups gain rights in the establishment and management of PAs May enable traditional knowledge systems to be included in the management of the PA
Procedure	Local stakeholder groups are able to participate in decision making, access information about PA management, resolve any disputes with co-management partner and raise any concerns about management

Research gaps and justification of thesis

In order to ensure that co-managed PAs meet their aims of reducing local costs, it is important to understand fine-scale governance processes and their local impacts. By investigating how these processes play out in reality it is possible to provide insights to improve co-managed PAs globally.

1.2.4 Important aspects of co-management and improving equity

1.2.4.1 Local community participation

Co-managed PAs do not necessarily include local communities by definition, but globally this has been increasing (Borrini-Feyerabend et al., 2012; Ojha et al., 2016). Local community involvement in conservation and environmental governance rose to prominence via the introduction of Community Based Natural Resource Management (CBNRM). One example

of CBNRM is found in Zimbabwe's Communal Areas Management Programme for Indigenous Resources (CAMPFIRE). CAMPFIRE aimed to provide benefits to local communities through a utilitarian approach to wildlife, and parallel programmes were established in countries across southern Africa (Roe, 2008; Dressler et al., 2010). Results were nevertheless mixed: elephant numbers grew in CAMPFIRE areas (Taylor, 2009), but projects were criticised for a lack of tangible benefits for local communities, and for exacerbating elite capture (Murphree, 2004; Dressler et al., 2010). Despite these conflicting results, community participation has continued to become more common in other areas of conservation (Dressler et al., 2010).

Participation is important both for pragmatic reasons and as a more democratic approach. Benefits of stakeholder participation in environmental management and decision making include improved decision making, increased support, reduced costs, increased representation, empowerment of marginalised groups, increased trust, and the promotion of social learning (Reed, 2008; Sterling et al., 2017). In the case of conservation and local communities, there have been numerous calls supporting the notion that giving local people decision making power and strengthening local voices in global conservation debates is key to conserving habitats and species (Cooney et al., 2016; UNEP, 2017; Biggs et al., 2017). Yet, there is limited evidence on who is participating, how and why, particularly in PA co-management. There have been case studies showing that participation can be dominated by powerful groups and may risk exacerbating elite capture (Persha and Andersson, 2014; Virah-Sawmy et al., 2014). Cases where participation is fully representative, and marginalised groups are given a voice, increases the likelihood of achieving conservation and socio-economic goals (Agarwal, 2009; Kaeser et al., 2016).

Participation is a broad term and can encompass a wide range of realities, from brief stakeholder consultations during PA establishment, to stakeholders becoming active management decision makers (Stringer et al., 2006). Existing research has shown that, in general, the greater the level of participation, the more likely the chances of improving governance to deliver shared goals (Arnstein, 1969; Hurlbert and Gupta, 2015). There have

nevertheless been some concerns that participation on paper rarely transforms into meaningful participation in reality (Agrawal and Gibson, 1999). When local communities feel excluded or ignored from decisions that impact their lives, it can lead to conflict and acts of resistance, for example continuation of prohibited livelihood activities or killing protected species (Holmes, 2007; Jones et al., 2008). This has obvious equity implications, but may also impact negatively upon conservation outcomes.

Previous studies have shown that participation can provide benefits for local communities, but this is more likely to happen under certain conditions. Such conditions include: legitimate representation of stakeholders, professional facilitation, effective communication, and decision-making power given to all participants (De Vente et al., 2016). Participation fits into both recognition and procedural dimensions of equity, and shapes distributional equity (Table 1-3). An aspect frequently missing from design of local community participation is consideration of the social, cultural and political context. Communities themselves are heterogeneous and dynamic entities, and will change depending on various shifting contexts (Waylen et al., 2013; Sterling et al., 2017). For example, political changes both national and international will impact local communities. This is particularly the case as the internet provides opportunities for engagement and communication (Ojha et al., 2016). PAs themselves can also act as a driver of change in community dynamics. Local and national governance regimes may impact levels of participation and engagement (Sterling et al., 2017). Fully representative participation may be difficult in certain contexts, where societies may marginalise certain groups (Agarwal, 2009; Waylen et al., 2013). Yet over time, this may change, shaping equitable and effective institutions at the community level may take up to a decade (Berkes, 2004; Waylen et al., 2013).

Different levels of engagement are likely to be appropriate in different contexts depending on the objectives and capacity of stakeholders, and multiple reviews have concluded that well designed participation can overcome challenging contexts (Brooks et al., 2012; Hurlbert and Gupta, 2015; De Vente et al., 2016; Sterling et al., 2017).

Research gaps and justification of thesis

Previous studies show that participation can provide benefits, but only when it is meaningful (Reed, 2008; De Vente et al., 2016; Oldekop et al., 2016). In order to ensure meaningful participation, we need to understand who is participating within local communities, how they are participating, and what influences their decisions on whether to participate or not. There have been a few studies asking these questions relating to environmental governance, as discussed above. However, few studies explore local perceptions of participation and even fewer still in relation to participation in PA governance. By answering these questions, it helps to untangle the complexities between participation on paper, in reality, and the kinds of outcomes it can achieve. Chapter 2 explores who is participating in PA governance, what they perceive the benefits and costs to be, and how these are distributed within and between communities.

1.2.4.2 Ecosystem service access

Another aspect of the shift towards recognising equity in conservation and involving local communities, has been a movement away from the 'fences and fines' approach towards encouraging sustainable resource use (Roe, 2008). Whilst there is not space to fully explore these discussions in this thesis, it is important to note where PA co-management fits into the wider conservation context. Category Ia and Ib IUCN PAs are one example of the 'Fences and fines' approach, alongside restrictions on natural resource use and greater enforcement of these rules. These PAs are strictly managed to exclude any natural resource use and in some cases only allow access by researchers or PA staff (Borrini-Feyerabend et al., 2012). Whereas the introduction of categories V and VI in 2008, enabled inclusion of PAs that allow sustainable-use of resources and continued human interaction with the environment (Dudley, 2008), this was (and has remained) controversial (Dudley et al., 2010). Strict protection vs. sustainable-use continues to be a contentious issue, with some conservation scientists maintaining that strictly managed PAs offer the best chance of conserving species (Hutton et al., 2005b; Holmes, Sandbrook, et al., 2017). Others argue that without allowing some sustainable-use, it is not possible to ensure that the costs of

conservation are not borne by local communities (Roe, 2008). These debates link to wider discussions around what conservation is and whether it should take an ecocentric or anthropocentric approach (Kareiva and Marvier, 2012). It may be that both of these approaches are valid approaches for different conservation issues, as long as any trade-offs are made explicit. For example no-take MPAs or temporal fishery closures have been shown to also provide benefits for local communities and fish populations (Gildas Andriamalala et al., 2013), whereas strict terrestrial PAs have in some cases led to decreases in key species and costs for local communities (Porter-Bolland et al., 2012). Yet with global commitments to both increase PA coverage and reduce costs of conservation on local communities, it is important that we understand which approaches are appropriate in which context. Recently published reviews have shown that PAs managed to promote sustainable use of resources, rather than enforcing stricter protection of biological resources, are more likely to meet their socioeconomic and conservation aims (Oldekop et al., 2016; UNEP, 2017).

ES are the benefits people obtain from ecosystems, and it is well established that ES underpin human well-being (Millenium Ecosystem Assessment, 2005; Sandhu and Sandhu, 2014; Bennett et al., 2015; Hirons et al., 2016). ES provide materials necessary for daily life, regulate the environments we live in, and contribute towards spiritual well-being (Millenium Ecosystem Assessment, 2005). There have been many different frameworks designed to outline the relationships between ES and human well-being, and these have been extensively reviewed within the literature (Fisher et al., 2013; Agarwala et al., 2014). Critiques of these frameworks have suggested improvements via interdisciplinary approaches, integration of subjective and objective dimensions of well-being, and equal inclusion of all ES categories (Agarwala et al., 2014; Fisher et al., 2014). The ES approach more generally has also enabled valuation of certain species, habitats or natural processes (Verma et al., 2017; Kubiszewski et al., 2017). This is another area of contention within conservation, with some arguing that a monetary value ensures policymakers and others understand the importance of biodiversity (Balmford, 2002; Kubiszewski et al., 2017). Others argue that some aspects of biodiversity are impossible to value, and valuation risks someone

identifying a cheaper manmade alternative (Adams, 2014). Valuation is very context dependent, what one person, or group of people, value highly may not be reflected by the rest of society, even within conservation scientists there is debate over what should be conserved and how (Sandbrook et al., 2011; Duraiappah et al., 2014). Although there are now some methodological solutions for valuing cultural and spiritual aspects of biodiversity, these are still often overlooked (Hausmann et al., 2015; Hirons et al., 2016). This is particularly relevant in the implementation of sustainable resource use approaches, as often this focusses entirely on provisioning services rather than considering cultural services or whether a provisioning service may also have cultural or spiritual values (Villegas-Palacio et al., 2016; Delisle et al., 2017).

In 2012, the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) was established to build upon the Millennium Ecosystem Assessment (MA) in terms of assessing the state of nature and the consequences for human well-being. The IPBES framework aimed to act upon critiques of previously existing frameworks by utilising multidisciplinary workshops, involving diverse stakeholders, knowledge systems and countries (Díaz et al., 2015; Schmeller and Bridgewater, 2016; Pascual et al., 2017).

One aspect frequently missing from interpretations of the relationship between ES and human well-being (and which is still missing in the IPBES framework), is the issue of access. People can only gain benefits from ES if they are able to access them (Daw et al., 2011). In reference to ES, access is defined as the capacity or opportunity to gain benefits from the environment. The degree to which an individual is able to access ES will depend on a complex range of mechanisms including social relationships, institutions, capabilities, property rights and various capitals (Ribot and Peluso, 2003). Access relates to the distribution dimension of equity, as it shapes how the benefits and costs of PA-restrictions may be distributed.

Research gaps and justification of thesis

Sustainable resource use requires fewer restrictions to be in place than a preservationist/strict conservation approach, yet it is still likely to lead to a

change in rules on natural resource and therefore ES access. Despite this, there has been little research on how the global shift in governance, specifically regarding co-management, is affecting access to ES. This is important in order to understand how aspects of governance may impact access to ES and whether these impacts are felt equitably by local communities. Chapter 3 explores which ES are considered most important by local communities, what factors are important in determining ES access, and how rules and regulations regarding ES access are decided and enforced, both formally and informally. As stated earlier, community perspectives are important for both moral reasons (i.e. communities should have a say in decisions they are effected by) and instrumental reasons (i.e. research has shown that where communities perceive greater equity, PAs are more likely to achieve their aims (Martin et al., 2014; Schreckenberg et al., 2016)).

1.2.4.3 Reducing negative local livelihood impacts

As described above (Section 1.2.2), it is generally accepted that PAs provide global benefits, whilst the costs are often incurred by local communities (Oldekop et al., 2016; Martin et al., 2013). Previous studies have shown that costs frequently include negative livelihood impacts (Foerster et al., 2011; Franks et al., 2014; Gurney et al., 2015). A livelihood can be defined as “*the means, activities, capabilities, assets and entitlements by which people build a living*” (DFID, 1999). It is important to note that a livelihood is therefore multidimensional and much more than just the activities undertaken to earn an income or subsist. The Sustainable Livelihood Framework (SLF) was developed in order to conceptualise the multiple influences on people’s livelihood strategies (DFID, 1999; Scoones, 2000). A livelihood is considered sustainable when it can withstand and recover from stresses and shocks to the extent that a household’s assets can be maintained or enhanced, while not undermining the natural resource base (Scoones, 2000). Conservation interventions, such as PA establishment can be considered as a ‘shock’ due to a potential change in natural resource/ES access and livelihood activity restrictions. There have been some applications of the SLF to investigate conservation or PA-related livelihood costs and benefits (e.g. Chinangwa et al., 2016; Bennett & Dearden, 2014), and it was used to inform part of the

Social Assessment of Protected Areas framework (Schreckenberg et al., 2010). Yet it still remains an under-used framework to assess local costs and benefits of conservation interventions, particularly as it provides a holistic view of livelihoods, incorporates governance processes and enables comparisons of different groups within communities.

One of the aims of PA co-management approaches is to reduce local livelihood costs. This is often via allowing sustainable use of natural resources (Section 1.2.4.2) and encouraging a shift in livelihood activities (Borrini-Feyerabend et al., 2012). Alternative livelihood projects or livelihood interventions aim to reduce livelihood activities considered to be environmentally damaging, whilst providing alternative activities (Wright et al., 2016). Although there have been documented cases where these projects have been successful, such as the introduction of sea aquaculture in Madagascar (Andriamalala et al., 2013), they have also received considerable criticism. This includes: not understanding the complexity of livelihoods; assuming livelihood activities can be 'substituted' without fully considering the mechanisms through which that can take place, if indeed it can; ignoring the cultural importance given to certain livelihood activities; too much focus on single livelihood activities, leaving households vulnerable to climatic changes; and assuming communities are homogeneous (Wright et al., 2016).

Research gaps and justification of thesis

Previous studies have analysed how PA-related benefits and costs are distributed (e.g. Foerster et al., 2011; Franks et al., 2014; Gurney et al., 2015), but few have explicitly linked this to PA governance processes and these studies have often focussed on indicator or broad-scale data. As community involvement in PA governance becomes more widespread, we need to understand whether and how it is meeting the aim of improving PA-related equity within particular country settings. Chapter 4 explores how co-management governance processes impact upon local livelihoods, and how these impacts are distributed within and between local communities.

1.2.5 Madagascar context

Madagascar is a biodiversity hotspot, with over 80% of species endemic to the country (Myers et al., 2000; Goodman and Benstead, 2005). Yet, it is also one of the poorest countries in the world, and has suffered from numerous periods of political instability. A military coup from 2009-2013, led to a slowdown in economic growth and development progress. In 2015, Madagascar had the highest proportion in the world of the working population living below the international poverty level (Waeber et al., 2016), and in 2016 this still remains at 77.8% of the population.(UNDP, 2016). Madagascar is also ethnically diverse, including 18 groups with shared ancestry, their own institutional arrangements and generally tied to particular geographical areas (Scales, 2014; Randrianja and Ellis, 2009). However, in reality ethnic identity can be fluid and is linked to livelihood activities and adherence to taboos or '*fadys*'. Anthropological research has found that the 18 ethnicities were defined during the colonial period in order to delineate territories, and have often been used to attach negative behavioural traits to certain groups (Scales, 2012; I.. Scales, 2014). This had led to distinct differences in wealth distribution between ethnicities, with the groups living in central plateau areas tending to have greater wealth, access to education and power than those living in coastal areas (Scales, 2014).

The combination of high conservation priority and challenges of a developing population, has meant that Madagascar has received considerable conservation attention over the last 30 years. Yet threats to biodiversity are still increasing (Waeber et al., 2016). The majority of the population are rural subsistence farmers, leading to a conflict between local livelihoods and conservation aims (Scales, 2014a). The main threat to biodiversity is land-use conversion, particularly due to the traditional method of shifting agriculture, locally known as '*tavy*' (in eastern Madagascar) and '*hatsake*' (in south-western Madagascar) (Desbureaux and Brimont, 2015). *Tavy* is not only an agricultural method, but also an integral part of Malagasy culture and an act of resistance to state control of forest land (I.R. Scales, 2014b; Desbureaux and Brimont, 2015). State control over forest resources began during the French colonial period, and continued post-independence. Yet many rural communities considered these laws illegitimate due to *de facto*

customary and ancestral forest access, and burning enabled them to express their anger towards the government (Gardner et al., 2008; Kull, 2014). There is a complex history surrounding the legal use of *tavy*. It was prohibited in the 1950s, but the ban was lifted after independence in 1960, reinstated in 2002, and then relaxed during the political crisis of 2009 (Kull, 2004; Pollini, 2012; Bidaud et al., 2016). Although it is still officially prohibited, rural farmers continue to use it as a method of expanding agricultural land, following their local norms, are often unaware of the legalities, and enforcement levels remain low or non-existent in remote areas (Kull, 2004; Pollini, 2012). Conservation initiatives in Madagascar have mostly focussed on establishment and expansion of PAs, which can be split into three phases: (i) The creation of reserves during the colonial period (1897-1958) (I.R. Scales, 2014a); (ii) the expansion of National parks in the 1990s during the implementation of the National Environmental Action Plan (Mercier, 2006); and (iii) the establishment of co-managed Durban Vision PAs from 2004 onwards (Virah-Sawmy et al., 2014). The case study PA in this thesis falls into the last of these categories, and so this section will focus on the reasons for their establishment, how they differ from other Malagasy PAs and existing studies.

In 2004, the President of Madagascar announced his 'Durban Vision' at the IUCN congress, pledging to triple PA coverage by establishing a new network of PAs. This was named as "*one of the most important announcements in the history of biodiversity conservation*" by Russell Mittermeier, president of Conservation International (Corson, 2014). The aim of this vision was not only to conserve biodiversity, but also to encourage local community involvement in governance processes and promote sustainable natural resource use for development and poverty alleviation (Gardner, 2011). This was partly influenced by World Bank analyses demonstrating the importance of Madagascar's forest, but the lobbying power of international NGOs and funders also played a large role (Duffy, 2006; Corson et al., 2014; Corson, 2014). This differed from the existing PAs which are state-managed and strictly protected (IUCN categories I and II), although these have also begun to include local community representatives in governance (Gardner et al., 2013; I.R. Scales, 2014a).

Co-management in these new PAs would be between a 'promoter' (most frequently NGOs but occasionally private companies) and local community associations, locally known as VOIs (*Vondron'Olona Ifotony*). Although the PA land is officially government owned, the 'promoter' and VOIs should be jointly responsible for PA governance and management decisions. VOIs provide a mechanism for local communities to become involved in decision-making from establishment of the PA through to daily management decisions and enforcing PA-related rules. The VOIs consist of general members, and a committee who are voted in by the rest of the members. All adult local community members are eligible to join the VOIs (Ferguson and Gardner, 2010; Gardner, 2011). This co-management approach also offers the potential to improve conservation-related equity in Madagascar (as demonstrated in Table 1-3). This is of particular importance given the history of land tenure conflict mentioned above. However, ensuring representativeness of all social groups in community associations is likely to be challenging as traditional institutions are often dominated by men and locally powerful ethnic groups (Virah-Sawmy et al., 2014). This is due to the history of different ethnic groups (as explained above) and also because there are often specific gender roles within households. These vary between ethnicities, but often men are responsible for farming and community discussions, whereas women are in charge of household activities. Although gender equality is improving in Madagascar overall, women are often under-represented in village-level institutions (Randrianja and Ellis, 2009; Waeber et al., 2016).

Despite many of these PAs having been established a decade ago, there are limited existing studies exploring whether they have succeeded at meeting their aims. Those that do exist tend not to be in-depth studies, but have suggested that although these PAs have made good progress at incorporating values of local communities, there is still scope for improvement (Virah-Sawmy et al., 2014). Others have raised concerns that: local community associations are not representative of all groups; promised consultations with local communities before PA establishment did not reach the community level; NGOs may have had more power in shaping PA boundaries and rules than planned; there were differences between verbal

and paper agreements; and PA-related benefits or compensation were not reaching the right households (Duffy, 2006; Brockington and Scholfield, 2010; Corson, 2012; Corson, 2014; Virah-Sawmy et al., 2014; Cullman, 2015).

Research gaps and justification for thesis

New PAs in Madagascar aim to promote local involvement in PA management whilst encouraging sustainable use of natural resources and protection of endangered species. Yet, there is mixed evidence to show whether they are meeting these aims (Gardner et al., 2013; Corson, 2014; Virah-Sawmy et al., 2014). Currently there are no in-depth studies that explore how these new governance systems work in reality and how they impact on local communities. As shared governance or co-management is increasing globally, Madagascar presents a useful and informative case-study to understand if and how this new governance type may be meeting its aims. The findings from this thesis can therefore provide locally useful recommendations as well as globally useful lessons.

1.3 Aim and objectives

Following the research gaps identified in the literature review, the aim of this thesis is to explore the role of PA governance in determining livelihood outcomes via access to ecosystem services and identify how associated benefits and costs are distributed between groups within communities.

1.3.1 Objectives

1. To determine who participates in PA co-management community associations, why they choose to participate, and understand how the costs and benefits of participation are distributed within and between communities
2. To explore how and why governance structures affect access to ecosystem services, and how this access is distributed within and between communities

3. To identify how co-management governance processes impact upon livelihood strategies and outcomes, how these impacts are distributed within and between communities

1.4 Research strategy

1.4.1 Research design

Historically, the natural sciences have tended to be the sole or primary information source used to guide conservation action. Yet, it has become widely recognised that engaging with the human dimensions of conservation and environmental management is needed to provide robust and effective conservation policies, actions and outcomes (Meffe, 1998; Moon and Blackman, 2014; Mascia et al., 2003; Bennett et al., 2017). Parallel to this has been the understanding that past and current conservation interventions have led to negative impacts for local communities (Milner-Gulland et al., 2014). As described in section 1.2.1, a more equitable approach to conservation is important for both moral and instrumental reasons (Schreckenberg et al., 2016). An interdisciplinary approach, incorporating methods and ideas from outside the natural sciences, is needed to understand what equitable conservation looks like and how we can measure our progress towards it (McDermott et al., 2013; Schreckenberg et al., 2016).

Conservation social science refers to diverse traditions of using social science to understand and improve conservation policy, practice, and outcomes (Bennett et al., 2017; Sandbrook et al., 2013). In this thesis I utilise theories from social-psychology, sociology, and development studies to explore how PA co-management impacts local communities. Each objective is based around a different theory, and these are outlined in more detail in each of the chapters, however Table 1-4 provides an outline of each framework. Each framework incorporates both qualitative and quantitative data. Figure 1-1 illustrates how the frameworks can be utilised together to understand how different aspects of PA co-management impact local communities, and how these impacts are distributed.

Table 1-4: A summary of conceptual frameworks used in each objective/chapter and why they were chosen

Objective	Framework	Discipline	Brief outline	Reason for inclusion
1 (Chapter 2)	The Theory of Planned Behaviour (TPB)	Social Psychology	It states that a person's decision to conduct a certain behaviour is controlled by their attitude (overall evaluation of the behaviour), subjective norms (estimate of the social pressure to conduct the behaviour) and perceived control (whether a person feels able to do the behaviour) (Ajzen, 1991)	With evidence suggesting that co-managed PAs with meaningful stakeholder participation are more likely to meet their aims (Oldekop et al., 2016), TPB provides a useful framework to understand why individuals are participating or not in co-management processes
2 (Chapter 3)	Modified IPBES with Theory of access		The IPBES framework defines how ES link to human well-being, what is driving changes in ES, and how these changes may impact human well-being (Díaz et al., 2015)	By modifying the IPBES framework it is possible to explore the relationship between PA co-management governance processes and ES

			The Theory of Access categorises what factors affect the ability to gain benefits from something	access
3 (Chapter 4)	Sustainable Livelihoods Framework (SLF)	Development studies	The SLF defines a livelihood as multidimensional, and considers how the vulnerability context, livelihood assets, influence and access, transforming structures and processes and livelihood strategies interact to lead to different livelihood outcomes.	This enables exploration of the relationship between PA co-management and livelihood impacts, and the distribution of these impacts within and between different communities

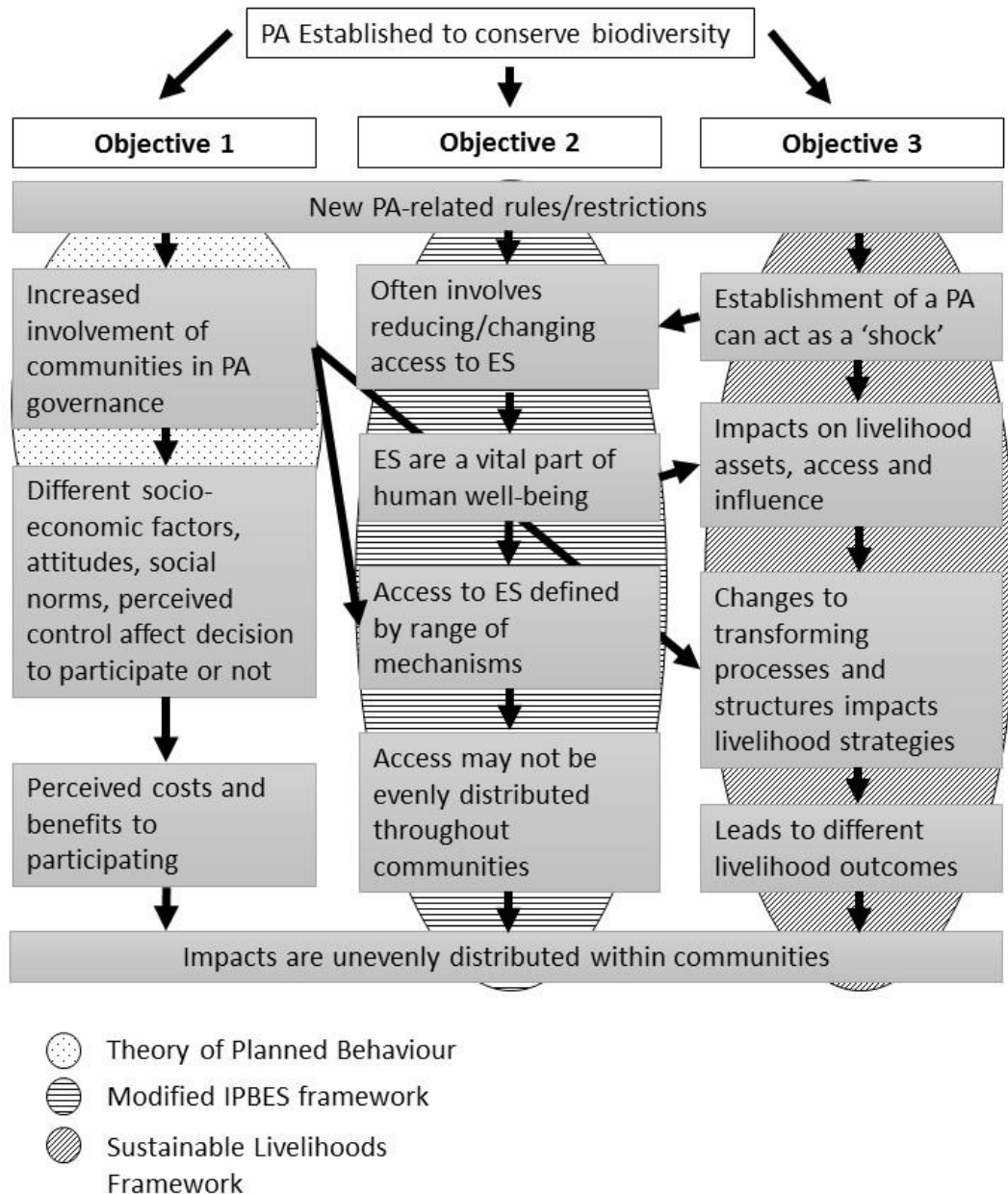


Figure 1-1: Diagram illustrating how theories used for each objective link together

Methods for all three objectives combine qualitative and quantitative approaches (see section 1.4.2.2 for more detail on the mixed methods approach). By incorporating qualitative alongside quantitative approaches, it is possible to explore in-depth 'how and why' questions (Tashakkori and Teddlie, 1998; Cresswell and Plano Clark, 2011). This ensures a greater understanding of the research context, and permits greater accuracy in interpretation and analysis of data (Drury et al., 2011).

The three frameworks outlined above, utilise perceptions as evidence. Measuring subjective views or perceptions, rather than solely focusing on objective measurements or indicators, is crucial to conservation success (Bennett, 2016). Perceptions are important in measuring human well-being (Woodhouse et al., 2015), understanding and influencing human behaviours (Ajzen, 1991), enlisting stakeholders' support (Gurney et al., 2015) and minimising negative impacts of conservation interventions. Yet, perceptions are frequently criticised as not being reliable evidence, as they are subjective, may not accurately represent outcome variables, can be purposefully inaccurate, and cannot be used to determine causality (Bennett, 2016). This is because perceptions are highly mediated by past experiences and personal motivations, but this is also where their strength as a form of evidence lies. Perceptions can be used to provide insight and are particularly useful in understanding the legitimacy of conservation governance and acceptability of management actions (Cinner and Pollnac, 2004; Martin et al., 2014; Bennett and Dearden, 2014; Vuola and Pyhälä, 2016). Therefore perceptions provide vital evidence in these thesis for understanding the subjective 'how and why' of local communities' experiences in PA co-management, rather than objective measurements.

1.4.2 Methodological approach

1.4.2.1 Case study approach

The thesis takes a case study approach to explore co-management governance processes and the local distribution of associated costs and benefits. It utilises one co-managed PA in eastern Madagascar and three surrounding villages (Figure 1-2). A case study enables investigation of an issue or phenomenon in depth and within its real world context (Yin, 2014), and is therefore well suited to the detailed exploratory inquiry required for this research. Case studies are used in many situations contributing to knowledge on individual, group, organisational, social, political and related phenomena. Case study research enables us to explore and answer the 'how' and 'why' questions which cannot be explored by experimental approaches, such as RCT (Randomised Control Trials; Yin, 2014). As conservation social science has developed as a discipline, there has been

increasing case study research applied to answer conservation-related questions (Newing et al., 2011), particularly relating to understanding the impact of conservation interventions on local human well-being (e.g. Clements et al., 2014; Bennett & Dearden, 2014; Hall et al., 2014; Gardner et al., 2015).



Figure 1-2: Map showing case study village locations (numbers are used to anonymise the villages)

Critiques of case study approaches are that they cannot generate generalisable results to wider populations. This has been a particular issue in conservation, with a movement towards a conservation evidence approach and calls for large-scale comparative quantitative RCT or similar studies (e.g. Andam & Ferraro, 2010; Clements & Milner-Gulland, 2014). Although these studies can produce useful broad-scale data on the impacts of conservation interventions, such as PAs, they are unable to explain how or why these impacts occur. By utilising a broader-scale approach, RCT studies often miss the local distribution of benefits and costs, assuming communities or villages are homogenous entities. In-depth case studies have been able to offer wider lessons for similar contexts, on their own (e.g. Beauchamp et al., 2018; Sommerville et al., 2010; Gardner et al., 2015) or

used together in review papers (e.g. Mckinnon et al., 2016; Oldekop et al., 2016; de Lange et al., 2015). In this thesis I use the case study results to draw out generalisations applicable to the wider scale. A multiple-level, multiple-case design (i.e. three study villages, and respondents from differing socio-economic groups in each) was selected to provide a rich variety of data (Blaikie, 2000). This enabled in-depth understanding of how co-management was perceived and experienced by local households, the drivers of these, data from a larger sample, and comparisons within and between communities.

1.4.2.2 Mixed methods

The term mixed-methods refers to research that combines quantitative and qualitative approaches, enabling exploration of in-depth issues alongside collecting breadth of information about the population as a whole (Newing et al., 2011). The case study approach provides the flexibility to combine various data collection techniques, in order to design a more comprehensive set of research questions and collect a richer and stronger range of evidence than is possible from a single methodological approach (Yin, 2014). In this thesis I combine qualitative and quantitative approaches throughout research design, data collection, analysis and interpretation (Bennett et al., 2017; Bennett et al., 2017a).

Mixed methods approaches can help to ensure both internal and external validity. Data validity is fundamental to scientific investigation. External validity evaluates the extent to which the results are representative of a population and is best facilitated by large-scale quantitative surveys. However, qualitative data is much better at representing the diversity of study groups or populations, and therefore facilitates internal validity (Drury et al., 2011).

Conservation has historically been based in the biological sciences, with most researchers trained in natural sciences. Understanding that many conservation issues revolve around understanding and changing human behaviour led to a rapid uptake and use of social science methods. Yet due to lack of social science training amongst conservation scientists, there have been issues with greater focus on quantitative rather than qualitative

methods and lacked the full rigour of research design needed (St. John et al., 2014). However, this is changing and conservation journals now encourage submissions utilising a wide range of social science methods (Teel et al., 2018). In this study a mixed methods approach enables the collection and analysis of qualitative data in order to understand PA co-management governance processes, motivations for participating in governance associations, and drivers of livelihood changes, and was used to inform design of quantitative data collection methods. Quantitative data collection and analysis provide answers to these questions from a larger sample of community populations.

A mixed methods approach may be structured sequentially (where one method informs the next) or concurrently (Newing et al., 2011). In this thesis both approaches were used. Qualitative data from focus groups (Appendix C) and semi-structured interviews (Appendix D) were used to inform household questionnaire design (Appendix E). Questionnaires incorporated both qualitative and quantitative data collection (Figure 1-3). This allowed the questionnaire design to be contextually and locally relevant, and analysis of the qualitative data enabled in-depth exploration of the topics covered.

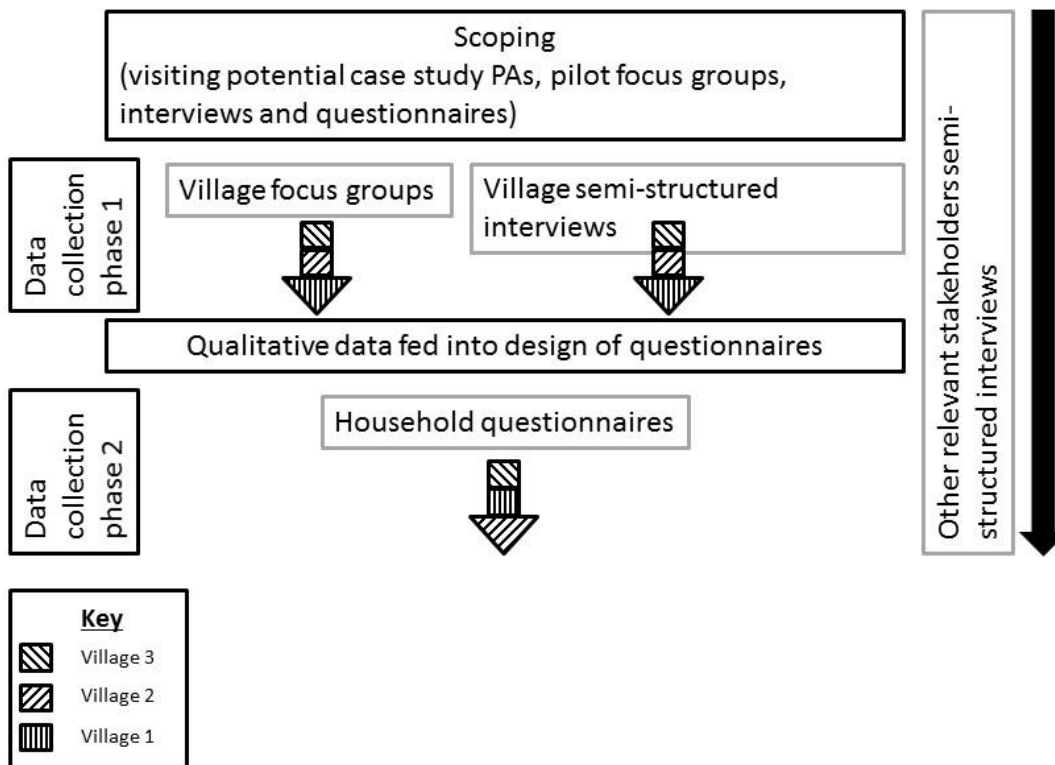


Figure 1-3: Summary of fieldwork stages

1.4.3 Methods

1.4.3.1 Scoping visit

A scoping visit facilitated choice of case study site, and enabled a deeper general understanding to be gained of co-management governance processes and related impacts on local communities. Furthermore, it was crucial to piloting methodologies before data collection began. For the scoping trip, I visited Madagascar in May 2015 for 6 weeks to visit potential research sites, pilot methodologies and undertake scoping interviews (Table 1-5). During this trip, 3 protected areas were visited that are co-managed by local communities and NGOs, where a total of 7 interviews and 43 questionnaires were conducted with a range of stakeholders to gain a better understanding of the management of these PAs. This included interviews with field and office NGO staff, local government officials, VOI committee members, VOI members and non-members, and also questionnaires with VOI members and non-members. Although this gave invaluable background information on PAs generally in Madagascar, none of the data collected on

the scoping trip was analysed for the research objectives as it did not directly relate to the PA case study.

Table 1-5: Summary of potential research sites visited on scoping trip

Name	NGO	Date Established	Size (ha)	Number of interviews/questionnaires carried out	Management Summary
COFAV (corridor made up of smaller protected areas)	Feedback Madagascar /Ny Tanintsika	2007 (some areas are waiting for contracts to be officially renewed)	Varies between sections	Interviews: 2 Questionnaires: 17	Each of the PAs has a VOI (village management association), with a 3-part contract between themselves, Ny Tanintsika and the local forestry department
Angalazaha Forest	Missouri Botanical Gardens (MBG)	2008 (received official status in 2015)	2745	Interviews: 2 Questionnaires: 11	Co-managed with local community association Soaznagahary, which is divided into 10 <i>foktany</i> (villages). There is a committee, made up of presidents and vice-presidents from each <i>foktany</i> , who have regular meetings with MBG and act as messengers between the village members and MBG
Mangabe Forest	Madagasikara Voakajy (MV)	2008 (received official status in 2015)	24000	Interviews: 3 Questionnaires: 15	Co-managed with 10 local community associations (VOIs). Each VOI has a committee of President, Vice President, Secretary and Treasurer who are elected by

VOI members. Anyone living in the village over the age of 18 can join the VOI

1.4.3.2 Study site selection

Utilising the results from my scoping trip, I selected my case study site after consideration of a number of factors. I chose Mangabe PA for a number of reasons (Table 1-6): there were valid comparisons to be made between villages; the PA had been established recently enough for changes to have taken place, but not so long ago that people had forgotten what it was like before the PA; there had been no social research carried out previously; the co-management NGO and local community members were keen to learn about the results of the thesis; and it was relatively easy to access logistically.

Table 1-6: Factors considered when choosing case study site

Factor	Importance	Case study site: Mangabe Forest
Management	Management and governance processes need to be similar enough to be able to compare between the sites, but also have enough differences to be able to understand what factors are having an effect on these processes	There are 10 VOIs in villages all involved in the management of the PA. They are all set up in a similar way and given the same guidelines, however from pilot interviews it seems that the governance processes can play out differently between VOIs. By sampling 3 different VOIs, therefore I should be able to find enough similarities for comparison, and also differences between them to enable me to fulfil my research objectives
Date of establishment	The PA needs to have been established recently enough for people to remember the difference, but long enough that the change in ES access has had an impact on people living nearby	The PA was established in 2008, and has been just given its official protection status decree from the government in July 2015. This will have given enough time for any changes in livelihoods and access to ecosystem services to have an impact upon local communities
Previous Studies	I hope to provide novel and useful findings from this PhD study, it is therefore important to	There have been a few studies on the protected area and villages surrounding, covering topics including: amphibian

	<p>be aware of any previous studies to make sure that I am not replicating previous work</p>	<p>populations and declines, lemur population monitoring, land use change and effects of environmental education. However none have looked at the governance processes of the protected area and how these may influence local people's well-being</p>
<p>Regulations on ES access</p>	<p>In order to understand how governance processes interact with access to ES, there need to be some restrictions on ES use. However, there needs to be a balance between having no restrictions (and therefore unable to answer the objectives) and restrictions which prevent anyone from accessing ES</p>	<p>There are regulations set in place regarding local people's access to ES, and differences between VOI members and non-members, but people are still able to access certain services in certain parts of the forest. Pilot questionnaires and interviews indicated that people living nearby are reliant on the forest for certain provisioning services and are accessing these fairly regularly. Pilot interviews and questionnaires suggested that people were willing and able to talk about their ES use within the protected area. This is important as it will enable investigation of how governance processes are interacting with ES access and use</p>
<p>Usefulness of study</p>	<p>Although the main aim is to produce a PhD thesis and associated academic papers, the study should be able to provide useful policy recommendations for this PA and others</p>	<p>As the NGO is primarily conservation-focussed with majority biologist staff members, this in depth look at how the governance processes of managing their protected area play out and affect local communities could provide useful information for them and the management of their other new protected areas</p>
<p>Logistics</p>	<p>Although less important in deciding which PA to study, this needs to be considered in terms of the risk assessment and</p>	<p>Logistically, all villages are accessible (or within a day's walk) from roads connected to Moramanga. Transport via 4x4 is possible down these roads (in</p>

practicalities of
conducting research

dry season) but not to the
villages themselves

From the ten villages involved in co-management of Mangabe Forest, three villages were selected for the study. The selection of these three villages was based on: similar community association establishment process, similar distance from forest, similar distance from roads/towns (as explained in Table 1-7). According to the NGO, there were different levels of participation in each village, i.e. a higher proportion of individuals in Village 3 were VOI members compared to Villages 1 and 2. However, there was no data available to confirm this. Differing levels of participation in the villages would enable exploration of factors relating to why people chose to participate or not, and therefore may be useful in answering Objective 1. This information was taken into consideration when choosing the case study villages, but as it was not possible to verify the information given, this was not a main criteria when selecting villages.

Mangabe PA is located in the eastern belt of humid forest, an area important for both biodiversity and livelihoods, and under pressure from agricultural expansion, illegal logging and artisanal mining (Poudyal et al., 2016). The PA was established to protect nationally important populations of golden mantella (*Mantella aurentica*), indri (*Indri indri*) and diademed sifaka (*Sifaka diadema*). The local population is mostly of the Bezanozano ethnic group, although there has been increased migration of other ethnicities for artisanal mining. The Bezanozano have strong cultural links to the forest including creating tombs inside sacred areas, and consider hunting or eating Indri (*Indri indri*) fady, as they believe them to represent their ancestors. The majority of the population are subsistence farmers, relying on shifting agriculture and collecting forest products for subsistence use and trade. Household roles tend to be gender-based, with men responsible for house construction, earning money and preparing fields for rice planting. Women are responsible for managing household finances, weaving, tending crops, collecting water and preparing meals.

Table 1-7: Village selection criteria

Criteria	Justification	Village 1	Village 2	Village 3
Distance from nearest town (hours walking)	Likely to impact livelihood strategies and reliance on forest resources (these were the most similar of the 10 villages surrounding the PA)	2-3	4-5	2-3
Distance from forest (hours walking)	Likely to be a proxy for forest resource reliance (assuming access to town/markets)	≤1	≤1	≤1
VOI establishment process	Likely to be an important factor in how VOIs function. Kept constant for comparison between VOIs	NGO & local community	NGO & local community	NGO & local community
VOI participation level (proportion of community participating according to NGO)	Variability useful for investigating factors related to VOI participation	Medium	Low	High

1.4.3.3 Data collection

Data collection took place in September-December 2015 and April-July 2016. This was split into two trips due to the road conditions in the rainy season (from December to April), which made reaching the villages logistically very difficult and potentially unsafe. Data collection was also divided into two phases (Figure 1-3). Firstly, focus groups and semi structured interviews were conducted in all three villages. This data was then used to design the household questionnaires, which formed the second phase of data collection. Data for all three objectives was collected

simultaneously. Table 1-8 provides a detailed summary of data collection approaches for each objective.

All methodologies were piloted during the scoping trip. Questionnaires were piloted in village 1 before data collection began. No changes were needed, so pilot data was included in the final sample.

Sampling biases may lead to distortions in the results collected, so triangulation can be used to facilitate validation of the data (Tashakkori and Teddlie, 1998; Cresswell and Plano Clark, 2011). Utilising a range of methods to collect data for each research objective enables cross-verification between methods (Blaikie, 2000). Any conflicts or contradictions between different methods were either resolved through validation using data collected from respondents in different social or stakeholder groups, or were explored further to ascertain whether conflict or consensus was observed between or within social groups.

Table 1-8: Summary of research objectives, frameworks, methods and analysis

*R version 3.4.1 (R Core Team, 2013) **NVIVO version 10 (QSR, 2012) ***MASS Package in R (Venables and Ripley, 2002)

Objective	Framework	Research questions	Data needed	Method	Analysis
1.To determine who participates in PA co-management community associations, why they choose to participate ,and understand how the costs and benefits of participation are distributed within and between communities	Theory of Planned Behaviour	a. Who participates in PA governance and why?	Information on who is a member of the VOI and who isn't Motivations for choosing whether to join the VOI or not	Household questionnaires covering VOI membership, reasons for joining or not joining, and Likert-style statements designed around the Theory of Planned Behaviour and incorporating attitudes, social norms and perceived control	Descriptive statistics and GLM predicting behaviour of joining VOI (R*) Thematic analysis (NVIVO**) on motivations for joining or not joining VOI
		b. What are the perceived benefits and costs of participating ?	Perceived benefits and costs of participating in the VOI	Semi-structured interviews and household questionnaires collecting information on perceived benefits and costs to participating	Thematic analysis (NVIVO**) on benefits and costs of participating

		c. How are the benefits and costs of participation distributed within and between villages?	Socio-economic data for comparisons between different groups (e.g. wealth, gender, ethnicity, age, village etc.)	Household questionnaires collecting data on socio-economic data	Descriptive and inferential statistics comparing different groups and perceived costs and benefits (R*)
2. To explore how and why governance structures may affect access to ecosystem services, and how this access is distributed across different groups within villages	Theory of access and IPBES framework	a. What ES are considered most important	Information on ES use and ranking of importance	<p>Focus groups free-listed ES or 'benefits from the forest' and then ranked their lists in terms of importance</p> <p>Semi-structured interviews also listed ES or 'benefits from the forest'</p> <p>Household questionnaires collected information on whether respondents had accessed provisioning ES in the last year</p>	<p>Content and thematic analysis (NVIVO**)</p> <p>Descriptive and inferential statistics on provisioning ES use and differences between villages (R*)</p>

b. What factors are important in determining whether a person has access to ES (e.g. VOI membership, wealth etc.)?

Information on ES use and factors affecting access

Semi-structured interviews discussed factors affecting forest and ES access

Household questionnaires collected data on provisioning ES use

Thematic analysis following access factors (NVIVO**)

Descriptive and inferential statistics comparing provisioning ES use between different social groups

c. How are rules/regulations regarding ES access decided and enforced?

Information on rules and regulations related to ES access and if/how they are enforced

Semi-structured interviews discussed how rules and regulations on forest or ES access were decided, who was involved in these decisions, who is in charge of enforcing these rules, and what happens if people are caught breaking rules

Content and thematic analysis (NVIVO**)

3. To identify how co-management governance processes impact upon livelihood strategies and outcomes, how these impacts are distributed within and between villages	Sustainable Livelihoods Framework	a. What are the livelihood impacts of PA co-management?	Information on livelihood impacts (livelihood assets, strategies and outcomes)	Focus groups discussed ES from the forest and relative importance of each Semi-structured interviews discussed livelihood impacts of PA Questionnaires collected data on livelihood asset indicators, changes in livelihood strategies and outcomes	Content and thematic analysis following SLF themes (NVIVO**)
		b. How are livelihood impacts distributed within and between communities?	Socio-economic data for comparisons between different groups (e.g. wealth, gender, ethnicity, age, village etc.)	Household questionnaires collected data on socio-economic details	Descriptive and inferential statistics comparing assets and strategies before and after PA establishment and an ordinal logistic regression model to explore distribution of livelihood outcomes*** (R*)

c. Which co-management PA governance processes have the greatest livelihood impacts?

Information on PA governance processes linked to livelihood impacts

Semi-structured interviews discussed in-depth information relating to PA governance processes

Content and thematic analysis (NVIVO**)

1.4.4 Positionality

Positionality refers to the social position of the researcher in relation to participants of the research process, and is influenced by a number of factors including race, gender, education, class, family status and other social identities (Merriam et al., 2001). A researcher's positionality will always bias their research in some way, and therefore it is important to acknowledge it and be transparent about what has been done to minimise the impact (Hammet et al., 2015). Researchers from different backgrounds, maybe considered as 'outsiders' and this may influence the answers given to research questions (Newing et al., 2011). The following section outlines how I designed my data collection to minimise issues of positionality, and was greatly helped by training from The University of Leeds, and the Researchers in Development Network.

Throughout this study I introduced myself as a student from the University of Leeds, UK. This association was important to local respondents' perceptions and to separate myself from the local NGO involved in PA co-management. Introductory meetings were held in each village with village presidents and elders. These meetings also enabled us to understand any local taboos or '*fadys*', which I and my research team were careful to adhere to in order to ensure we did not cause insult to any of the local communities. For example in one village it was *fady* to wear jewellery in the forest, so we made sure that we followed this when travelling through the forest to reach households. Findings from my scoping trip indicated that once respondents understood that I was working independently of government or local NGOs, they were very willing to discuss topics relating to PA management, livelihoods and ES access. Respondents were often pleased to be able to share their opinions and experience relating to the case study PA. Participants were also repeatedly reassured that their answers would be kept anonymous throughout the research process, and appeared to understand this through their willingness to share views on potentially sensitive topics. Regarding other aspects of positionality, extended visits to each village, unaccompanied by representatives from formal organisations, being hosted by local families, employing local residents as guides and cooks, and

participating in social events fostered trust between myself, my research team and local community members.

Although research assistants and translators working as part of my research team were all Malagasy, they were mostly of a different ethnicity to respondents. However, they were familiar with working in similar contexts and were briefed on the importance of their own positionality on the research and how they should explain this to respondents.

1.4.5 Foreign language research

Research conducted across cultural contexts in a foreign language requires consideration of multiple meanings and realities involved in the translation and interpretation of any texts (Smith, 1996). Malagasy research assistants were able to conduct household questionnaires themselves, after a brief training period. For household semi-structured interviews, translation occurred concurrently with interviews. Interviews were also recorded and played back with the translator present to ensure that everything had been translated correctly. Focus groups (FGs) were facilitated by research assistants in Malagasy, after training on how to conduct FGs and the topics to be covered. Focus groups were audio-recorded and research assistants took notes throughout. These were translated into a summary of key points by myself, the translator and research assistants. Collaboration between the translator and research assistants allowed some discussion about the meaning of the data collected. Whilst it is inevitable that translation will produce some diminished and distorted interpretations (Smith, 1996), it must be recognised that research conducted in a native language is also subject to the same limitations. Data is always interpreted by the researcher to some extent, for example by maintaining the power to select which voices are heard and which quotations are included in the research (England, 1994). Interviews with government officials and NGO staff were conducted in English rather than Malagasy.

1.4.6 Research ethics

As the research conducted for all chapters involved working with human participants, ethical approval was granted by University of Leeds Ethics

Review Committee (ref: AREA 14-123; Appendix A) before data collection began. Key concerns were regarding positionality (as discussed in Section 1.4.4), cultural contexts, discussing sensitive topics, avoiding raised expectations, anonymity of respondents, obtaining free, prior informed consent and the possibility of work causing reputational damage.

Introductory village meetings were organised and conducted in each village, in order to introduce my research team and the aims of the project. This helped to reduce risks associated with raised expectations, ensuring respondents understood their answers would be kept anonymous and introducing the idea of free, prior informed consent. I was aware that not all participants would attend this meeting, so research assistants repeated these messages at the beginning of each FG, interview and questionnaire survey.

In order to avoid raising expectations, I maintained transparency with all informants about the purpose of my research and reminded participants at the beginning of each interview, FG and questionnaire that I, and my research team, were independent from the government or PA co-management NGO.

In the communities surrounding the protected areas there was a high level of illiteracy, and it would have been inappropriate to ask participants to read and sign a consent form. In order to ensure we obtained free, prior and informed consent we ensured that informants understood the aim and implications of the study and, asked for verbal consent. This was carefully framed in an accessible and easily understood manner without any jargon. Participants were able to end interviews or questionnaires at any stage and ask for their answers to be withdrawn from the study at any point during data collection, although this was not requested by anyone.

During the project design stage, I was careful to have open discussions with the PA co-management NGO, due to the possibility of the results reflecting negatively on them. The NGO were aware of this risk but happy for the research to go ahead. Throughout the research process I have been in contact with the NGO, sharing journal articles before they are published, the NGO staff have not offered any feedback on these.

Risk assessment approval was also granted by The University of Leeds (Appendix B).

1.4.7 Limitations

Although the methodological approach used for this thesis has facilitated the collection and analysis of a rich set of empirical data, and the emergence of a number of interesting and novel insights, it is useful and important to acknowledge the limitations of this approach.

Sampling

As discussed above (Section 1.4.3.3), it was difficult to design a rigorous sampling frame due to lack of village-level census data. Given the limited information available alongside time and logistical constraints of a PhD project, I designed the sampling approach to be as representative as possible. This is frequently an issue when working in remote areas, and utilising local knowledge is an important mechanism to overcome these issues (Newing et al., 2011). With more time, it might have been possible to create a sampling frame with details from each village sub-section and participatory mapping (e.g. Poudyal et al., 2016), yet with the limited information available, time and logistic constraints this was the best possible strategy available.

Research in a foreign language

As discussed in Section 1.4.5, the process of translation is always open to bias. By working with research assistants and a translator, we were able to ensure that interpretations were not biased by one individual (England, 1994; Smith, 1996; Newing et al., 2011). Recording interviews and discussing them afterwards, allowed for a second chance to catch anything that may have been missed in translation during the interviews. During pilot and training work, it was emphasised that translations should be direct and continual rather than summarising. These methodological strategies ensured that any meaning lost in translation was kept to a minimum.

Using perceptions

As discussed in Section 1.4.2.2, perceptions can provide rich in-depth data but may also be biased due to individual agendas, and concern about giving

the 'right' answer (Bennett, 2016). However, use of perceptions was crucial to this thesis to provide an understanding of how people experience co-management and identifying the distribution of benefits and costs.

Perceptions provide subjective data, which is important in this thesis where the aim was to understand how people experience PA co-management and the costs and benefits impacting their lives.

Snapshot rather than longitudinal study

PA governance and co-management is a dynamic process (Berkes, 2009; Lyver et al., 2014), yet the findings from this thesis present a snapshot of a constantly changing and evolving situation. Whilst it would be interesting to see how local perceptions relating to co-management change over time (and this is discussed further in Section 5.5), this is beyond the scope of this thesis. Respondents were asked about their perceptions of changes over time, and although these may not always be reliable from an objective point of view, they can provide valuable information on subjective experiences (Bennett, 2016; Waeber et al., 2017). Subjective views are more likely to shape individuals' attitudes and behaviour rather than objective data (St. John et al., 2013; Bennett, 2016). The findings from this study provide important insights regarding local perceptions of PA governance, and impacts on ES access and livelihoods. From these it is possible to draw useful conclusions in terms of improving PA-related equity.

1.5 Novelty and contribution of the thesis

This thesis offers a number of conceptual and empirical contributions to enhance the understanding of how PA co-management plays out in reality.

There are many previously existing studies which show the importance of participation for PA success (Persha et al., 2011; Oldekop et al., 2016). However, chapter 2 of this thesis provides new evidence exploring who is participating in PA governance and why. This is important because it can provide recommendations to ensure that local participation can reduce local costs for communities and improve conservation outcomes. Chapter 3 provides useful insights into the relationship between ES and human well-being, by considering the local contextual factors in ES access. There are

many studies documenting benefits and costs of PA establishment to local communities (e.g. Holmes & Brockington, 2012), but chapter 4 of this thesis provides a link to the PA governance processes which are leading to these outcomes. This is vital information in order to understand how the benefits and costs of co-management may be distributed, and identify where actions need to be taken to mitigate the situation for those bearing the highest costs.

As discussed throughout chapter 1, conservation is moving towards governance approaches which emphasise equity, for both moral and instrumental reasons (Schreckenberg et al., 2016; Law et al., 2017). In order to ensure this is achieved, it is important to understand what equitable approaches to conservation look like, how they can be achieved, and how to measure equitable outcomes. Chapters 2, 3 and 4 of this thesis provide useful insights into PA co-management, whether it is producing equitable outcomes, and how it can move towards a more equitable approach.

Qualitative data and perceptions are an undervalued form of evidence in conservation, they enable us to explore perceptions of local changes associated with conservation (crucial to understanding conservation equity), and provide rich insight to supplement quantitative analyses. This thesis provides a useful example of how mixed methods approaches can be applied to obtain a better picture of who is winning and losing out from conservation interventions and to inform solutions towards improved equity.

1.6 Outline and thesis structure

The following three chapters are the academic journal papers produced from the research conducted for this thesis. Chapter 2 explores who is participating in PA governance, why, what they perceive the benefits and costs to be, and how those are distributed. Chapter 3 investigates how PA co-management impacts local access to protected areas and how access is distributed within and between local communities. Chapter 4 takes a livelihoods approach to understand how protected area co-management leads to different impacts and how those impacts are distributed. The three results chapters are followed by a discussion and conclusion (Chapter 5) that brings together insights from the three papers, and highlights challenges

found for PA co-management to meet its aims of improved equity and reducing local costs of protected areas. The final chapter also reflects on the research approach, and possible future research directions.

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Chapter 2 Perceived barriers to and drivers of community participation in protected area governance

2.1 Abstract

Protected areas (PAs) are a frequently used conservation strategy, yet their socio-economic impacts on local communities remain contentious. A shift towards increased local community participation in PA governance has sought to deliver benefits for human well-being as well as biodiversity. Although participation is considered critical to the success of PAs, few studies have investigated individuals' decisions to participate and what this means for how local people experience the costs and benefits of conservation. This paper explores: a) who participates in PA governance associations and why, b) the perceived benefits and costs to participation, and c) how costs and benefits are distributed within and between communities. Methods included focus groups, interviews and questionnaires conducted with 3 communities and other stakeholders in PA governance in Madagascar. The study design is conceptually grounded in the Theory of Planned Behaviour (TPB), the most commonly applied behaviour model in social psychology. Results show that participation was limited by miscommunication and lack of knowledge about who could get involved and how. Respondents perceived limited benefits and high costs, and uneven distribution of these within and between communities. Men, poorer households and more remote villages reported highest costs. Findings illustrate several challenges related to co-management of PAs: (1) understanding the heterogeneous nature of communities; (2) ensuring all households are represented in governance participation; (3) understanding differences in the meaning of forest protection; and (4) targeting interventions to reach households most in need, avoiding elite capture.

2.2 Introduction

Governance, referring to the formal and informal processes and structures through which decisions are made, was identified as “*central to the conservation of protected areas throughout the world*” at the Durban World Parks Congress in 2003 (WCPA, 2004: 257). Protected Areas (PAs) are a frequently used conservation tool, with global coverage reaching 15.4% in 2014 (Juffe-Bignoli et al., 2014). This is set to increase to meet the Aichi Target to protect 17% of terrestrial areas by 2020 (CBD and UNEP, 2010).

Case studies document the costs and benefits PAs have imposed on local communities (Brockington et al., 2006; Andam and Ferraro, 2010) and the global and local uneven distribution of these, with the poorest and weakest often impacted most (Oldekop et al., 2016). PAs are now expected to deliver benefits beyond biodiversity protection to communities living nearby or within them, including increasing communities’ well-being (Pullin et al., 2013) and promoting human rights (Corson et al., 2014). To meet these new aims, there has been a global expansion of community-based and other more bottom-up approaches to PA governance compared to the more top-down “fences and fines” approach (Berkes, 2009).

Co-management or shared governance refers to PAs where power, responsibility, decision-making and enforcement is shared between the state and other non-state actors, including NGOs, local communities and private companies (Berkes, 2010; Borrini-Feyerabend et al., 2012). Although PA management (the means and actions taken to meet PA objectives) differs from PA governance (who holds the authority, power and responsibility and how they are held accountable), these terms have become intertwined in the literature (Borrini-Feyerabend et al., 2012). Shared governance structures do not necessarily lead to co-management structures (Lyver et al., 2014) and arrangements tend to evolve over time. There is no universally accepted definition of co-management, and many definitions do not consider the many layers of complexity (Berkes, 2010). In this study, stakeholders were involved in both governance and management structures, and we refer to this approach as co-management throughout. Following much of the

conservation and development literature (e.g. Wright et al. 2016; Ojha et al. 2016), we do not consider “community” as a “*static, isolated group of people*” (Berkes 2004: 623), but as heterogeneous, changing over time and affected by global trends, and geographically bounded.

Participation of local communities in decision making processes is central to many co-managed PAs (Borrini-Feyerabend et al., 2012). Levels and timings of participation can vary from brief stakeholder consultations during establishment, to stakeholders becoming active management decision makers (Stringer et al., 2006). Participation is important both for pragmatic reasons (improved decision making, increased support and reduced costs) and as a more democratic approach (increased representation, empowerment of marginalised groups, increased trust, promoting social learning) (Reed, 2008; Sterling et al., 2017). Reviews of existing studies have shown that PAs with meaningful participation are more likely to deliver positive outcomes for livelihoods and biodiversity, although local context was also an important predictor of success (De Vente et al., 2016; Oldekop et al., 2016). Yet, the literature also offers a number of critiques to participation: 1) increasing the range of perspectives in decision-making can increase potential for conflict, 2) it is expensive and time-consuming to involve all stakeholders, leading to trade-offs, and 3) it can be susceptible to elite capture, where wealthier or more powerful individuals gain a disproportionately large share of any benefits, increasing inequalities and marginalising weaker stakeholders (Persha and Andersson, 2014). Real or perceived social inequity can create conflict and impede achievement of socio-economic and biological PA goals (Gurney et al., 2015).

Participatory conservation governance is now globally widespread (Ojha et al., 2016), and non-participatory governance systems are increasingly seen as “*illegitimate, ineffective and undemocratic*” (Bulkeley & Mol 2003: 144). Yet few studies provide evidence to evaluate participation. Previous studies have shown that participation can be affected by socio-economic factors at individual and community level (Gurney et al., 2016). This underlines the need to understand the influences on participation and perceptions of related benefits and costs. Given the continued popularity of community

involvement, it is important to understand why people choose to participate in governance processes, the perceived benefits and costs and how they are distributed within and between communities. This paper addresses these questions through a case study PA in Madagascar.

2.3 Conceptual approach

Measuring subjective views or perceptions, rather than solely focussing on objective measurements or indicators, is crucial to conservation success (Bennett, 2016). Perceptions are important in measuring human well-being (Woodhouse et al., 2015), understanding and influencing human behaviours (Ajzen, 1991), enlisting stakeholders' support (Gurney et al., 2015) and minimising negative impacts of conservation interventions. Perceptions of PA-related benefits and costs are often linked to socio-economic and geographical variables (Chinangwa et al., 2016; Diedrich et al., 2016). For example, individuals who perceive PA management as effective, are more likely to perceive PA-related benefits (Bragagnolo et al., 2016). However few studies have established the relationship between predictors of participation and the distribution of benefits and costs within communities, this study aims to fill this gap.

This research is conceptually grounded in the Theory of Planned Behaviour (TPB), the most commonly applied behaviour model in social psychology (St. John et al., 2011). It considers that a person's decision to behave in a particular way is controlled by their attitudes (overall evaluation of the behaviour), subjective norms (estimate of the social pressure to perform or not perform the target behaviour) and perceived control (the extent to which they feel able to perform the behaviour) (Ajzen, 1991). As the purpose of conservation interventions is generally to modify human behaviour (St. John et al., 2011; St. John et al., 2013), TPB can be applied to identify the relative importance of each determinant (attitude, subjective norms and perceived control) for a specific behaviour, informing intervention design (Fishbein and Ajzen, 1975; Ajzen, 1991). TPB has been widely applied to designing successful interventions in health and education; two-thirds of these reported some positive behavioural change (Hardeman et al., 2002). Yet few studies

apply TPB to conservation-related behaviours (e.g. Williams et al. 2012; Mastrangelo et al. 2014). These studies illustrate that attitudes, which are frequently used as a proxy for pro-conservation behaviours, offer a limited explanation of human behaviour (see St. John et al. 2010, 2013). There have been calls for greater use of TPB to better understand and influence human behaviours driving biodiversity loss and conservation (St. John et al., 2013). Additions to TPB, including contextual and cognitive considerations (e.g. Gurney et al., 2016), have increased TPB's explanatory power. In this study, TPB predictors (attitudes, subjective norms and perceived control) are combined with socio-economic factors, forest reliance and perceived benefits and costs to understand the motivations behind participation in community forest governance. Use of both qualitative and quantitative data can provide an in-depth understanding of individuals' reasons for participating in PA governance alongside their perceptions of how it impacts them (St. John et al., 2013).

2.4 Methods

2.4.1 Study area

Madagascar presents a "*classic conservation and environmental management conundrum*" (Scales, 2014: 2), as one of the least developed but most biodiverse countries (Goodman and Benstead, 2005; World Bank, 2013). PA coverage in Madagascar has tripled over the last 30 years. Although deforestation is, on average, lower in PAs (Eklund et al., 2016), it remains a key driver of biodiversity loss (Waeber et al., 2016). This, combined with increasing poverty (Waeber et al., 2016), highlights the need for conservation interventions that enhance social and economic development whilst protecting the environment.

The Durban Vision aims to increase PA coverage in Madagascar whilst encouraging local ownership and sustainable use of natural resources (Gardner, 2014) via co-management between local community associations (VOIs) and a non-state partner (promoter). VOIs provide a mechanism for individuals to participate in PA governance, from establishment through to daily management decisions. VOIs may be established by the promoter or

based on existing village associations, and consist of a committee and members. Anyone in the community is eligible to join and the committee is elected by the members. Concerns about this new governance form include: 1) difficulties in ascertaining true levels of participation, 2) differences between verbal and paper agreements, 3) marginalisation of weaker stakeholders, and 4) a lack of compensation for local communities (Corson, 2012; Corson, 2014; Virah-Sawmy et al., 2014). As co-management of PAs increases globally, Madagascar offers an important case through which to understand how this governance approach plays out in reality.

This study focuses on a newly established PA, Mangabe Forest, in eastern Madagascar, co-managed by a national NGO and 10 VOIs, and established by the NGO. All villages surrounding the PA were involved in establishing VOIs, although they differ in their forest use. Due to time constraints, three study villages were selected (Table 1-7; Figure 1-2). These all had similar distances from forests (1 hour walking; as a proxy for forest resource use) and VOI establishment processes, but different levels of participation within VOIs (pers. comm. NGO staff). Differing levels of VOI participation allowed us to explore what factors may be affecting participation. Villages differed in terms of distance from roads and towns, this was presumed likely to affect levels of forest resource use but there were not 3 villages with similar distances.

2.4.2 Research design and sampling strategy

This study consisted of 1) village focus groups (FGs), 2) semi structured interviews with key stakeholders and 3) questionnaires (Table 1). Data were collected September-December 2015 and April-July 2016.

Table 2-1: A summary of the study methods, their purpose and total sample size

Method	Purpose	Total sample size
Village focus groups	To free-list ecosystem services, or benefits gained from the forest	7
Semi-structured interviews	To gain an in depth understanding of PA governance and opinions relating to the VOI	37
Questionnaires	To sample a larger proportion of the population for a more representative set of views relating to the VOI and PA governance, and collect socio-economic details	240

2.4.3 Focus groups

FGs covered forest ecosystem services (ES) and aspects of VOI membership (Appendix C). Seven focus groups were held (village 1 n=2, village 2 n=1, village 3 n=2), with 8-10 participants in each. FGs were split into VOI members and non-members to reduce conflict risks. Participants were recruited with the help of key stakeholders in each village. FGs were facilitated by translators trained by the lead author, recorded and summarised by the lead author and translator.

2.4.4 Semi-structured interviews

Interviews covered PA governance, VOI membership, forest use and livelihoods (Appendix D). 37 interviews were conducted with village members. VOI and village presidents were interviewed first and further interview participants identified via snowball sampling. Interviews were conducted by the lead author and interpreted by a translator.

2.4.5 Questionnaires

Questionnaire design was informed by FG and interview data. Ordinal and categorical questions relating to socio-economic indicators and forest resource use, and open-ended questions about perceived benefits and costs of VOI membership were included (Table 2-2; Appendix E). The questionnaire was written in English and translated to Malagasy. Questionnaires were administered by Malagasy research assistants from the University of Antananarivo. Questionnaire piloting in study villages, testing for clarity and length, found no modifications needed. Pilot data were included in the final sample. Methods were approved by the University of Leeds ethics committee before data collection.

Table 2-2: Components of questionnaire

Section	Purpose
Introduction	Explaining the purpose of the study, informing participants of anonymity and ensuring prior informed consent
(1) Socio-demographics	Information to ascertain representation within VOI, influence of characteristics in joining VOI and distribution of benefits and costs of VOI participation. Material Style of Life (MSL) used as proxy for wealth
(2) PA governance	To find out whether participants were VOI members and what they perceived the benefits and costs of this to be
(3) Forest resource use	To find out how reliant participants were on forest resources, measured by listing of resources accessed/used in the last year
(4) TPB	To investigate how attitudes, subjective norms and perceived behavioural control affect decisions to join the VOI

2.4.5.1 Measuring wealth

Material Style of Life (MSL) was used as a proxy for wealth, and calculated for each household based on locally-relevant household structures and possessions (Appendix F). MSL is widely used in developing countries

providing a useful and robust indicator (Cinner et al., 2010; Hill, 2011). MSL scores were calculated by running a principal component analysis (PCA) on all the variables. Items with low factor loadings were removed (Cinner et al., 2010).

2.4.5.2 Theory of Planned Behaviour

To measure attitudes, subjective norms and perceived control towards VOI membership, participants rated their agreement with each statement on a Likert scale ranging through strongly disagree, disagree, neutral, agree and strongly agree (Appendix G). Statements were written to be target, action, context and time-specific (St. John et al 2011). Determinants were measured both directly and indirectly. For indirect measures, participants were asked about specific beliefs and outcome evaluations/motivations to comply/perceived control. Response items were converted to numbers prior to analysis (strongly disagree=1, disagree=2 etc.) in order to calculate scores. For the indirect measurements, belief scores were multiplied by the relevant evaluation score and results were summed (Francis et al. 2004; Aipanjiguly et al. 2003).

2.4.5.3 Sampling strategy

Village level census information was unavailable, as there are few records on the location and size of communities in rural Madagascar. This made it difficult to ensure representative sampling in each village, discussions with village presidents and elders confirmed all remote areas of the villages had been sampled. Households were randomly selected.

2.5 Data analysis

Due to non-normally distributed data, non-parametric tests using R (R Core Team, 2013) were used to measure differences between demographics, socio-economic characteristics and perceived benefits and costs of members and non-members.

To assess whether attitudes, subjective norms or perceived control predict behaviour, a general linear model was used with VOI membership as the binomial response variable and a conditional log-log function, as this gave

the lowest residual deviance and AIC value (Thomas et al., 2015). A second model also included socio-economic variables (village, gender, age, education level and wealth), forest reliance and perceived benefits and costs. Models were refined using the drop1 function until only significant variables remained. AICs of refined models were also compared, to ensure that model refinement improved goodness of fit (Appendix G). AICs are frequently used as a measure of goodness of fit, where the lowest AIC indicates the best model (Burnham and Anderson, 2004). Prior to constructing scores for the direct and indirect attitudes, subjective norms and perceived control, McDonald's omega was calculated to verify internal consistency of measurement items (Dunn et al., 2014). Consistency is deemed questionable if Omega <0.4, suggesting items should be assessed separately (Dunn et al., 2014). For direct measurements the scores of each statement were added together. Indirect measures were checked for validity by testing for correlations between them and direct measures (Francis et al., 2004; Appendix G).

Transcribed interviews and FG summaries were analysed using NVIVO software through reading, coding, comparison with quantitative data, and recoding (Newing et al., 2011). Qualitative data is used throughout to support or further explain quantitative results.

2.6 Results

2.6.1 Who participates and why?

VOI members were more likely to be male ($\chi^2=34.08$, $p<0.001$). The model with the lowest AIC retains gender, forest reliance and the indirect measurement of attitude as significant predictors of membership (Appendix G). This shows individuals were more likely to join the VOI if they were male, had higher reliance on forest resources and a positive attitude towards membership.

In this model, a higher indirect attitude score suggests individuals were more likely to participate when they perceived participating would (i) protect the forest and (ii) make it easier to access forest resources (Appendix G). 37.6%

of questionnaire respondents cited environmental reasons for joining the VOI, including: *“I like protecting the forest”* (member, male, village 2); and *“In the beginning I saw the forest was being destroyed and I wanted to improve it”* (member, male, village 3). Individuals were more likely to participate if they were using a wider range of forest resources. This is supported by questionnaire responses highlighting the practical importance of the forest: *“[I joined] to protect the environment because we depend on it”* (member, male, village 3).

‘Subjective norms’ was not a significant predictor of membership in the model, but 21.8% of members gave reasons for joining relating to social pressure or ‘following the crowd’: *“I joined because everyone else was joining”* (member, female, village 1), and *“I just do what everyone else does”* (member, male, village 2). 18.1% gave reasons relating to community or teamwork, such as *“I liked the idea of working together”* (member, male, village 2) and *“it’s good to be in an association, we are stronger together”* (member, male, village 3).

Gender was a significant predictor in the model. 7.41% of non-members, all female, had felt excluded due to their gender: *“I thought it isn’t for women to join”* (non-member, female, village 2), Other reasons for not joining the VOI were: a lack of information or not having heard of the VOI (33.3%): *“No one told me about the VOI or asked me to be a member”* (non-member, male, village 3); time constraint (18.5%): *“Being a member takes up too much time”* (non-member, female, village 2); not interested (13.6%) and excluded by age or ethnicity (9.9%).

2.6.2 What are the advantages and disadvantages of participating?

Perceived advantages and disadvantages to VOI membership varied between members and non-members. Most respondents reported advantages (72.4%) and disadvantages (76.5%) to participation.

When asked about advantages of VOI membership, 36.8% of members and 13.1% of non-members stated there were not any, and 60.7% of non-members and 11.3% of members answered “don’t know”. Environmental

advantages were highlighted by both members (23.3%) and non-members (11.9%). For both groups, responses followed similar logic to environmental reasons for joining the VOI, i.e. “*protecting the forests is important*” (member, male, village 2) and “*the forest is kept safe*” (member, male, village 1).

Receiving direct benefits from the NGO was mentioned by both members (16.5%) and non-members (11.9%). This included paid work: “...*being a porter and building the new campsite*” (member, male, village 3), training: “*we get training on techniques for farming and growing crops*” (member, male, village 2), and materials.

When asked about disadvantages to membership, the majority (54.8%) of non-members answered “don’t know”; whilst members were most likely (36.1%) to state negative livelihood impacts. Responses focused on being unable to burn or clear the hills surrounding their rice fields: “*our fields are becoming useless because we can't clear the edges*” (member, female, village 1) and activities in the forest being restricted: “*there are fewer livelihood activities we can do*” (member, male, village 2). A smaller proportion of non-members (14.3%) also identified negative livelihood impacts as a disadvantage, stating the same reasons. Interview responses linked negative livelihood impacts to a lack of available alternatives “*Our lives haven't gone well since the forest was protected, because now we can't go to the forest to cut and sell trees... The rice we grow isn't enough. Maybe if we had funding from [the NGO] to help us develop things would be better*” (member, male, village 1).

14.3% of members and 4.8% of non-members reported conflict as a disadvantage of membership. This included conflict between: (1) members: “*we often have arguments between members*” (member, male, village 1); (2) villagers and outsiders coming to use forest resources: “*we are not popular, especially with [outsiders] who come here to hunt*” (member, male, village 3) (3) members and the NGO: “*[We] disagree with [the NGO] about the way to protect the forest*” (member, male, village 2); and most frequently mentioned (4) members and non-members: “*there are clashes between members and non-members*” (member, male, village 3) and “*non-members hate us*”

(member, male, village 2). Members noted they were often blamed for restrictions on forest access and prevention of certain livelihood activities, even though they felt they were not fully involved in decision making: “*We don't have full rights and we are not completely entitled to take decisions on our own- we have to rely on the NGO and the ministry of forest*” (member, male, village 1).

27.8% of members and 16.7% of non-members reported there were no disadvantages to membership.

2.6.3 How are the advantages and disadvantages distributed?

Negative livelihood impacts were reported by significantly more respondents in village 2 ($\chi^2=31.5$, $p<0.001$, $df=2$) (49.4%) compared to village 1 (20.0%), and village 3 (8.62%). Only village 2 reported reduced forest access as a disadvantage (3.8%). This village is most remote from markets, roads and towns, therefore households may have been more reliant on forest livelihood activities. Interview data suggests in this village particularly, new restrictions have left people struggling: “*we can't do gold mining anymore and we can't expand the rice fields, so we don't have a way of making money now*” (member, male, village 2). 32.8% of respondents in village 3 perceived receiving direct benefits (work, training or materials) from the NGO to be an advantage to membership, which was significantly higher than 10.0% in village 1, and 6.33% in village 2 ($\chi^2=23.18$, $p<0.001$, $df=3$). Interview responses frequently mentioned that not everyone involved in the VOI would necessarily receive benefits: “*Not everyone gets help from [the NGO], so we want some sort of compensation from [them] or something because we protect the forest, but we don't get anything in return*” (member, male, village 3). However when directly asking which households had received direct benefits from the NGO, questionnaire responses show there are no significant differences between villages ($\chi^2=0.83$, $p<0.65$, $df=3$; fig. 1), i.e. the distribution of direct benefits from the NGO was fairly even between villages, but there were large differences in whether respondents considered this to be a key advantage of VOI membership. Conflict was reported as a cost by significantly more respondents ($\chi^2=6.12$, $p<0.05$, $df=2$) in villages 1 (15.0%) and 3 (13.8%) than in village 2 (3.8%). This could be linked to the

very high reporting of negative livelihood impacts in village 2, discussed above.

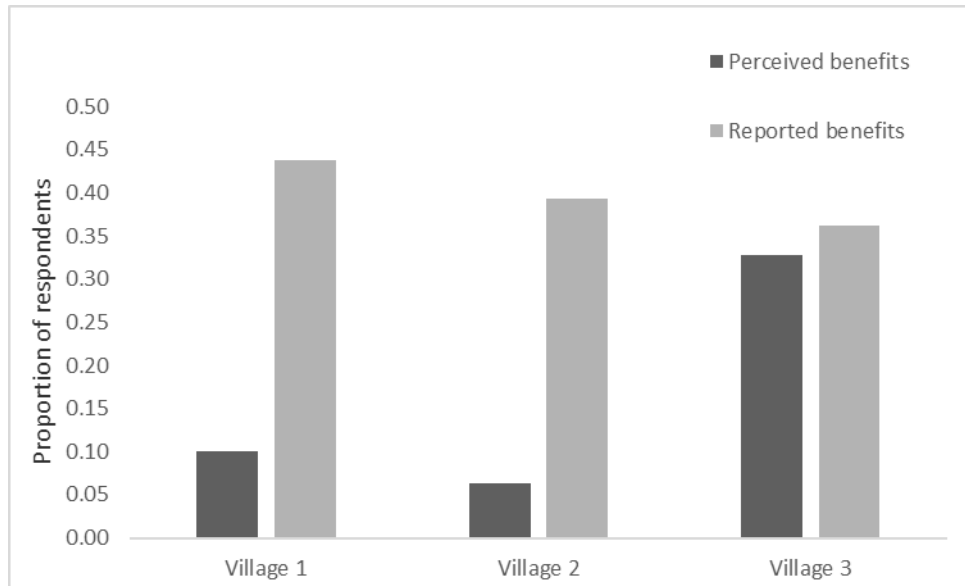


Figure 2-1: Proportion of respondents who perceived receiving benefits (work, training or materials) from the NGO to be an advantage of VOI membership compared to proportion of respondents who had received direct benefits from the NGO. Direct benefits from the NGO were relatively evenly distributed between villages, yet there were large differences in whether respondents perceived this to be an advantage of VOI membership.

Men were significantly more likely to report conflict (13.8%) as a cost of participation than women (1.75%; $\chi^2=6.38$, $p<0.05$, $df=1$). Two potential explanations for this emerged from interviews and focus groups: (1) men are more likely to be members, attend meetings and therefore be aware of conflicts within the VOI or with the NGO; (2) men are more likely to go into the forest, and therefore more likely to encounter other village members or outsiders breaking rules. Women who are less likely to attend VOI meetings or go into the forest may still encounter conflict within the village however.

Households who perceived receiving benefits from the NGO as an advantage to VOI membership, on average, had a significantly higher wealth score (0.534) than those who did not (-0.083; $t=-2.30$, $p<0.05$, $df=215$).

Households receiving direct benefits from the NGO also had a higher wealth score on average (0.0457) than those who had not (-0.0136), although this is not significant ($t=-0.32$, $p>0.05$, $df=215$).

2.7 Discussion

The quantitative analysis illustrated the importance of gender, attitudes and forest reliance in predicting participation in co-management associations. TPB allows for informed intervention design, by identifying the most important determinant(s) of behaviour. Our results suggest focussing on attitudes could encourage participation. Individuals were more likely to participate when they perceived it would (i) help to protect the forest and (ii) make it easier to access the forest. This set of statements highlights: 1) the struggle of individuals aware of the importance of protecting their environment, but also reliant on it for their livelihoods, and 2) a different cultural perspective on the environment and conservation. Shared governance structures need to find a way in which different sets of values can be combined and are understood by different stakeholder groups.

In order to meet the aims of shared governance, co-management associations should be representative (CBD and UNEP, 2010; Borrini-Feyerabend et al., 2012), yet women were less likely to participate due to perceived financial and time constraints, and miscommunication about VOI rules and eligibility. Virah-Sawmy et al (2014) highlighted that traditional Malagasy village-level institutions are dominated by older men, and basing VOIs on this risks marginalising women and migrants. In Belize, women reported similar barriers to participation (Kaeser et al., 2016). Yet, communities in India and Nepal had more effective forest protection when a higher proportion of women were involved in governance (Agarwal, 2009).

Lack of knowledge about co-management associations and how to join, limited participation. Communication may be logistically difficult in countries such as Madagascar, where households are often extremely inaccessible and dispersed. Households in rural Madagascar rely on subsistence farming (World Bank, 2013), and may be reluctant to give time to attend village or community association meetings. When local people are excluded from conservation decision making it can lead to acts of resistance (Holmes, 2007). In another area of Madagascar, anger towards PA authorities was expressed by local people killing a radio collared sifaka (*Propithecus edwardsi*) after communities were prevented from accessing forest

resources (Jones et al., 2008). Effective communication in participatory governance can ensure incorporation of local knowledge, increase accountability of decision making and increase perceived legitimacy of rules. In coastal communities in Madagascar, a social marketing campaign was successful in improving knowledge of, attitudes towards, and enforcement of local laws (Gildas Andriamalala et al., 2013). Success there was due to good understanding of existing governance structures, and integrating the intervention within these.

Respondents reported limited benefits and high costs to participating in co-management. Although co-managed PAs are typically associated with delivering greater benefits than community or state managed PAs (Oldekop et al., 2016), local context is also important. Other studies illustrate co-management can improve livelihoods by working with local communities to design locally relevant and useful schemes including: income generating activities, facilitating local lending and savings, enhancing social capital and development of human capital through training (Chinangwa et al., 2016). Limiting the costs of conservation interventions to local communities is not just a socio-economic issue: it can also affect conservation outcomes (Oldekop et al., 2016).

Communities are heterogeneous and the impact of PA-related costs and benefits will be felt differently throughout social divisions, as this study demonstrates. This is why efforts to increase participation in conservation governance need to be representative. Local institutional capacity building is likely to be important for successful and equitable projects (Brooks et al., 2012), yet utilising pre-existing institutions may reinforce or exacerbate inequalities where 'elites' are able to have a greater say or capture more of the benefits. Risks of elite capture can be mitigated where external organisations are involved (Persha and Andersson, 2014). Co-management organisations, such as NGOs, could do more to ensure participatory decision-making processes are inclusive and representative while also promoting monetary benefits and their equitable distribution (Oldekop et al., 2016).

Our study illustrates both the potential and limitations of applying TPB to conservation-related behaviours. The TPB provided useful insights into the drivers surrounding choices to participate in forest governance, however it missed factors highlighted by the qualitative data, such as subjective norms. Other studies have shown the TPB can explain behaviour incompletely, and many authors have suggested contextual and other additions (Mastrangelo et al., 2014; Gurney et al., 2016). As shown in our study, qualitative data can be valuable in exploring and understanding quantitative results.

Community participation in governance has been shown to be more likely to provide socio-economic and biological benefits, and reduce costs for local communities, than other governance approaches (Persha et al., 2011; Oldekop et al., 2016). This study provides further evidence that PA-related benefits and costs can be unevenly distributed. It shows participation within communities can be unevenly distributed. Here we illustrate several challenges related to co-management of PAs: (1) understanding the heterogeneous nature of communities; (2) ensuring all households are represented in governance participation; (3) exploring differences in perceptions of forest protection; and (4) targeting interventions to reach households most in need (and avoid elite capture). By designing governance structures which specifically address these challenges, PAs may be better able to provide both socio-economic and biodiversity benefits, and ensure the costs of PA establishment are not borne by the poorest, most marginalised groups.

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Chapter 3 Changing governance, changing inequalities: protected area co-management and access to forest ecosystem services

3.1 Abstract

Access, in reference to Ecosystem services (ES), is defined as the capacity to gain benefits from the environment. There has been a global shift in natural resource governance, particularly increased co-management of protected areas (PAs). Yet there has been little research on how this change may be affecting access to ES. We aim to fill this research gap by considering: a) what ES are considered most important, b) what factors are important in determining whether a person can access ES, and c) how rules and regulations regarding ES access are decided and enforced.

Qualitative and quantitative data were collected using questionnaires, focus groups and interviews with stakeholders in a case study PA in Madagascar, co-managed by local community associations (VOIs) and an NGO. Data analysis was framed around the IPBES framework and access factors.

Respondents considered provisioning services most important, but also valued cultural and regulating services. Institutions and social identity had the largest impact on access to ES. VOI members and individuals who knew VOI committee members had greater access to ES than non-members. Findings show that co-management may be shifting ES access inequalities rather than reducing them, and we outline a number of challenges relating to PA co-management.

3.2 Introduction

Ecosystem services (ES) are the benefits people obtain from ecosystems (Millennium Ecosystem Assessment, 2005). It is well established that ES underpin human well-being, providing material things necessary for daily life, regulating the environments we live in, and contributing towards spiritual well-being (Millennium Ecosystem Assessment, 2005). Many different

frameworks have been developed to conceptualise these links, incorporating social and natural sciences, and objective and subjective measures (Millenium Ecosystem Assessment, 2005; Agarwala et al., 2014; Fisher et al., 2014; Díaz et al., 2015). Yet, there continue to be debates about how best to measure the links between the natural environment and human well-being, especially because these relationships are dynamic. One factor frequently missing from these frameworks is an understanding of what may affect access to ES, as people are only able to realise ES benefits if they can access them. It is important to understand this in order to better evaluate environmental management interventions and their impacts on human wellbeing. This paper addresses this research gap.

Access, in reference to ES, can be defined as the capacity to gain benefits from the environment (Ribot and Peluso, 2003). The degree to which any individual benefits from ecosystems will depend on a complex range of mechanisms shaping access, including social relationships, institutions, capabilities, property rights and various capitals (Table 3-1). Daw et al (2016: 11) identify access as key to “*the ability of people to benefit from [ES], whether or not that ability is realised*”. Increasing stocks or quality of an ES will therefore have little effect on the well-being of people living nearby if they do not have access mechanisms to benefit from it (Daw et al., 2011). Conceptualising the unequal distributions of benefits has an established history within the social sciences. For example, Sen's (1981) entitlements approach to the analysis of famines showed that people may still experience famine when food is available, due to social, economic and institutional mechanisms affecting their access. Leach et al (1999) highlight the importance of endowments, the rights and resources individuals have, and entitlements, the means to use a resource. There has been limited application of these frameworks to ES access, but previous studies have illustrated that social and institutional mechanisms, alongside knowledge, were more important than economic or rights-based mechanisms in determining access (Hicks and Cinner, 2014). This has led to calls for increased incorporation of social data relating to ES, to improve understanding of how people use and value ES (Dawson and Martin, 2015). Addressing such calls is particularly important given trends towards

increasing areas under conservation protection and the development of new mechanisms for their governance.

Protected areas (PAs) are a popular way to conserve ES and constitute “...a socially constructed set of rules that... allocate access to and use of natural resources among stakeholders” (Mascia and Claus, 2009: 17). By definition, PAs will affect ES access for local communities. This change in access may be positive or negative, and may be felt differently by different groups within communities (Schreckenberg et al., 2010). Often there are trade-offs between different services, resource-use objectives and societal goals, current and future generations, and between different beneficiaries (McShane et al., 2011). In developing countries this can lead to local livelihood costs, which may not be distributed equally, while the benefits are shared globally or at least at supra-livelihood scales (Oldekop et al., 2016). At the same time, at international level the Aichi targets not only aim to increase protected area coverage, but also to ensure these are “*equitably managed*” (CBD and UNEP, 2010).

Various interventions have been introduced in order to recognise the unequal distribution of costs and benefits of maintaining ES. Once such response is shared governance or the co-management of PAs, where the power, responsibility, decision-making and enforcement is shared between the state and other non-state actors, including NGOs, local communities and private companies (Berkes, 2010; Borrini-Feyerabend et al., 2012). Co-managed PAs aim to provide both socio-economic and ecological benefits. Frequently, local communities are involved as a partner in co-management in order to increase their representation, empower marginalised groups, increase trust, and promote social learning. Overall, evidence suggests that co-managed PAs are more likely to reduce costs and provide benefits for local communities than other governance approaches (Persha and Andersson, 2014; Oldekop et al., 2016). Yet, not all co-managed PAs have succeeded in meeting these aims (Persha and Andersson, 2014). This study adds to the evidence base in this area by examining which forest ES are considered most important by local communities in Madagascar, what factors are important in determining ES access, and how rules and

regulations regarding ES access are decided and enforced. As local participation in governance increases, it is important that we understand how aspects of governance may impact people's access to ES, and whether this is equitable for those living near to PAs.

3.3 Conceptual framework

Conceptualising the links between the natural world and human well-being is crucial to improve environmental management whilst understanding the impacts this may have on local communities. This is particularly the case for the world's poorest, whose well-being is often most depending on ES, and where the impact of environmental change is often differentiated not only across age, livelihood, and gender, but also across culture and socio-economic status (Dawson and Martin, 2015).

There have been many different frameworks designed to outline the relationships between the natural world and human well-being, drawing upon environmental sciences, economics, psychology, sociology, and anthropology (e.g. Díaz et al., 2015; Millenium Ecosystem Assessment, 2005). Due to the complexities and dynamics of these relationships, new frameworks are constantly emerging as our understanding changes. Existing frameworks have been extensively reviewed within the literature, with critiques focussing on: a need for an interdisciplinary approach, integration of subjective and objective dimensions of well-being, equal inclusion of all ES categories (particularly cultural), integration of the diversity of values given to ES and consideration of ecosystem 'disservices', which have negative impacts on human well-being (Agarwala et al., 2014; Fisher et al., 2014; Pascual et al., 2017).

One of the more recent frameworks to emerge is from the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES; Figure 3-1). IPBES was established in 2012 as an independent intergovernmental body open to all member countries of the United Nations (UN), with the goal of *“strengthening the science-policy interface for the conservation and sustainable-use of biodiversity, long term human well-being and sustainable*

development” (IPBES Secretariat, 2017). The IPBES framework was constructed through multidisciplinary workshops involving diverse stakeholders, knowledge systems and countries, and defines how ES link to human well-being, what is driving changes in ES and how this may impact human well-being (Díaz et al., 2015). It will be used to inform future policy recommendations from the IPBES findings, yet due to its relatively recent release, it has had few real-world applications.

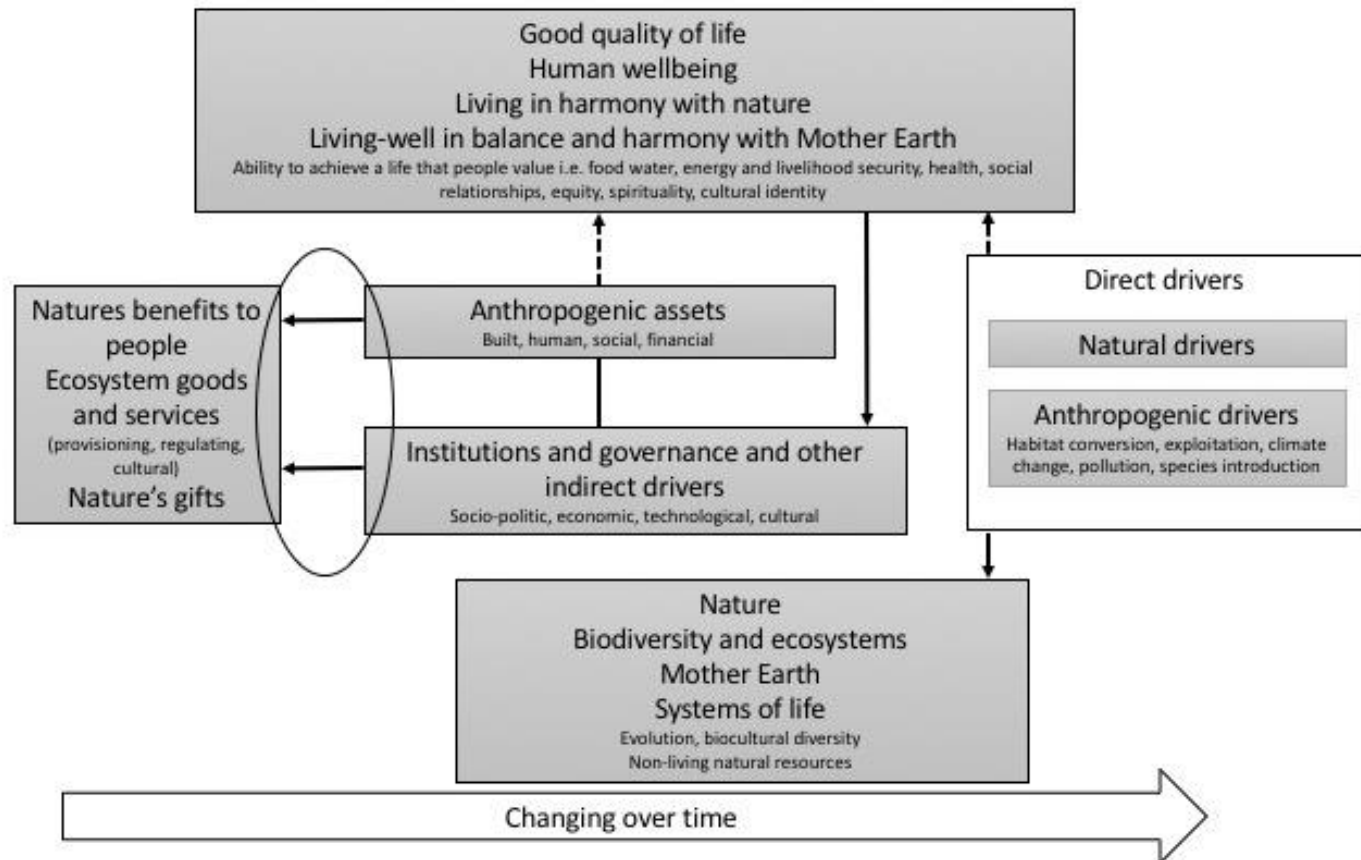


Figure 3-1: IPBES conceptual framework (adapted from Díaz et al., 2015): The circle highlights the section where access to ES could be incorporated and the focus of this study

By diversifying those involved in framework construction, IPBES aimed to meet critiques of previous frameworks which lacked interdisciplinary approaches to understanding both ES and human well-being. It has been particularly praised for its approach to understanding the diversity of values given to ecosystem services, with some suggestions of reclassifying ES to 'nature's contributions to people' in order to incorporate aspects of nature which cannot be valued or easily classified (Tengö et al., 2016; Pascual et al., 2017). However, while the framework includes anthropogenic assets, institutions and governance systems, it does not make clear the link between these and other factors and how they may affect an individual's ability to access ES, i.e. to realise the potential benefits from the environment. This is a repeated critique of many frameworks, as discussed in section 3.2.

For this study, we attempt to target these critiques and combine Ribot and Peluso's access factors (Table 3-1) with a section of the IPBES framework (Figure 3-2). This allows us to explore which factors are important in determining ES access in PA co-management.

Table 3-1: A summary of factors affecting access to ES (adapted from Ribot & Peluso, 2003) and relating to IPBES framework (Díaz et al., 2015)

Factor	Definition	Relation to IPBES framework	Relation to ES
Institutions	<p>Laws, customs, conventions and authorities</p> <p>Access can be affected by both formal (e.g. laws) and informal (e.g. social custom) rules</p> <p>Access may be affected by laws denoting property ownership, permits and licenses</p>	<p>Institutions and governance (socio-political)</p>	<p>Ownership of land, paying for permits and local customs can all affect access to ES</p> <p>In the case of joint resource management, forest rights are sometimes not fully transferred to local people, allowing other agents greater control over allocating access</p>

Physical assets	Technology, capital, markets and labour Physical ability to access resources may require tools, infrastructure, financial capital, access to markets and labour	Anthropogenic assets (built, human, financial) Institutions and governance (technological)	Many provisioning services cannot be extracted without the use of tools Financial capital may be required to buy permits or legal rights to access
Social identity and relationships	Identity, relationships and power Access is often affected by an individual's social identity (e.g. gender, age etc.), status within society (e.g. community leaders, village chiefs) and relationships with others. All mechanisms of access are forms of social relations	Anthropogenic assets (social, financial, human) Institutions and governance (socio-political)	Relationships with PA managers or committee members may allow easier access and more leniency towards rule breaking or the opposite for some groups.
Knowledge	Direct knowledge relating to access (i.e. how, where, what), and also perceived knowledge status e.g. expert status, can give privileged access to resources, or authority to control resource-use	Anthropogenic assets (human) Institutions and governance (cultural)	Knowledge of where a particular provisioning service may be found (e.g. medicinal plants) Within strict PAs only 'experts' or researchers may be allowed access

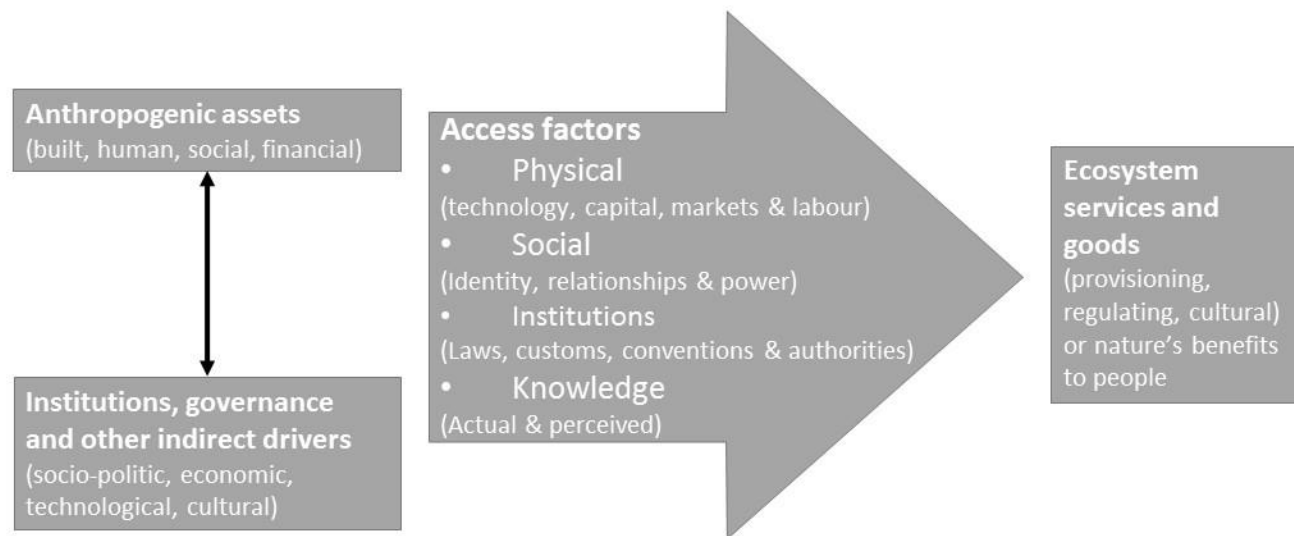


Figure 3-2: Combining Ribot & Peluso's (Ribot and Peluso, 2003) access factors with the IPBES conceptual framework to explore what may impact individuals' or households' ability to access and use ES

3.4 Materials and methods

3.4.1 Study area

Madagascar presents a “*classic conservation and environmental management conundrum*” (Scales, 2014: xx), as one of the world’s least developed countries (UNEP 2013), yet also classed as a biodiversity hotspot with over 80% of species endemic to the island (Myers et al., 2000; Goodman and Benstead, 2005). 80% of the population are rural and rely on a combination of subsistence farming and non-timber forest products (NTFPs) for their livelihoods, illustrating the importance of provisioning ES (Sarrasin and Ramahatra, 2006). The slash and burn agriculture system, known as *tavy*, is regarded as the country’s main driver of deforestation (Waeber et al., 2016). At low population densities *tavy* may be sustainable, but population growth, from 5 million in 1960 to 24 million in 2015 (World Bank, 2016), means that reducing this practice is now considered a priority by many conservation organisations (I.R. Scales, 2014a). A key strategy has been to establish a new network of PAs, aiming not only to increase PA coverage and increase connectivity between existing PAs, but also to allow communities to continue accessing forest resources sustainably as they move towards alternative livelihoods (Gardner, 2014). These new PAs are co-managed by local associations (locally known as VOIs) and a non-state partner (promoter). VOIs provide a mechanism for individuals to participate in PA governance, from establishment through to daily management decisions. VOIs may be established by the promoter or based on existing village associations, and consist of a committee and members. Anyone in the community is eligible to join and the committee is elected by the members. A number of concerns surrounding the legitimacy, true levels of local participation, elite capture and lack of promised compensation have been raised within the academic literature (Corson, 2014, 2012; Virah-Sawmy et al., 2014; Ward et al., In press). Yet few studies explore how this new approach to managing PAs in Madagascar affects access to ES. Consequently, we are limited in our understanding of whether these new PAs are meeting their aims. As co-management of PAs increases globally,

Madagascar offers an important case through which to explore how this governance approach plays out in reality.

This study focusses on one of these newly established PAs, Mangabe Forest, located in eastern Madagascar and co-managed by 10 VOIs and a national NGO. The eastern forest corridor belt in Madagascar is made up of a number of PAs, which are recognised as extremely important for conserving Madagascar's biodiversity but are under pressure from expansion of agricultural land, illegal logging and artisanal mining (Poudyal et al., 2016). In particular, Mangabe Forest contains 60% of the remaining population of the locally endemic and critically endangered golden mantella (*Mantella aurantiaca*), and important populations of endemic and critically endangered lemur species indri (*Indri indri*) and diademmed sifaka (*Propithecus diadema*) (Pers. comm. NGO staff).

3.5 Data collection methods and sampling strategy

Three data collection methods were used: (1) village focus groups, (2) semi-structured interviews, and (3) household questionnaires. Data were collected in September-December 2015 and April-July 2016 (Table 3-2). Ethical approval was granted by relevant bodies before data collection began.

Three study villages were selected due to their similar distances from forests (1 hour walking), variations in VOI participation and similar VOI establishment processes (pers. comm. NGO staff;

Table 1-7). Distance from forest was considered likely to affect frequency of forest access and reliance on forest resources, and therefore kept as similar as possible between villages.

Table 3-2: Summary of data collected

	Village 1		Village 2		Village 3		Total
	VOI members	VOI non-members	VOI members	VOI non-members	VOI members	VOI non-members	
Focus groups	1	1	1	-	1	1	5
Interviews	7	5	7	2	7	6	34
Questionnaires	45	35	62	18	27	35	220

Focus groups (FG) discussed ES and disservices (benefits and costs) from the forest, and varying importance of each (Appendix C). Purposive sampling did not aim to be fully representative of each village, but to gain a wide range of opinions. After consultation with village members, FGs were divided into members and non-members due to concerns of conflict between these groups. Participants were identified during village introductions, with each FG consisting of 8-10 participants. FGs were facilitated by research assistants with input from the lead author if needed. Discussions were recorded and written into summaries by the lead author and research assistants. 5 FGs were conducted (Table 3-2).

Interviews aimed to discuss in-depth topics relating to PA governance, ES use and access and the rules or laws related to this (Appendix D). Sampling aimed to gain a wide range of views, and allowed us to speak to individuals living further away from village centres who may not have been able to participate in FGs. VOI and village presidents were interviewed first, and further interview participants identified via snowball sampling to give a total $n = 34$. We aimed to interview an equal number of VOI members and non-members, although found that there were many more VOI members living in villages than non-members and therefore our total sample size for members and non-members follows this distribution (Table 3-2). Interviews were conducted with the assistance of a translator. Interviews were also conducted with 2 NGO staff members, in order to gain background understanding on the rules relating to ES access and use.

Questionnaires aimed to sample a larger proportion of the population for a more representative set of views. Census information was unavailable, as there are few records on the location and size of communities in rural Madagascar, making it difficult to develop a rigorous sampling frame. We aimed to collect a representative set of views for each village. Households were randomly selected, by choosing every 2nd household. Permission was requested to interview head-of-households (as defined by the household). If they declined to participate, or were not available, we moved onto the next household. Discussions with village presidents and elders confirmed that all remote areas of the village had been sampled. Ordinal and categorical

questions relating to socio-economic indicators and ES use, and open-ended questions about access to ES were included (Appendix E). 217 questionnaires were completed (Table 3-2). Questionnaires were conducted in Malagasy by research assistants from the University of Antananarivo. Material Style of Life (MSL) was used as a proxy for wealth, and calculated for each household based on locally appropriate household structure and possessions (Appendix F). MSL is a widely used, useful and robust indicator of wealth in developing countries (see Cinner et al., 2010 for more detail). The MSL score was calculated using a principal component analysis (PCA) on all variables and items with low factor loadings were removed (Cinner et al., 2010). Questionnaires were piloted in the villages to test for clarity and length before data collection began. As no modifications were needed, pilot data were included in the final sample.

3.6 Data analysis

T-tests using R (R Core Team, 2013) were used to measure differences between demographics, socio-economic characteristics and number of ES accessed. Proportions were used when comparing between different groups (such as VOI members and non-members) due to unequal sample sizes. Transcribed interviews and questionnaire responses were analysed using NVIVO software version 10 (QSR, 2012) to identify answers relating to ES use, factors affecting access and rules relating to ES access. Qualitative analysis was conducted in several stages of reading, coding, comparing to quantitative data and recoding. Responses were classified by ES category and access mechanisms included within the access framework presented in Figure 3-2 (Newing, 2010). In order to understand which factors (listed in Table 3-1) had the greatest impact on ES access, we compiled evidence from qualitative and quantitative methods. From this combined data, it was possible to draw out which factors had the greatest impact.

3.7 Results

3.7.1 What ES are most important or used most frequently?

In FG discussions, respondents considered provisioning services such as wood for fuel, building and tools, to be the most important benefits from the forest (Table 3-3). Rainfall, a regulating service, was also considered important in two of the three study villages. Data from interviews and questionnaires highlighted perceived links between the forest, air or water quality and rainfall: “*the forest makes the air clean and helps our health*” (Village 1, female, VOI non-member) and “*The forest helps to clean the air, give water and rain*” (Village 2, male, VOI member). Cultural services were mentioned infrequently (28/220), but considered the importance of forest existing for future generations: “*there will still be forest for future generations*” (Village 2, male, VOI member), aesthetic aspects: “*the forest is beautiful to see*” (Village 1, male, VOI non-member), the value of wildlife: “*I like to see the wildlife*” (Village 3, male, VOI member), and the importance of local beliefs related to the forest: “*the forest is the home of our ancestors, so we must respect the fadys. It is fady to wear rings or earrings in the forest and to speak foolishly*” (Village 3, VOI member).

Table 3-3: FG responses to the question: “what are the most important benefits you get from the forest?”

These are used to indicate perceived ES importance. Answers focussed mostly on provisioning services but also included regulating and cultural services (P=provisioning service, R=regulating service, C=cultural services)

Relative importance of ES	Village 1		Village 2		Village 3
	VOI members	VOI non-members	VOI members	VOI members	VOI non-members
1	Wood/plants for construction (P)	Fuelwood (P)	Rainfall (for rice agriculture) (R)	Rainfall (for rice agriculture) (R)	Fuelwood (P)
2	Honey (P)	Wood/plants/for construction (P)	Medicinal plants (P)	Wood/plants for construction (P)	Rainfall (for rice agriculture) (R)
3	Animals for hunting (P)	Honey (P)	Honey (P)	Fuelwood (P)	Wood/plants for construction (P)
4		Fish (P)	Wood/plants for construction (P)	Number of animals in the forest (C)	

Questionnaire data on provisioning services showed that ES used most frequently (Figure 3-3) were fuelwood (23.0%), wood/plants for construction (13.4%) and fish (7.8%). ES use varied between villages and village 2 had the highest proportional use of all ES categories (Figure 3-3). Fuelwood use was consistently high across all three villages.

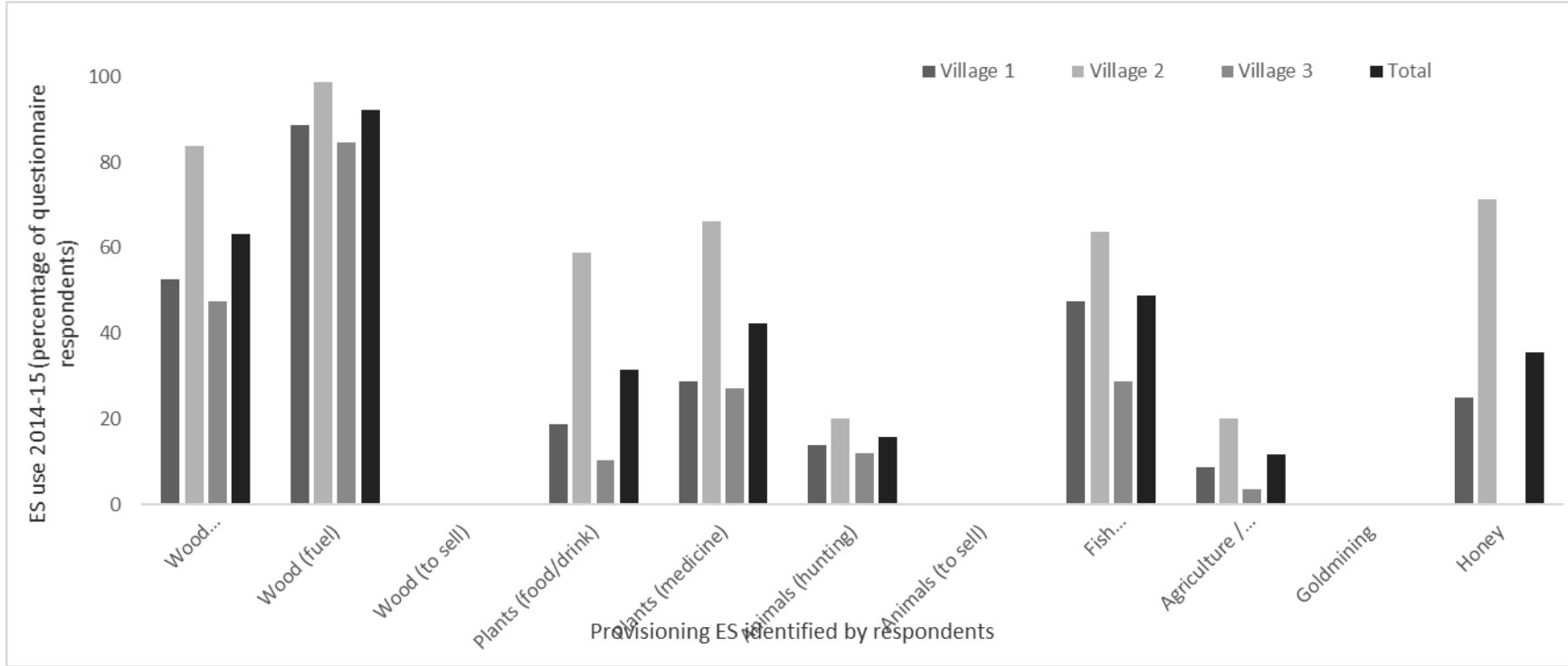


Figure 3-3: Percentage of respondents (total and per village) using provisioning ES from 2014-15

3.7.2 What factors are important in defining whether a person has access to provisioning ES?

Results are summarised following the access factors defined in Table 3-1. Table 3-4 explains in detail how and why each access factor affects ES access, and Figure 3-4 depicts how these findings relate to the conceptual framework. The paragraphs below summarise these findings. Overall institutions and social identity appeared to have the greatest impact on ES access.

3.7.2.1 Institutions

VOI members had fewer barriers to accessing ES including fewer restrictions via rules/laws. 17/34 interview respondents stated that there were significant differences in forest access rules for members and non-members. However, explanations of these differences varied, including no forest access for non-members, permission required by non-members, and payment required for access (see Table 3-4). Questionnaire responses showed that VOI members were more likely to be accessing a wider range of provisioning ES ($t=5.57$, $d.f.=210$, $p\leq 0.001$; Figure 3-5). VOI membership also related to knowledge and social identity.

3.7.2.2 Physical

Physical factors had less of an impact on ES access. Lack of infrastructure was discussed as an issue relating to transporting forest resources to towns or markets, but only by a minority of respondents and is unrelated to PA co-management. The NGO involved in PA co-management has been encouraging households to increase rice cultivation. A few respondents (7/34) stated that this left them with less time to travel into the forest. A minority of respondents (7/34) stated that non-members had to pay to access forest resources, but questionnaire data gave no statistically significant relationship between household wealth and provisioning ES use ($t=-1.75$, $d.f.=210$, $p<0.08$).

3.7.2.3 Social identity

Provisioning ES use varied between villages, with village 2 having the highest use of all categories (Figure 3-3). This was also the only village

where FG discussions on ES importance mentioned medicinal plants, and many questionnaire respondents (50/80) stated there were a lack of possible income-earning livelihood activities, and life had become more difficult: “*There are less activities to earn money due to the regulations*” (village 2, male, VOI member). This village is located the furthest from roads and markets via a mud path, which could explain the higher reliance on provisioning ES compared to the other two villages.

VOI members were more likely to know VOI committee members or patrollers, which respondents stated would both make it easier for them to get permissions to access the forest, and make it less likely they would be reported if caught breaking rules (Table 3-4). Power could be gained through VOI membership or being a VOI committee member, to give greater access to ES or more involvement in deciding the rules of forest access or punishments for breaking the rules.

3.7.2.4 Knowledge

VOI members were more likely to know the rules surrounding ES use than non-members. However, other respondents suggested that punishments for breaking rules might be more lenient for non-members (Table 3-4).

3.7.2.5 Overlaps

The results highlight the overlaps and relationships between factors in the analytical framework (Figure 3-4). VOI membership was incorporated by both social identity and institutions, and also related strongly to knowledge, as VOI members had greater knowledge of rules/laws relating to ES access.

Table 3-4: Summary of factors affecting ES access

Access factors	Relation to co-management	Evidence	Effect on ES access	Description
Institutions VOI membership	VOI established as a mechanism to involve local communities in PA governance	<p>17/34 interview respondents stated that there were differences in access between members and non-members, 9/34 stated that there were no differences, and 6 didn't know</p> <p><i>“VOI members just talk to the committee to get wood, it is easy. But non-members must get permission from [the NGO] and the ministry so that they can get a permit for taking the wood”</i> (Village 3, male, VOI member)</p> <p><i>“Non-members have to pay to cut the trees, but members don't”</i> (Village 1, male, VOI member)</p> <p><i>“Non-members are not allowed to get resources from the forest”</i> (Village 2, male, VOI member)</p> <p><i>“There is no difference between members and non-members”</i> (Village 3, male, VOI non-member)</p> <p>On average, VOI members accessed a significantly wider range of</p>	Membership increases access	There were mixed responses on whether forest access was easier for VOI members or not. Interview respondents gave a variety of answers. Overall it appeared that VOI members had fewer barriers to accessing the forest and questionnaire responses indicated that VOI members were accessing a wider range of provisioning ES

Rules/laws	<p>The forest is now divided into a core protected area and sustainable use zone. Within the sustainable use zone only subsistence use of forest resources is allowed and certain activities are prohibited (including tavy, commercial logging and gold mining)</p>	<p>provisioning ES (Figure 3-5; $t=5.57$, $d.f.=210$, $p<0.001$)</p> <p>22/34 interview respondents were aware of the new rules, although their interpretations of the details varied. 12/34 did not know or incorrectly described the rules</p> <p><i>“Now we can't do non-selective logging, slash and burn or gold mining”</i> (village 2, male, VOI member)</p> <p><i>“I think people can't take what they want from the forest. There are only certain things they can take, but I don't know”</i> (Village 3, female, VOI non-member)</p> <p><i>“The forest is divided into two parts: the reserve and the forest for the local community. In our part of the forest, we can get trees for households, medicinal plants, and we can hunt”</i> (village 2, male, VOI member)</p> <p><i>“Now it is protected we can't get anything from the forest”</i> (village 3, male, VOI member)</p>	<p>Depends individual understanding of the rules and VOI membership</p>	<p>The majority of interview respondents were aware of the new rules. However, there were also responses stating much stricter rules and others who did not know the rules</p> <p>Relating to the institution access factor, there was a lot of disagreement about whether VOI members and non-members had to follow the same rules</p>
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Physical	Lack of infrastructure	-	<p><i>"I don't know what we are allowed to get in the forest, I only know that we are now protecting the forest"</i> (village 1, female, VOI member)</p> <p>3/34 interview respondents and 55/220 questionnaire respondents stated that lack of infrastructure caused problems reaching towns and markets</p> <p><i>"The problem is the road, vehicles can't get here and it takes a long time for us to take things to [the town] to sell"</i> (village 3, male, VOI non-member)</p> <p><i>"We sell [weaving products] in [the town], but it's difficult to get them to [the town]"</i> (village 2, female, VOI non-member)</p>	<p>No effect on initial ES access</p> <p>Some effects on gaining further benefits from ES (e.g. poor roads make it difficult to access markets)</p>	<p>Villages lack infrastructure, such as roads or bridges, increasing time taken to reach the forest or to transport forest resources out for subsistence or selling. This is particularly an issue in the rainy season, when paths can become treacherous and bridges destroyed by high river levels or cyclones (however this is unrelated to PA co-management)</p>
	Labour	Encouragement from NGO to shift livelihoods towards rice/beans agriculture to	<p>7/34 interview respondents linked increased time spent on agriculture to less time available to go into the forest</p> <p><i>"Now we do more rice and bean farming, there is less time to go into</i></p>	<p>Decreases access</p>	<p>Rice agriculture in particular is very labour intensive. This leaves less time for individuals to go into the forest, although</p>

		reduce forest resource reliance	<i>the forest</i> " (Village 3, male, VOI member)		was mentioned as an issue by only a minority of respondents
	Financial capital	-	7/34 interview respondents stated that non-members would have to pay to access forest resources <i>"It is easier for VOI members to get access to resources and also cheaper than non-members"</i> (Village 1, male, VOI member) Respondents using a wider range of provisioning ES tended to be less wealthy, but this was not a significant difference (t=-1.75, d.f.=210, p<0.08)	No effect	Qualitative data showed confusion over whether households have to pay fees to access resources. There was no significant relationship between wealth and provisioning ES use
Social identity	Village	-	Village 2 had much higher reported use of provisioning services than other two villages (Figure 3-3).	Likely to be affected due to differing distances to roads, towns and markets	Study villages were similar distances from the forest, but differed in distances from roads, towns and markets
	Relationships	Village members working as patrollers as part of co-management	<i>"If we patrol and we see someone we know breaking the rules, then it sometimes creates conflict within the community"</i> (village 2, male, VOI member)	Relationships with VOI president and patrollers increases	Interview responses highlighted that patrollers may not report people they know, if they see them

		<p><i>"We have to get permission from the VOI president before we cut any trees"</i> (village 2, male, VOI member)</p>	access	<p>breaking rules</p> <p>Some interview respondents stated that permission was needed from the VOI president to access the forest, suggesting that relationships with the VOI president may improve access</p>
Power	<p>VOI committee members and patrollers gain power from establishment of VOI</p>	<p><i>"The president of the VOI is in charge of making decisions"</i> (village 2, male, VOI member)</p> <p><i>"It depends on how seriously they break the rules. If they just cut one tree they might just get a fine (the VOI decides), but if they do slash and burn then the VOI must make a report to [the NGO] and the ministry, and the person might be sent to jail"</i> (village 3, male, VOI member)</p> <p><i>"We often catch them, but we can't punish people, we have to send a report to the government and we don't know how the case continues after that, whether people actually get punished or not"</i> (village 1, male, VOI member)</p>	<p>Being a VOI committee member or patroller increases access</p>	<p>Confusion over who has power to make decisions regarding ES access rules</p> <p>Depending which rule is broken, VOI members may lack powers of enforcement. Patrollers have to send a physical report to ministry/NGO, which may take a long time due to the distance from villages to the town</p>

Knowledge	Rules	New rules established as part of co-management	<p>member)</p> <p>17/21 VOI members were aware of the new rules, compared to 5/13 non-members</p> <p><i>“The members know where in the forest they can get trees. But non-members don’t know, so they have to ask”</i> (Village 3, male, VOI member)</p> <p><i>“Usually it’s people from outside [who break the rules] so they don’t know what the rules are”</i> (village 2, male, VOI member)</p> <p><i>“Some people don’t know about the rules”</i> (village 1, male, VOI member)</p> <p><i>“If they are not aware of the rules then we tell them that we are protecting the forest, and give them a second chance”</i> (village 1, male, VOI non-member)</p>	Mixed	Members have greater knowledge of the rules and where they can access resources in the forest. Non-members are less aware of the rules but may therefore be given greater leniency if caught breaking the rules
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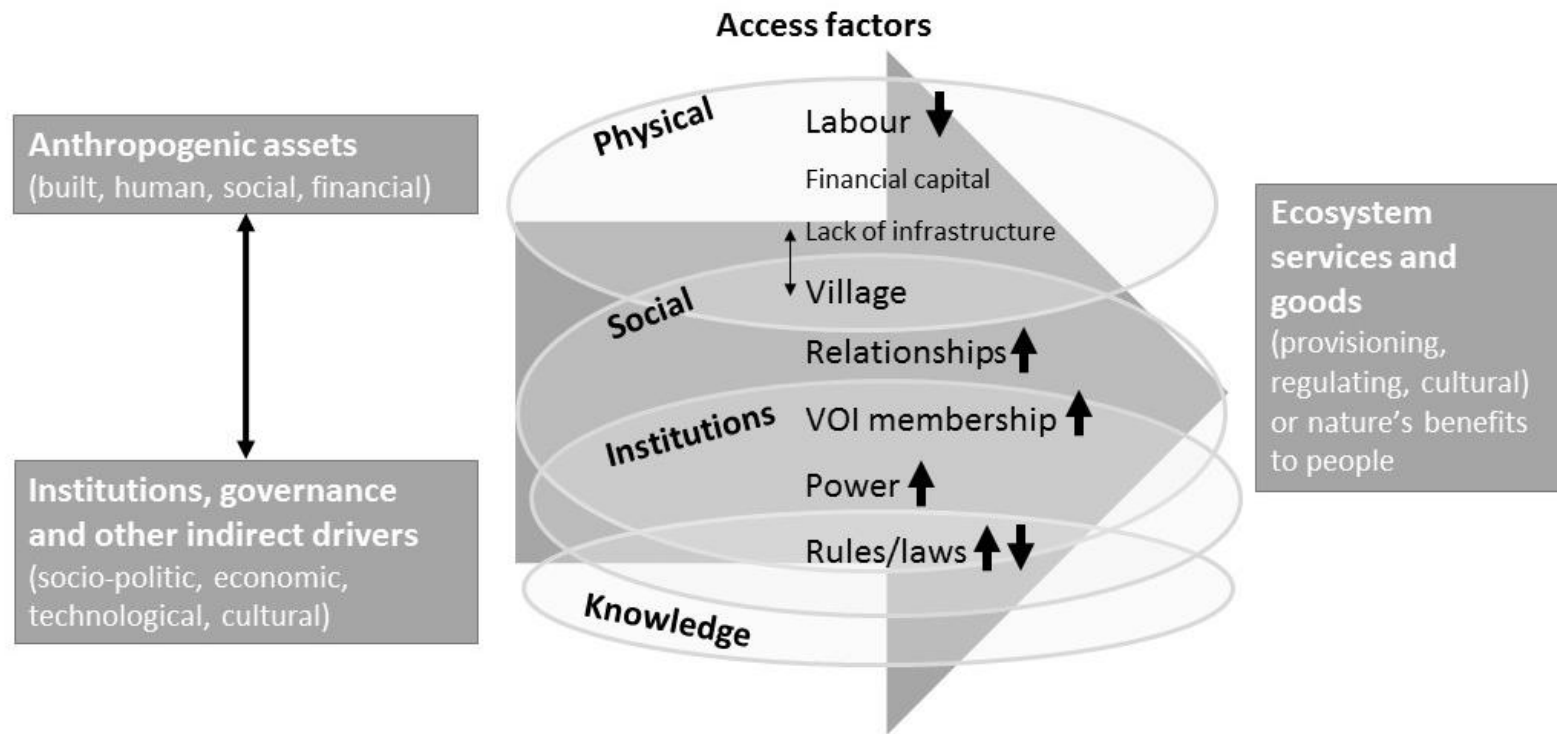


Figure 3-4: Summary of access factors impacting ES access and their direction

This figure shows an expanded version of Figure 3-2, indicating the results of the study. The access factors have been expanded to indicate what was most important in each factor identified in Figure 3-2, following the results from Table 3-4. The arrows illustrate whether factors increase or decrease access to ES, utilising the evidence summarised in Table 3-4. Factors without arrows showed no obvious effect on access. Note that there was evidence that knowledge of rules and laws both increased and decreased access (see Table 3-4). Factors overlap as there were many linkages between them.

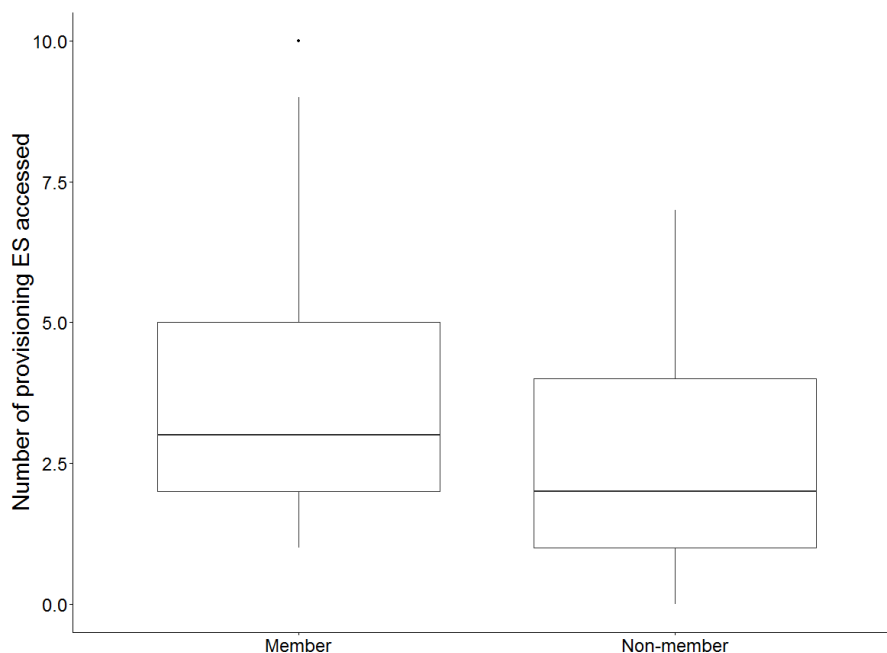


Figure 3-5: Mean and interquartile range of provisioning ES accessed by VOI members and non-members.

On average, VOI members were accessing a significantly wider range of provisioning ES (see Figure 3-3; $t=5.57$, $d.f.=210$, $p<0.001$)

3.7.3 How are rules/regulations surrounding ES access decided and enforced?

Interview respondents gave a variety of answers about who was involved in decision making related to ES access. This included: the VOI (4/28), VOI committee (1/28), VOI president (6/28) NGO (5/28), government (2/28), a combination of all four (5/28) or not knowing (5/28). For example: *“there was a meeting between [the NGO], the local people and the forest ministry, and we all decided together”* (village 3, male, VOI member), *“[the NGO] told us where we can get trees from and where we can’t”* (village 2, male, VOI member) and *“the president tells us where we can get resources from and what times of year we can fish and hunt”* (village 1, male, VOI non-member).

Responses suggested that the enforcement of these rules is complex, as VOI committee members are employed as forest patrollers but lack any power to arrest rule breakers. Some interview respondents highlighted issues with enforcing rules including: lack of regular payment for patrol work; lack of power to arrest rule-breakers; lack of materials needed for patrolling;

and that the process for reporting rule-breakers was convoluted and rarely successful. For example: *“We lack materials and we need them, as a patroller we need materials like cameras to get proof that people have broken the rules... Sometimes if people are caught then there is no proof and it is just our word against them, so sometimes they win... even if they are put in jail it's not for very long, only 1 or 2 months... Also we need a telephone because sometimes when we catch people breaking rules they threaten us so we need to be able to call the [police] or people around to come and help us...”* (Village 1, male, VOI member).

Other interview responses focussed on the social and political issues with potentially reporting rule-breakers from their own communities, suggesting that it had increased conflict between people involved with the VOI and those who were not: *“people threaten us when we patrol and tell them that they can't do things in the forest”* (village 3, male, VOI member).

3.8 Discussion

In our study, the factors most important in shaping ES access were institutions and social identity. This echoes previous findings across wider scales and within different contexts (Hicks and Cinner, 2014). Institutions are frequently highlighted as an important factor in accessing ES. Power can be exercised through formal and informal institutions, determining who may control or benefit from ES, who suffers from ecosystem disservices, which ES are considered legitimate, and whose values and perspectives are acknowledged and accounted for (McShane et al., 2011; Dawson and Martin, 2015). Previous conservation-related work in Madagascar has often highlighted the relevance of ‘fadys’, a set of informal institutions which make certain behaviours taboo (Jones et al., 2008). These have been linked to the conservation of certain species (e.g. relatively low levels of bush meat hunting (Jenkins et al., 2011) and threats to others (e.g. Goodman, 2015). This approach has received criticism for viewing ‘fadys’ as simplistic and static, rather than the complex, dynamic, evolving set of social norms that they are (Kaufmann, 2014). None of the interview respondents mentioned ‘fadys’ in relation to accessing ES, and they were only mentioned by a few

respondents in terms of cultural ES, where the forest represents a spiritual link to the ancestors. The findings in this study emphasise the role of VOIs, as formal institutions, although in some cases VOIs have been created by formalising existing informal institutions. This risks reinforcing or worsening inequalities by enabling 'elites' to have a greater say or capture more of the benefits. Virah-Sawmy et al (2014) stated that traditional Malagasy village-level institutions tend to be dominated by older men, and basing VOIs on these risks marginalising women and migrants. This may undermine the aim of PA co-management to improve rights and natural resource access of local communities. In our study villages, VOIs were newly created with the PA establishment, yet results suggest they are potentially creating new inequalities or reinforcing existing ones. This presents a challenge for conservation interventions, where working with previously existing institutions is likely to improve the chance of success, but existing institutions may not be representative and vulnerable to elite capture. Co-management institutions need to recognise the heterogeneity within local communities, in order to ensure that all social divisions are represented within decision-making processes (Ward et al., 2017).

Social identity and relationships with VOI members and patrollers also had an important role in determining ES access in this study. It is well documented that employing local community members to patrol PAs and enforce rules, is complex. Responses in this study showing leniency to local rule-breakers are echoed in different case studies throughout Madagascar (Sodikoff, 2009; Reuter et al., 2017). Rural villages in Madagascar have a high importance placed upon *fihavanana*, familial relations, where households within villages will offer reciprocal help with sowing, harvesting and cultural activities (Sodikoff, 2009). Yet in other countries, employing local patrollers has had different impacts, increasing the likelihood of local people breaking rules (Holmes, 2013). This highlights the importance of understanding local context when designing and implementing interventions.

The results from our study illustrate the importance of forest ES to local livelihoods in this area, particularly in the village most remote from roads, towns and markets. Households were reliant on provisioning services for

food, medicine, construction materials, cultural and spiritual reasons. This adds to the extensive literature showing that ES are essential for human well-being (e.g. Millenium Ecosystem Assessment, 2005; Sandhu and Sandhu, 2014). Unlike other studies, we did not find ES reliance related to wealth. Instead, it related to distance from roads, towns and markets. This is most likely to be linked to a lack of access to alternative food sources, building materials from areas outside the PA and income generating livelihood activities unrelated to the PA. Other studies have shown that where people struggle to meet multiple basic needs and few alternatives exist beyond natural resources, demand is only likely to rise for provisioning ES (Dawson and Martin, 2015). Madagascar's biodiversity is under high anthropogenic pressures, and unsustainable use of resources will also create problems for future generations. Yet, preventing resource use without offering alternatives is likely to create more resentment towards conservation than it is to reduce pressure on biodiversity. Even with continued 'sustainable-use' of ES there is still a short-term opportunity cost which needs to be explicitly recognised. If conservation interventions aim to decrease ES use, they will need to ensure that households are able to access affordable alternatives.

Cultural forest ES were mentioned in both interviews and FGs, yet the management of sustainable ES use is not necessarily set up with these in mind. Cultural ES tend to be more difficult to value and consider within environmental management as they are highly subjective, and shaped by individuals' views, needs and values (Anthem et al., 2016). Yet cultural services contribute towards human well-being in many complex ways, and also interact with other types of ES. Previous research has shown that people often perceive ES benefits in bundles, rather than as discrete individual benefits. For example provisioning services (such as fishing) offer both income (provisioning) and non-income benefits such as tradition and enjoyment (cultural services) (Hicks and Cinner, 2014). This suggests that not only do conservation interventions need to ensure that alternatives to ES are available and affordable, but also need to explore other values given to ES, to understand whether individuals would be willing to reduce their use or switch to alternatives. A recent study by Rakotonarivo et al. (2017)

conducted close to the study site we worked in, highlighted that *tavy* is given important cultural value here and considered as an “identity”, not just a livelihood activity to produce crops. Cleared land is also seen as an important inheritance for children and future generations. This is where studies using monetary proxies to represent ES values such as contribution to income, cost-benefit or contingent valuation may overlook the importance of non-material benefits or the crucial contribution ES make to meeting human needs. Therefore a more explicit consideration of the diversity of values and possible taboos might support improved decision making (Dawson and Martin, 2015; Daw et al., 2015).

The IPBES framework represents a relatively new method of exploring the links between ES and human well-being. It aimed to respond to critiques of previous frameworks by including perspectives from a variety of disciplines and knowledge types. Yet, it lacks inclusion of local factors which may impact upon people’s abilities to access ES. We have shown in this study that local contextual factors strongly influence whether individuals are able to access ES. The IPBES framework could usefully be revised to include this aspect.

3.9 Conclusion

There have been a number of commitments stating that local people living close to or within forest environments, many of whom are extremely poor, should not be negatively affected by efforts to conserve forests for the global benefits they provide. By involving local communities in PA governance, the aim is to decrease opportunity costs for local communities, whilst providing both socio-economic and biodiversity benefits. The findings from this study show that local contextual factors, particularly institutional and social identity, strongly affect access to ES, and co-management may be shifting inequalities rather than reducing them.

Findings from our study have highlighted a number of challenges related to PA co-management: (1) any reduction in ES access is likely to create a short term opportunity cost. These costs need to be explicitly recognised and livelihood interventions designed with this in mind; (2) The diversity of

cultural and social values given to livelihood activities relating to ES use needs to be carefully incorporated rather than considering them as conservation or sustainability issues; (3) Community-level PA institutions need to ensure that all household types and social divisions are represented, in order to prevent worsening existing or creating new inequalities. By meeting these challenges, PA co-management will be more likely to meet its aims of providing biological and socio-economic benefits.

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Chapter 4 Protected area co-management, equity and perceived livelihood impacts

4.1 Abstract

Creation of protected areas to conserve biodiversity can have both positive and negative impacts, with impacts unequally distributed within local communities. A global shift towards local community involvement in protected area governance and co-management has aimed to reduce costs of protected area establishment and their uneven distribution. Yet, there is mixed evidence to support whether such initiatives are succeeding. Here, a co-managed case study protected area in Madagascar is used to explore how co-management governance processes impact upon livelihood strategies and outcomes, and how these impacts are distributed within and between villages.

Qualitative and quantitative data were collected in 2015/16 from households surrounding a protected area, co-managed by local community associations and a national NGO. Qualitative data was coded into themes following categories in the sustainable livelihoods framework and perceived differences between association members, villages, gender and wealth analysed.

Perceived livelihood impacts were distributed unevenly between groups, and the majority of respondents perceived negative livelihood outcomes. Respondents were more likely to report negative livelihood outcomes if they were from remote villages, poorer households and reliant on provisioning ecosystem services before protected area establishment. Qualitative data showed that the main drivers of this were protected area-related rules and regulations restricting forest activities. Drivers of improved livelihood outcomes were training and materials improving agricultural yields and increased community cohesion.

Although co-managed protected areas may overall be more effective in meeting biological and socio-economic goals than protected areas of other

governance types, the evidence here suggests that governance processes can lead to local perceptions of inequity.

4.2 Introduction

Protected areas (PAs) are one of the most frequently used conservation strategies, but remain contentious due to their negative impacts on local communities (Holmes and Brockington, 2012; Pullin et al., 2013) and mixed evidence on their ability to conserve species and habitats (Geldmann et al., 2013; Eklund and Cabeza, 2017). A global shift towards co-management and community involvement in PA governance and management, has in part, aimed to reduce local costs of PAs and provide more equitable management (Berkes, 2009). Yet there is mixed evidence as to whether this new form of governance is meeting its aims. In this study, how co-management governance processes impact upon local livelihoods and how these impacts are distributed within and between local communities are explored.

There is no universally agreed definition of co-management, but generally it refers to shared authority and decision making between parties, often local communities and the government or NGOs (Berkes, 2010). IUCN categorises these PAs as shared governance, and defines this as where a governmental agency and other stakeholders, such as local/indigenous communities that depend on the area culturally or for their livelihoods share power and responsibility to make and enforce decisions (Borrini-Feyerabend et al., 2012). It is clear that this may encompass both governance and management, and although these terms are often used interchangeably in the literature it is important to distinguish between them. Governance refers to who holds the power, authority and responsibilities, whereas management refers to resources, plans and actions (Lockwood, 2010; Borrini-Feyerabend et al., 2012; Lyver et al., 2014).

Signatories to the Convention on Biological Diversity (CBD) and Aichi Targets have agreed to not only increase PA coverage by 2020, but also to ensure that PAs are managed equitably (CBD and UNEP, 2010). Equity broadly refers to “the fair or just treatment of individuals or groups” (Law et

al., 2017: 4). Co-managed PAs may offer a more equitable method of establishing and running PAs, as they provide opportunities to reduce local costs or provide benefits via the potential to tailor rules to local conditions, increase regulatory compliance, improve collaboration, and lead to greater stakeholder engagement and empowerment (Carlsson and Berkes, 2005; Berkes, 2009; Ayers et al., 2017). Challenges of implementing co-management include institutional barriers, engaging all relevant stakeholders, conflict throughout planning processes and equity issues relating to collective decisions or unequal distribution of benefits (Manzoor Rashid et al., 2013; Trimble Nunez et al., 2013; Kocho-Schellenberg and Berkes, 2015). Successful co-management arrangements often require time to develop institutional networks and trust between them (Berkes, 2017). Existing research shows that co-managed PAs are more likely to provide socio-economic benefits than other governance-types, but this varies (Oldekop et al., 2016). Positive outcomes are more likely for PAs allowing sustainable-use, empowering local people, reducing inequalities and providing cultural and livelihood benefits (De Vente et al., 2016; Oldekop et al., 2016). But also, co-management may be more efficient in areas where there is resource control (for example forestry or fisheries) where it can improve data quality, reducing overcapitalisation, promoting economic development, ensuring more equitably allocation decisions, sharing power and reducing conflict (Gurney et al., 2016; Ayers et al., 2017).

A key part of many PA co-management approaches is the participation of local communities in PA governance or management. Participation can range from a brief consultation before PA establishment to full participation in daily management decision-making (Reed, 2008; De Vente et al., 2016; Sterling et al., 2017), yet this is all grouped under community participation. Involving local communities in conservation interventions, particularly PAs, has been well documented in the academic literature. Advantages are similar to those given to co-management and include: greater evidence base and diversity of views to improve decision making; increased trust between stakeholders; and increased support for interventions. Disadvantages include: risk of elite capture and dominance; potential for conflict between stakeholder groups; and increased time needed for decision-making (Reed,

2008; De Vente et al., 2016; Sterling et al., 2017; Ward et al., 2017).

However, a recent review of the literature concluded that there are still many aspects of participation which are poorly understood and studies could be improved by incorporating qualitative data (Sterling et al., 2017).

Existing studies have analysed how the benefits and costs of PA establishment are distributed (e.g. Foerster et al., 2011; Franks et al., 2014; Gurney et al., 2015), but few have explicitly linked this distribution to who is involved in PA decision-making and how. As community involvement in PA governance becomes more widespread, we need to understand whether and how it is meeting the aim of improving PA-related equity within particular country settings. To explore this, in this thesis I focus on Madagascar, which has seen a strong shift towards co-management of PAs, presenting a useful case study to explore how co-management governance processes play out in reality.

In 2003, President Marc Ravalomanana of Madagascar announced the 'Durban Vision', which aimed to establish a new network of PAs across Madagascar (Virah-Sawmy et al., 2014). These PAs differ from the existing state-run network of strictly protected National Parks in two main ways. Firstly, the new PAs would be co-managed by a 'promotor' (usually an NGO) and local community associations (locally known as VOIs); and secondly, the new PAs would contain sustainable resource-use areas alongside more strictly managed no-take zones (Gardner et al., 2013). The VOIs act as a mechanism for local community members to have a say in PA governance and management, from establishment through to daily management decisions. The creation of this new PA network followed both instrumental (increased PA coverage without stretching the limited Malagasy government resources) and moral (involving local communities to reduce PA-related costs and potentially even provide benefits) drivers. Studies of this new PA governance have so far found mixed results in terms of meeting these aims (Corson, 2012; Corson, 2014; Virah-Sawmy et al., 2014; Ward et al., 2017).

This study is conceptually designed around the Sustainable Livelihoods Framework (SLF; Figure 4-1) to explore PA-related benefits and costs, and how they interact with co-management governance processes. The SLF has

had wide application in development disciplines, and some use within conservation (Bennett, 2010), but has been criticised for not considering political aspects and wider contexts (de Haan and Zoomers, 2005). I argue that it provides a useful framework as it takes a holistic view of livelihoods, incorporates governance processes and is easy to look at different social groups, making it ideal for investigating the links between PA co-management and perceived livelihood impacts. It defines a livelihood as the “means, activities, capabilities, assets and entitlements by which people build a living”, and can be applied to explore how a certain event or ‘shock’ can lead to different livelihood outcomes (DFID, 1999). In this case, I define PA establishment as a ‘shock’, due to a potential change in access to natural resources and change of rules prohibiting certain livelihood activities (Ward et al., under review). The SLF has previously been applied to investigate impacts of forestry co-management (Chinangwa et al., 2016), marine PAs (Bennett and Dearden, 2014) and was used to design the Social Assessment of Protected Areas framework (Schreckenberget al., 2010). The present study differs from these, by explicitly exploring the links between governance processes, and changes in livelihoods and their distribution. The SLF also allows investigation of different aspects of livelihoods or human well-being, which have not been frequently covered in the conservation literature, such as social and human aspects.

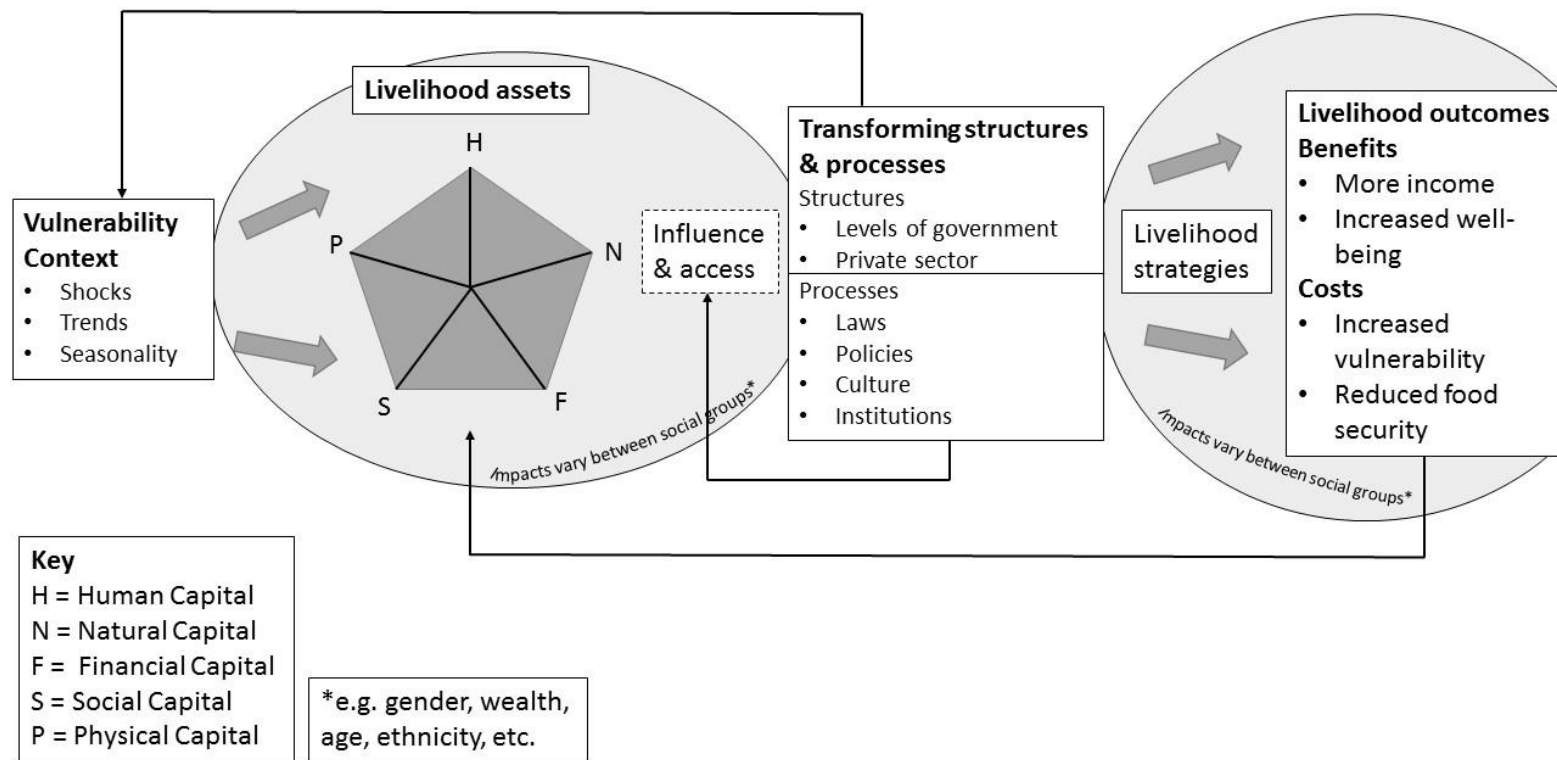


Figure 4-1: Sustainable Livelihoods Framework

Adapted to show how it can be applied to understand impact distribution between different social groups (adapted from DfID, 1999)

4.3 Methodology

4.3.1 Study site

The case study PA, Mangabe Forest, is located in Eastern Madagascar, and forms part of the Eastern tropical forest belt. This area is of high conservation priority due to significant levels of biodiversity and increasing human pressures from mining, shifting agriculture locally known as ‘tavy’, and illegal rosewood trade (Poudyal et al., 2016). The local population are mostly rural subsistence farmers and of Bezanozano ethnicity (pers. comm. NGO staff).

Mangabe PA was established 2008 to protect globally important populations of the critically endangered indri lemur (*Indri indri*), and the critically endangered golden mantella frog (*Mantella aurantiaca*). The PA consists of a core zone, which is strictly protected, and sustainable use areas. Local communities are allowed to access and use natural resources from sustainable use areas, but only for subsistence use. Common activities include firewood collection, collecting medicinal plants, collecting honey and hunting game species. Certain livelihood activities are restricted throughout the PA including goldmining, hunting lemur species, collecting animals to sell and commercial logging. Mangabe PA forms part of the ‘Durban Vision’ network of PAs, and is co-managed by a national NGO and 10 local community associations (VOIs). VOIs consist of a committee and members. All local community members over the age of 18 are eligible to join the VOI, and the committee is voted in by members. VOI members have regular meetings to discuss aspects of PA management and governance. NGO staff are not always present at these meetings, in which case a report of the meeting is sent by the VOI president or other committee member.

4.3.2 Data collection and sampling strategy

Three villages or VOIs were selected for this study (Table 1-7: Village selection criteria), each of which were similar distances from the forest and had similar VOI establishment processes (i.e. in each of the sample villages the VOI was established by the NGO). Distance to forest was assumed as

proxy for forest access and reliance on natural resources (Newton et al., 2016), and similar VOI establishment processes allowed data on governance processes to be comparable (pers. comm. NGO staff). Villages 1 and 3 were similar distances to towns and markets but village 2 was more remote (Table 1-7; Figure 1-2). Although this was assumed to impact local livelihoods, there were not three villages at similar distances.

Data collection took a mixed-methods approach, comprising: (1) Semi-structured interviews, (2) village focus groups, and (3) household questionnaires. This research was part of a broader study that also focused on co-management governance, participation and ecosystem service access (Ward et al., under review; Ward et al., 2017). Research design was informed by the SLF and included both qualitative and quantitative methods to ensure both depth and breadth of information (Bennett et al. 2016; Table 4-1). Data collection was conducted in September-December 2015 and May-July 2016 by the lead author with the help of trained local translators and research assistants. Ethical approval was sought from the University board before data collection began.

Table 4-1: Methods used to address different parts of the SLF

SLF section	Livelihood assets	Influence and access	Transforming processes and structures	Livelihood strategies	Livelihood outcomes
Methods	Indicators identified for each capital in interviews (n=37) and focus groups (n=5) based on what was perceived to be most important Data collected on each indicator using questionnaires (n=217)	Interviews (n=37)	Interviews (n=37)	Livelihood activities free-listing in focus groups (n=5) Data collected using questionnaires (n=217)	Interviews (n=37) and questionnaires (n=217)
Data collected	Likert-type scale questions for each indicator	Respondents were asked about access to each of the livelihood capitals, with a particular focus on access to the forest and how this varies between groups	Respondents were asked about informal and formal rules regarding forest access, different institutions and how they impacted forest access and how this related to livelihoods	Main and other livelihood activities identified from list (process repeated for subsistence and income generating activities)	In interviews respondents discussed how they perceived their lives had changed

Perceived change measurement	For each indicator response to increased, decreased, no change (averaged out for each capital)	Respondents were asked these questions about the situation currently and 10 years ago (before PA establishment)	Respondents were asked these questions about the situation currently and 10 years ago (before PA establishment)	Respondents asked about livelihood activities now (2015-2016) and 10 years ago (2005-2006)	In questionnaires respondents were asked whether they perceived their lives to have improved, got worse or stayed the same
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Focus groups (FGs) were conducted in each village. They consisted of 8-10 participants, and were split into VOI members and non-members due to concerns of conflict and power inequalities between these groups (pers. comm. village elders). Participants were identified by speaking to village presidents, elders and VOI committee members. FG discussions covered topics relating to livelihood assets and strategies. Two focus groups were conducted in villages 1 and 3, but due to logistical constraints it was only possible to conduct one in village 2.

Interviews were conducted in all case-study villages with key stakeholders, such as village presidents, elders and VOI committee members, to gain in-depth information relating to PA governance processes and livelihoods. Sampling followed a snowball approach, and 10 interviews were completed in each village. Interview data aimed to cover each section of the SLF and topics covered included PA co-management governance processes, livelihood activities and perceived changes since PA establishment. 12 interviews were also conducted with NGO employees, local government officials and other relevant stakeholders to gain general understanding of the Durban Vision PA network.

Household questionnaires aimed to collect information from a larger sample size within each village (Newing et al., 2011). There was no census information available for the villages, and we were unable to create a complete sampling frame. To make sure our sample was as representative as possible given these constraints, every 2nd household in each village was selected. It was also ensured that all remote village areas had been sampled by checking with village presidents and elders. Questionnaires included both open-ended and closed questions, and covered socio-economic information, co-management governance processes, provisioning forest ES use, livelihood activities, livelihood capital indicators, livelihood outcomes, and how these were perceived to have changed since PA establishment. Questionnaire design was informed by interview and FG data. Livelihood capitals were assessed using 2-3 indicators for each capital (Table 4-2), which had been identified and verified in semi-structured interviews and

FGs. Scores were designed to be comparable (i.e. a higher score for 'doctor visits' corresponded to fewer 'doctor visits')

Table 4-2: Indicators used to measure livelihood capitals and perceived changes since PA co-management

Livelihood capitals	Indicators	Score
Natural	Provisioning ecosystem service access and use	Count
	Fields owned	Score (0-3)
	Rice harvest	Number of months (0-12)
Financial	Access to bank	Score (0-1)
	Money for emergencies	Score (0-1)
	Ability to earn income	Score (0-1)
	Zebu ownership	Count
Physical	Distance to nearest town	Score (1-7)
	Asset ownership (motorbike, plough, bicycle)	Count
	House structure	Score (0-2)
Social	Participation in community work	Score (0-5)
	Helping others with emergencies	Score (0-5)
	Others helping you in emergencies	Score (0-5)
Human	Doctor visits	Score (0-4)
	Years in education	Score (0-4)

4.4 Analysis

Interviews and qualitative responses from questionnaires were transcribed and coded into themes in NVIVO (QSR, 2012). Themes were organised under the various components of SLF: livelihood assets, influence and access, transforming processes and structures, livelihood strategies and livelihood outcomes.

Quantitative data were analysed in R (R Core Team, 2013). Livelihood capital scores were calculated using a principal component analysis (PCA) on indicators for each factor, following the methodology used to calculate Material Style of Life (MSL; Cinner et al., 2010). Chi squared statistical tests were used to test for perceived changes in livelihood capitals and activities since PA co-management had been established. In order to explore the distribution of impacts within and between communities, social groups were chosen as informed by interview and FG data. These included village, VOI membership, gender, household wealth, ethnicity and age. After initial data exploration, ethnicity was removed as a factor, as all non-Bezanzano respondents had moved into the area after the PA had been established and therefore no data could be collected on livelihood changes due to PA establishment. Age was also removed due to extreme uneven sample sizes of different age groups making comparisons unreliable. Chi squared statistical tests were used to test for differences between the remaining groups.

In order to explore distribution of livelihood outcomes, an ordinal logistic regression model was run in R using the MASS package (Venables and Ripley, 2002; UCLA: Statistical Consulting Group, 2017). This consisted of an ordinal outcome variable with three potential responses: declined, no change, improved; and predictor variables: village, gender, wealth, VOI membership, provisioning ecosystem service use now and before PA establishment.

4.5 Results

Results are framed around the SLF, where establishment of the PA is considered to be a 'shock' as listed in the vulnerability context.

4.5.1 Livelihood impacts

Across all respondents, physical, social and financial capitals were perceived to have remained stable since PA establishment, natural capital to have decreased and human capital to have increased (Figure 4-2). Natural capital was measured through provisioning ecosystem service access,

number of fields owned and rice harvest. Interview responses stated that the perceived decrease was mostly due to new restrictions on forest-resource use e.g.: “*now that we can't access the forest, life is harder*” (village 2, male, VOI member). Human capital was measured via education level and number of doctor visits. Interview responses stated that since the PA had been established there were now more local primary schools and fewer issues with health, but this was not linked to PA governance: “*we have repaired the school, and now we have a teacher too*” (village 3, female, VOI member); “*our health is better now than it was*” (village 1, male, VOI member).

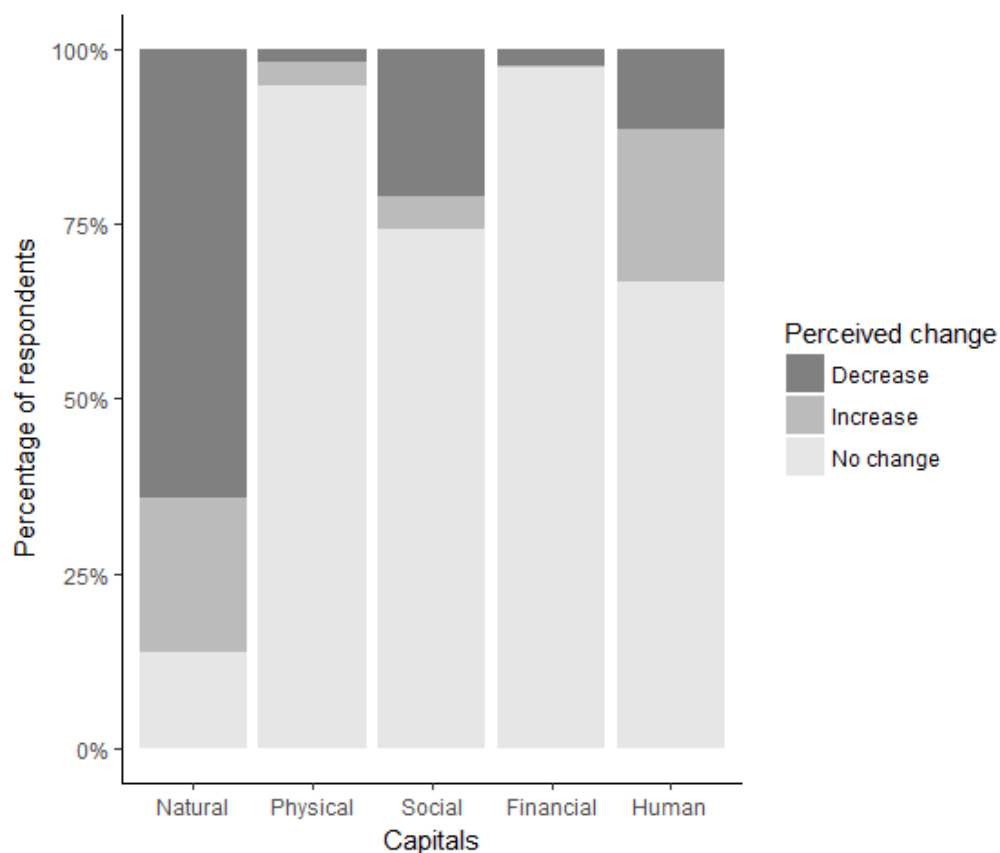


Figure 4-2: Perceived changes in livelihood capitals

Across all respondents, there were perceived changes in income-generating livelihood activities (Figure 4-3). Forest-based activities were perceived to have decreased (particularly collecting honey, cutting wood and goldmining), whereas agriculture and farming were perceived to have increased since PA establishment. There were no significant changes in subsistence activities. Interview responses stated that new rules meant that many forest-based

livelihood activities had been prohibited: “*We’re not allowed to sell wood from the forest*” (village 3, female, VOI non-member); “*before there were no restrictions related to the forest, but now there are lots of regulations*” (village 2, male VOI member); “*our income has decreased because of the prohibition of mining*” (village 3, female, VOI member). This had led more people to try to earn an income from agriculture or farming: “*people have less ways to earn an income and so more people do agriculture now*” (village 1, male, VOI member). Other responses stated that training and provision of materials from the NGO had increased harvests and encouraged people to switch to agriculture and farming: “*we have had training for better agricultural techniques*” (village 2, male, VOI member); “*now the forest is protected we don’t do timber logging, so we learn to grow rice and other crops*” (village 1, male, VOI member).

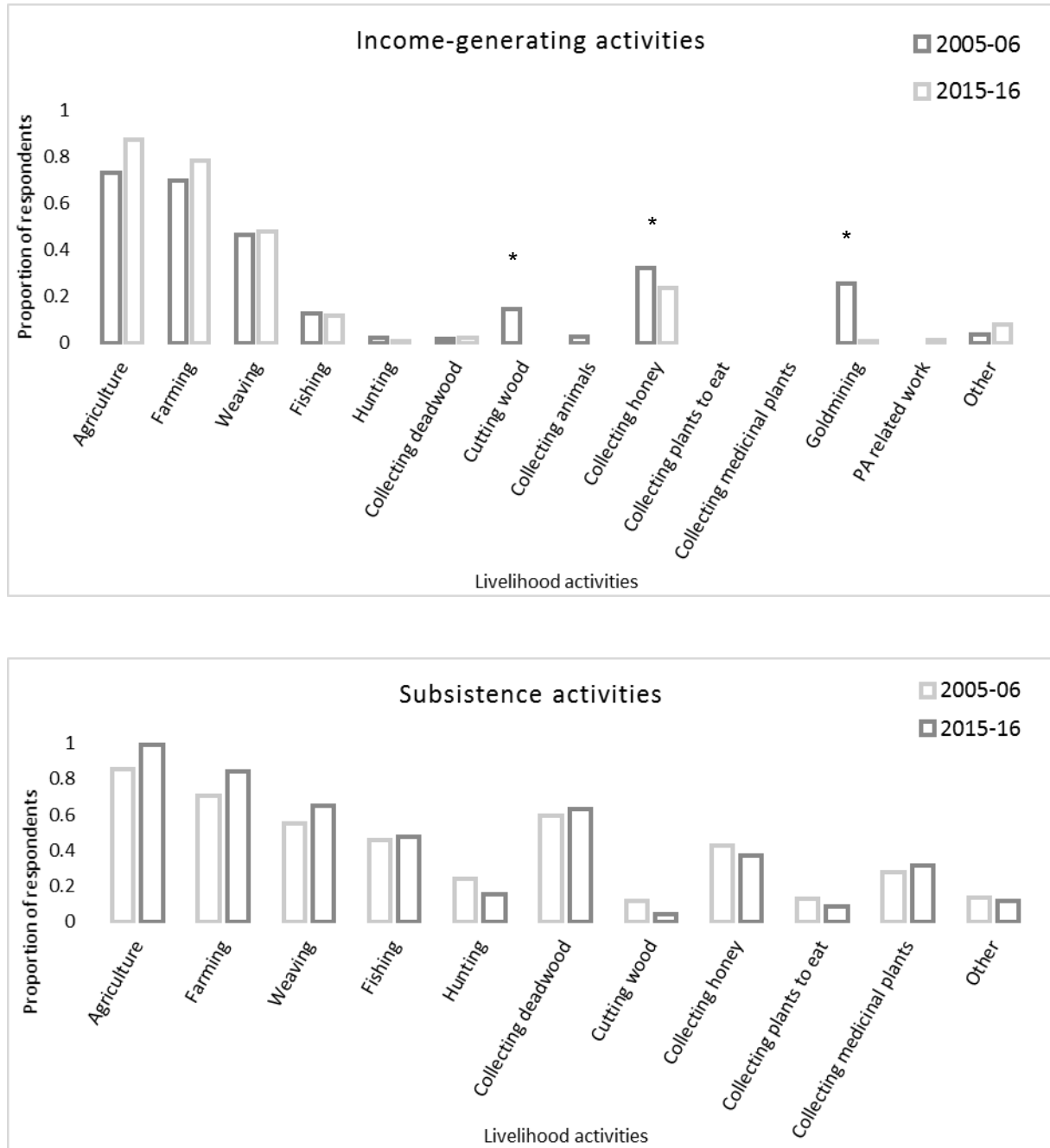


Figure 4-3: Proportion of respondents undertaking income generating and subsistence livelihood activities now (2015-16) and before PA establishment (2005-06) (* denotes significant changes)

Collecting honey ($\chi^2=11.3$, $df=1$, $p<0.001$), cutting wood ($\chi^2=28.0$, $df=1$, $p<0.001$) and goldmining ($\chi^2=42.3$, $df=1$, $p<0.001$) were perceived to have significantly decreased as income-generating activities.

Agriculture and farming were perceived to have increased as income generating activities but these differences were not significant ($\chi^2=1.45$, $df=1$, $p>0.05$; $\chi^2=0.469$, $df=1$, $p>0.05$). There were no significant changes for subsistence activities.

Across all respondents, 53% stated that life had 'got worse' or declined since PA co-management, 28% that it had improved and the remainder that there had been no change. Qualitative data illustrated that respondents related declining livelihood outcomes to a lack of income-generating options, a change in weather meaning less rain for rice fields, increased conflict within villages and a decline in *herana* (*Cyperus latifolius*) required for weaving products: "we still have problems with the rainfall being too low" (Village 2, male, VOI member), "apart from the protection of the forest, I now have no way of making an income" (village 2, male, VOI member). Respondents linked the lack of income-generating options to the new rules and regulations relating to PA co-management: "our lives haven't gone well since the forest was protected, because now we can't go to the forest to cut and sell trees. And we used to hunt the lemurs too, but we can't now. The rice we grow isn't enough, maybe if we had funding from [the NGO] to help us develop things would be better" (village 1, male, VOI member). The shift from forest-based livelihoods to agriculture and farming listed above, was also blamed for the decline in *herana*: "the area for the plants we need for weaving to grow has decreased as it's been converted to rice fields" (village 3, male, VOI member). Increased conflict within villages was linked to establishment of the VOI and rules relating to PA co-management: "the problem is that there is constantly animosity between VOI members and non-members" (village 3, male, VOI member); "the problem is that we have lots of arguments with non-members, because the rules are so strict and stop people from doing tavy so some people hate us for that" (village 2, male, VOI member), although it should be noted that this did not appear to have affected social capital overall.

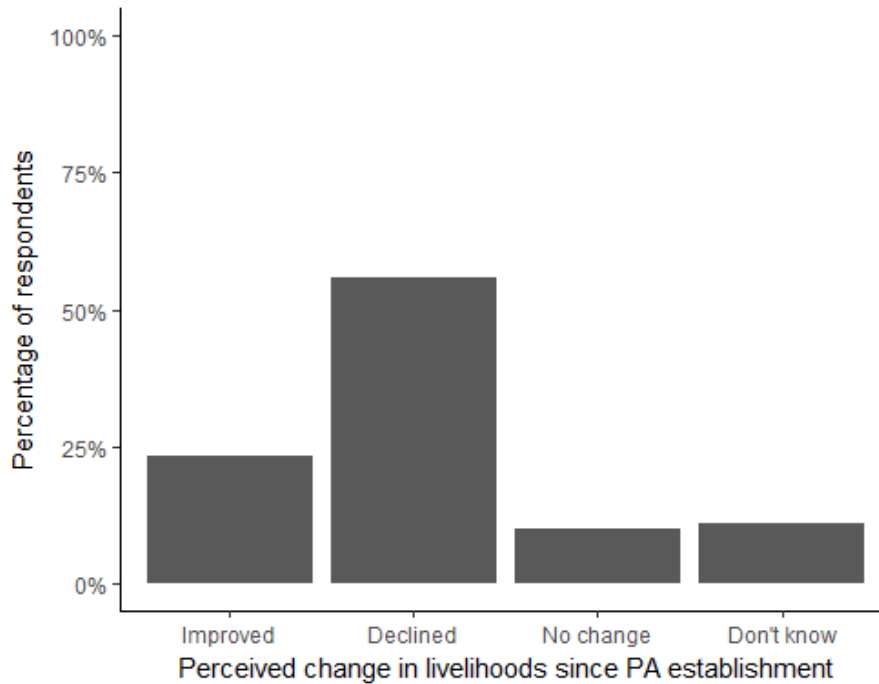


Figure 4-4: Perceived change in livelihood outcomes since PA establishment

Interview responses relating to improving livelihoods discussed enhanced village cohesion, training to improve agriculture and farming yields and jobs with the NGO: *“things are improving slowly through training and [the NGO] gave us some different grains to try growing”* (village 2, male, VOI member); *“now we have more cohesion in the community, so we can all work together and build important things like the school”* (village 1, female, VOI member); *“the offers for work have increased because MV and the VOI need people to lead meetings, so now I have more money for food and other things”* (village 3, female, VOI member). Conflicting with the results shown above, improved village cohesion was related to the establishment of the VOI for PA co-management: *“cohesion in the community is better because of the VOI”* (village 3, male, VOI member); *“[the VOI] makes work easy because members help each other”* (village 1, male, VOI member).

4.5.2 Distribution of livelihood impacts

The livelihood impacts listed above mask any inequalities experienced between social groups within communities. To understand these, we have looked at differences between villages, VOI members and non-members,

gender and wealth. Perceived changes in livelihood capitals, activities and outcomes all differed between these social groups (Appendix H; Table 4-3).

Table 4-3: Summary of ordinal logistic model results.

The ordinal logistic model results showed that village, wealth and ES use before PA establishment were significant predictors in livelihood outcomes. Respondents in village 2 and 3, from poorer households and who used a higher number of ES before PA established were significantly more likely to state that life had “got worse” since PA establishment.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Predictor variables	Value	Standard Error	t value	p value
Village2	-1.371	0.442	-3.099	0.002***
Village3	-1.052	0.440	-2.390	0.017*
Female	0.391	0.386	1.012	0.311
Wealth Score	0.334	0.129	2.504	0.012*
VOI Non-member	-0.271	0.364	-0.744	0.457
Provisioning ecosystem service use now	-0.001	0.109	-0.009	0.993
Provisioning ecosystem service use 10yrs	-0.290	0.069	-4.192	0.000***
Declined No change	-1.562	0.494	-3.165	0.002
No change Improved	-1.896	0.485	-1.849	0.064

4.5.2.1 Villages

Village 2 perceived a significantly greater decrease in natural capital ($\chi^2 = 10.5$, $df = 4$, $p < 0.05$) and increase in human capital ($\chi^2 = 14.8$, $df = 4$, $p < 0.01$). The natural capital indicator includes data from provisioning ES use (Table 4-2), and previous work has shown that village 2 was more reliant on these than the other two villages (Ward et al., under review), so the new PA rules may have had a larger impact. Interview responses from this village focus on the loss of forest access: “*it's forbidden now to take things from the forest and everyone suffers*” (village 2, male, VOI member); “*people are wary to go into the forest now*” (village 2, male, VOI member); “*the area we*

can go in the forest is limited now" (village 2, male, VOI member). Village 2 had established their own primary school with a teacher since the PA had been established, although interview responses stated that this had not been due to input from the NGO. This demonstrates the challenges in disaggregating the impacts of the PA from those associated with wider development processes.

Village 3 perceived a significantly greater decrease in social capital ($\chi^2 = 23.8$, $df = 4$, $p < 0.001$). Conflict between VOI members and non-members, villagers and 'outsiders' and village members and the NGO, were mentioned in interviews from across all villages, but were particularly an issue in village 3: *"there are problems from other people who don't agree with the VOI because it stops them from hunting lemurs and doing tavy, so it causes animosity between groups"* (village 3, male, VOI member); *"people hate the VOI members because we don't have a solution to them not being able to hunt anymore"* (village 3, male, VOI member); *"the VOI creates conflict between members and non-members"* (village 3, male, VOI member).

Villages 2 and 3 reported decreases in forest-related income-generating activities (Figure 4-3; Table 4-4: Summary of application of SLF to understand the distribution of livelihood impacts between social divisions.). Villages 1 and 3 reported greater increases in agriculture, farming, and PA-related work, although these were not significant. Similar to the differences observed with livelihood capitals, this underscores the greater reliance of households in village 2 on forest-based livelihoods before the PA was established. It also shows that the shift towards agriculture and farming is not necessarily being made by those who are having to cope with the greatest decrease in forest-related activities. Respondents in villages 2 and 3 reported greater decreases in forest-related subsistence activities compared to village 1 (Figure 4-3; Table 4-4: Summary of application of SLF to understand the distribution of livelihood impacts between social divisions.).

Respondents in villages 2 and 3 were more likely to report declining livelihoods (Table 4-3). As illustrated by the quotes above, respondents in village 2 reported greater impacts from new PA rules due to restrictions on

forest-based livelihood activities, and village 3 due to increased intra-village conflict.

4.5.2.2 VOI membership

There were no significant differences in perceived changes of livelihood capitals between VOI members and non-members. VOI members reported greater decreases in forest-related income-generating and subsistence activities and increases PA-related work (Table 4-4; Appendix H). These results may be due to VOI members having greater knowledge of PA-related rules than non-members, and therefore adhering to these rules, or their greater reluctance to admit rule-breaking. Previous research showed that VOI members had greater knowledge of PA-related rules (Ward et al., under review). VOI non-members reported greater increases in agriculture and farming for income-generating and subsistence. These results show that the increase in certain livelihood activities is not necessarily able to offset loss of income from prohibited activities, and the increases in agriculture and farming are not necessarily helping the households most affected by PA restrictions. There were no significant relationships between VOI membership and livelihood outcomes (Table 4-3).

4.5.2.3 Gender

Men perceived a significantly greater decrease in social capital ($\chi^2 = 7.9$, $df = 2$, $p < 0.05$) than women. Previous research (Ward et al., 2017) has shown that men were more likely to be VOI members than women, and therefore may have been more likely to encounter any conflict relating to the VOI. In terms of livelihood activities, male respondents reported significant decreases in cutting wood ($\chi^2 = 25.7$, $df = 1$, $p < 0.001$) and goldmining ($\chi^2 = 36.1$, $df = 1$, $p < 0.001$). Female respondents perceived significant increases in collecting deadwood ($\chi^2 = 21.7$, $df = 1$, $p < 0.001$). This represents the gender divide in livelihood activities, as described in FGs, with men doing activities inside the forest, and women focussing on activities closer to villages or houses. There were no significant relationships between gender and livelihood outcomes (Table 4-3).

4.5.2.4 Wealth

Poorer households perceived a greater decrease in natural capital ($\chi^2 = 14.73$, $df = 4$, $p < 0.001$). Previous work showed no significant difference between provisioning ES use and wealth (Ward et al., under review). Some interview respondents mentioned losing agricultural land which had been inside the PA, which may have impacted poorer households more as they were unable to buy or access other land: “*a lot of land where we used to grow rice is not used now because it is in the protected area*” (village 3, male, VOI member). High and low wealth respondents reported significant decreases in cutting wood ($\chi^2 = 16.8$, $df = 1$, $p < 0.001$; $\chi^2 = 46.8$, $df = 1$, $p < 0.001$) and goldmining ($\chi^2 = 3.88$, $df = 1$, $p < 0.05$; $\chi^2 = 3.87$, $df = 1$, $p < 0.05$). Yet, poorer households were more likely to report declining livelihoods (Table 4-3), and this may be linked to the greater decrease that they perceived in natural capital. Richer households may also have been better able to cope with the livelihood impacts, by selling livestock or relying on savings.

Table 4-4: Summary of application of SLF to understand the distribution of livelihood impacts between social divisions.

p<0.05, **p<0.01, *p<0.001; ↑ increase, ↓ decrease, → no change*

Social division		Livelihood Assets	Influence & access	Transforming processes & structures	Livelihood strategies		Livelihood outcomes
					Income	Subsistence	
Overall		Natural ↓ Physical → Social → Financial → Human →	Establishment of VOI has created new inequalities/power dynamics	Restriction of forest resource use and certain livelihood activities Establishment of VOI NGO development activities: training, jobs and materials	Agriculture ↑ Farming ↑ Goldmining ↓*** Cutting wood ↓*** Collecting honey ↓***	Little or no change	Life has got worse: 53% Life has improved: 28%
Village	Village 1	Natural ↓ Physical → Social → Financial → Human →	No significant differences between villages		Agriculture ↑ Farming ↑ Fishing ↓ Cutting wood ↓ Goldmining ↓	Agriculture ↑ Farming ↑ Weaving ↑ Fishing ↑ Collecting medicinal plants ↑	More likely to report improved livelihoods
	Village 2	Natural ↓* Physical →		Further from roads, markets and towns.	Agriculture ↑ Fishing ↓	Fishing ↓ Hunting ↓	Significantly more likely to report

		Social ↓*		Therefore more reliant on forest resources and greater impacts from forest and livelihood restrictions	Cutting wood ↓***	Cutting wood ↓*	declining livelihoods
		Financial →			Collecting honey ↓	Weaving ↑	
		Human ↑*			Goldmining ↓***	Collecting plants to eat ↓	
	Village 3	Natural ↓		Creation of VOI increases intra-community conflict	Agriculture ↑	Agriculture ↑	Significantly more likely to report declining livelihoods
		Physical →			Farming ↑	Farming ↑	
		Social ↓			Cutting wood ↓**	Fishing ↑	
		Financial →			Collecting honey ↓	Collecting deadwood ↑	
		Human →			Goldmining ↓	Collecting honey ↓*	
					PA related work ↑	Collecting medicinal plants ↑	
VOI membership	Members	Natural ↓	VOI members have easier access to natural resources, and are involved in	VOI members have greater knowledge of PA-related rules (Ward et al., under review)	Agriculture ↑	Agriculture ↑	No significant difference
		Physical →			Farming ↑	Farming ↑	
		Social →			Cutting wood ↓***	Hunting ↓	
		Financial →			Collecting	Cutting wood ↓**	
		Human →					

	Non-members	Natural ↓ Physical → Social ↓* Financial → Human →	creation or changing of rules related to forest resources (Ward et al., under review)	VOI members more likely to access NGO development activities	honey ↓ Goldmining ↓*** Other ↑ Agriculture ↑ Farming ↑ Cutting wood ↓ Collecting honey ↓	Agriculture ↑ Farming ↑	No significant difference
Wealth	High	Natural ↓ Physical → Social → Financial → Human →	No significant differences between provisioning ecosystem service use and wealth (Ward et al., under review)	Richer households may be able to use livestock or savings as a buffer against the 'shock' of livelihood restrictions	Goldmining ↓ Agriculture ↑ Farming ↑ Cutting wood ↓*** Weaving ↑ Collecting honey ↓* Goldmining ↓*	Agriculture ↑ Farming ↑ Hunting ↓ Cutting wood ↓	More likely to report improving livelihoods
	Middle	Natural ↓ Physical →			Agriculture ↑ Farming ↑	Agriculture ↑ Farming ↑	

		Social →			Weaving ↓	Hunting ↓	
		Financial →			Collecting honey ↓	Collecting honey ↓	
		Human →			Goldmining ↓		
	Low	Natural ↓			Agriculture ↑	Agriculture ↑	More likely to report declining livelihoods
		Physical →			Farming ↑	Farming ↑	
		Social →			Cutting wood ↓***	Hunting ↓	
		Financial →			Weaving ↑**	Cutting wood ↓*	
		Human →			Collecting honey ↓	Weaving ↑	
					Goldmining ↓*	Collecting plants to eat ↓	
					PA related work ↑		
Gender	Men	Natural ↓	Women were less likely to be VOI members and therefore have less 'power' associated with VOI membership	Typically, male household roles involve forest-related activities	Agriculture ↑	Agriculture	No significant difference
		Physical →			Farming ↑	Farming ↑	
		Social →			Cutting wood ↓***	Hunting ↓	
		Financial →			Goldmining ↓***	Cutting wood ↓*	
		Human →				Weaving ↑	
	Women	Natural ↓			Agriculture ↑	Agriculture ↑	No significant

Physical →	(Ward et al., 2017)	Collecting deadwood ↓***	Hunting ↓	difference
Social →		Collecting medicinal plants ↓***		
Financial →		Goldmining ↓***		
Human →				

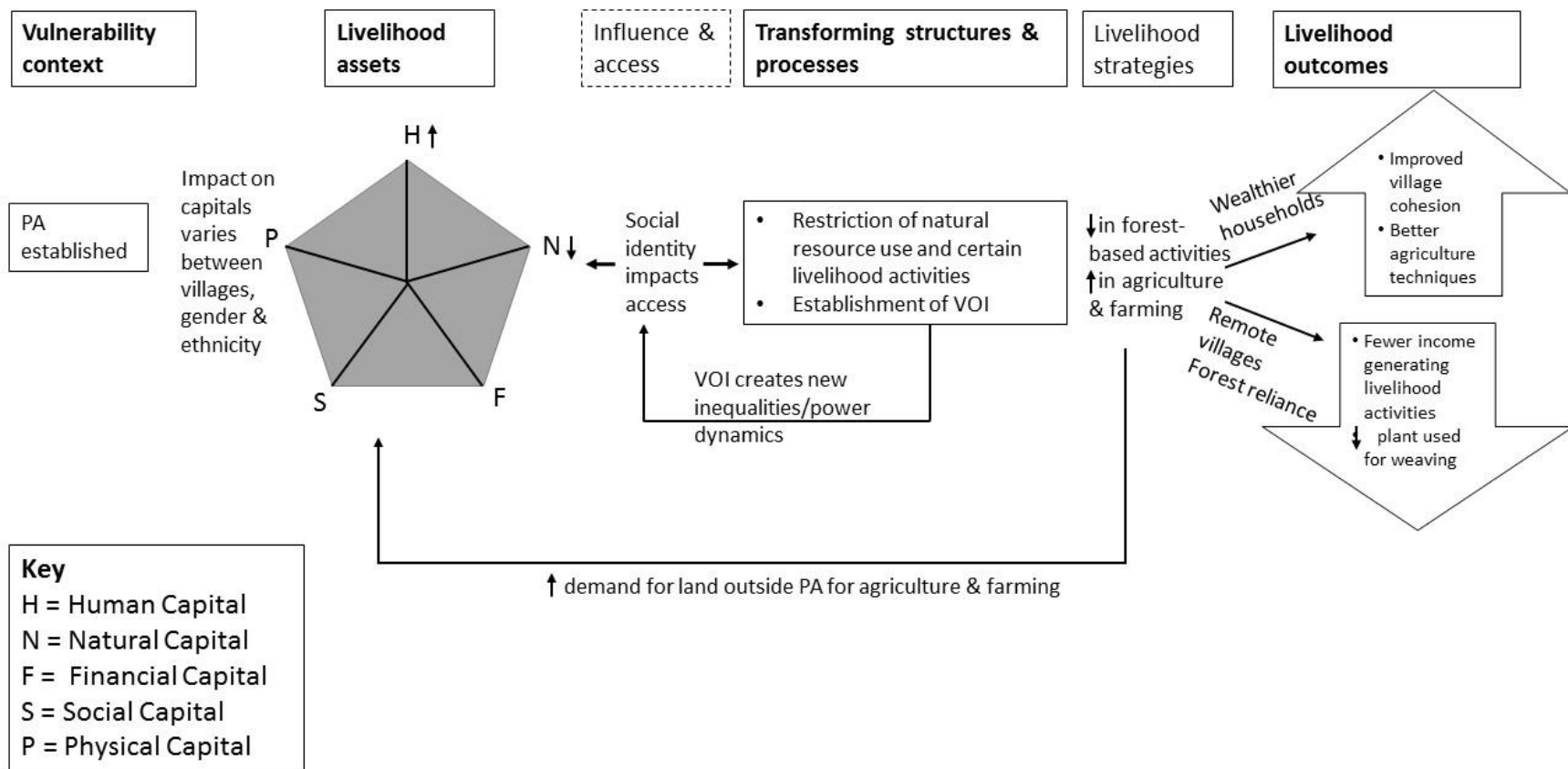


Figure 4-5: Summary of results interpreted via SLF

4.5.3 Governance processes and livelihood impacts

From interview and questionnaire data VOI establishment and the introduction of new rules had the greatest impact on livelihoods across communities (Table 4-4). Establishment of the VOI created new power dynamics and changed inequalities in accessing natural resources. Previous work has shown that VOI members have greater access to forest resources via reduced permit costs and relationships with committee members and patrollers (Ward et al., under review): *“VOI members just talk to the committee to get wood, it is easy. But non-members must get permission from [the NGO] and the ministry so that they can get a permit for taking the wood”* (Village 3, male, VOI member); *“It is easier for VOI members to get access to resources and also cheaper than non-members”* (Village 1, male, VOI member).

The introduction of new rules restricted certain livelihood activities: *“we used to hunt lemurs to eat or sell. Also we used to collect red mantella to sell, and we used to let people cut trees in the forest when they paid us”*. Although PA co-management is between the NGO and local communities, there are set rules and regulations from the government which have to be applied when a PA is created. These relate to the creation of core and sustainable-use zones and the activities allowed and restricted in each: *“in all of the new PAs there are two main zones, the core zone that means the strictly protected area ... But in the sustainable use zone they can do their everyday life activities, like they can collect fuelwood for instance for their subsistence use”* (NGO staff).

Interview data also highlighted the existing strong culture of ‘*firasakina*’ where village members help each other in times of need or during harvest and engage in community work. Interview responses showed conflicting opinions on whether VOI establishment had strengthened or weakened these social ties: *“the VOI creates conflict between members and non-members”* (village 3, male, VOI member); *“cohesion in the community is better because of the VOI”* (village 3, male, VOI member).

The co-management NGO organised development activities such as training and materials for improved agricultural and farming techniques, to

encourage households away from forest-based activities, and this was highlighted as a key benefit from the PA by local community members; “*we have had training for better agricultural techniques*” (village 2, male, VOI member). However, this has been focussed on VOI members: “*this is a pilot project so we start with VOI members*” (NGO staff). Some community members viewed this as not necessarily reaching those households most impacted by the PA and as a sort of favouritism from the NGO “*We haven’t received any training or help, and the jobs always go to the same people*” (Village 3, male, VOI non-member).

4.5.4 Local community perspectives compared to NGO perspectives

The sections above focus on local community perspectives of livelihood impacts and how these relate to co-management, yet it is also important to explore the NGO perspective, and how this compares to local communities, given both communities and the NGO are involved in co-management. There were two key issues from the NGO interview data relating to government involvement and issues with livelihood projects which had been planned to compensate local costs of PA establishment.

Interview data highlighted that there are many aspects of management and rules which are beyond the control of both the NGO and government. For example, the rules surrounding the core zones, restrictions on activities in the sustainable-use zone, and enforcement of those rules: “*The government is in charge to enforce these rules and the government is represented by the ministry of environment, ecology and forests. So the rules come from this ministry and also the application of these rules*” (NGO staff). The NGO perspectives highlight similar problems raised by local communities, and highlight issues of who is truly responsible and accountable for various aspects of PA governance and management.

Prior to establishing the PA, much of the NGO work had focussed on education: “*because the important species of Mangabe are the Indri and the golden mantella and we did lots of education about these species to the primary schools during the creation*”; and also on mapping the potential costs of PA establishment. The PA management plan included a summary

of the potential impacts of PA establishment and the household groups at most risk. These groups included households depending solely on forest-related activities, high use of medicinal plants, low education levels and young households with large families. Costs were identified as prohibiting livelihood activities, and benefits were identified as pride in protecting the environment, protection for sacred forest areas and participation in livelihood projects set up by the NGO. These livelihood projects included poultry farming, bean cultivation, beekeeping, cassava and improved rice cultivation and aimed to substitute potential livelihood losses from forest restriction. Yet interviews with NGO staff showed that these projects had not yet been fully implemented and only involved VOI members, despite PA rules and regulations having been in place since 2008: *“there are still lots of efforts that needs to be done, because these local populations before they were dependent on the natural resources, so they are requesting to better improve their livelihoods. Some of these activities started last year and also we gave training to the local populations in the 10 villages around the PA... about improved agricultural techniques, about rice, beans, maize, compost and so on”* (NGO staff). NGO staff highlighted issues with funding delays, locating the households most impacted, and a mis-match between what their projects were likely to achieve and what community members wanted: *“to get big community projects for example to maintain the roads for transporting their agricultural products and to have also some water for drinking for their health... these kind of projects are beyond our competence but we try to collaborate with other stakeholders who have a competence to do this kind of big projects”* (NGO staff). They also hoped by piloting and evaluating these projects, they could improve them in terms of funding efficiency and providing benefits for households, and that those who had received training might share this knowledge with other households: *“In the long term after these VOI members receive the support it's their turn to support the other villages to better improve their livelihoods... We are now evaluating these households who received our support to see what has happened after the interventions”* (NGO staff).

4.6 Discussion

This study provides further evidence that the costs and benefits of PA establishment are unevenly distributed within and between local communities. This is a common theme throughout the literature relating to local impacts of PA establishment (e.g. Foerster et al., 2011; Gurney et al., 2015). However, this study offers new evidence by taking an in-depth approach to explore what respondents perceive to be the cause of these impacts.

The results suggest that the current set-up of co-management in this case study PA does not allow both co-management partners to equally contribute to decision making. Respondents viewed the main causes of perceived livelihood impacts to be restrictions on certain livelihood activities and access to the forest. Yet interview data showed that both co-management partners (local communities and the NGO) were unable to participate in these decisions as these rules apply to all Durban Vision PAs in Madagascar. In essence, this leads to the PA in reality having similar impacts on the local community as a strictly managed PA would. We acknowledge that co-management arrangements often take time to develop, yet Berkes et al (2017) state that long-term success often depends on the early experience of cooperation amongst stakeholders. This could be overcome by beginning to develop co-management institutions for a longer period before establishing the PA (Chuenpagdee and Jentoft, 2007), although this may conflict with short term conservation priorities of protecting species at risk of extinction.

Gardner et al (2011) stated that Durban Vision PAs did not fully conform to the IUCN categorisation they were given (Categories V and VI) as this assumed positive relationships with natural resource use. The results from this study support this, and also suggest that the PAs do not fully fit into the IUCN shared governance category either. IUCN do differentiate between collaborative governance (where one partner has power to make decisions but must inform or consult with stakeholders), and shared governance (where various partners take decisions jointly) but note that these are both

referred to as co-management (Borrini-Feyerabend et al., 2012). The case study PA could fit into collaborative governance, although we have also shown evidence that not all stakeholders were fully consulted and kept informed. Potentially the shared governance category could be broken up to acknowledge the wide range of realities that can fall into this category. This would encourage greater consideration given to categorising PAs, as it is important to consider not only who is involved in PA governance, but also how they are involved in order to fully understand which governance type is appropriate. How stakeholder groups are involved in co-management will have the greatest impact on social and ecological outcomes.

The findings from this study have useful lessons in terms of improving co-management as an equitable approach to PA management in Madagascar and beyond. Particularly in the case of distributive equity, as we found that the benefits and costs of PA establishment were distributed unevenly and that VOI members have benefitted more from NGO livelihood projects. Remote communities, poor households and those with high forest resource reliance were more likely to report negative outcomes. Uneven participation in PA governance may allow for elite capture, thereby increasing inequitable sharing of PA-related benefits (Persha and Andersson, 2014), and previous research in this PA has shown that certain groups were more likely to participate (Ward et al., 2017). When investigating impacts of National Parks in Thailand, Sims et al (2010) found higher levels of inequality in communities near National Parks, and related this to elite capture of PA-related tourism benefits. There were clear differences in PA-related impacts between villages. Other studies have found similar results and suggest that this shows determinants of human well-being are highly localised and that it may not be possible to generalise this to wider spatial scales (Foerster et al., 2011; Gurney et al., 2015).

Benefits from PA co-management were identified as training or receiving materials from the co-management NGO. However, these projects had a large time-delay between PA establishment and projects being trialled and eventually rolled out to all households affected. Households with experience of past conservation interventions and unfulfilled promises will shape their

willingness to engage in future conservation interventions and overall perception of conservation (Rakotonarivo et al., 2017). This shows the importance of considering the short-term costs of changing rules and access when a PA is established. Establishing any benefits will take time due to a need to identify households, communicate with them and uptake of projects (Poudyal et al., 2016; Mackinnon et al., 2017).

It is important to note that distributing benefits and costs equally amongst local communities will not necessarily be considered equitable by them, and deciding how conservation-related compensation should be distributed is highly complex. A study in Rwanda found that residents preferred PA-related benefits to be distributed equally, rather than directed to those most in need or who faced the highest PA-related costs (Martin et al., 2014). Although we did not assess this, other studies have shown that in Madagascar, secure land tenure and agricultural training may be more preferred compensation from conservation interventions than cash payments. In some cases financial rewards can 'crowd out' more intrinsic conservation motivations (Agrawal et al., 2015), and may not reach the target households (Poudyal et al., 2016). This highlights the importance of exploring local cultural norms, before deciding what is 'equitable', and that there is unlikely to be a 'one size fits all' approach. Dawson et al (2017) argue that this is why promoting equity in conservation will need to take a reflexive and adaptable approach.

The findings of this study are also relevant to procedural equity, which is built on the inclusive and effective participation of all relevant actors in affairs that concern them (Schreckenberg et al., 2016). We found that community participation in governance associations did not provide any real opportunity to contribute in certain aspects of decision making, and was causing conflict in some of the villages. Local participation in PA governance is often a key part of PA co-management, yet if stakeholders feel that they are being excluded or ignored in decision-making, this can lead to mistrust and intentional rule-breaking, alongside the obvious equity implications. For example, local communities were seen killing an endangered radio-collared sifaka (*Propithecus edwardsi*) near a PA in Madagascar, in response to being excluded from an area where they had traditionally gathered forest

resources (Jones et al, 2008). Co-management approaches where communities are empowered to contribute to decision-making are more likely to meet socio-economic and biological goals (Oldekop et al., 2016).

Our results show a shift in livelihood strategies, from forest-based strategies towards agriculture and farming. This is commonly pursued and promoted by NGOs and policy-makers in areas where there is high pressure on biodiversity (e.g. Freudenberger, 2010), and not just related to co-management. In this study the NGO identified it as a key strategy to reduce local costs of PA establishment. Yet it also puts greater pressure on the land outside of PAs, as more is converted to agricultural land (Ament and Cumming, 2016). Such “leakage” reduces connectivity between patches of forest, and other potentially valuable non-forest habitat types, which may have negative impacts on biodiversity (Almeida-Rocha et al., 2017). There is also an ethical aspect to this shift, as is shown in the present study, with respondents highlighting a decline in *herana* (*Cyperus latifolius*) used to weave products such as mats and bags, an activity mostly undertaken by women. If this decline continues there may be negative impacts for households reliant on weaving to generate income.

Shifting livelihoods from a range of forest-based activities to mainly agriculture, farming and weaving may also have implications for their long-term sustainability. This may be exacerbated in the future due to climate change, unpredictable seasons and increasing cyclone threat (Waeber et al., 2016). While the introduction of new varieties of crops may be more resistant to future climate changes, interventions need to align with household needs and aspirations, and fulfil the same range of functions as the original activity or activities (Wright et al., 2016). There also needs to be more consideration given to cultural implications of a livelihood shift; other studies in Madagascar have highlighted the cultural importance of *tavy*. It is seen as an identity or way of life, rather than just an agricultural method, and a way to provide for future generations: “*land ... is seen as the most valuable inheritance they can leave their children*” (Rakotonarivo et al., 2017 p7).

Restricting unsustainable livelihood activities is likely to provide global benefits in the long term, such as carbon storage (Kremen et al., 2000), as

well as local benefits such as catchment area protection and other locally-derived ecosystem services (Neudart et al., 2016). Yet there will always be short-term local costs which need to be stated explicitly, with compensation or alternatives provided in order to mitigate their impacts. In this study, we found that although the NGO had identified households who would be most impacted by PA establishment, planned compensation and livelihood projects had been delayed leaving those households to bear the costs of newly implemented rules. If short term costs are minimal or will lead to longer term gains, then they may be considered more acceptable. For example, seasonal octopus fishery closures in Madagascar were considered acceptable by local communities as they only represented 15% of local fishing grounds, so the short-term cost was bearable by local households (Harris, 2006). Interventions need to be designed with short term and long-term benefits in mind. Agricultural training and introduction of new varieties of crops may increase harvests in the future, but will not compensate for loss of income or subsistence in the short term. This is an issue raised in sustainable development interventions as well. Suggested solutions have included subsidies to encourage up-take of interventions and publically-funded payment for ecosystem services schemes to acknowledge the societal benefits provided (Dallimer et al., 2016).

The SLF provides a useful framework for understanding a range of impacts, including social and human factors which have historically had less attention when investigating impacts of conservation interventions (Mckinnon et al., 2016). It also enables exploration of how co-management can interact with impacts. In this study we have extended its application to enable explicit focus on differences between groups. Our study considers local perceptions of changes, rather than measured changes. Perceptions are an undervalued form of evidence in conservation science and alongside qualitative data can provide enhanced understanding of local equity concerns (Bennett, 2016; Dawson et al., 2017). However, it is also important to consider that perceptions may be unreliable in terms of the objective truth and cannot determine causation. For this study perceptions were the most appropriate evidence to look at as people are less likely to cooperate when they perceive a lack of fairness, and perceived inequity may result in attempts to resist or

undermine PA rules (Hirsch et al., 2011). Perceptions of unfairness therefore lead to higher PA management costs (Pascual et al., 2014), sometimes through active resentment, such as vengeance killing of charismatic fauna (Jones et al., 2008), whereas positive perceptions of governance and social outcomes are associated with improved effectiveness (Oldekop et al., 2016; Koning et al., 2017). Quantitative large-scale studies have provided useful data, and can show whether costs and benefits are shared equally, but without in-depth studies we are unable to know whether this is considered equitable by local stakeholders, and this is crucial for both moral and instrumental reasons. We need to ensure that there are studies of both types and use the data together when measuring success of PAs and conservation interventions more generally, as well as when identifying where equity concerns need to be addressed.

4.7 Conclusion

Although co-managed PAs may overall be more effective in meeting biological and socio-economic goals than PAs of other governance types, this paper has presented further evidence to show that it is necessary not only to consider who is involved in PA co-management, but more importantly how they are involved. PA governance and management is a dynamic process, and the findings provide a snapshot of current perceptions. Nevertheless, there are useful lessons that can be learned from these results, these are particularly relevant for the new network of co-managed PAs in Madagascar but also globally. Careful consideration is needed as to whether these new Durban Vision PAs in Madagascar can truly be defined as co-managed when there are certain rules and regulations which local communities and NGOs are not involved in designing. The IUCN governance typology may need greater flexibility in its descriptions of how co-management partners may be involved in PA governance and management. We also presented further evidence showing that: (1) Policy-driven livelihood shifts need to take short-term and cultural implications into account. To understand what these may be, we need to take a more holistic view of what is incorporated in a livelihood; and (2) Qualitative data and in-

depth studies enable us to explore perceptions of local changes associated with conservation interventions. These are vital in order to obtain a better picture of who is winning and losing out from co-managed PAs and to identify where actions need to be taken to mitigate the situation for those who bear high costs.

4.8 References

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Chapter 5 Discussion and Conclusion

5.1 Introduction

Previous research has shown that co-managed PAs are more likely to achieve their socio-economic and conservation goals than other governance types, but still are not always successful (Oldekop et al., 2016). As this governance type becomes more widespread, and efforts intensify in order to meet Aichi target 11, it is important to understand how and why this governance type does not always meet its aims. This thesis has taken a mixed methods approach to explore the links between PA governance, access to ecosystem services and livelihood impacts. It has investigated perceived drivers and barriers to participation in PA governance, explored the factors affecting ES access and assessed how PA co-management can impact on local livelihoods. Through the three results chapters, the thesis has made a range of contributions to current knowledge, which can serve to enhance the theory and practice of PA co-management in Madagascar and beyond.

This chapter discusses the key findings from each chapter, the links between them and what they mean in relation to co-management and Aichi target 11 for Madagascar and more widely. Section 5.2 revisits each of the three research objectives in turn to draw out the key findings from each of the empirical chapters, and discuss the extent to which this thesis has helped to advance our understanding of the links between PA co-management, local community participation, access to ES and livelihood impacts. Section 5.3 shows how the insights from the three research objectives can be viewed together in relation to conservation equity and highlights the key considerations that need to be borne in mind if PA co-management is going to make progress towards achieving Aichi target 11 of 'equitably' managed PAs. This informs Section 5.4, which highlights the implications of thesis findings for policy and practice. Section 5.6 outlines priorities and opportunities for further research. Lastly, Section 5.7 provides a summary of the contributions to this field of study.

5.2 Revisiting the research objectives

Results chapters 2-4 have focused on examining research objectives 1-3. The main findings of these chapters, how they advance the knowledge in this area and policy recommendations is summarised in Table 5-1. The insights gained from each individual research objective, and how these interlink is considered in section 5.3.

Chapter 2 considered participation in PA governance, and perceived benefits and costs of this linked to a co-managed PA. The chapter was conceptually grounded in the Theory of Planned Behaviour (TPB). Findings showed that participation was uneven and unrepresentative; respondents perceived high costs and limited benefits to participation; and these were unevenly distributed within and between communities. These results illustrate the potential and limitations of applying TPB to conservation-related behaviours, as application of TPB enabled identification of drivers of participation, but also missed some factors which were identified in qualitative data. Findings bolster evidence that PA-related benefits and costs are unevenly distributed, and provide new empirical insights that demonstrate that local community participation in PA governance can also be unevenly distributed within and between communities.

Chapter 3 considered access to ES and how this links to PA governance structures. Here, the research was conceptually grounded in the IPBES framework. Findings showed that respondents considered provisioning services most important, however they also valued regulation and cultural services. Institutions and social identity had the greatest impact on ES access. VOI members and individuals who knew VOI committee members perceived greater access than non-members. Findings showed that co-management may be shifting ES access inequalities rather than reducing them.

Chapter 4 considered livelihood impacts of PA co-management, and the distribution of these. This chapter was conceptually grounded in the Sustainable Livelihoods Framework (SLF). Findings showed that the majority of respondents perceived negative livelihood impacts from PA co-

management; impacts were unevenly distributed within and between communities; and PA regulations and livelihood activity restrictions were the main drivers of negative livelihood outcomes. These results indicate that co-management governance processes and structures can lead to local perceptions of inequity.

Table 5-1: Summary of research objectives, key findings and policy recommendations

Chapter	Objective	Justification for chapter	Framework	Key findings	Importance of findings	Policy implications
2	<i>To determine who participates in PA co-management community associations, why they choose to participate, and understand how the costs and benefits of participation are distributed within and between communities</i>	Although participation is considered crucial to the success of PAs (Ojha et al., 2016), few studies have investigated individuals' decisions to participate and what this means for how local people experience the costs and benefits of conservation	Theory of Planned Behaviour	<ol style="list-style-type: none"> 1. Respondents who were strongly reliant on provisioning ES, had a positive attitude towards governance associations and were male were most likely to participate 2. Respondents perceived limited benefits and high costs to participating 3. Benefits and costs were unevenly distributed within and between local communities 	<p>The findings from this chapter illustrate the potential and limitations of applying TPB to conservation-related behaviours.</p> <p>This study provides further evidence that PA-related benefits and costs can be unevenly distributed, and it also shows that participation can be unevenly distributed</p>	<ol style="list-style-type: none"> 1. Understand the heterogeneous nature of communities 2. Ensure all households are represented in governance participation 3. Understand differences in the meaning of forest protection 4. Target interventions to reach households most in need, avoiding elite capture
3	<i>To explore how and why governance structures affect access to</i>	It is important we understand how new forms of environmental governance impact	Modified IPBES	<ol style="list-style-type: none"> 1. Provisioning, regulating and cultural services were all highly valued by 	The findings indicate that co-management maybe shifting inequalities in ES	<ol style="list-style-type: none"> 1. Recognition of short-term costs of reduction in ES access

	<i>ecosystem services, and how this access is distributed across different groups within villages (e.g. VOI membership)</i>	access to ES, as this in turn shapes the distribution of related costs and benefits. This information will enable progression towards targets of ensuring local communities are not negatively impacted by conservation efforts and the global benefits these can provide		respondents	access rather than reducing them	<ol style="list-style-type: none"> 2. Inclusion of a diversity of cultural and social values given to ES and related livelihoods 3. Full representation of all household types in community associations
4	<i>To identify how co-management governance processes impact upon livelihood strategies and outcomes, how these impacts are distributed within and between villages</i>	Wealth of evidence documenting local costs of PAs (Ferraro, 2002; Agrawal and Redford, 2009; Franks et al., 2014; Gurney et al., 2015), but very few studies linking these to governance processes and taking an in-depth view to understand how the costs are distributed within	Modified SLF	<ol style="list-style-type: none"> 1. The majority of respondents perceived negative livelihood impacts 2. Impacts were distributed unevenly within and between local communities 3. PA-related rules and regulations restricting forest activities were driving negative livelihood 	Although co-managed PAs may overall be more effective in meeting biological and socio-economic goals than PAs of other governance types, this paper has presented further evidence to show how governance processes can lead to local perceptions of	<ol style="list-style-type: none"> 1. Meaningful local participation in decision-making 2. Taking an adaptable and context dependent approach to understand what is equitable and how to achieve it 3. Recognition of

and between
communities

outcomes

inequity

the holistic
meaning of a
'livelihood',
particularly
relating to
cultural and
social
importance

5.3 Linking PA co-management, ES access and livelihoods together

Combining findings from each research objective enables consideration of the overall aim of the thesis: to explore the role of protected area governance in determining livelihood outcomes via access to ecosystem services and identify how associated benefits and costs are distributed between groups within communities.

Although there has been research relating co-management, ES and livelihoods to PAs (e.g. Macura et al., 2015; Naughton-Treves et al., 2005; Agrawal et al., 2008), there has been less focus on the links between these areas. There are frameworks for assessing 'good governance', evaluating ES and measuring social impacts of PAs (Lockwood, 2010; Peh et al., 2013; Franks and Small, 2016), and a wide range of reviews and assessments of co-management and local community participation (Reed, 2008; De Vente et al., 2016; Sterling et al., 2017). However, it remains a struggle to link these together, even though there are strong indications of links between these areas (Borrini-Feyerabend et al., 2012). Furthermore, where there have been studies linking governance, ES and livelihoods, these have often been at a very broad scale and therefore focussing on ES which are easily measured such as provisioning and regulating rather than cultural services (e.g. Willemen et al., 2013). In response to these omissions, this thesis took an in-depth approach, which enabled respondents to identify ES which they perceived to be most important, captured their subjective changes in livelihoods and ES access and enabled exploration of what was causing these perceived impacts. There have been broad studies comparing different PA governance approaches, but not all PAs within a particular governance type will be managed similarly. Cultural aspects of ES and livelihoods are areas which have been neglected in evaluating impacts of conservation on local communities (Hausmann et al., 2015; Daw et al., 2016), and frameworks tend to focus on provisioning services rather than cultural services as these are easier to measure (Daniel et al., 2012; Ament et al., 2016). ES typology also makes it difficult to define ES in multiple

categories, for example, hunting offers a provisioning service of food but may also be valued as an important cultural activity (Delisle et al., 2017). The IPBES framework improves on this by incorporating non-material ES, but there are few links made to governance and access to ES (Pascual et al., 2017; Díaz et al., 2018). The results from this thesis highlight that local and cultural values given to ES, livelihoods and local institutions need to be understood and incorporated into PA management.

Many studies focus on the trade-offs between different ES beneficiary groups, types of protection and livelihoods over spatial and time contexts i.e. comparing the current distribution of costs and benefits between geographical groups or between current and future generations. For example, strictly protected areas (prohibiting natural resource use or access) may provide regulating services (such as carbon storage) for beneficiary groups further away, whilst removing provisioning services from local beneficiary groups (Kari and Korhonen-Kurki, 2013). Strict protection may also provide ES for future generations whilst current generations face restrictions (Daw et al., 2015; Daw et al., 2016). In this thesis, the case study PA encourages sustainable use of resources through processes of co-management. This has led to perceived immediate local negative impacts whilst providing global and future regulating, provisioning and cultural services. There has been evidence for, and increasing acknowledgement, that restricting natural resource use does not necessarily take into account any cultural or non-material values (Pascual et al., 2017; Delisle et al., 2017). This could be overcome by moving towards a greater understanding and incorporation of socio-environmental dynamics (Velázquez Gomar and Stringer, 2011).

Figure 5-1 builds upon Figure 1.1 (Chapter 1) to demonstrate the links between the theories used in this thesis and the results collected. By combining these frameworks, it is possible to fill gaps in each of the individual frameworks, and also identify where governance, participation, ES access and livelihoods link together. For example, participation in local community governance associations fits into the transforming processes and structures section of SLF, but also influences livelihood strategies due to

training and benefits received by VOI members. ES also fit into both the measurement of natural capital and also map directly onto some forest-reliant livelihood activities. Other studies have highlighted the usefulness of SLF in considering a holistic view of livelihoods. By ensuring all capitals are sufficiently targeted, it enables a multi-dimensional view of livelihoods; something that is frequently lacking, as many conservation studies focus solely on the economic aspects of livelihoods (Mckinnon et al., 2016).

Combining the results from the modified IPBES framework and SLF shows the important of access in both gaining benefits from ES, but also relating to all five of the capitals. Results from Chapters 3 and 4 highlighted that local institutions alongside social identity and relationships had the greatest influence on access in this case study, but this will differ depending on culture and context. Given that institutions play an important role in determining access, application of the TPB enables greater understanding of why individuals choose to participate in local community associations or not. This can provide useful lessons in ensuring all households are able to participate, and therefore decision making regarding access to ES and other livelihood capitals is inclusive and representative. When communities are assumed to be homogeneous, the needs of marginalised or disadvantaged groups can be overlooked or misinterpreted (Dawson and Martin, 2015).

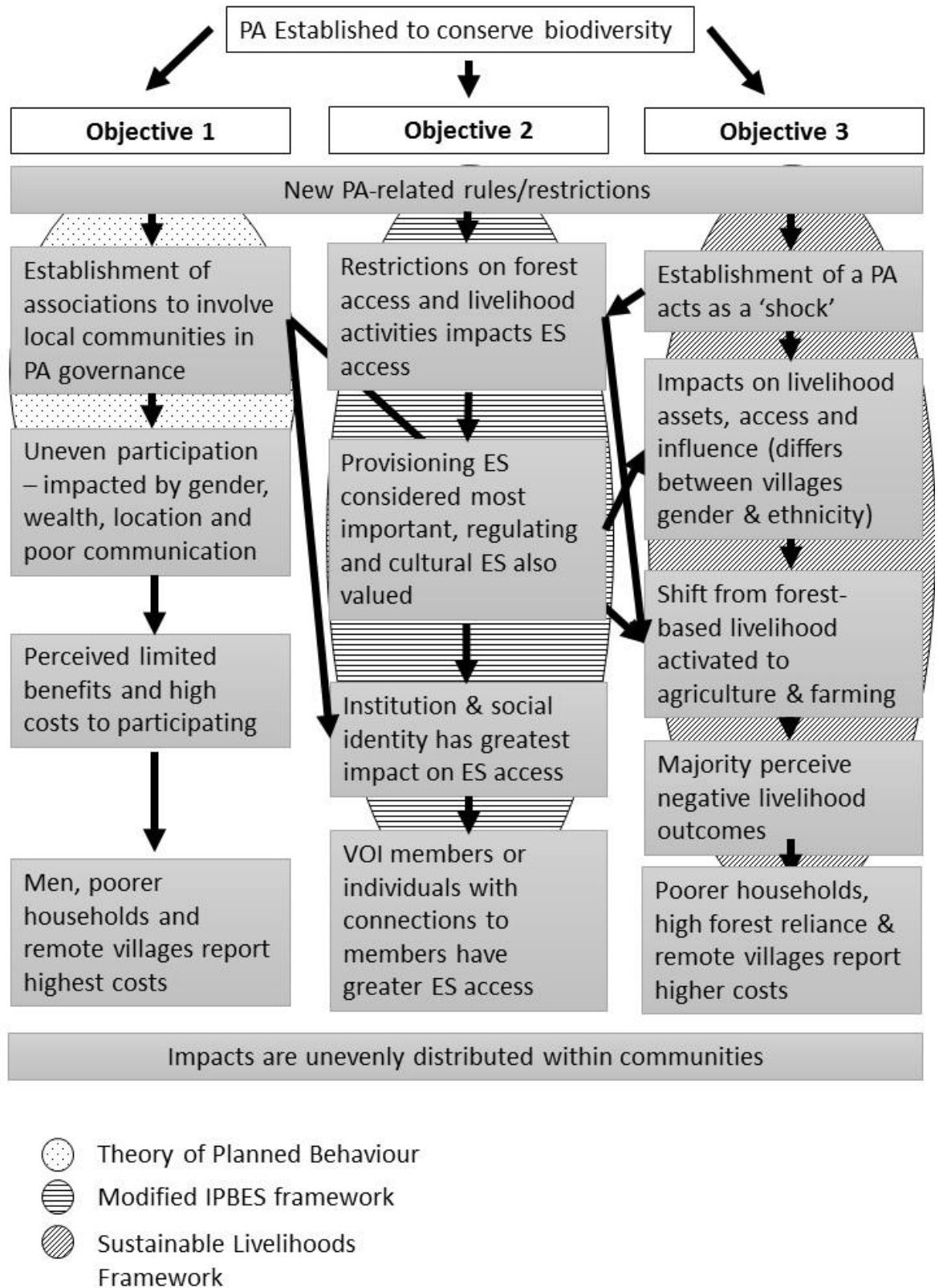


Figure 5-1: Linking theories used in the thesis and results to demonstrate the links between governance, ES access and livelihood impacts

Another framework, currently still under development, which enables exploration of the links between governance ES access and livelihood impacts is the PA-related equity framework (Schreckenberg et al., 2016; Zafra-Calvo et al., 2017). As mentioned throughout the thesis, equity is important in conservation for both moral and instrumental reasons, but also more recently, for political reasons due to the inclusion of the phrase '*equitably managed*' into Aichi Target 11. Building upon the literature discussed in the thesis introduction (Chapter 1), Table 5-2 illustrates the opportunities for PA co-management to be a more equitable approach than other governance types. In summary, by providing a mechanism for local communities to participate in PA decision-making, co-management should be able to incorporate local knowledge, cultural values, resolve disputes between stakeholders and ensure any PA benefits are equitably shared. However, the results from this thesis find areas where the case study PA is not able to deliver on this potential. This is expanded further for each equity dimension in the paragraphs below. The policy implications of this are discussed further in section 5.4.

In terms of distributional equity, Chapter 2 illustrated that participating in PA governance was perceived to have limited benefits and high costs, and that these were distributed unevenly within and between communities. Chapter 3 built upon these findings by illustrating that access to ES was also distributed unevenly. Chapter 4 tied this together by showing that respondents perceived greater negative livelihood impacts than positive, and these were also unevenly distributed. There are different ways of distributing benefits and costs, and what is considered equitable will vary depending on context and culture and this should be decided by local stakeholders (Pascual et al., 2010). At a very minimum it is agreed that locally appropriate compensation should be given to the most vulnerable households impacted by conservation regulations (Adams et al., 2010; Zafra-Calvo and Moreno-Peñaranda, 2018), but in this thesis there was evidence that the poorest, most reliant on forest resources and most remote households, bore the greatest costs. The local costs of PA establishment are well documented in the academic literature (Schreckenberg et al., 2010; de Lange et al., 2015), and there have been a few studies demonstrating the uneven distribution of

these costs (Martin et al., 2013). All three results chapters of the thesis add to this evidence base. However there have been few studies which investigate the perceived costs and benefits of local participation in a PA governance system which is established specifically with the assumption that it will improve equity (Borrini-Feyerabend et al., 2012). Chapter 2 provided new evidence that participation in PA co-management is perceived to have high costs and limited benefits and these are also unevenly distributed.

Procedural equity concerns the inclusive and effective participation of all relevant stakeholders. Findings from all chapters illustrated that there was mixed understanding among community respondents on how decisions regarding PA co-management were made, and who was involved in making these decisions. A lack of participation and transparency in decision making can undermine the effectiveness of conservation (Richmond and Kotowicz, 2015) and efforts to improve equity (Borrini-Feyerabend et al., 2012), leading to conflict (Holmes, 2007; Jones et al., 2008). Chapters 2 and 4 illustrated that rather than providing opportunities for raising concerns and offering resolution to conflicts, co-management and establishment of VOIs had increased intra-village conflict. Various other instances of conflict between groups of people generated by conservation interventions have been documented (Sommerville et al., 2010; Larson et al., 2016). This thesis adds to the evidence base showing that when local stakeholders feel excluded from or ignored in PA decision making, this can generate or exacerbate conflict. Recommendations to resolve conflicts include appropriate compensation, meaningful involvement of local stakeholders in decision making, recognition of rights to access natural resources and training of PA managers to work with local communities. These are all aspects which should be included in PA co-management Table 5-2, but in this case study PA are missing or not applied to their full extent. Consideration of this in relation to policy implications for Madagascar and beyond is further explored in Section 5.4.

Recognition has been mostly neglected in assessments of PA impacts on local communities, which has led to physical eviction or economic and

symbolic exclusion (Brockington and Igoe, 2006). Chapter 2 illustrated that not all social groups are represented in VOIs. Chapters 2 and 3 showed that cultural meanings and importance given to ES and livelihood activities, were not appropriately addressed in PA management plans, yet it is culture and identity which will shape understanding of what requires and deserves conservation, and this may not always align between local communities and NGOs or governments (Martin et al., 2016). Respondents had also lost access to rice fields within the PA, for which they felt they had not been adequately compensated. Again this may be a mismatch between what 'outsiders' may view as simply a livelihood activity which can be easily substituted, while local communities perceive rice farming as an important cultural identity (Desbureaux and Brimont, 2015). Failure to recognise local social norms and cultures may lead to mistrust, conflict and a lack of support to PA management decisions (Brooks et al., 2012; Hicks and Cinner, 2014), problems which are illustrated throughout the thesis findings.

Table 5-2: Equity dimensions, relation to participation in PA co-management and thesis findings (McDermott et al., 2013; Schreckenberget al., 2016; Zafra-Calvo et al., 2017)

Equity dimension	Relation to community participation in PA management	Findings from thesis	Thesis chapter	Policy recommendations	Barriers	Opportunities
Distribution	Community governance associations enable understanding and design of intervention to minimise costs and maximise benefits	Perceived negative impacts of PA establishment and participating in PA governance	2 & 4	Members should be fairly compensated for time taken to participate in PA governance	Co-management associations can be susceptible to dominance by certain groups leading to elite capture (Persha and Andersson, 2014)	Perceptions of equity may differ (Martin et al., 2014) therefore working with co-management associations can ensure distribution mechanisms are agreed by the majority of affected households
		PA-related benefits not reaching all affected households	2 & 4	Utilise co-management associations to design locally appropriate mechanisms of benefit distribution		
	Community associations able to shape distribution of PA-related benefits in a culturally appropriate way	PA-related costs and benefits perceived to be unevenly distributed within and between communities	2 & 4			
		Access to provisioning ES unevenly distributed	3			
Procedure	Meaningful participation of all relevant actors in PA decision making via community	Confusion over who is involved in PA management decisions	2, 3 & 4	Ensure that co-management associations provide a mechanism for	Risk of dominance of certain groups (Persha and Andersson,	Local participation in decision making should enable greater transparency and

associations				local community members to be involved in decisions which will impact them	2014; Virah-Sawmy et al., 2014), and not all impacted households may be able to travel to meetings	accountability (Sterling et al., 2017)
Local community able to access information about management and planning	Confusion about PA-related rules and regulations	2				
Resolution of PA-related disputes	Increased conflict within communities, with NGO and with 'outsiders' – suggests limited access to justice	2 & 4		Co-management associations can provide a mechanism to solve conflicts with outside mediation when necessary	Risk of dominance by certain groups, meaning other groups may not feel able to raise their concerns (Persha and Andersson, 2014; Virah-Sawmy et al., 2014)	Reduction of conservation-related conflict can improve both conservation and socio-economic outcomes (Richmond and Kotowicz, 2015; Zafra-Calvo et al., 2017)
Local community members able to raise concerns via community association	Perceived increased conflict between VOI members and non-members	2 & 4				
Involvement of local community from PA establishment ensures free, prior and informed consent (FPIC)	Not all households aware of governance associations/PA rules	3		Identification of all households impacted by PA and effective communication to these	Lack of census information, poor infrastructure and remote households make this	When implemented correctly FPIC can ensure fair dialogue in agreements and negotiations

					difficult and time-consuming (e.g. Poudyal et al., 2016)	between local stakeholder groups and outsiders (Zafra-Calvo et al., 2017)
Recognition	All cultural identities/social groups represented in decision making via community associations	Not all social groups/household types are represented in PA governance associations (particularly women and older individuals)	2	Ensure community associations are representative of all social groups	It may be difficult to identify and involve all social groups in remote areas	This may lead to disagreements or conflicts between different social groups with different priorities and values (De Vente et al., 2016)
		Lack of recognition of cultural importance of certain livelihood activities	4			
	Traditional knowledge systems included in PA management	Lack of inclusion of cultural ES in PA management/forest access rules	3	Involve local communities from establishment of PA onwards to ensure cultural values are incorporated	Cultural aspects to ES or livelihoods are difficult to value (Infield and Mugisha, 2013)	Incorporation of traditional knowledge systems gives a greater evidence base for conservation intervention design (Etiendem et al., 2011)

Local stakeholders gain or retain their rights in PA establishment or management	Lack of access to previously owned fields now inside core zone of PA	4	Involve local communities in mapping out areas currently used before PA establishment	It may be difficult to identify and involve all social groups in remote areas There may have to be trade-offs in land-use	Recognition of rights is important from a moral viewpoint and may also help to increase trust, reduce conflict and increase support for PA management (Brooks et al., 2012)
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5.4 Madagascar context

It is important to consider how the research presented in this thesis fits into both the national and local Madagascar context discussed in section 1.2.5 and 1.4.3.2.

Firstly with regards to land tenure contestation, a few respondents highlighted rice fields within the PA which they were no longer able to access or use. This situation highlights the conflict between *de jure* state owned forest land and *de facto* customary land tenure, where households are able to claim forest land that they have cleared. Local community associations should be able to resolve these conflicts with adequate compensation for lost land or land swaps for area outside the PA (Berkes, 2017). But in this case where the VOI does not fully represent communities, it is difficult for households to communicate these issues. This is parallel to the issue of *tavy*, which as discussed throughout the thesis, is also an important part of culture, inheritance for future generations and represents a symbol of resistance to state ownership of land (Kull, 2004; Pollini, 2012; Desbureaux and Brimont, 2015; Rakotonarivo et al., 2017). Although legally *tavy* is prohibited, the enforcement of this ban has been weak (and potentially non-existent in remote areas) and in rural areas farmers continue to use it following local norms (Kull, 2014; Rakotonarivo et al., 2017). The view of local communities regarding *tavy* is in direct conflict with conservation priorities, as it remains a key driver of deforestation both locally and nationally. Co-management between VOIs and conservation NGOs will therefore need to carefully navigate these conflicts, ensuring time and space for discussion from both sides (Gardner, 2014).

From a local perspective, as expected, the majority of respondents were Bezanozano ethnicity. There were a few respondents of other ethnicities who had migrated to the area for agricultural land but less discussion of artisanal mining opportunities attracting migrants. This may be because respondents were aware of legal restrictions on mining and therefore were less willing to discuss it. However, mining had been a fairly common income generating livelihood activity for households in the past, particularly in village

2. Engagement in mining didn't appear to differ between ethnicities. Alternatively migrants attracted by mining potential often set up their own communities, as in the case of Bermainty (North of Mangabe PA) which generated a lot of controversy in 2016 (Jones, 2016). The few respondents of a different ethnicity stated that they felt excluded from participating in the VOI, yet it is important that they are represented. Although only a minority of the population, migration of different ethnicities in other regions of Madagascar has led to changes in local cultural norms and *fadys* relating to natural resource use. For example, previous studies have shown that rapid migration of different ethnicities can erode or change local *fadys* particularly linked to bush meat consumption (Jenkins et al., 2011; Golden and Comaroff, 2015b; Golden and Comaroff, 2015a). Although this thesis did not investigate specific *fadys* and changes over time, there was no mention of this within interviews. This may become an issue in the future, if migration increases however.

5.5 Implications of the research

The research presented in this thesis is specific to the case study co-managed PA. Whilst caution should be applied in drawing general conclusions from case studies (Yin, 2014), a number of key insights can nevertheless be outlined for co-managed PAs in Madagascar and globally. These insights, whilst providing valuable theoretical and empirical contributions to the academic debate on PA co-management and conservation-related equity, can also be used to outline a number of practical recommendations, as well as highlighting where further research is needed. Results demonstrate that the involvement of local communities in co-managed PAs does not necessarily reduce local costs, or improve their distribution.

5.5.1 Implications for co-management in Madagascar and globally

PA co-management, particularly involving local communities, aims to reduce local costs of PA management whilst conserving biodiversity (Carlsson and Berkes, 2005; Borrini-Feyerabend et al., 2012). Overall this governance

approach is more likely to meet its aims than other PA governance approaches, yet not always (Oldekop et al., 2016). Globally there has been an increase in this governance type, increasing from 2.43% in 1999 to 10.9% in 2014 of PAs registered in the World Database of Protected Areas (WDPA Juffe-Bignoli et al., 2014).

The Durban Vision PA network in Madagascar provides a globally relevant example of the increased use of co-management approaches, as it aimed to increase PA coverage whilst encouraging sustainable use of natural resources and reducing costs for local communities. This should be achieved, according to the Durban Vision, by local community involvement in PA co-management, via community associations (VOIs) (Gardner et al., 2013). There has nevertheless been limited in-depth investigation into whether Durban Vision PAs really are meeting these aims (Gardner et al., 2013; Virah-Sawmy et al., 2014). Results from this thesis show that whilst PA coverage has increased due to new PA establishment using co-management approaches, local community involvement is not necessarily reducing costs, and there is mixed evidence towards the encouragement of sustainable resource use. Results suggest that this is due to a lack of decision-making power for local community associations and NGOs. However, it should be noted that this thesis does not provide a comparison of PA governance approaches, and co-management may still provide better results than other existing governance approaches. This is discussed further in Section 5.6.

Respondents perceived high costs and limited benefits to participating in co-management (Chapter 2). Local community associations were not fully representative of the population, as women were less likely to participate. This is an issue that has been highlighted in the Durban Vision PAs before, as associations are often built upon pre-existing institutions which tend to be dominated by older men (Virah-Sawmy et al., 2014). By working with communities to establish new VOIs, NGOs should work on ensuring VOIs are fully representative of all social groups within communities. In order to ensure that traditionally marginalised groups, such as women, are included, some PAs in Madagascar have worked specifically with women's groups to

avoid any biases (e.g. Virah-Sawmy et al., 2014), but there is a lack of data on the success of this approach. The majority of respondents also perceived negative livelihood impacts due to establishment of the PA (chapter 4). Negative livelihood impacts and conflict are costs commonly associated with PA establishment, and may be experienced alongside positive impacts or at the expense of any positive impacts (Schreckenberget al., 2010; de Lange et al., 2015). Yet if VOIs are fully involved in PA decision making, it should be possible to identify potential costs and design locally appropriate benefit mechanisms (Pascual et al., 2010), as well as cost-mitigation mechanisms. NGOs need to work with VOIs in order to identify potential costs and co-design locally appropriate benefit mechanisms. These could include land rights, monetary compensation, agricultural training to improve yields, improving access to selling agricultural goods to markets and hunting allowances.

Co-managed PA-related benefits were highlighted by some respondents, yet it appeared that they were not distributed evenly or to those most impacted by PA establishment (chapter 4). Again, previous studies have suggested that building VOIs upon existing institutions may enable elite capture, by allowing more 'powerful' households to gain a greater share of any benefits (Gardner et al., 2013; Virah-Sawmy et al., 2014). The study area, and the majority of Madagascar, is extremely inaccessible, households are often remote, and potentially several days' walk from the nearest roads. This, combined with a lack of census population data available, means that it can be extremely difficult to identify which households should be involved in PA co-management and will be impacted by PA establishment. This risks exacerbating elite capture as benefits may only go to those easiest to identify or reach. Another study identified that REDD+ payments were not necessarily reaching the households most in need of compensation in Eastern Madagascar (Poudyal et al., 2016). This impacts the ability of those responsible for implementing the Durban Vision to both ensure effective participation and equitable distribution of any benefits. Realistic time and funding will be needed to ensure that affected households are able to participate and receive any PA-related benefits, compensation or at a very minimum ensure they do not face any costs.

Marine projects in Madagascar have succeeded in spreading their messages via social marketing, which is the application of commercial techniques to achieve positive social change (Gildas Andriamalala et al., 2013). These techniques included designing a campaign brand and slogan, which were spread via use of t-shirts, radio broadcasts, posters and songs (Gildas Andriamalala et al., 2013). There have been suggestions that terrestrial conservation could learn from these successes. Yet this may be easier in a coastal environment, where movement between villages is facilitated by boat movements along the coastline. Other terrestrial PAs in Madagascar have been more successful at establishing links with eco-tourism and commercial ventures, but there is no data on whether these benefits are equitably shared within communities or provide enough to compensate for loss of forest access and other livelihood activities, and these projects can only succeed in areas with existing infrastructure and market access (Gardner et al., 2013). This highlights a need for VOIs to be representative of local communities as a first step to support equitable sharing of PA benefits; for more research to understand their distribution; and to address the logistical difficulties of establishing co-management in difficult terrain with limited infrastructure.

Respondents placed high importance on provisioning, regulating and cultural ES, yet co-management governance processes had shifted inequalities in access to ES (chapter 3). There was little evidence of the incorporation into PA management of the cultural or spiritual values placed on ES by local communities. This may particularly be an issue in Madagascar, where traditionally communities have strong spiritual links to the forest and other environments (Jones et al., 2008; Golden and Comaroff, 2015b). For example, in the study area it is taboo to kill or eat indri (*Indri indri*) as they are believed to represent human ancestors, whereas aye ayes (*Daubentonia madagascariensis*) are believed to represent evil and may be killed upon sight. These beliefs may be beneficial or negative to conservation, and previous projects have misunderstood these beliefs leading to unexpected conservation outcomes (Lingard et al., 2003; Jones et al., 2008; Golden and Comaroff, 2015b; Thorburn and Kull, 2015). For example, in Eastern Madagascar local beliefs offer protection to the Critically Endangered

radiated tortoise (*Geochelone radiata*), yet oversimplification of this belief meant that conservation NGOs misunderstood that this belief didn't extend to stopping 'outsiders' from killing or removing tortoises (Kaufmann, 2014). This is not specifically related to co-management, but by ensuring local community participation is meaningful, it may be easier to understand the links and clashes between conservation goals and local beliefs and prevent (or at least reduce) conflict (Holmes, Smith, et al., 2017).

Overall, livelihoods in the study area had shifted from forest-based livelihoods towards agriculture and farming, which suggests that the PA may have made some progress towards reducing unsustainable use of natural resources within the protected site. However, restricting natural resource use in the PA may have displaced these activities to non-PA land. This has been documented in other PAs in Madagascar and globally – both co-managed and not (Ewers and Rodrigues, 2008; Allnutt et al., 2013). Many respondents stated that the reported shift in livelihood activities had negative impacts on their lives. Shifting agriculture, or *tavy*, is also highly valued from a social-cultural perspective, and therefore should not be solely considered as a subsistence or income generating activity that can be easily replaced (Desbureaux and Brimont, 2015; Rakotonarivo et al., 2017). There has been similar mis-matching of ES values with traditional hunting practices; where they are valued as provisioning services, missing the cultural values placed upon them. (Delisle et al., 2017). Other studies on Durban Vision PAs have shown mixed effects on encouraging sustainable resource use, with greater success in marine PAs than terrestrial ones. Gardner et al (2013) state that Durban Vision marine PAs tend to focus more on encouraging better management of natural resources whilst terrestrial PAs focus more on reducing natural resource use and substituting livelihood activities. There is also evidence that enabling continued use of natural resources may have negative impacts on biodiversity and development, thereby defeating the aims of the Durban Vision PAs. Traditional resource use in Madagascar can have negative impacts on biodiversity, and particularly on rare endemic species, for example deadwood collection limits habitat availability for vertebrate species (Gardner, 2011; Gardner et al., 2016). At the same time, a dependence on low-value natural resources may create 'poverty-traps',

where users are unable to transition out of natural resource-dependent livelihood activities (Dorward et al., 2009; Vira and Kontoleon, 2012), although these livelihood activities also provide a safety net for sudden changes or shocks (Bennett, 2010). PA management plans therefore need to be dynamic and evolve in response to developing livelihoods, whilst ensuring that restrictions are not impacting livelihood resilience (e.g. in the case of fluctuating weather and climate).

There are no published comparisons between the existing state managed and new Durban Vision co-managed PAs. From the findings in this thesis and existing published studies, there may be some evidence that the new Durban Vision co-managed PAs may have fewer impacts on local communities (Ferguson and Gardner, 2010; Ferguson et al., 2012; Gardner et al., 2013; Corson, 2014; Virah-Sawmy et al., 2014). Yet they are by no means perfect, as the issues outlined above demonstrate. There are also a lack of published studies on whether the new Durban Vision PAs differ in terms of meeting their biodiversity conservation goals compared to existing state-managed PAs. A general review found that community forest management in Madagascar had no discernible effect on reducing deforestation, however this is not specifically focussed on co-managed PAs so further research is needed (Rasolofoson et al., 2015). Comparing the two PA governance approaches in Madagascar was not the aim of this thesis, however the results highlight that more research is needed to understand the differences between these approaches and their outcomes. This is discussed further in section 5.6.

Globally, PA co-management is increasing, and many of the lessons drawn from this thesis can also be applied to contexts beyond Madagascar. Results highlighted a need to understand and incorporate local cultural and social values particularly relating to the environment, livelihoods and equity. This means that there may not necessarily be a one size fits all approach to co-management that can be rolled out globally.

Local community participation in co-management can only provide the benefits it aims to if participation is meaningful, via representation of all social groups/household types in community associations (Reed, 2008; CBD

and UNEP, 2010; De Vente et al., 2016). This can enable the determination of local and cultural values, informing conservation, equity, development projects and compensation. This is an issue which has been repeatedly raised in conservation interventions (e.g. UNEP, 2017). Studies have shown the positives of ensuring a gender balance, particularly in cases where different genders may have different roles relating to the environment and livelihoods (Agarwal, 2009; Kaeser et al., 2016). This also applies to other social divisions beyond gender, such as ethnicity, age, wealth etc. It may nevertheless be difficult to attain a gender balance in certain cultures/contexts where institutions are traditionally male-dominated, particularly if community participation relies on pre-existing local institutions (Virah-Sawmy et al., 2014). Even when creating new groups or associations which are representative, certain groups may not feel as though they have the ability or right to speak up. If certain groups or individuals dominate community associations, this may also lead to a risk of elite capture, and there is evidence that co-management approaches are particularly susceptible to this (Waylen et al., 2013; Persha and Andersson, 2014). However, where time and resources are devoted to long term capacity building of community associations, and particularly focussing on involving marginalised groups, these barriers can be overcome (Brooks et al., 2012; Chinangwa et al., 2016).

Compensation or related projects need to identify and reach households most in need. There is often a lack of recognition that interventions can create future benefits alongside short-term costs, therefore locally appropriate short-term compensation should be designed into interventions alongside creation of future benefits (Neudart et al., 2016). Again these need to be locally and culturally appropriate. For example, a previous study found that people in Madagascar did not think that infrastructure improvement was sufficient compensation for PA-related costs as this was something that should be provided by the government (Rakotonarivo et al., 2017). This highlights the importance of involving local households in the design of development projects or PA-related benefits, and communicating with local government departments.

5.5.2 Implications for equity in Madagascar and globally

Equity is important for both moral and instrumental reasons (McDermott et al., 2013; Klein et al., 2015; Schreckenberg et al., 2016). Co-management, especially involving local communities, theoretically could be a more equitable approach than other PA governance approaches. Yet the results from this research highlight areas where co-management may fall short of meeting these aims. This has already been discussed in Section 5.3, so here I will focus on the policy recommendations from these findings. This is particularly important in terms of meeting the Aichi Target 11, and ensuring that all PAs are managed '*equitably*' by 2020. The Protected Planet report (2016) highlighted that there has been limited data or progress on this aspect since 2010.

Distributional equity is the dimension which has had the greatest attention in academic literature evaluating impacts of PAs, although this has largely focussed on material or provisioning ES which are more easily measured than regulating, cultural or non-material ES (de Lange et al., 2015; Mckinnon et al., 2016). Yet, the present study still finds evidence for the same issues reported from PA establishment, generally, over a decade ago (e.g. Brockington, 2004). Weak governance or elite dominance will impede distribution of PA-related benefits equally or to those most impacted (Neudart et al., 2016), and benefits of PAs and conservation more generally still tend to accumulate globally whilst the costs are felt by local communities (Oldekop et al., 2016). In order to improve distributional equity, co-management associations should allow local stakeholders to identify locally appropriate benefits, and distribution mechanisms for these (Dawson et al., 2017). This may differ depending on context, for example, in Rwanda residents opted for PA-related benefits to be distributed equally, rather than directed to those most in need or impacted most (Martin et al., 2014). This provides an opportunity for NGOs involved in co-management to ensure that local stakeholders are involved in identifying compensation or benefits and also how these should be distributed, and shows that it may not be appropriate to apply ideas from one site to another.

Before PA establishment, co-management associations can enable identification of potential costs for local communities and which households will be most impacted by these (Borrini-Feyerabend et al., 2012). This means that setting up local community associations and participation needs to happen from the very beginning of PA establishment (De Vente et al., 2016; Sterling et al., 2017). It may be difficult to ensure that associations are not dominated by certain individuals and groups, enabling elite capture and masking impacts felt by marginalised groups (Persha and Andersson, 2014). This is where it is crucial that associations are not built upon existing community institutions and the time is taken to identify all local stakeholders and involve them (Virah-Sawmy et al., 2014). However, in some cases, it may be difficult to reconcile cultural appropriateness and reduction of dominance by elites, and this will need to be evaluated for individual cases (Martin et al., 2014). Recognition is needed that participation in associations may have costs for local stakeholders, and they should be fairly compensated for this (Ward et al., 2017). Particularly in remote areas, it may be time-consuming for stakeholders to travel to meetings. Projects which have overcome these barriers tend to be long-term, with longer establishment periods in order to gain trust of local communities, build relationships and improve local governance capacity (Chinangwa et al., 2016). These timelines tend not to fit with short-term NGO and donor driven agendas. If communities are let down by conservation projects and unfulfilled promises they will be less willing to engage in the future (Rakotonarivo et al., 2017).

Findings relating to procedural equity relate to fully involving community associations in decision-making from establishment through to daily management. Community associations should also provide a space for resolving conflicts and disseminating information relating to PA rules and co-management (Schreckenberget al., 2016). As mentioned previously, there is a risk of local community associations being dominated by certain groups. On the other hand, local community associations have the ability to increase accountability and transparency (Sterling et al., 2017), but this can only be effective if associations are truly involved in decision-making (Reed, 2008). In the absence of meaningful involvement, there is the potential to

exacerbate conflict, as demonstrated in chapter 2, where association members felt they were held accountable by other community members for decisions that they were not involved in making.

Recognition has had limited attention when evaluating local costs of PAs, until recently (Martin et al., 2014; Martin et al., 2016; Vuola and Pyhälä, 2016). In this thesis findings emphasise representation and involvement of all social groups within communities, as well as inclusion of their cultural values given to ES and livelihood activities. This will require substantial time and resources devoted to identifying all stakeholders and enabling them to participate in decision-making. Mixed methods approaches will be vital to this, as qualitative data will ensure depth of understanding given to cultural values, alongside quantitative approaches which will enable breadth of information and collecting views from a greater number of respondents (Blaikie, 2000; Cresswell and Plano Clark, 2011). Activities such as participatory mapping or scenario planning can provide valuable tools to understand current use of natural resources and landscapes and future changes (Gardner et al., 2015; Oteros-Rozas et al., 2015).

Frameworks for assessing equity in PAs have recently been developed, but with limited real-world application and they lack clear methodology for tracking progress towards equitable management (McDermott et al., 2013; Zafra-Calvo et al., 2017; Dawson et al., 2017). Other authors have argued that equity is too context-dependent for a set of standardised measurements (Dawson et al., 2017). However, there needs to be a way of measuring PA-related equity, to ensure that future research is focussed where it is needed and that we can measure progress towards Aichi Target 11. The results from this thesis align with other researchers who have stated that equity measurements will need to be locally and culturally appropriate (Martin et al., 2014; Dawson et al., 2017), but that these may be difficult to identify or quantify. Another challenge to measuring equity is that equitable PA management will be a dynamic and constantly evolving process as local communities change, rather than having a fixed end point to aim for. Assessment will need to focus on evaluating and reflecting on processes, such as empowerment, regularly. Qualitative approaches may be more time

consuming, but are more likely to uncover areas of inequity and understand local perceptions of what is and is not considered to be equitable.

Many newly established PAs are co-managed, and some have argued that this is, in one sense, a measure of progress towards PA-related equity (Juffe-Bignoli et al., 2014; UNEP-WCMC and IUCN, 2016). Yet the results from this thesis (and some other studies) show that PA co-management does not necessarily lead to equitable processes or outcomes. Firstly, from a moral perspective, findings show that local communities lack agency in decisions which impact them, and perceive high costs and limited benefits. Secondly, previous studies have shown that when local communities perceive benefits from conservation, interventions are more likely to meet their aims. Finally in terms of a shift to PA co-management contributing towards meeting Aichi target 11 which seeks to ensure equitable management, this section has raised issues in how to assess and measure PA-related equity.

5.5.3 The challenge of a win-win for conservation and development

The rise of the win-win rhetoric has led to a call for projects that benefit both conservation and development goals. This is particularly evident in the recent agreement of the sustainable development goals (SDGs). Yet, there is limited evidence to support the view that it is possible to provide development benefits whilst conserving biodiversity or specific species and habitats (Roe et al., 2012). Some studies have found links between PA establishment and reduced poverty (Andam and Ferraro, 2010; Clements et al., 2014), however these studies were carried out at broad scales and only focussed on economic indicators. These conclusions could be strengthened with the addition of qualitative data at local scales, incorporating a wider range of potential PA-related costs and benefits across a range of different capitals to reflect multi-dimensional poverty, and investigating how these are distributed within and between communities. As is reiterated throughout this thesis, economic measures can only give us a limited idea of impacts and costs, and benefits are often unevenly distributed at a much smaller scale.

Madagascar's Durban Vision PA network exemplifies the challenges of meeting potentially conflicting goals, by prioritising both biodiversity conservation and promoting sustainable natural resource use in order to provide benefits for local communities (Gardner et al., 2013; Virah-Sawmy et al., 2014). Although this thesis has not explicitly focused on conservation progress, chapters 2-4 indicate limited perceived benefits and high costs for local communities and their uneven distribution within and between communities. Without data on species and habitat conservation, it is not possible to conclude whether a trade-off is being made in terms of prioritising conservation over development. Nor is it possible to tell that whether by trying to focus on both conservation and development together, the PA is unable to meet either of its objectives. Other studies suggest mixed results on both conservation and development goals, and call for more in-depth research to understand conditions for success (Gardner et al., 2013; Virah-Sawmy et al., 2014; Gardner et al., 2016). Many studies have highlighted that there will always be trade-offs when establishing PAs but being more up-front about these choices from the beginning may prevent costs being borne by those least able to communicate these issues (McShane et al., 2011; Hirsch et al., 2011).

The current donor agenda drives the inclusion of development projects within conservation projects. Whilst this is important given all the aforementioned evidence about equitable conservation being more ethical and likely to achieve conservation goals; this can lead to poorly designed development interventions, implemented by organisations and individuals with limited development experience (Roe et al., 2012). Interdisciplinary approaches are needed to identify these trade-offs, as natural scientists are able to evaluate biodiversity implications, whilst social scientists can evaluate development and equity implications. Although there is now widespread recognition of the importance of interdisciplinary work in conservation (Mascia et al., 2003; Sandbrook et al., 2013; St. John et al., 2014; Bennett, Roth, Klain, Chan, Christie, et al., 2017), a number of barriers still exist.

Firstly social sciences or political ecology approaches have been critiqued in some areas of conservation for raising issues rather than providing solutions (Redford et al., 2008). Yet, conservation and development can only move forward by understanding where and why interventions are not succeeding (Balmford and Knowlton, 2017; Balmford, 2017) and what characterises pockets of successful practices. In this thesis I provide suggestions and solutions to the issues my findings have uncovered in order to push beyond this barrier. Secondly, most conservation scientists are trained in the natural sciences, with limited understanding and experience of social science approaches, assumptions, techniques and jargon. There is a need for greater interdisciplinary training in order for effective communication between disciplines, and correct application of social science tools and methods to conservation issues as well as ensuring conservationists have the necessary skills to manage stakeholder engagement processes.

5.5.4 Utilising a mixed methods approach

Even with greater incorporation of the social sciences into conservation science, qualitative data and perceptions remain an undervalued form of evidence in conservation (Newing et al., 2011; Drury et al., 2011; Bennett, 2016). The use of qualitative methods enables us to explore perceptions of local changes associated with conservation interventions and provide rich insight to supplement quantitative analyses (Bennett and Dearden, 2014; Bennett, 2016; Waeber et al., 2017). By combining various data collection techniques, it is possible to design a more comprehensive set of research questions and collect a richer, stronger range of evidence (Newing et al., 2011; Yin, 2014). Use of mixed methods is therefore vital in order to obtain a better picture of who is winning and losing out across both conservation and development dimensions, which in turn is vital to make conservation approaches more equitable for both moral and instrumental reasons (Schreckenberg et al., 2016; Law et al., 2017).

Mixed methods approaches can be challenging due to the expertise needed in both method and analyses types. Use of social science approaches in conservation has sometimes been criticised for lacking the same rigorous design given to ecological approaches (St. John et al., 2014). However, this

can be very easily rectified with appropriate training, reading and speaking with method-related experts.

Use of several different methods can sometimes generate mismatching results. However, this provides an opportunity for triangulation, and offers an ability to catch any results which may have been missed by using a single method (Tashakkori and Teddlie, 1998; Cresswell and Plano Clark, 2011). Where results are in conflict, it is possible to refer between the two. In this thesis, there were no conflicts between the data types but there were occasions where the qualitative approaches picked up issues which were missed by quantitative approaches, such as in Chapter 2 where qualitative data highlighted social factors which were missed by quantitative model data. As this was a factor mentioned in many of the qualitative interviews, this was included alongside the findings from TPB in the chapter's discussion and conclusions. Qualitative data may be used to inform quantitative data collection, or to expand on results found by quantitative methods (Rakotonarivo et al., 2017).

5.6 Future research directions

Future research can build further on the methodological, conceptual and empirical insights from this thesis, and throughout this discussion chapter there have been a number of research questions and gaps highlighted by the results from this thesis.

Madagascar

Are the results from this case study replicated in other Durban Vision PAs in Madagascar?

The Durban Vision PA network set out to increase PA coverage whilst providing local benefits and encouraging sustainable resource use, introduction of a different PA governance type to those pre-existing in Madagascar (Gardner et al., 2013; Virah-Sawmy et al., 2014). This thesis presented an in-depth case study approach to understanding whether it meets these aims, providing evidence that it may not and outlining recommendations to improve this. Madagascar is an extremely diverse

country, in terms of culture, landscape and biodiversity. Yet there are very few in-depth studies evaluating these new PAs. Further in-depth case studies would allow us to explore further how this new governance type plays out in reality, whether these new PAs are succeeding in other regions in Madagascar and to identify what role local context plays in PA co-management.

Are Durban Vision PAs in Madagascar meeting both their ecological and social aims?

This thesis has been solely focussed on the social impacts of co-managed PAs, and it has shown that co-managed PAs may be failing in some ways to meet their aims of reducing PA-related costs. Yet this reduction of costs and provision of benefits for local communities is only one goal of Durban Vision PAs, and it is also important to understand whether they are meeting their conservation aims (Gardner et al., 2013; Virah-Sawmy et al., 2014). Further studies could aim to evaluate both social and ecological data, to evaluate whether this new governance type is succeeding at protecting biodiversity alongside providing socio-economic benefits, or at least reducing costs. Considering the amount of evidence suggesting that win-wins for conservation or development are unlikely to succeed (Pullin, 2015), such a study could also identify if there are trade-offs being made in order to meet one set of aims. Results from these studies could therefore provide useful policy recommendations for Madagascar, and the Durban Vision PAs, and also globally in whether it is possible to achieve win-wins for conservation and development.

How do Durban Vision and state-managed PAs in Madagascar differ in their ability to conserve biodiversity and reduce PA related costs for local communities?

The new Durban Vision co-managed PAs aimed to reduce PA-related costs compared to existing state-managed strictly protected PAs. This was to be achieved via co-management between local community associations and a 'promoter', with PAs zoned into sustainable use and strictly protected areas (Gardner et al., 2013; Virah-Sawmy et al., 2014). The existing PA network in Madagascar continues to be state-managed and strictly protected, i.e. no

local access for natural resource use. Currently there are few comparisons of how these different PA governance types vary in meeting conservation aims and their impacts on local communities. A comparative study of existing state-managed PAs and co-managed Durban Vision PAs would enable exploration of how governance types and processes can impact conservation aims and lead to differing impacts on local communities.

Global

How do perceived livelihood impacts of PAs vary from establishment through to management?

The results from this thesis provide a snapshot of current perceptions, although the research design takes this into account, and co-management is a dynamic process (Carlsson and Berkes, 2005; Lyver et al., 2014). It would be interesting to take a longitudinal data collection approach to understand how co-management governance, local participation, ES access and perceived livelihood impacts vary throughout PA establishment and management in the longer term. This could inform assessments on PA-related equity, by exploring how PA governance might evolve and change in response to community dynamics, alongside documenting whether trade-offs change over different timeframes. This is not possible within the constraints of PhD research, but would make an interesting extension of the findings. Data collection could take place before, during and on multiple occasions after PA establishment. Longitudinal studies of PA-related impacts already exist but tend to focus more on collecting quantitative data (e.g. Clements et al., 2014; Beauchamp et al., 2018). By incorporating qualitative data into longitudinal studies, this would allow more in-depth exploration of why and how changes are taking place, rather than just monitoring what the changes are.

Are the findings from this case study PA applicable to co-managed PAs in other countries?

This thesis focusses on a case study PA in Eastern Madagascar, which provided various advantages in terms of exploring perceptions of local changes in participation, ES access and livelihoods in-depth. Case studies can provide recommendations and lessons applicable to similar contexts, or

comparisons to different contexts. Yet currently, there are few in-depth studies of PA co-management and implications for ES access, livelihood impacts and participation. By replicating the methods and drawing on the conceptual underpinnings used in this study in other contexts in Madagascar and globally, this could help to provide insight into which aspects of PA-related equity and co-management are context dependent and which aspects (if any) are globally applicable.

Do different PA governance approaches lead to different equity and conservation outcomes?

As mentioned above, this would be particularly interesting in Madagascar where there is a clear divide between PA governance types. But it would also be both interesting and useful to expand this globally to compare different governance approaches. This has been already done to some extent on a very broad scale (Macura et al., 2015; Oldekop et al., 2016). However, the findings from this thesis highlight the need to incorporate more qualitative evidence.

Do equitable PA approaches help to achieve biodiversity conservation goals?

Throughout this thesis it has been reiterated that an equitable approach is important for both moral and instrumental reasons (Schreckenberg et al., 2016; Law et al., 2017). Yet, there is fairly limited evidence on whether and how equitable approaches achieve conservation goals. Further case-studies on different governance types, how governance processes link to each dimension of equity, identification of any trade-offs, and equity outcomes would enable answering of this question, which is vital in terms of improving PA equity globally.

5.7 Conclusion

Co-managed protected areas are generally more likely to achieve socio-economic and biological goals than other governance-types, yet this is not always the case. In 2010, signatories to the CBD Aichi Targets pledged to not only increase PA coverage by 2020, but also to ensure '*equitable*' management of these. In order to improve PA-related equity, we need to understand why involvement of local communities in PA governance may not always meet its aims. This thesis explored the relationships between PA co-management, local community participation, access to ES and livelihood impacts. The mixed methods and case study approach enabled this thesis to make empirical and theoretical contributions toward advancing our knowledge in these areas.

Results from this thesis demonstrated that involvement of local communities in co-managed protected areas does not necessarily reduce local costs, or improve their distribution. Findings from this study suggest that consideration of certain factors may increase the chances of PA co-management meeting both conservation and socio-economic goals. Firstly, approaches need to be adaptive and context-specific, in order to understand and incorporate local cultural and social values; particularly regarding the environment, livelihoods and equity. Secondly in all contexts approaches need to ensure meaningful local participation in decision making, via representation of all social groups in community associations. Thirdly conservation interventions often create future benefits alongside short-term costs for local communities. These costs need to be recognised and locally appropriate short-term compensation designed into interventions. Finally, qualitative data and perceptions are an undervalued form of evidence in conservation. In this thesis their use has enabled exploration of perceptions of local changes associated with conservation interventions and provided rich insights to supplement quantitative analyses. Mixed-methods approaches are vital in order to obtain a better picture of who is winning and losing out from conservation interventions and to inform solutions towards improved equity. By considering these factors, PA managers and policy-makers in Madagascar

and beyond can take steps to help co-management to meet its aims of reducing local PA-related costs, moving towards a more equitable form of conservation in order to meet the Aichi Target 11 of ensuring all PAs are ‘*equitably managed*’ by 2020, and the Sustainable Development Goals in 2030.

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Chapter 6 Appendices

Appendix A : Ethics Form and Approval

A.1 Ethics Form

UNIVERSITY OF LEEDS RESEARCH ETHICS COMMITTEE APPLICATION FORM

Please read each question carefully, taking note of instructions and completing all parts. If a question is not applicable please indicate so. The superscripted numbers (eg⁸) refer to sections of the guidance notes, available at <http://ris.leeds.ac.uk/uolethicsapplication>. Where a question asks for information which you have previously provided in answer to another question, please just refer to your earlier answer rather than repeating information. Research ethics training courses: <http://www.sddu.leeds.ac.uk/research-innovation/research-ethics-training-and-guidance>

To help us process your application enter the following reference numbers, if known and if applicable:

Ethics reference number:	AREA 14-123
Student number and/ or grant reference:	200888311

PART A: Summary

A.1 Which [Faculty Research Ethics Committee](#) would you like to consider this application?²

- Arts and PVAC (PVAR)
- Biological Sciences (BIOSCI)
- ESSL/ Environment/ LUBS (AREA)
- MaPS and Engineering (MEEC)
- Medicine and Health (Please specify a subcommittee):
 - School of Dentistry (DREC)
 - School of Healthcare (SHREC)
 - School of Medicine (SoMREC)
 - Institute of Psychological Sciences (IPSREC)

A.2 Title of the research³ Protected area governance, ecosystem services and livelihoods in Madagascar	
A.3 Principal investigator's contact details⁴	
Name (<i>Title, first name, surname</i>)	Miss Caroline Ward
Position	PhD Student
Department/ School/ Institute	Sustainability Research Institute
Faculty	Environment
Work address (<i>including postcode</i>)	University of Leeds, Leeds LS2 9JT
Telephone number	07772035275
University of Leeds email address	Eecwa@leeds.ac.uk
A.4 Purpose of the research:⁵ (Tick as appropriate)	
<input checked="" type="checkbox"/> Research <input type="checkbox"/> Educational qualification: Please specify: _____ <input type="checkbox"/> Educational Research & Evaluation ⁶ <input type="checkbox"/> Medical Audit or Health Service Evaluation ⁷ <input type="checkbox"/> Other	
A.5 Select from the list below to describe your research: (You may select more than one)	
<input checked="" type="checkbox"/> Research on or with human participants <input type="checkbox"/> Research with has potential significant environmental impact. ⁸ If yes, please give details: <hr/> <input checked="" type="checkbox"/> Research working with data of human participants	
<input checked="" type="checkbox"/> New data collected by qualitative methods <input checked="" type="checkbox"/> New data collected by quantitative methods <input checked="" type="checkbox"/> New data collected from observing individuals or populations <input type="checkbox"/> Research working with aggregated or population data <input type="checkbox"/> Research using already published data or data in the public domain <input type="checkbox"/> Research working with human tissue samples (<i>Please inform the relevant Persons Designate if the research will involve human tissue</i>) ⁹	

A.6 Will the research involve any of the following:¹⁰ (You may select more than one)

If your research involves any of the following an application must be made to the National Research Ethics Service (NRES) via IRAS www.myresearchproject.org.uk as NHS ethical approval will be required. There is no need to complete any more of this form. Contact governance-ethics@leeds.ac.uk for advice.

- Patients and users of the NHS (including NHS patients treated in the private sector)¹¹
- Individuals identified as potential participants because of their status as relatives or carers of patients and users of the NHS
- Research involving adults in Scotland, Wales or England who lack the capacity to consent for themselves¹²
- A prison or a young offender institution in England and Wales (and is health related)¹⁴
- Clinical trial of a medicinal product or medical device¹⁵
- Access to data, organs or other bodily material of past and present NHS patients⁹
- Use of human tissue (including non-NHS sources) where the collection is not covered by a Human Tissue Authority licence⁹
- Foetal material and IVF involving NHS patients
- The recently deceased under NHS care
- None of the above

You must inform the Research Ethics Administrator of your NRES number and approval date once approval has been obtained.

If the University of Leeds is not the Lead Institution, or approval has been granted elsewhere (e.g. NHS) then you should contact the local Research Ethics Committee for guidance. The UoL Ethics Committee needs to be assured that any relevant local ethical issues have been addressed.

A.7 Will the research involve NHS staff recruited as potential research participants (by virtue of their professional role) or NHS premises/ facilities?

- Yes No

If yes, ethical approval must be sought from the University of Leeds. Please note that NHS R&D approval is needed in addition: www.myresearchproject.org.uk. Contact governance-ethics@leeds.ac.uk for advice.

A.8 Will the participants be from any of the following groups? (Tick as appropriate)

- Children under 16¹⁶ **Specify age group:**

- Adults with learning disabilities¹²

- Adults with other forms of mental incapacity or mental illness
- Adults in emergency situations
- Prisoners or young offenders¹⁴
- Those who could be considered to have a particularly dependent relationship with the investigator, e.g. members of staff, students¹⁷
- Other vulnerable groups
- No participants from any of the above groups

Please justify the inclusion of the above groups, explaining why the research cannot be conducted on non-vulnerable groups.

It is the researcher's responsibility to check whether a DBS check (or equivalent) is required and to obtain one if it is needed. See also <http://www.homeoffice.gov.uk/agencies-public-bodies/dbs> and http://store.leeds.ac.uk/browse/extra_info.asp?modid=1&prodid=2162&deptid=34&compid=1&prodvarid=0&catid=243.

A.9 Give a short summary of the research¹⁸

*This section must be completed in **language comprehensible to the lay person**. Do not simply reproduce or refer to the protocol, although the protocol can also be submitted to provide any technical information that you think the ethics committee may require. This section should cover the main parts of the proposal.*

Protected areas (national parks, nature reserves etc.) are one of the most commonly used conservation tools, covering 15.4% of the earth's surface in 2014. However there is mixed evidence on their impact towards and within local communities, with cases documenting both exacerbation and a reduction in poverty. People rely on resources from the natural environment, often described as ecosystem services, for their livelihoods. If a protected area is established, it will affect the ecosystem services that people can access and use. With protected area coverage set to increase in order to meet the Convention of Biodiversity (CBD) Aichi Target (in 2020), it is crucial that we understand the balance of positive and negative impacts on human livelihoods that arise from protected area establishment, the distribution of these benefits and costs, and the factors that might cause this to vary, including those related to governance. The aim of this project is to investigate, in the case of Madagascar, how different governance processes affect people's access to these ecosystem services and how this affects their livelihoods. This will be conducted using two case study protected areas, co-managed by NGOs and local communities, in Eastern Madagascar via a range of quantitative and qualitative methodologies.

The research will be split into two sections; a scoping trip during which I will be interviewing key informants and deciding which protected areas will be best suited as case studies. Using the data that I collect on the scoping trip I will develop my research project and return to complete my data collection.

A.10 What are the main ethical issues with the research and how will these be addressed?¹⁹

Indicate any issues on which you would welcome advice from the ethics committee.

Positionality

Coming from a different ethnic background to those I am interviewing I am aware that this will affect how they view me and potentially their answers to my questions. This will be particularly relevant in the more remote communities. As I will be working with translators in these areas this will also add another dimension as to how they are viewed by the communities. There will be a tricky choice of balancing the choice of a translator from the area who will know of any local cultural customs but not having anyone who knows the participants and is likely to have an effect on their responses, I will have to decide which is most appropriate at the time. Malagasy dialects can differ between areas and therefore it is likely that I'll need multiple translators during my fieldwork.

I will make sure that all participants are aware that I am working independently from NGO or protected area management, via an introductory village meeting.

Cultural contexts

Although I will want my research to be distanced and separated from the NGO/protected area management, it may be necessary to be introduced to the village president via these managers in order to gain legitimacy. However after this I will make it clear that I am working independently from them, and will reiterate this message in introductory meetings within the villages and before every interview and questionnaire takes place.

Sensitive topics/illegal behaviours

The ecosystem services/natural resources which people are accessing may involve illegal behaviours; therefore they may be unwilling to talk to me. This is one of the reasons that I am going on a scoping trip, to find out whether people will be willing to talk to me about these potentially sensitive subjects. I will take reasonable steps to ensure confidentiality and anonymity for all participants and will not be sharing results between informants or with the protected area managers without prior consent.

Avoid raising expectations

I will maintain transparency with all informants about the purpose of my research and that I am independent from any government or NGOs who may have introduced me to participants. I will organise an introductory village meeting in the communities where I work, in order to introduce my research team and the aims of the project.

Data protection/anonymity of participants

Names and positions may need to be recorded from key informant interviews for future reference, however they will be assigned pseudonyms and the document with real names will be stored securely on a laptop with password protection. Names will not be used in any publications unless permission is given. In some cases, identifying the position/role of an interviewee will make the person's identity apparent. Therefore, informants will be asked as to whether their role can be named in the research. For the questionnaires, pseudonyms will be given immediately and there will be no need to store any names. However, village names and the protected area will not be anonymised and therefore participants may be able to be identified from their answers and village location. Participants will be made aware that this may be the case before questionnaires are conducted and will therefore be able to consider whether they still wish to take part in the study.

Obtaining free, prior and informed consent

In the communities surrounding the protected areas there is likely to be a high level of illiteracy. Therefore asking participants to read and sign a consent form would not be appropriate. I will also need to work with translators in the more remote locations. They will make sure that informants understand the aim and implications of the study and, participants will be asked to give verbal consent. This will need to be carefully framed in a way that is accessible and easily understood without any jargon, for example instead of talking about ecosystem services it may be framed as the benefits (and drawbacks) people have from the forest. Informants will be informed that they can end the interview at any

stage, and ask for their answers to be withdrawn from the study. Due to the remote location of some of the villages, it will not be possible for participants to withdraw their answers from the study once the research team has left that area.

Possibility of work causing reputational damage

There may be issues with protected area managers or government officials not wanting any results which reflect negatively on them to be published or released. I will discuss this with the NGO/protected area management at the beginning of the project as there is potential for my results to not show what they are hoping for and therefore they must be aware of this. Publications will go ahead, even if the NGO are not happy with the results; however publications will be shared with NGO or protected area authorities before being published.

PART B: About the research team

B.1 To be completed by students only²⁰

Qualification working towards (e.g. Masters, PhD)	PhD
Supervisor's name (Title, first name, surname)	Professor Lindsay Stringer
Department/ School/ Institute	Sustainability Research Institute
Faculty	Environment
Work address (including postcode)	University of Leeds, Leeds LS2 9JT
Supervisor's telephone number	+44(0) 113 34 37530
Supervisor's email address	L.stringer@leeds.ac.uk
Module name and number (if applicable)	n/a

Part C: The research

C.1 What are the aims of the study?²² (Must be in language comprehensible to a lay person.)

The aim is to understand how governance processes of protected areas may affect people's access to ecosystem services i.e. their ability to gain benefits from the environment, and how this affects their livelihoods. The research will be based on case studies in Madagascar.

C.2 Describe the design of the research. Qualitative methods as well as quantitative methods should be included. (Must be in language comprehensible to a lay person.)

It is important that the study can provide information about the aims that it intends to address. If a study cannot answer the questions/ add to the knowledge base that it intends to, due to the way that it is designed, then wasting participants' time could be an ethical issue.

The research design will follow a mixed methodology, combining both quantitative and qualitative methods to provide a detailed understanding of the governance processes in place, what ecosystem services people are accessing and how this affects their livelihoods. There will be two distinct phases to the research:

Scoping Trip:

Firstly, I will undertake a scoping trip. This will allow me to visit potential case study sites, where I will be able to **interview** key informants from both the villages and protected area management committees. I will also be interviewing informants based in Antananarivo who are involved in protected area management. These interviews will follow a snowball sampling technique to find informants who are involved in protected area management.

Focus group discussions in villages will supplement the information gained from the interviews to further understand what ecosystem services people are accessing and how. The interviews with protected area managers and government officials will be conducted by myself with a translator present if needed. However the interviews and focus groups conducted in the villages will be conducted by a translator. Interviews will be open or semi-structured in order to gain the most amount of relevant information as possible. I will also aim to pilot some **participatory methods**, such as ecosystem service and stakeholder mapping. In ecosystem service mapping I will ask participants to physically map out where they are accessing forest resources from. For stakeholder mapping I will ask participants to list all of the stakeholders related to management of the protected area and then indicate who is most important or has the most power.

The data gathered on this trip will enable me to decide which areas will provide the best opportunities to answer my research questions and find out more information in order to continue to develop my project ideas. This will also give me a chance to pilot some of my methodologies, such as questionnaires and participatory exercises (including ecosystem service and stakeholder mapping). Although the main aim of this trip is to decide on research sites and methods, some of the data collected (in interviews etc.) may be used within the final thesis.

Data Collection:

The second stage will be to begin actual data collection. **Interviews** and **focus groups** with villages/communities surrounding two case study protected areas will be used to understand what resources people are using from the environment, how they are accessing these and how this relates to their livelihoods. This will be supplemented by **participatory ecosystem service mapping**, and **participatory stakeholder mapping** (as explained above). The interviews, focus groups and participatory exercises will be carried out by myself, research assistants and translators. Research assistants are likely to be biology university students from the University of Antananarivo, as this is where my in-country partner is based. They may have some previous experience of qualitative and quantitative surveys. I will be getting advice from my in-country partner on recruiting translators, as this will depend on which sites I choose as my case study due to the variation in Malagasy dialects. The research assistants and translators will be trained before data collection begins, this will include ethical guidance on how they should relate to participants and the methods being used.

These results will feed into developing a **questionnaire**, in order to target a larger number of people within the villages. The questions will be developed from the data collected in the above methods but will focus on access to ecosystem services and how this impacts upon livelihoods. The questionnaire will be administered by myself, research assistants and translators and participating households will be selected via a stratified sampling strategy.

Research will also be conducted with protected area managers and other officials, this will be in the form of **semi structured interviews**, and will focus on the governance processes and structures in place. These will cover topics such as: who has the power to make decisions, who is consulted about these decisions etc. The interviews will be administered by myself and research assistants with the help of translators if necessary.

This mixed method iterative-type research allows for the research to be continually directed by the results and data that are collected as the study progresses.

C.3 What will participants be asked to do in the study?²³ (e.g. number of visits, time, travel required, interviews)

Scoping Trip

Key informants will be **interviewed** on the topics surrounding protected area governance, access to ecosystem services and livelihoods. As the aim of this section of the research is to find out more information, these interviews will be open or semi-structured. In the communities, I will also be conducting interviews with key informants and will also aim to trial **participatory methods** where participants will be asked to physically map out stakeholders and where they are accessing ecosystem services.

An example interview/questionnaire is not attached as the exact questions are still being developed. However the topics covered will include: what livelihood activities are being undertaken, what resources people are using from the forests and how they access them.

Data Collection

Communities

Focus groups and key informant **interviews** will be used to first gain an understanding of what ecosystem services people are accessing and how and what livelihoods are most commonly being undertaken. This data will be used to inform **questionnaire** design in order to target a larger number of people within each community.

Protected Area Managers

Interviews with key informants will be used to understand the governance processes which are in place and how they are affecting people's abilities to access ecosystem services.

C.4 Does the research involve an international collaborator or research conducted overseas?²⁴

(Tick as appropriate)

Yes No

If yes, describe any ethical review procedures that you will need to comply with in that country:

The research will be conducted in Madagascar; a research permit will be required for both stages of the research. This is being applied for in collaboration with the Department of Water and Forests in Madagascar. Requirements for the research permit vary between the trips. For my longer fieldwork visit I will be required to support and train a Malagasy student whilst I am conducting my research. This will be organised via The University of Antananarivo and The Department of Water and Forests.

Describe the measures you have taken to comply with these:

I have been in contact with the Malagasy Department of Water and Forests, Professors at the University of Antananarivo, Malagasy Research Institutions and other researchers working in Madagascar. During my scoping trip I will be meeting with these people, in order to arrange a student to work alongside and a Malagasy institutional partner who will be required for my permit in the next stage of my fieldwork.

C.5 Proposed study dates and duration

Research start date (DD/MM/YY): _October 2014_____ Research end date (DD/MM/YY): __September 2018__

Fieldwork start date (DD/MM/YY): _May 2015, September 2015 & May 2016_ Fieldwork end date (DD/MM/YY): _June 2015, December 2015 & August 2016_

C.6. Where will the research be undertaken? (i.e. in the street, on UoL premises, in schools)²⁵

In villages surrounding protected areas, government offices and protected area management buildings.

RECRUITMENT & CONSENT PROCESSES

How participants are recruited is important to ensure that they are not induced or coerced into participation. The way participants are identified may have a bearing on whether the results can be generalised. Explain each point and give details for subgroups separately if appropriate.

C.7 How will potential participants in the study be:

(i) identified?

Scoping Trip:

For the key-informant **interviews**, I have already made contact via email with potential key informants from several protected area NGOs and the Madagascar National Parks government department. Following a snowball sampling strategy I will then speak to other key informants as suggested by them.

In the communities surrounding the protected areas, where I will be conducting **interviews** and piloting **questionnaires** and **participatory methods**, I will be introduced to key informants (including the village president and members of the village management committees) via protected area managers. I will then use a snowballing sampling strategy in order to speak with other people in the villages and organised focus groups/discussions in order to get a wide range of input from different people within the villages.

Data Collection:

For **focus groups** and **interviews** within villages I will speak to the village president and committee leaders in order to identify potential participants.

For **questionnaires**, I will follow a stratified sampling strategy to identify households within villages (depending on village size) in order to ensure a representative sample of households for inclusion in the study.

(ii) approached?

Scoping Trip:

For key informant **interviews**, I have been in contact with potential key informants via email, and have asked if it is possible to discuss the research in person. I will continue to approach government officials and protected area managers by email I will continue to do this with protected area management key informants. In the villages, where I will be conducting **interviews** and piloting **questionnaires** and **participatory methods**, I will be introduced to the president via the protected area managers in order to gain permission for my research. I will then ask the president to suggest people for interviews and focus groups. Before every interview and focus group, the aims of the study will be reiterated and everyone will be given the option not to take part.

Data Collection:

For the data collected from villages surrounding protected areas, where I will be conducting **interviews**, **focus groups**, **questionnaires** and **participatory methods**, I will reintroducing myself to the village president I will organise a village meeting to enable me to introduce myself and the research aims to all village members and differentiate myself from the protected area managers. This will be done with the help of a translator. Before every focus group and questionnaire myself, research assistant or translator will reiterate the aims of the research and give participants of whether they want to participate.

Interviews with protected area managers and government officials will be approached via email with the aims of the research explained via email, or asked if they would like to meet to discuss the research in person. These emails will also explain the potential issues of anonymity (as discussed above) and how they can withdraw from the study after the interviews have been conducted.

(iii) recruited?²⁶

For both the scoping trip and data collection participants will participate on a voluntary basis and will be able to stop **interviews**, **questionnaires**, **focus groups** or **participatory exercises** at any point. If requested by a participant I will delete any data collected from

them; due to the remote location of many of the villages, participants will be unable to withdraw once I have left their villages.

C.8 Will you be excluding any groups of people, and if so what is the rationale for that?²⁷

Excluding certain groups of people, intentionally or unintentionally may be unethical in some circumstances. It may be wholly appropriate to exclude groups of people in other cases

No groups will be excluded

C.9 How many participants will be recruited and how was the number decided upon?²⁸

It is important to ensure that enough participants are recruited to be able to answer the aims of the research.

Scoping Trip

For **interviews**, a snowball sampling strategy will be used in order to try and speak to as many key informants as possible. This will include protected area managers for each protected area site visited, members of the villages surrounding these protected areas, and experts in protected area management and governance in Madagascar. Due to this sampling technique, it is difficult to pre-determine how many people will be interviewed. **Focus groups** will have between 8-10 people in, and I will aim to conduct one in every protected area I visit on the trip, this should be around 4 in total.

Data Collection

For the **questionnaires**, a stratified sample of village households will be used, this will vary in size between different villages, but approximately 50 households in each of the four villages will be sampled. The **focus groups** and **participatory methods** will be conducted in groups of between 8-10 people, as this is the suggested size for a focus group method.

The number of key informant **interviews** will depend on which protected area is chosen for data collection. I will aim to speak to key officials, protected area managers and village committee leaders, it is difficult to predict how many people I will need to interview as it will depend on the management structure but I will aim for 10 at each of my protected area sites.

If you have a formal power calculation please replicate it here.

Remember to include all advertising material (posters, emails etc.) as part of your application

C.10 Will the research involve any element of deception?²⁹

If yes, please describe why this is necessary and whether participants will be informed at the end of the study.

There will be no element of deception in this research

C.11 Will [informed consent](#) be obtained from the research participants?³⁰

Yes No

If yes, give details of how it will be done. Give details of any particular steps to provide information (in addition to a written information sheet) e.g. videos, interactive material. If you are not going to be obtaining informed consent you will need to justify this.

Verbal free, prior and informed consent will be obtained before conducting any interviews, questionnaires, focus groups and participatory methods. As mentioned previously, the aims of the study will be re-phrased in an accessible way and translators will be trained in how

best to explain this to participants who have no knowledge of what an ecosystem services is.

Within the villages, there will be a very low level of literacy and therefore asking for signed consent or giving out information sheets will not be appropriate. However, with officials and protected area managers I will be contacting them via email prior to interviews or questionnaires. In these emails I will explain the aims of the study and what I would like them to participate in, and ask them for confirmation if they would like to take part. Before the interview or questionnaire takes place, I will reiterate the aims of the study and ask for verbal consent.

If participants are to be recruited from any of potentially vulnerable groups, give details of extra steps taken to assure their protection. Describe any arrangements to be made for obtaining consent from a legal representative.

Copies of any written consent form, written information and all other explanatory material should accompany this application. The information sheet should make explicit that participants can withdraw from the research at any time, if the research design permits.

Sample information sheets and consent forms are available from the University ethical review webpage at <http://ris.leeds.ac.uk/InvolvingResearchParticipants>.

C.12 Describe whether participants will be able to withdraw from the study, and up to what point (e.g. if data is to be anonymised). If withdrawal is not possible, explain why not.

Participants will have the aims of the study explained to them before the interview, questionnaire, focus group or participatory exercise begins. With officials and protected area managers, this will be done via email before meeting. For communities, there will be a meeting which potential participants will be invited to and the aims will be explained again before interviews or questionnaires begin. All participants will have the option of not answering any of the questions and if they are not happy with finishing then they may end the data collection method at any time. Due to the remote location of many of these communities, after the data has been collected and I have left the villages it will not be possible for participants to withdraw their answers. For key informant interviews, participants will have up until publication of results to withdraw, and they will be made aware of this in the email arranging the interview. They can withdraw by emailing the researcher.

C.13 How long will the participant have to decide whether to take part in the research?³¹

It may be appropriate to recruit participants on the spot for low risk research; however consideration is usually necessary for riskier projects.

The research involves minimal risk, and the research aim will be explained to informants before interviews, questionnaires, focus groups or participatory exercises begin. Officials and protected area managers will be contacted via email at least a week before interviews will take place. Communities will be informed of the aims of the research in a meeting before data collection takes place. Due to the remoteness of some of these communities it will not be possible to give participants as long to consider whether they would like to take part in the research. Informants will be able to stop the data collection and withdraw their answers at any time.

C.14 What arrangements have been made for participants who might not adequately understand verbal explanations or written information, or who have special communication needs?³² (e.g. translation, use of interpreters etc. It is important that groups of people are not excluded due to language barriers or disabilities, where assistance can be given.)

Translators will be needed for the majority of the interviews and questionnaires within rural and isolated communities surrounding protected areas. Literacy rates are likely to be very low in these areas and therefore verbal consent will need to be discussed with informants before interviews begin.

Positionality of the translators and researcher will be considered in all elements of the research and I will do my best to counteract this where possible. Translators will be trained and briefed on the confidentiality arrangements of the research, and by agreeing to work

with the researcher and assistants, they will be agreeing to keep everything they hear confidential, and to not use any information collected in any way, other than report to the research team.

C.15 Will individual or group interviews/ questionnaires discuss any topics or issues that might be sensitive, embarrassing or upsetting, or is it possible that criminal or other disclosures requiring action could take place during the study (e.g. during interviews or group discussions)?³³ *The [information sheet](#) should explain under what circumstances action may be taken.*

Yes No *If yes, give details of procedures in place to deal with these issues.*

In interviews and questionnaires, when discussing how and where people are accessing ecosystem services from, it is possible that this could include some illegal behaviours, such as illegally extracting resources from a protected area or bush meat hunting. I will ensure that the participants remain anonymous and that their responses are not shared with the relevant protected area managers. In focus groups or participatory exercises I will remind participants that what is discussed in the room should be kept private, I will; also try to arrange the groups so that everyone is on an equal social level in order to help participants feel comfortable with discussing these issues. However if participants are not willing to answer the questions, they will be reminded that it is on a voluntary basis and they can withdraw whenever they would like.

Informants will also be reminded in this instance that they do not have to answer any questions if they do not wish to and that the interview can be ended or they can take a break if they feel it necessary.

C.16 Will individual research participants receive any payments, fees, reimbursement of expenses or any other incentives or benefits for taking part in this research?³⁴

Yes No

If Yes, please describe the amount, number and size of incentives and on what basis this was decided.

RISKS OF THE STUDY

C.17 What are the potential benefits and/ or risks for research participants?³⁵

The research does not involve any direct risks for the informants, and they will not receive direct benefits for participating. However, it is hoped that the scoping trip will lead into the design of a study which will enable better understanding of the links between governance of protected areas, access to ecosystem services and livelihood impacts. Through the dissemination of these findings there may be some indirect benefits to participants.

Indirectly participants may experience the effects of lost time from other activities (such as livelihood activities), however I will aim to minimise this by giving informants prior notice (where possible) and gaining verbal consent.

C.18 Does the research involve any risks to the researchers themselves, or people not directly involved in the research? *Erg lone working*³⁶

Yes No

If yes, please describe: _____

Is a [risk assessment](#) necessary for this research?

Yes No *If yes, please include a copy of your risk assessment form with*

your application.

The risk assessment has been submitted to the department coordinator for approval and is attached to this form.

NB: Risk assessments are a University requirement for all fieldwork taking place off campus. For guidance contact your Faculty Health and Safety Manager or visit <http://www.leeds.ac.uk/safety/fieldwork/index.htm>.

RESEARCH DATA

C.19 Will the research involve any of the following activities at any stage (including identification of potential research participants)? (Tick as appropriate)

- Examination of personal records by those who would not normally have access
- Access to research data on individuals by people from outside the research team
- Electronic transfer of data
- Sharing data with other organisations
- Exporting data outside the European Union
- Use of personal addresses, postcodes, faxes, e-mails or telephone numbers
- Publication of direct quotations from respondents
- Publication of data that might allow identification of individuals to be identified
- Use of audio/visual recording devices
- FLASH memory or other portable storage devices

Storage of personal data on or including any of the following:

- Manual files
- Home or other personal computers
- Private company computers
- Laptop computers

C.20 How will the research team ensure confidentiality and security of personal data? E.g. anonymisation procedures, secure storage and coding of data.³⁷ Refer to

<http://ris.leeds.ac.uk/ResearchDataManagement>

Informants' data will be kept as anonymous as possible, where roles/positions may give away identities permission will be asked before storing the data as such.

While I am on fieldwork I am likely to have limited access to internet, therefore data will be stored on my personal computer and password protected. When I have internet access I will attempt to upload the data onto the University M drive, however this may not always be possible due to slow internet connections. Any data which I have not been able to upload

will be uploaded to the University m drive on my return to the UK.

Manual files such as fieldwork journals, will be kept which may contain information from or about informants, where possible these will use pseudonyms or simply roles and positions rather than names. This will be kept on the researcher or in a locked hotel room. Data will be backed up onto a laptop after returning from remote communities. This will be password protected and kept in a locked hotel safe.

C.21 How will you make your research data available to others in line with: the University's, funding bodies' and publishers' policies on making the results of publicly funded research publicly available (while not compromising requirements around data protection legislation)? (max 200 words) Refer to <http://ris.leeds.ac.uk/researchdatamanagement>

All data collected using NERC funding must be made available to NERC data centres 2 years after data collection ends. Data may also need to be submitted to journals in order to support article submissions. As discussed previously, data will be anonymised as much as possible before being submitted.

C.22 How do you intend to share the research data? (Indicate with an 'X')

- Depositing in a specialist data centre or archive
- Submitting to a journal to support a publication
- Depositing in a self-archiving system or an institutional repository
- Dissemination via a project or institutional website
- Informal peer-to-peer exchange
- No plans to report or disseminate the data
- Other, please state:
_____.

C.23 How do you intend to report and disseminate the results of the study? (Indicate with an 'X')

- Peer reviewed journals
- Internal report
- Conference presentation
- Publication on website
- Other publication
- Submission to regulatory authorities
- No plans to report or disseminate the results

Other, please state:

_____.

C.24 For how long will data from the study be stored? Please explain why this length of time has been chosen.³⁸ Refer to the [RCUK Common Principles on Data Policy](#)

Students: It would be reasonable to retain data for at least 2 years after publication or three years after the end of data collection, whichever is longer.

___3___ years, _____ months

The data will be used to inform the PhD study design and focus and then may be used in writing the PhD thesis. Any journal articles would aim to be submitted during the final year of the project.

CONFLICTS OF INTEREST

C.25 Will any of the researchers or their institutions receive any other benefits or incentives for taking part in this research over and above normal salary or the costs of undertaking the research?³⁹

Yes No

If yes, indicate how much and on what basis this has been decided

C.26 Is there scope for any other conflict of interest?⁴⁰ For example will the research funder have control of publication of research findings?

Yes No *If yes, please explain*

C.27 Does the research involve external funding? (Tick as appropriate)

Yes No *If yes, what is the source of this funding?*

Funding for the fieldwork is from a NERC DTP grant.

PART D: Declarations

Declaration by Chief Investigators

1. The information in this form is accurate to the best of my knowledge and belief and I take full responsibility for it.
2. I undertake to abide by the University's ethical and health & safety guidelines, and the ethical principles underlying good practice guidelines appropriate to my discipline.
3. If the research is approved I undertake to adhere to the study protocol, the terms of this application and any conditions set out by the Research Ethics Committee.
4. I undertake to seek an ethical opinion from the REC before implementing substantial amendments to the protocol.
5. I undertake to submit progress reports if required.
6. I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of patient or other personal data, including the need to register when necessary with the University's Data Protection Controller (further information available via <http://ris.leeds.ac.uk/ResearchDataManagement>).
7. I understand that research records/ data may be subject to inspection for audit purposes if required in future.
8. I understand that personal data about me as a researcher in this application will be held by the relevant RECs and that this will be managed according to the principles established in the Data Protection Act.
9. I understand that the Ethics Committee may choose to audit this project at any point after approval.

Sharing information for training purposes: Optional – please tick as appropriate:

- I would be content for members of other Research Ethics Committees to have access to the information in the application in confidence for training purposes. All personal identifiers and references to researchers, funders and research units would be removed.

Principal Investigator

Carward

Signature of Principal Investigator: (This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name:Caroline Ward..... Date: (dd/mm/yyyy):
.....29/4/2015.....

Supervisor of student research: I have read, edited and agree with the form above.

Lindsay Stringer

Supervisor's signature: (This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name:Lindsay Stringer..... Date: (dd/mm/yyyy):29/4/2015.....

A.2 Ethics Approval

Performance, Governance and Operations
 Research & Innovation Service
 Charles Thackrah Building
 101 Clarendon Road
 Leeds LS2 9LJ Tel: 0113 343 4873
 Email: ResearchEthics@leeds.ac.uk



UNIVERSITY OF LEEDS

Caroline Ward
 Sustainability Research Institute
 School of Earth & Environment
 University of Leeds
 Leeds, LS2 9JT

ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee

University of Leeds

15 June 2018

Dear Caroline

Title of study: **Protected area governance, ecosystem services and livelihoods in Madagascar**

Ethics reference: **AREA 14-123**

I am pleased to inform you that the above research application has been reviewed by the ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee and following receipt of your response to the Committee's initial comments, I can confirm a favourable ethical opinion as of the date of this letter. The following documentation was considered:

Document	Version	Date
AREA 14-123 Ethics approval response letter CW.docx	1	15/05/15
AREA 14-123 Visite Caroline WARD à ISL ASB AKF MDA_mai 2015 (2).pdf	1	15/05/15
AREA 14-123 Autorisation Caroline Wards Agro.pdf	1	15/05/15
AREA 14-123 Ethical_Review_Form CW.doc	3	30/04/15
AREA 14-123 High-Risk-Fieldwork-RA-form CW.doc	1	29/04/15
AREA 14-123 participant interview email CW.docx	1	01/05/15
AREA 14-123 Caroline Ward PhD Concept Note - PA Governance, livelihoods and ES in Madagascar.pdf	1	01/05/15

Please notify the committee if you intend to make any amendments to the original research as submitted at date of this approval, including changes to recruitment methodology. All changes must receive ethical approval prior to implementation. The amendment form is available at <http://ris.leeds.ac.uk/EthicsAmendment>.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited. There is a checklist listing examples of documents to be kept which is available at <http://ris.leeds.ac.uk/EthicsAudits>.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to ResearchEthics@leeds.ac.uk.

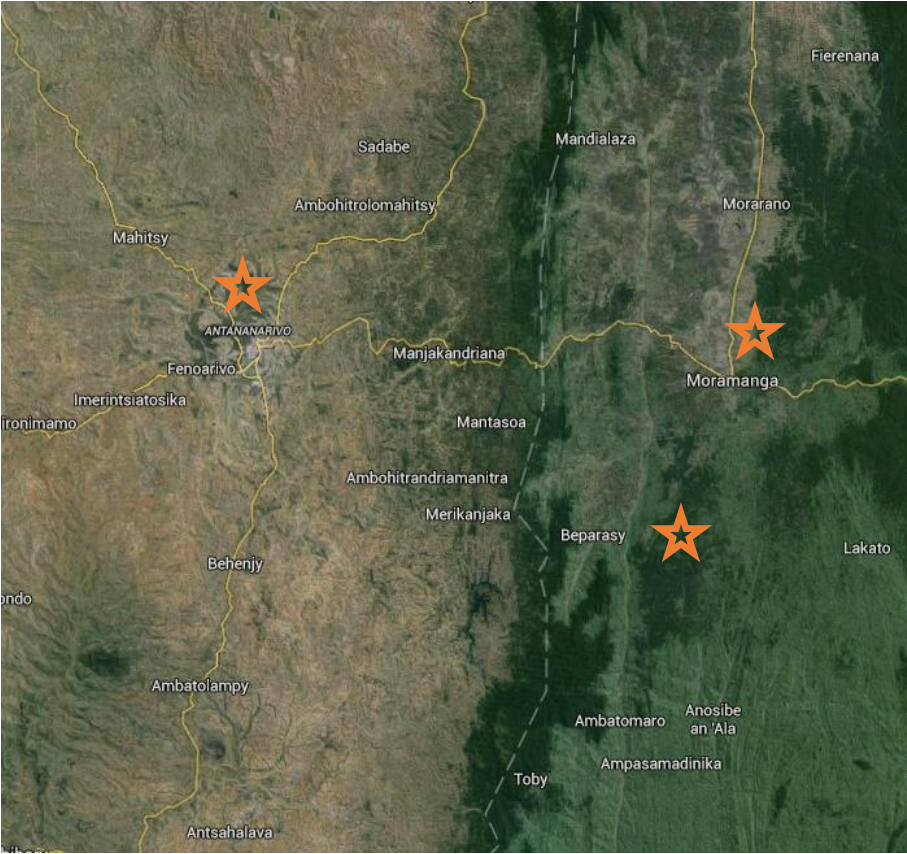
Yours sincerely

Jennifer Blaikie

Senior Research Ethics Administrator, Research & Innovation Service

On behalf of Dr Andrew Evans, Chair, [AREA Faculty Research Ethics Committee](#)

Appendix B Risk Assessment

<p>Fieldwork Project Details</p>	
<p>Faculty School/Service</p>	<p>Sustainability Research Institute, School of Earth & Environment</p>
<p>Location of Fieldwork</p>	<p>Madagascar</p> <p>Meetings/fieldwork will be carried out in the following locations:</p>  <p>Antananarivo Moramanga Moramanga district – villages surrounding Mangabe forest, South of Moramanga</p>
<p>Brief description of Fieldwork activity and purpose <i>(include address, area, grid reference and map where applicable)</i></p>	<p>This is a fieldwork trip for my PhD, I will be conducting interviews and questionnaires with different stakeholders about protected areas. These will include interviews with government and NGO officials in Antananarivo and Moramanga town, and also conducting interviews and questionnaires with people living in villages surrounding the protected area located in Moramanga district.</p>

Fieldwork itinerary <i>e.g. flight details, hotel address</i>	Timetable:		
	11-17 th April	Antananarivo	<p>Depart UK 11th April</p> <p>Arrive Tana (via Nairobi) 12th April (flight number KQ101/KQ256)</p> <p>Visit university to reintroduce self and research and renew/extend research permit</p> <p>Meet up with translator/RAs to check availability over next 3 months</p> <p>Begin national level interviews</p> <p>Brush up on Malagasy lessons</p> <p>Staying at Maison du Pyla</p>
	18-24 th April	Antananarivo	National level Interviews
	25 th April -1 st May	Moramanga/ Antananarivo	<p>National and regional Interviews</p> <p>Speak with NGO about logistics of fieldwork – updates on road/rain situation</p>
	2 nd -8 th May	Holiday	Family in Madagascar from 3 rd -18 th May
	9 th -15 th May	Holiday	
	16 th -22 nd May	Moramanga/ Antananarivo	<p>Continue national/regional interviews as needed</p> <p>Speak with NGO about logistics of fieldwork – updates on road/rain situation</p> <p>Plan logistics of fieldwork – car hire, RAs, translator, food</p> <p>Print questionnaires & research permit documents</p> <p>Get permit stamped at district forest ministry</p>
	23 rd -29 th May	Andranomandr y	<p>Travel to Andranomandry (1 day)</p> <p>Village questionnaires, village FGs, any in depth interviews as needed (should need around 1 week for data collection)</p>
	20 th May- 5 th June	Andranomandr y/Lakambato	<p>Finish data collection in Andranomandry</p> <p>Travel to Lakambato (1/2 day)</p> <p>Begin data collection in Lakambato (village questionnaires, village FGs, any in depth interviews as needed (should need around 1 week for data collection))</p>
	6 th -12 th June	Lakambato	Continue data collection in Lakambato

		Plan logistics for next fieldwork session – car hire, RAs, translator, food
13 th -19 th June	Lakambato/Antananarivo	Contingency time for data collection Travel back to Antananarivo (1-2 days) Data entry
20 th -26 th June	Antananarivo	Contingency time for data collection Data entry Follow up on any interviews needed
27 th June–3 rd July	Antananarivo	Contingency time for data collection Data entry Follow up on any interviews needed
4 th - 10 th July	Antananarivo/ return to UK	Finish sorting logistics – final visit to university Follow up on any interviews needed Depart Tana 9 th July Arrive UK (via Nairobi) 9 th July (flight number KQ263/100)
11 th -17 th July	Contingency time if needed can extend stay	
18-24 th July	Contingency time if needed can extend stay	
5 th -31 st July	Contingency time if needed can extend stay	
<p>Contact details</p> <p>UK mobile number +44777 2035 275 Malagasy number +261 337205114 Satellite phone to be added once phone is collected from Gary Keech</p> <p>Accommodation details</p> <p>La Maison du Pyla - Lot VA 14 ia Tsiadana, 101 Antananarivo Madagascar Telephone : 00 261 33 11 386 74 00 261 32 02 439 36</p> <p>In the villages/protected areas I will be camping in the villages.</p>		

	<p>Contact details for the NGO I will be working with are as follows:</p> <p>Madagasikara Voakajay</p> <p>Julie Raza</p> <p>Lot II F 14 P Bis A Andraisoro</p> <p>B. P. 5181</p> <p>Antananarivo (101)</p> <p>Tel: +261 32 4093690/ +261 33 1224372/ +261 (0) 20 2252379</p> <p>In-country supervisor</p> <p>Bruno Ramamonjisoa</p> <p>BP 175 ESSA Forêts</p> <p>Antananarivo 101</p> <p>Tel : +261 24 74249/ +261 33 0885235</p>
Organiser Details	<p>Contact details</p> <p><i>Name, Email, Telephone</i></p>
Supervisor	<p>Lindsay Stringer, L.Stringer@leeds.ac.uk, Sustainability Research Institute</p> <p>George Holmes, G.Holmes@leeds.ac.uk, Sustainability Research Institute</p>
Departmental Co-ordinator	
Nature of visit	
<i>Size of Group, lone working, staff, postgraduate, undergraduate</i>	<p>PhD fieldwork</p>
Participant Details	<p>Contact details</p> <p><i>Name, Address, email, telephone, Next of Kin contact details</i></p>
<i>Attach information as separate list if required</i>	<p>Caroline Ward, eecwa@leeds.ac.uk, +447772035275</p>
	<p>Next of kin: Lesley Mattin (Mother) +447860933966</p> <p>27 Ridgeway gdns, London N6 5XR</p>

HAZARD IDENTIFICATION	
<i>Identify all hazards specific to fieldwork trip and activities, describe existing control measures and identify any further measures required.</i>	
HAZARD(S) IDENTIFIED	CONTROL MEASURES <i>(e.g. alternative work methods, training, supervision, protective equipment)</i>
<p>Nature of the site <i>School, college, university, remote area, laboratory, office, workshop, construction site, farm, etc</i></p> <ul style="list-style-type: none"> • Antananarivo – offices etc. • Protected areas and villages - remote field sites 	<p>Antananarivo</p> <ul style="list-style-type: none"> • I will be staying in the guesthouse Maison du Pyla. • Hospital: Cenhosoa Route de Tamatave Tananarive Antananarivo Madagascar Tel: +261 20 23 397 51 • Police: Lalana Dok. Raharinosy, Antananarivo +261 20 22 227 35/36 • Contact available via internet and mobile phone <p>Moramanga</p> <p>Closest hospital: Centre Hospitalier De District Ii Moramanga Moramanga, 0514, Toamasina Province +261 34 017 8384</p> <ul style="list-style-type: none"> • I will be camping in the villages • Communication will be mostly available via mobile phone, satellite phone or email. I will be in weekly contact with my parents via text message. If I am in an area with no mobile phone signal, I will have a departmental satellite phone which I will be able to use in case of emergencies. Dr Ramamonjisoa and my parents will have a copy of my itinerary and also the contact details for the NGO that I will be visiting. Therefore if Dr Ramamonjisoa or my parents do not hear from me within a certain time limit, they will know who to get in contact with. I will also make sure that I am in contact with my UK supervisors updating them on my itinerary and progress whenever internet access is available.
<p>Environmental conditions <i>Extremes of temperature, altitude, exposure to sunlight, potential weather conditions, tidal condition etc</i></p>	<p>Tropical Climate</p> <ul style="list-style-type: none"> • Risk of dehydration and sunburn - I will bring and use sun protection (cream and clothing) and drink sufficient bottled water. In some rural areas the temperature may drop at night and therefore I will also bring suitable

<ul style="list-style-type: none"> • Tropical Climate <ul style="list-style-type: none"> ○ Dehydration ○ Sunburn ○ Hyperthermia/heat exhaustion ○ Tropical diseases (Malaria and Dengue Fever) ○ Mosquitos (and other biting insects) ○ Plague Outbreak • Remote Location <ul style="list-style-type: none"> ○ Water purity ○ Medical Emergency Evacuation • Political Instability • Lack of local Infrastructure 	<p>warm clothing.</p> <ul style="list-style-type: none"> • Risk of hyperthermia – fieldwork in villages may involve trekking through forest to reach villages. Therefore I will make sure that I carry and drink enough water and have frequent rests when needed. • Period of acclimatisation likely to be needed before fieldwork begins. There will be time for this as I will have meetings in Antananarivo/be sorting out logistics before I begin fieldwork • Both malaria and dengue fever and endemic in Madagascar. I will obtain malaria prophylaxis before leaving the UK. I will also protect myself as appropriate using insect repellent/long sleeves/trousers and sleeping under a mosquito net at night. • I have previously had the necessary vaccinations for travel to Madagascar, and have had an appointment with the Occupational Health team to check that my vaccinations are all up to date. <p>Remote Location</p> <ul style="list-style-type: none"> • Antananarivo – whilst in the capital, I will only drink bottled water • Protected area/villages – I will aim to take enough bottled water out with me, but in some cases this may not be possible (if villages are only accessible via trekking) therefore I will also make sure I am carrying sufficient water sterilisation tablets. • I am covered by the university travel insurance which covers medical evacuation. I will make sure that I always have the numbers for this evacuation service and that the team I am working with are aware of who to call if anything happens <p>Political instability</p> <ul style="list-style-type: none"> • As there are no elections scheduled and the last election succeeded without any problems, there is low risk of any political unrest while I am out there. I will make sure that I am aware of any political activities which are going on and stay clear of these (particularly in Antananarivo). The university travel insurance service provides daily texts and emails on relevant security country updates. I will make sure that I read these. <p>Lack of local infrastructure</p> <ul style="list-style-type: none"> • The road conditions are very poor throughout Madagascar, but particularly in rural areas. I will need a car in order to access some of my sites. I will make sure that this is able to cope with the difficult road conditions and carry repair equipment. Due to the difficulty of road travel (and safety reasons as discussed below) I will also have a driver. Roads are also impassable in rainy season, so I will limit my data collection to the dry season (May-November)
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<p>Site specific conditions</p> <p><i>e.g. cliffs, scree, bogs, featureless landscapes, local endemic infectious diseases, zoonoses etc</i></p>	<p>Antananarivo</p> <ul style="list-style-type: none"> I will minimise the chances of encountering any crime (such as pickpocketing/mugging) by not going out at night (or taking a taxi if it is necessary) and not carrying anything valuable or obvious on myself. I will lock my valuables in the hotel safe.
<ul style="list-style-type: none"> Antananarivo <ul style="list-style-type: none"> Crime Protected areas/remote villages <ul style="list-style-type: none"> Remoteness Tropical climate conditions Water purity fadys 	<p>Protected area and remote villages</p> <ul style="list-style-type: none"> As discussed previously I will make sure that I have the number for the medical evacuation service and everyone in the team is aware of what to do in an emergency situation. I will make sure that the research team carries enough supplies to last for the time we are at the field site for, plus extra in case we are delayed by anything I will follow the recommendations I set out above for dealing with tropical conditions and water purity Fadys are local cultural taboos related to religion or spirituality. They can range from forbidden foods, restrictions on clothing and visiting certain areas. They vary between regions. I will make sure that I am aware of any relevant fadys in the areas I visit by speaking with my contacts in order to avoid giving offence
<p>Process</p> <p><i>Operating machinery, electrical equipment, driving vehicles, handling or working with animals etc</i></p>	<p>I will be carrying out interviews/questionnaires/focus groups. These methods involve minimal risk (other than due to the tropical/remote locations). I may cover some sensitive issues within these methods and will therefore not push anyone for answers and make it clear that participants can withdraw whenever they would like. This is outlined further in my ethics clearance form.</p>
<p>Questionnaires</p> <p>Interviews</p>	<p>All participants will be given prior notice before questionnaires and interviews take place, and full prior and informed consent will be gained before interviews or questionnaires begin. The ethics form for this project has been submitted for review.</p>
<p>Transport</p> <p><i>Mode of transport while on site, to and from site, carriage of dangerous goods etc</i></p>	<p>Transport within Antananarivo</p> <ul style="list-style-type: none"> Muggings and pick pocketing are fairly frequent in Antananarivo (according to FCO website). As mentioned previously, I will not walk around at night and will keep all valuables hidden or locked in the hotel room.
<ul style="list-style-type: none"> Flight Transport within Antananarivo <ul style="list-style-type: none"> High crime level Transport to protected areas/villages <ul style="list-style-type: none"> Lack of/poor infrastructure Heat exhaustion/d dehydration/h 	<p>Transport to protected area/villages</p> <ul style="list-style-type: none"> As mentioned previously there is a lack of infrastructure, with very poor roads. I am aware of this and will make sure that I travel in a vehicle which is able to cope with these roads and avoid the rainy season (when many roads are inaccessible). There has also been a recent increase in armed robberies on main roads between towns particularly at night (according to FCO website). I will not be travelling on roads at night. Some villages may not have road access and will therefore involve trekking/walking to reach them. I will make sure that I carry enough water and drink frequently and have frequent rest stops to prevent dehydration and heat exhaustion.

yperthermia	<ul style="list-style-type: none"> Whilst working in the villages I will be accompanied by a translator and research assistants who I have worked with previously, and were recommended by the University
Equipment <i>manual handling risks, operation of machinery, tools, use of specialist equipment etc</i>	n/a
n/a	
Violence <i>potential for violence (previous incidents etc)</i>	Crime <ul style="list-style-type: none"> Crime can be an issue in Madagascar, however I will minimise the risk to myself, as mentioned previously, by not walking around in towns/cities at night, not carrying valuables on myself, not travelling at night and staying vigilant. Political demonstrations <ul style="list-style-type: none"> The FCO list the political situation as potentially volatile. However since the democratic election of the president in 2014, the situation has improved. I will stay aware of the situation by reading security updates from the university travel insurance providers and will stay away from any political demonstrations
<ul style="list-style-type: none"> Crime Political demonstrations 	
Individual(s) <i>medical condition(s), young, inexperienced, disabilities etc</i>	Experience of working/travelling in Madagascar <ul style="list-style-type: none"> I spent 3 month in Madagascar last year, conducting the same research and data collection methods. So I have previous knowledge of the area I am visiting and. I have previously worked in Madagascar for 6 months and travelled around the country for a month. Mild nut allergy <ul style="list-style-type: none"> I have a mild nut allergy, which has never led to anaphylactic shock but I will be carrying an epi-pen with me and will make sure that all people I am working with are aware and know how to use it.
<ul style="list-style-type: none"> Previous experience of working in Madagascar Mild nut allergy 	
Work Pattern <i>time and location e.g. shift work, work at night</i>	I will only be working during the day and try to ensure that I have sufficient time off during the week
Permissions Required <i>Contact details, restrictions and details of permissions</i>	Visa – a visa is required for entry into Madagascar, this is available to buy upon arrival at the airport. I have already filled in the appropriate forms and checked that I fulfil the requirements Research permit – I have a research permit which is currently still valid from my previous trip. It expires in May and therefore I will be renewing it through the university when I arrive in
Visa Research permit	

Ethics clearance	Madagascar.. Ethics clearance – My ethics form was submitted and approved in May 2015
Other Specific Risk Assessments <i>e.g. COSHH, Manual Handling, Lone Working if so what is identified in these assessments? Are there training requirements? (cross reference where appropriate)</i> n/a	n/a
Health Questionnaire Completed <i>Is it required and has it been completed, who by and where is it recorded</i>	n/a
Health Surveillance Required <i>Is it required and has it been completed, who by and recorded</i>	n/a
Vaccinations Required <i>Obtained and certificate where applicable</i>	I am up to date with all vaccinations recommended by the NHS fitfortravel website: Diphtheria Hepatitis A Hepatitis B Rabies Tetanus Typhoid Malaria prophylaxis is also required and I will be taking Malarone. Other sensible precautions such as using insect repellent, covering up with long sleeved and long trousers and sleeping under a mosquito net will also be used.
First Aid Provision <i>Requirement for first aid or specialist first aid equipment, access to medical equipment and hospitals</i>	Emergency First Response Qualification 2014 First Aid Kit – I will always carry a full medical kit, with all equipment needed to deal with minor issues relating to carrying out fieldwork abroad in tropical locations. Previous experience – I have a total of 19 months of previous experience conducting fieldwork in remote tropical places and therefore a lot of experience of dealing with related illnesses and injuries

Additional Supporting Information	
<p>Pre-departure Briefing <i>Carried out and attended</i></p>	n/a
<p>Training <i>Identify level and extent of information; instruction and training required consider experience of workers, details of relevant training</i></p>	<p>I have previously worked and travelled around Madagascar so am aware of many of the local issues (such as lack of/poor infrastructure) and cultural context.</p> <p>I have also worked/carried out fieldwork in tropical countries many times previously, so am aware of many of the likely risks and issues.</p>
<p>FCO advice <i>Include current FCO advice for travel to the area where applicable</i></p>	<p>Advice from FCO website:</p> <p>The Foreign and Commonwealth Office (FCO) advise against all travel to Batterie Beach, north of Toliara (Tuléar), where there have been violent attacks including fatalities.</p> <p>There has been continued political instability in Madagascar since the 2009 coup d'état. Despite the political transition back to democracy in early 2014, the situation remains fragile and may have an impact on security, especially in the capital, the larger regional cities, and the Betroka region in the south. There were riots in December 2014 in Morondava and Port Berge (Boriziny). You should avoid all crowds and political demonstrations. See Political situation</p> <p>Take great care and follow local advice in the south-east of the country. In the southern triangle between Ihosy, Toliara/Tuléar and Fort-Dauphin the security situation remains tense and the roads are in very poor condition. Avoid overnight stays in the countryside.</p> <p>You should avoid travelling at night on Route Nationale 13 (RN 13) between Ambovombe and Ihosy and on the RN 10 between Betioky and Andranovory (the western route to Toliara/Tuléar). There have been several attacks on vehicles. Take great care on these roads during the daytime. See Crime and Local travel</p> <p>In October 2013 on the island of Nosy Be, 2 foreigners and 1 Malagasy were lynched and burned by the local population. Remain vigilant during visits to beaches.</p> <p>Crime is widespread in Madagascar. Be vigilant in the capital Antananarivo particularly on the Avenue de L'Indépendance, Ambohitato, Analakely, Bohorika, Isoraka Ampasamandinika, 67ha, Analakely and</p>

	<p>around the military barracks at Betongolo.</p> <p>Be especially vigilant at night and don't touch any suspect packages.</p> <p>Be vigilant and maintain a low profile while moving around the country, in particular if you're travelling alone. If you're travelling independently, monitor the local media closely for the duration of your visit. See Local travel</p> <p>In 2013 there were just over 8,000 British visitors to Madagascar and most visits were trouble free. If possible, travel with established organisations or travel companies who know the terrain and have the capacity to warn of potential hazards.</p> <p>There is a low threat from terrorism.</p> <p>The cyclone season in Madagascar normally runs from November to April. Coastal areas are particularly affected. You should monitor the progress of approaching storms. See Natural Disasters</p> <p>Piracy is a significant threat in the Gulf of Aden and Indian Ocean, and has occurred more than 1,000 nautical miles from the Somali coast. See River and sea travel</p> <p>Take out comprehensive travel and medical insurance before you travel.</p>
<p>Supervision</p> <p><i>Identify level of supervision required e.g. full time, Periodic telephone/radio contact</i></p> <p>Remote location – mobile phone/satellite phone</p>	<p>In contact with UK supervisors via email, I will give them my Malagasy phone number when I arrive. They will have a copy of my planned itinerary and contact details for Dr Ramamajisoa and the NGO who I will be working alongside. I will update them via email on any changes to this itinerary and will be in contact via email whenever I have internet access.</p> <p>My Malagasy institutional partner Dr Ramamajisoa will act as my in-country supervisor and he will also have a copy of my itinerary and contact details the NGO I will be working with.</p>
<p>Other Controls</p> <p><i>e.g. background checks for site visits, embassy registration</i></p>	<p>There is a British Embassy in Madagascar, and I will register with them before arriving:</p> <p>British Embassy Antananarivo Ninth Floor Tour Zital Ravoninahitriniarivo Street Ankorondrano Antananarivo 101 Madagascar Email: BEAntananarivo@moov.mg Telephone +261 202233053/+261 202235627</p>
<p>Identify Persons at Risk</p> <p><i>This may include more individuals than the fieldwork participants e.g. other</i></p>	<p>n/a</p>

<i>employees of partner organisations</i>	
<i>Copy of other Organisation's risk assessment attached?</i>	
Additional Information <i>Relevant to the one working activity including existing control measures; information instruction and training received, supervision, security, increased lighting, emergency procedures, access to potable water etc.</i>	n/a

Residual Risk <i>Is the residual risk acceptable with the identified controls?</i>		Yes	
		No	

Assessment carried out by	Name:	
	Signature:	
	Date:	
Names of person(s) involved in Fieldwork <i>N.B: This can take the form of a signed class register when large group work</i>	Name:	Caroline Ward
	Signature:	<i>Cward</i>
	Date:	14/3/16
Supervisor	Name:	Lindsay Stringer
	Signature:	<i>Lindsay Stringer</i>
	Date:	14/3/16

Appendix C Focus Group Protocol

- Introduction
- ES free listing
 - What benefits do you get from the forest? – try to capture provisional services and any other benefits linked to the forest e.g. rain/climate control/importance in culture & religious beliefs
 - Seasonality of ES use (How does your use of the forest vary during the year? Which if resources/services mentioned do you use at different times of the year)
 - Importance of each ES (Which of the services/resources we have discussed would you consider as most important to you - using beans/counters)
 - Why are these ES important?
- Livelihoods
 - What is important in having a good life in this community? How would you describe in general, a person who is doing well in this community?
 - Subjective aspect – why are these things important for people in the village?
 - Do people feel they have the ability to meet their aspirations/do things they value? Do people feel they have a sense of control/power
 - Why?
 - How does this relate to livelihood strategies?
 - Do people feel like they have confidence in their future, that they are secure and safe, that there is security in old age and for future generations?
 - How does this relate to livelihood strategies?
 - How have livelihoods/well-being changed in the community since the PA was established, and why?
- Livelihood capitals
 - Natural
 - Which resources are important and why?
 - How do you access these?
 - How do these relate to livelihood strategies?
 - E.g. Land, water, livestock (grazing), other natural resources (maybe from areas outside the PA forest)
 - Social
 - Are there many links between households in the village (community associations, family)?
 - When are those links between people important (labour, illness, helping people)?
 - How does this relate to livelihood strategies?
 - E.g. good relations with family/community/ country, ability to help people/fulfil social obligations, ability to care for children
 - Human
 - What education/skills/training/knowledge is important for people in this village, and why?
 - How do people access this?
 - How does this relate to livelihood strategies?

- E.g. education, skills, training, knowledge, freedom of choice/action, security
- Physical
 - What is it important to have in order to have a good life in this village? Why?
 - How does this relate to livelihood strategies? Are there any tools or equipment they need for livelihood activities, and how do they access these (own, borrow, rent, share?)
 - What infrastructure do people have access to (transport, markets, health, water)? How do they access these (need to pay)?
 - What infrastructure do they not have access to (and why)?
 - E.g. infrastructure, physical assets (livestock, housing, furniture, tools)
- Financial
 - What activities do people do to earn an income? Are there any other finance sources available (NGO support, bank credit)?
 - Is the income available from answers to above question adequate and secure?
 - E.g. Income livelihood strategies, access to savings/bank credit

Appendix D Interview Protocols

D.1 Interview questions for village interviews

Introduction – My name is Caroline Ward and I am a student from a University in England. I am not working with the government or [NGO]. I am doing some research to learn about protected areas in Madagascar and how they affect people who live near them. I would like to invite you to participate in an interview as part of my project. If you choose to take part, we will not use your real name, and what you tell me will only be used for my research. This interview will take around 40 minutes – would you like to take part?

1. What is the decision making process for the protected area forest management?
 - a. Who is involved in decision making?
 - b. Can you give me an example of a decision that you were happy about and one that you were not?
2. What role does the community play in managing the forest?
3. What role does the government play in managing the forest?
4. What role does the [NGO] play in managing the forest?
5. Are you happy with the decisions made about managing the forest?
 - a. If yes, why?
 - b. If no, why not?
6. What is the aim of the COBA/VOI (i.e. what does it do)?
7. What are the advantages/benefits of being a COBA/VOI member?
8. What are the disadvantages/costs of being a COBA/VOI member?
9. Why did you (or didn't you) become a COBA/VOI member?
 - a. How long have you been a COBA member for?
10. Was the forest protected before it became a protected area?
 - a. If yes, how and by who?
11. Before the forest was protected, were there any rules about using resources/going into the forest?
 - a. If yes, what were these rules?
 - b. If yes, who decided these rules?
 - c. If yes, how were they enforced?
12. What are the rules on getting and accessing resources from the protected forest?
 - a. Are people allowed to access and get resources from the protected forest?
 - b. What are you allowed to access or get from the protected forest?
 - c. Who can get access to these resources? (E.g. are there any differences in access between COBA/VOI members and non-members?)
 - d. Do you need permission or permits first?
13. How were these rules decided, and who was involved in making those decisions?
14. Are these rules enforced?
 - e. If so, how?
 - f. What happens if the rules are broken (i.e. are there punishments or fines, and if yes what are they)?
 - g. How often are these rules broken?
 - h. Why are the rules broken?

15. What are the benefits you get from the protected forest?
 - i. Has this changed since the protected area was set up?
16. Are there any bad things about living near the forest or going into the forest? (E.g. any dangers?)
17. What are the main (non-income generating/subsistence) livelihood activities people do?
 - a. Has this changed since establishing the protected area?
 - b. If yes, how and why?
 - c. What are your main (non-income generating/subsistence) livelihood activities now?
18. What are the main (income generating) activities that people do?
 - d. Has this changed since establishing the protected area?
 - e. If yes, how and why?
 - f. What are your main (income generating/subsistence) livelihood activities now?
19. Is there anything from the forest that people need for their livelihoods?
 - g. Has this changed since establishing protected area?
 - h. If yes, how and why?
20. How have your lives changed since the forest has been protected (in good and bad ways)?

D.2 Interview questions for NGO/government officials (not related to case study PA)

1. Who are the stakeholders involved in the new Durban Vision PAs?
 - a. What are the roles of each of the stakeholders mentioned?
2. What is the decision making process for PA management? (link this back to stakeholders mentioned in q.1 if needed)
 - a. Who is involved in making decisions?
3. Are existing informal/cultural rules included in management plans when establishing PAs?
4. Are existing informal/cultural rules included in PA management once the PA is set up?
5. How are the community associations (VOI/COBAs) set up and by whom?
6. How do community members join the community associations (VOI/COBAs)?
7. What factors affect people's decisions to join the community associations (VOI/COBAs)?
8. Are there any specific activities/responsibilities that VOI/COBA members do, as part of their role as the VOI/COBA?
9. Are the rules on accessing and using resources for all Durban Vision PAs similar or are they specific to each individual PA?
10. In general, are people allowed to access and use resources?
 - a. If yes, which ones?
 - b. If yes, does this change under any particular circumstances (e.g. seasonality, emergencies)?
11. Are there any differences in access between VOI/COBA members and non-members?
12. Do people need permission or permits before accessing or using resources?
13. Are access rules enforced?
 - a. If so, how and by who?
 - b. What are the punishments or fines for breaking these rules?
14. How were these rules decided, and by who?
15. How are the locations of the different zones decided? (i.e. strictly protected areas vs. sustainable use areas)
 - a. Who is involved in making this decision?

16. In general, how has establishment of Durban Vision PAs impacted upon people's livelihoods?
 - a. Is this livelihood impact different to the previously existing PAs?
17. Why were Durban Vision co-managed PAs introduced?
 - a. Do you think they are fulfilling their intended role?
 - b. How do they differ from previously existing PAs?
18. How was your organisation involved in introducing and designing the Durban Vision PAs?
19. How was your organisation involved in implementing the Durban Vision PA policy?

Extra questions for NGO/government officials involved in case study PA

20. Specifically in Mangabe PA, are people allowed to access and use resources?
 - a. If yes, which ones?
 - b. If yes, does this change under any particular circumstances (e.g. seasonality, emergencies)?
21. Are there any differences in access between VOI members and non-members? Do people need permission or permits before accessing or using resources?
22. Are these rules enforced?
 - c. If so, how and by who?
 - d. What is the role of the VOI patrollers?
 - e. What are the punishments or fines for breaking these rules?
 - f. How many people are caught breaking the rules each month (roughly)?
23. Who was involved in deciding these rules about resource access?
24. When were these rules decided?
25. Who was involved in deciding the different zones of the PA (i.e. strictly protected vs. sustainable use areas)?
26. What ES/resources are people using from the forest?
 - g. Do you know if and how this has this changed since establishing the PA?
 - h. What factors affect people's ability to access ES/resources?
27. What are the main (non-income generating/subsistence) livelihood activities for people living near the PAs?
 - a. Has this changed since establishing PAs, and if so, how?
28. What are the main (income generating) livelihood activities for people living near PAs?
 - b. Has this changed since establishing PAs and if so, how?
29. What ES are people reliant on for these livelihood activities?
 - c. Has this changed since establishing PAs?
30. In general how has establishment of the Durban Vision PAs impacted upon people's livelihoods?

Extra questions for case study PA NGO

31. Has any environmental education/outreach taken place in any of the villages?
 - a. If yes, in which villages?
 - b. If yes, when?
 - c. If yes, for how long?
 - d. If yes, what were the key messages?

- e. If no, why not?
32. Are there any development/livelihood activities planned in the villages as part of the PA establishment?
- a. If yes, what are they?
 - b. If yes, when/where are they planned to take place?
 - c. If yes, who will be involved (i.e. just VOI members, other social groups or everyone)?
 - d. If no, why not?
33. What benefits do the people living in the villages surrounding the PA get from PA establishment?
- a. DO you think there are any particular groups in the villages who will benefit more?
34. What costs do the people living in the villages surrounding the PA get from PA establishment
- a. Do you think there are any particular groups in the villages who will have more costs?

Appendix E Questionnaires

E.1 English Questionnaire

Research assistant:

Date:

Time at start:

Time at end:

Village name:

Fokontany:

Commune:

Section 1 general household info:

- | | | | | | |
|--|-------|-------|-------|--------|------|
| 1. Gender | | Male | | Female | |
| 2. Age | | | | | |
| 15-25 | 26-35 | 36-45 | 46-55 | 56+ | |
| 3. Ethnicity | _____ | | | | |
| 4. Household size (how many people live in your household) | _____ | | | | |
| a. Adult men | 0 | 1 | 2 | 3 | 4+ |
| b. Adult women | | 0 | 1 | 2 | 3 4+ |
| c. Children | 0 | 1-2 | 3-5 | 6-8 | 8+ |
| 5. Have you lived here all of your life? | Yes | | No | | |
| a. If no, how long have you lived here (in years)? | | | | | |
| 0-2 | 3-5 | 6-8 | 9-11 | 12+ | |
| b. If no, why did you move here | | | | | |
| 6. Education level (number of years spent at school) | | | | | |
| 0 | 1-3 | 4-7 | 8-11 | 11+ | |
| 7. Distance from village centre (in minutes/hours walking) | _____ | | | | |

Section 2 governance

- | | | | | | |
|---|----------------------|------------------|------|--------|--|
| 8. Are you a VOI member? | Yes | | No | | |
| a. If yes | | | | | |
| i. Standard member or committee member? | | | | | |
| ii. How long have you been a member for (in years)? | | | | | |
| 0-1 | 2-4 | 5-7 | 8-10 | 10+ | |
| iii. Why did you decide to join the VOI? | _____ | | | | |
| iv. When was the last meeting you attended? | | | | | |
| In the last month ago | in the last 6 months | in the last year | | Longer | |
| v. What was discussed at the last meeting? | _____ | | | | |
| b. If no | | | | | |
| i. Have you heard of it? | Yes | | No | | |

ii. Why did you decide not to join?

9. What do you think is the role of the VOI?

10. What are the advantages/benefits of being a VOI member?

11. What are the disadvantages of being a VOI member?

12. Are you happy with the decisions made about managing the forest?

Yes No

c. Why or why not? _____

13. Do you think the VOI is working to achieve its aim? Yes No

a. Why/why not _____

14. What role does the community have in managing the forest?

15. What role does the government have in managing the forest?

16. What role does Madagasikara Voakajy have in managing the forest?

17. Has you or anyone in your household received any benefits from Madagasikara Voakajy? Please give details

	When	Description	For how long
Work			
Materials			
Training			
Other:			

Section 3 ecosystem services

18. Thinking about you and your household, how has your use of resources from the forest changed over the last 5 and 10 years and why?

Which of these resources do you use now or did you use 10 years ago, and if this has changed, why?

21. In general, how would you say your life has changed in the last 10 years? _____

Section 5 livelihood capitals

22. How many fields do you own? 0 1-2 3-5
5+

a. How has this changed in the last 10 years?

Decreased No change Increased
Don't know

23. On average, over the last year, how often has your household had a shortage of rice

Never Weekly Monthly Every couple of months Once or
twice

a. How has this changed in the last 10 years?

Decreased No change Increased
Don't know

24. How far do you have to travel to get water (in minutes/hours)? (Is it clean?)

0-15 minutes 15-30 minutes 30 minutes-1 hour 1-2 hours 2
hours+

a. How has this changed in the last 10 years?

Decreased No change Increased
Don't know

25. When was the last time you or someone in your household was involved in asa iombanana (community work)?

In the last month in the last 3 months in the last 6 months in
the last year over a year ago

a. How has this changed in the last 10 years

Decreased No change Increased
Don't know

26. When was the last time you or someone in your household was involved with helping someone else in the village (firaisakina)?

In the last month in the last 3 months in the last 6 months in
the last year over a year ago

a. How has this changed in the last 10 years

Decreased No change Increased
Don't know

27. When was the last time other people in the village helped you (firaisakina)?

In the last month in the last 3 months in the last 6 months in
the last year over a year ago

a. How has this changed in the last 10 years

Decreased No change Increased
Don't know

28. How many times in the last year has you or someone in your household had to visit the doctor

0 1-3 3-6 7-10 10+

a. How has this changed in the last 10 years?

Decreased No change Increased
Don't know

29. How long does it take you to reach nearest town with markets and doctor (in hours)?

0-1 2-3 4-5 6-7 7+

a. How has this changed in the last 10 years?

Decreased No change Increased
Don't know

30. Do you or anyone in your household own any of the following (circle)?

Zebu (if yes, how many?) Motorbike Bicycle
Plough Separate room or hut for cooking Metal roof

31. Do you have a bank account? Yes No

a. How has this changed in the last 10 years?

Got worse No change Improved
Don't know

32. Do you have enough money for emergencies? Yes

No

a. How has this changed in the last 10 years?

Got worse No change Improved
Don't know

33. What would you do to get money in case of an emergency?

Section 6

34. Being a member of the VOI is a good thing to do

Strongly disagree Disagree Neutral Agree Strongly agree

35. Being a member of the VOI allows me to access forest resources more easily

Strongly disagree Disagree Neutral Agree Strongly agree

36. Accessing forest resources more easily is a good thing

Strongly disagree Disagree Neutral Agree Strongly agree

37. Being a member of the VOI will help protect the forest

Strongly disagree Disagree Neutral Agree Strongly agree

38. Protecting the forest is a good thing

Strongly disagree Disagree Neutral Agree Strongly agree

39. My family think that I should be a member of the VOI

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
40. It is important to me that I do what my family think I should do				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
41. The other people in the village think that I should be a member of the VOI				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
42. It is important to me to do what other people in the village think that I should do				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
43. Most of my family are members of the VOI				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
44. It is important to me to do what my family would do				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
45. Most people important to me would approve of me being a VOI member				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
46. Most people like me are members of the VOI				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
47. Most people in the village are VOI members				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
48. It is important to me to do what other people in the village do				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
49. I am confident that I am able to be a VOI member				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
50. Being a VOI member is my decision				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
51. Being a VOI member takes up a lot of time				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
52. I am less likely to be a VOI member because of the time commitment required				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
53. Being a VOI member means that I will get benefits from the NGO				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
54. Getting benefits from the NGO makes it more likely that I will be a VOI member				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
55. Being a member of the VOI would make me happier				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
56. Madagasikara Voakajy think that I should be a member of the VOI				

Strongly disagree Disagree Neutral Agree Strongly agree

57. It is important to me that I do what my family think I should do

Strongly disagree Disagree Neutral Agree Strongly agree

58. It is important to me that I do what Madagasikara Voakajy think I should do

Strongly disagree Disagree Neutral Agree Strongly agree

59. I intend to become a VOI member or continue being a VOI member

Yes No Don't know

60. Is there anything else you would like to say

61. Do you have any questions for us about the research?

Appendix F MSL variables and PCA scores

Table F-1: Variables used in MSL score and their corresponding factor loadings in the principal components analysis.

PC1 explains 36% of variation in data and all variables have high/even factor loadings. Variables are locally representative and taken from village FG discussions

Variable	Type (range)	Description	Factor loadings		
			PC1	PC2	PC3
Zebu	Count (0-26)	Number of zebu owned by household	0.37	0.70	-0.42
Motorbike	Score (0-1)	Motorbike ownership	0.38	-0.54	-0.65
Bicycle	Score (0-1)	Bicycle ownership	0.47	0.32	0.26
Separate room/hut for cooking	Score (0-1)	Presence of a separate room or hut for cooking	0.47	-0.23	0.56
Metal roof	Score (0-1)	Presence of metal roof	0.52	-0.20	0.04
Cumulative variation explained			0.36		

Appendix G Supplementary Materials for Chapter 2

Table G-1: Statements used to assess TPB framework for VOI membership, score calculation, code used in analysis

(A: Attitudes, SN: Subjective Norm, PC: Perceived control)

	Statement	Description	Code in analysis
A (indirect)	Being a member of the VOI allows me to access forest resources more easily	Behavioural belief (BB1)	$AB1=BB1*OE1$
	Accessing forest resources more easily is a good thing	Outcome evaluation (OE1)	
	Being a member of the VOI will help protect the forest	Behavioural belief (BB2)	$AB2=BB2*OE2$
	Protecting the forest is a good thing	Outcome evaluation (OE2)	
			$AB=AB1+AB2$
A (direct)	Being a member of the VOI is a good thing to do		A1
	Being a member of the VOI would make me happier		A2
			$A=A1+A2$
SN (injunctive indirect)	My family think that I should be a member of the VOI	Injunctive norm (IN1)	$NBI1=IN1*MC$ 1
	It is important to me to do what my family think I should do	Motivation to comply (MC1)	
	The other people in the village think that I should be a member of the VOI	Injunctive norm (IN2)	$NBI2=IN2*MC$ 2
	It is important to me to do what other people in the village think I should do	Motivation to comply (MC2)	
	[The NGO] think that I should be a member of the VOI	Injunctive norm (IN3)	$NBI3=IN3*MC$ 3
	It is important to me to do what	Motivation	

	[the NGO] think I should do	to comply (MC3)	
SN (descriptive indirect)	Most of my family are members of the VOI	Descriptive norm (DN1)	$NBD1=DN1*M$ C4
	It is important to me to do what my family do	Motivation to comply (MC4)	
	Most people in the village are VOI members	Descriptive norm (DN1)	$NBD2=DN1*M$ C5
	It is important to me to do what other people in the village do	Motivation to comply (MC5)	
			$NB=NBI1+NBI$ $2+NBI3+NBD1$ $+NBD2$
SN (direct)	Most people important to me would approve of me being a VOI member		N1
	Most people like me are VOI members		N2
			$N=N1+N2$
PC (indirect)	Being a VOI member takes up a lot of time	Perceived control (PC1)	$CB1=PC1*PB1$
	I am less likely to be a VOI member because of the time commitment required	Power belief (PB1)	
	Being a VOI member means that I will get benefits from the NGO	Perceived control (PC2)	$CB2=PC2*PB2$
	Getting benefits from the NGO makes it more like that I will be a VOI member	Power belief (PB2)	
			$CB=CB1+CB2$
PC (direct)	I am confident that I am able to be a VOI member		C1
	Being a VOI member is my decision		C2
			$C=C1+C2$

Table G-2: Variables used in MSL score and their corresponding factor loadings in the principal components analysis.

PC1 explains 36% of variation in data and all variables have high/even factor loadings. Variables are locally representative and taken from village FG discussions

Variable	Type (range)	Description	Factor loadings		
			PC1	PC2	PC3
Zebu	Count (0-26)	Number of zebu owned by household	0.37	0.70	-0.42
Motorbike	Score (0-1)	Motorbike ownership	0.38	-0.54	-0.65
Bicycle	Score (0-1)	Bicycle ownership	0.47	0.32	0.26
Separate room/hut for cooking	Score (0-1)	Presence of a separate room or hut for cooking	0.47	-0.23	0.56
Metal roof	Score (0-1)	Presence of metal roof	0.52	-0.20	0.04
Cumulative variation explained			0.36		

Table G-3: Internal consistency and validity of constructs used in Theory of Planned Behaviour analysis

McDonalds Omega was used to test for internal consistency, >0.4 is considered acceptable (in bold), results suggest that the direct measurements for attitude and subjective norms were not similar enough to be used as a single factor, and therefore should be considered as individual factors. Correlations between direct and indirect measures for all three constructs were weak, suggesting that they are measuring different characteristics. Therefore direct and indirect measurements for these constructs have not been combined to give an overall score. The correlation between direct and indirect measures for subjective norms was reasonable, suggesting that these can be combined. Correlations between constructs and behaviour were weak but significant, with the exception of the indirect measurement of perceived control which showed a weak negative correlation with behaviour.

***p<0.001

Measures	Number of factors	McDonalds Omega (internal consistency)	Correlation with direct (validity)	Correlation with behaviour
AB (indirect)	2	0.5	0.38***	0.26***

attitude)				
A (direct attitude)	2	0.2	-	0.29***
NBI (indirect injunctive norms)	3	0.6	-	0.46***
NBD (indirect descriptive norms)	2	0.7	-	0.41***
NB (indirect norms)	5	0.7	0.55***	0.49***
N (direct norms)	2	0.3	-	0.49***
CB (indirect perceived control)	2	0.4	-0.18***	-0.30***
C (direct perceived control)	2	0.4	-	0.34***

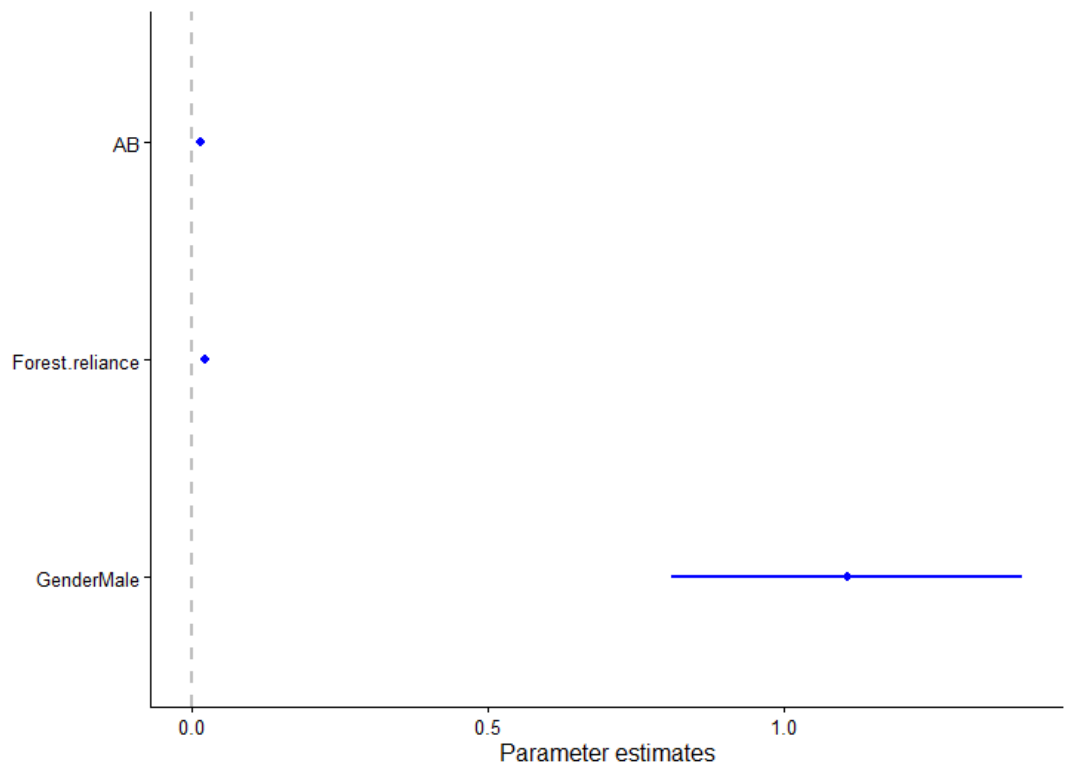


Figure G-1: Coefficient plot showing the estimates for coefficients predicting VOI membership.

The central circles are the mean coefficient estimate for each parameter and lines indicate 95% confidence intervals. There is a positive effect of AB (indirect measure of attitude), forest reliance and male gender.

Table G-4: AIC values of models

Models were refined using the drop1 function, this allows for manual backwards-stepwise refinement until all remaining factors are significant. AIC values allow us to ensure that each refinement is improving the model

Model	Village	Gender	Age	Wealth	Education	Forest reliance	Perceived costs	Perceived benefits	A1	A2	A B	N1	N2	NB	C	CB	AIC
1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	179.51
2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		177.58
3	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		175.68
4		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		172.55
5		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y			170.90
6		Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y			169.06
7		Y	Y		Y	Y	Y	Y	Y		Y		Y	Y			167.87
8		Y	Y		Y	Y	Y	Y			Y		Y	Y			166.51
9		Y	Y		Y	Y		Y			Y		Y	Y			165.82
10		Y	Y		Y	Y		Y			Y		Y				164.21

11	Y	Y		Y		Y	Y	162.6 7
12	Y	Y		Y		Y	Y	159.2 3
13	Y			Y		Y	Y	155.1 0
14	Y			Y		Y		151.3 2

Appendix H Supplementary Materials for Chapter 4

Table H-1: Indicators used to measure livelihood capitals and perceived changes since PA co-management

Livelihood capitals	Indicators	Score (higher is better)	PCA weighting	Proportion of variance explained by PC1
Natural	Provisioning ES access and use	Count	0.670	0.50
	Fields owned	Score (0-3)	0.372	
	Rice harvest	Number of months (0-12)	0.642	
Financial	Access to bank	Score (0-1)	0.626	0.31
	Money for emergencies	Score (0-1)	0.712	
	Ability to earn income	Score (0-1)	0.313	
	Zebu ownership	Count	0.062	
Physical	Distance to nearest town	Score (1-7)	0.157	0.48
	Asset ownership (motorbike, plough, bicycle)	Count	0.682	
	House structure	Score (0-2)	0.714	
Social	Community work (asa iombanana)	Score (0-5)	0.186	0.52
	Helping others	Score (0-	0.698	

	(firaikina)	5)		
	Others helping you (firaikina)	Score (0-5)	0.691	
Human	Doctor visits	Score (0-4)	0.707	0.53
	Years in education	Score (0-4)	0.707	

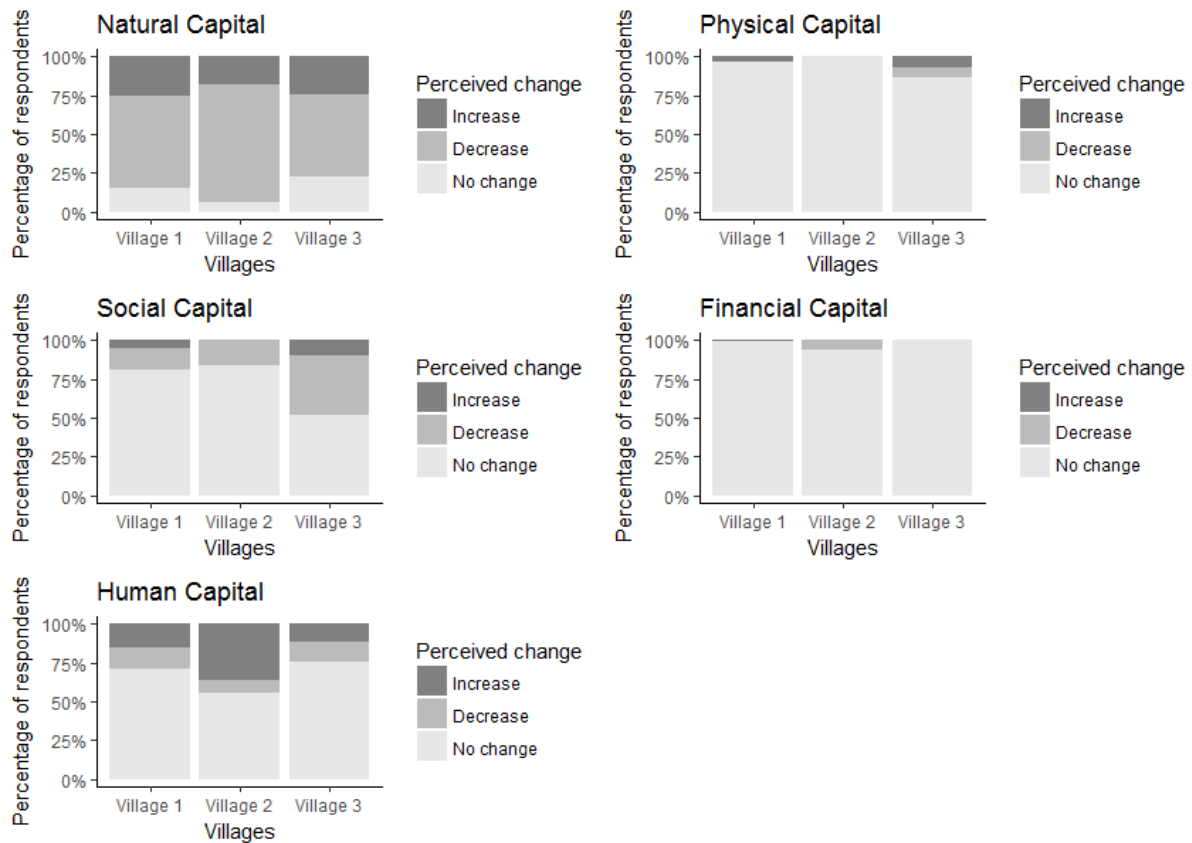


Figure H-1: Perceived changes in livelihood capitals since PA co-management established and villages.

Significantly more respondents in village 2 reported a decrease in natural capital ($x^2 = 10.5$, $df = 4$, p -value < 0.05). Significantly more respondents in village 3 perceived a decrease in social capital ($x^2 = 23.8$, $df = 4$, p -value < 0.001). Significantly more respondents perceived an increase in human capital in village 2 ($x^2 = 14.8$, $df = 4$, p -value < 0.01).

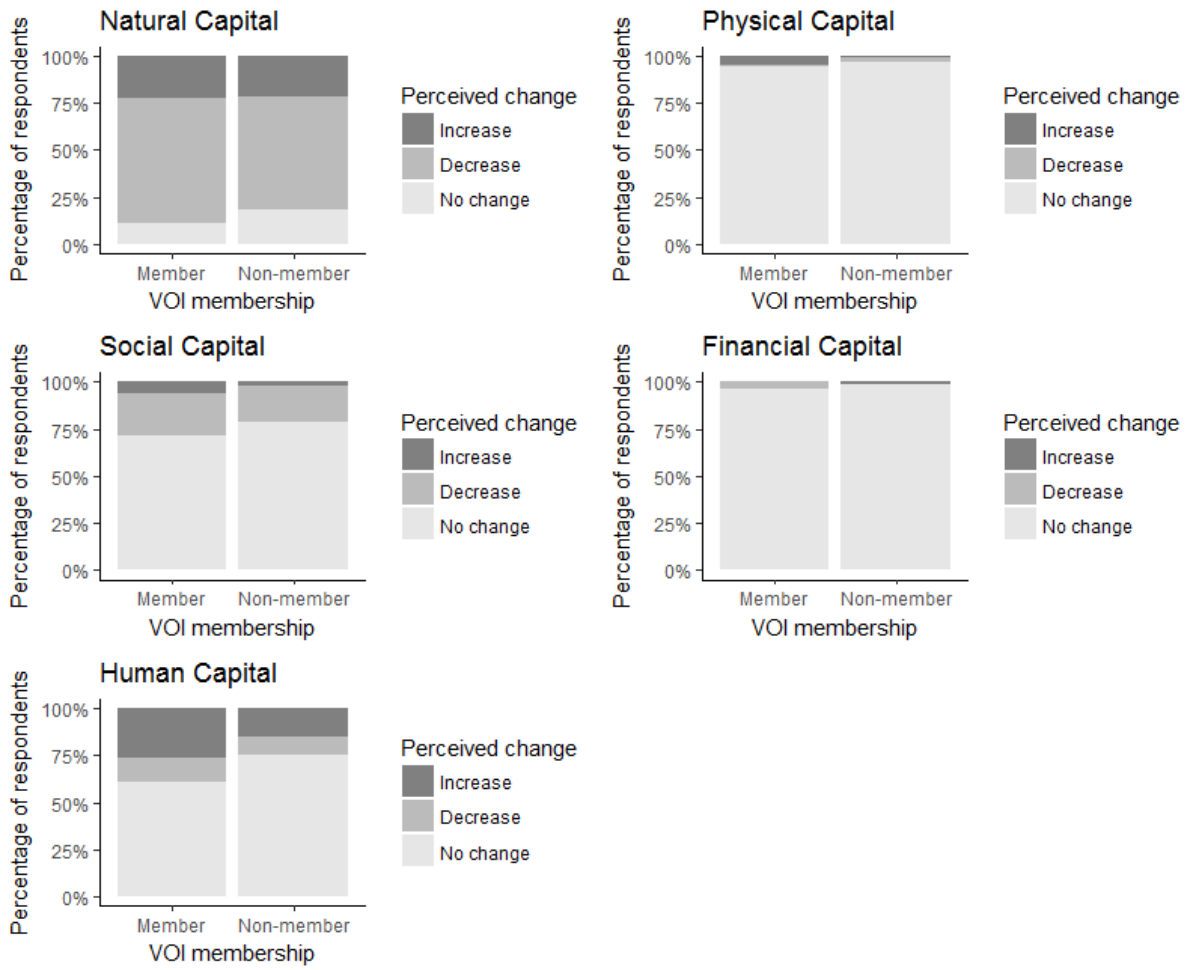


Figure H-2: Perceived changes in livelihood capitals since PA co-management establishment and VOI membership.
 There are no significant differences between VOI members and non-members

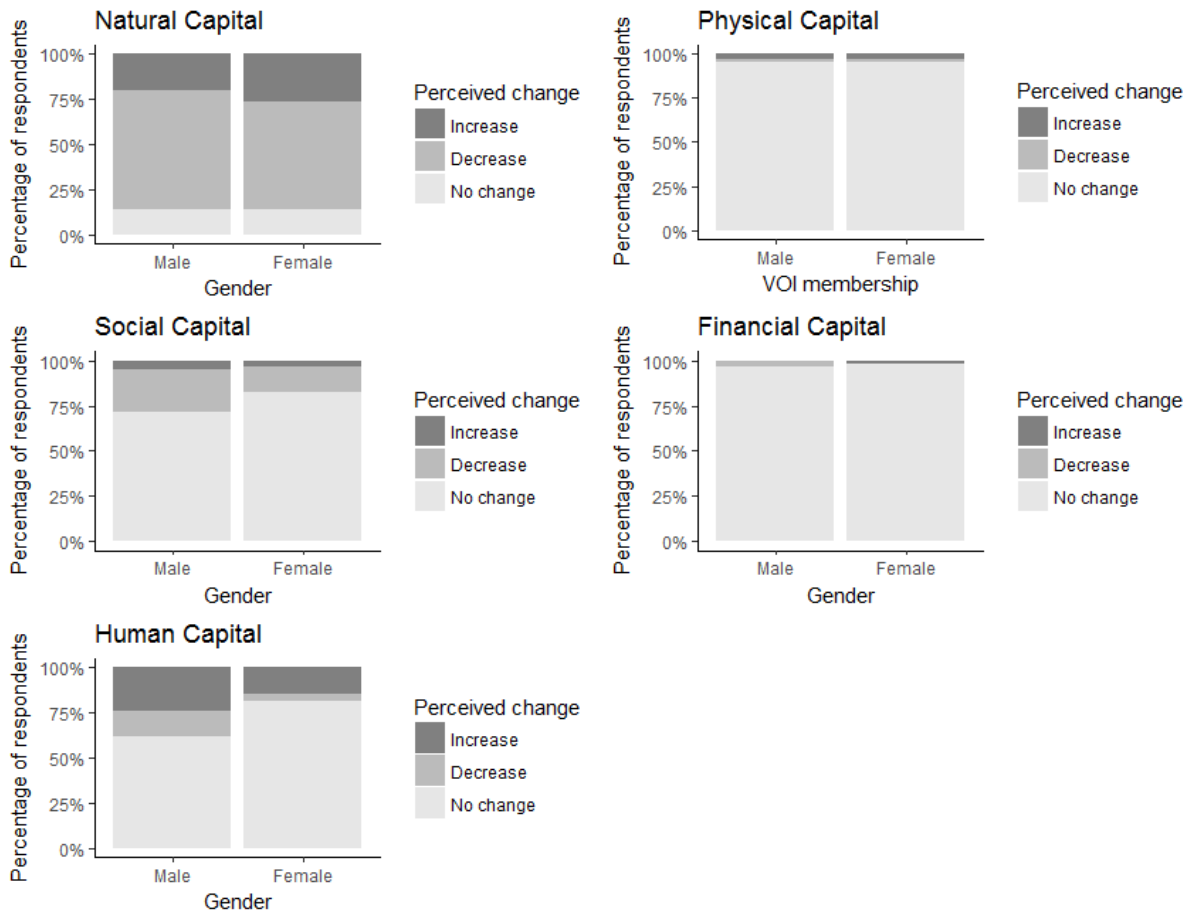


Figure H-3: Perceived changes in livelihood capitals since PA co-management establishment and gender.
 Significantly more male respondents reported a decrease in social capital ($\chi^2 = 7.9$, $df = 2$, p -value < 0.05).

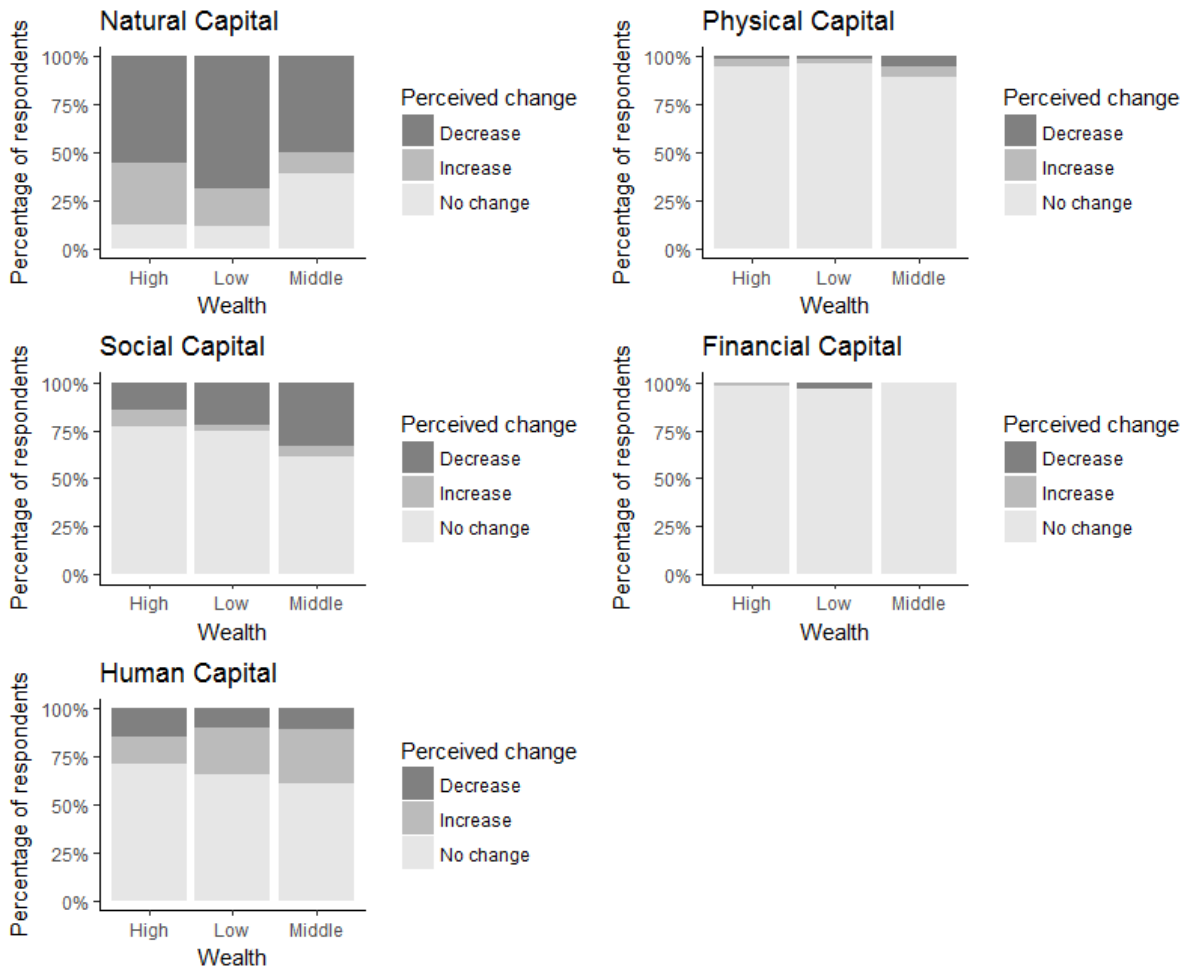


Figure H-4: Perceived changes in livelihood capitals since PA co-management establishment and wealth.

Significantly more low wealth respondents reported a decrease in natural capital ($\chi^2=14.7$, $df=4$, $p<0.01$).

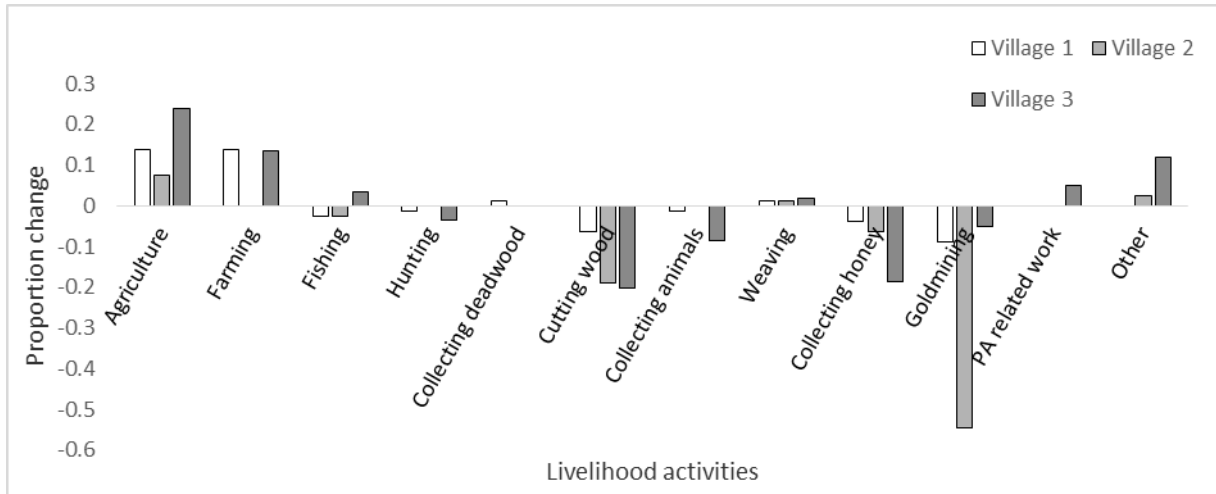


Figure H-5: Perceived change in income-generating activities since PA establishment (2005-06 to 2015-2016) and villages.

Respondents in village 2 and 3 perceived significant decreases in cutting wood ($\chi^2=11.9$, $df=1$, $p<0.001$; $\chi^2=9.06$, $df=1$, $p<0.01$). Respondents in village 2 perceived significant decreases in goldmining ($\chi^2=32.3$, $df=1$, $p<0.001$).

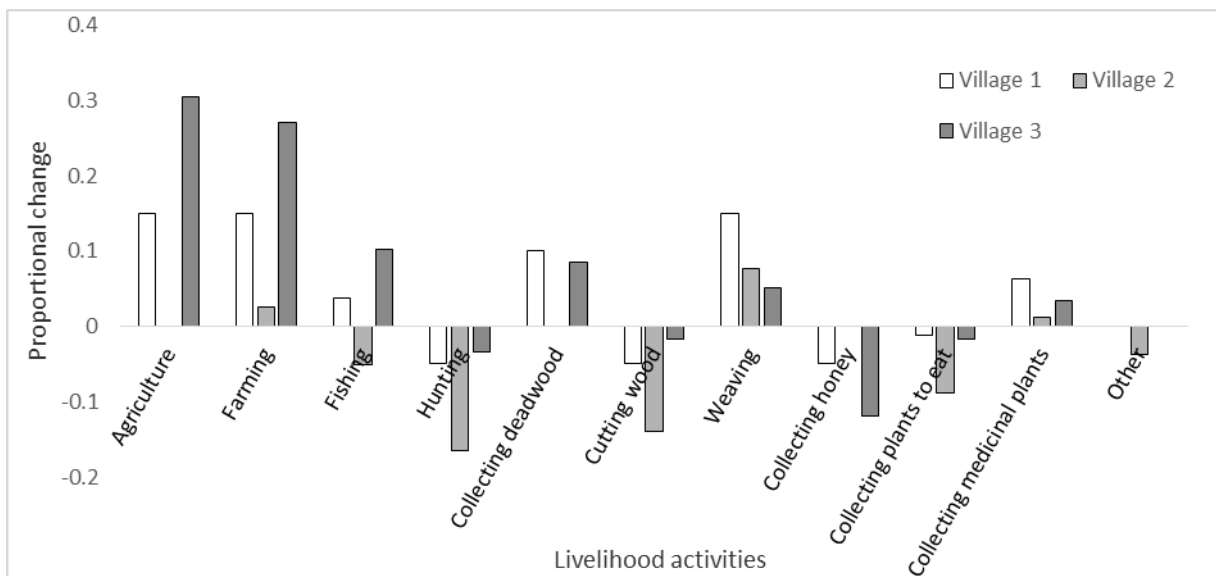


Figure H-6: Perceived changes in subsistence activities since PA establishment (2005-06 to 2015-2016) and villages.

Respondents in village 2 perceived significant decreases in cutting wood ($\chi^2=6.01$, $df=1$, $p<0.05$). Respondents in village 3 perceived significant decreases in collecting honey ($\chi^2=4.77$, $df=1$, $p<0.05$).

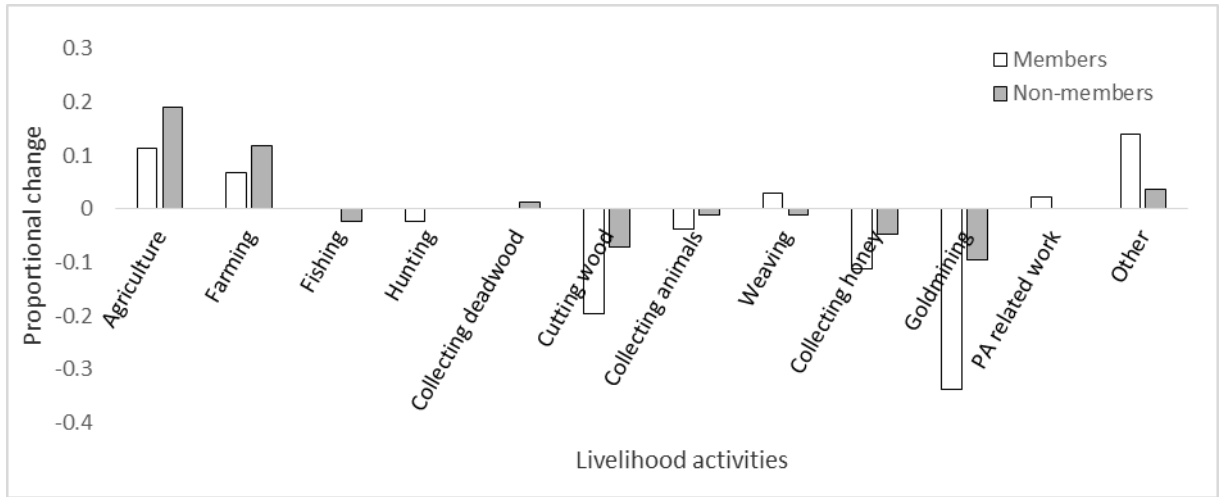


Figure H-7: Perceived changes in income-generating activities since PA establishment (2005-06 to 2015-2016) and VOI membership. Respondents who were VOI members perceived significant decreases in cutting wood ($\chi^2=21.9$, $df=1$, $p<0.001$) and goldmining ($\chi^2=32.3$, $df=1$, $p<0.001$).

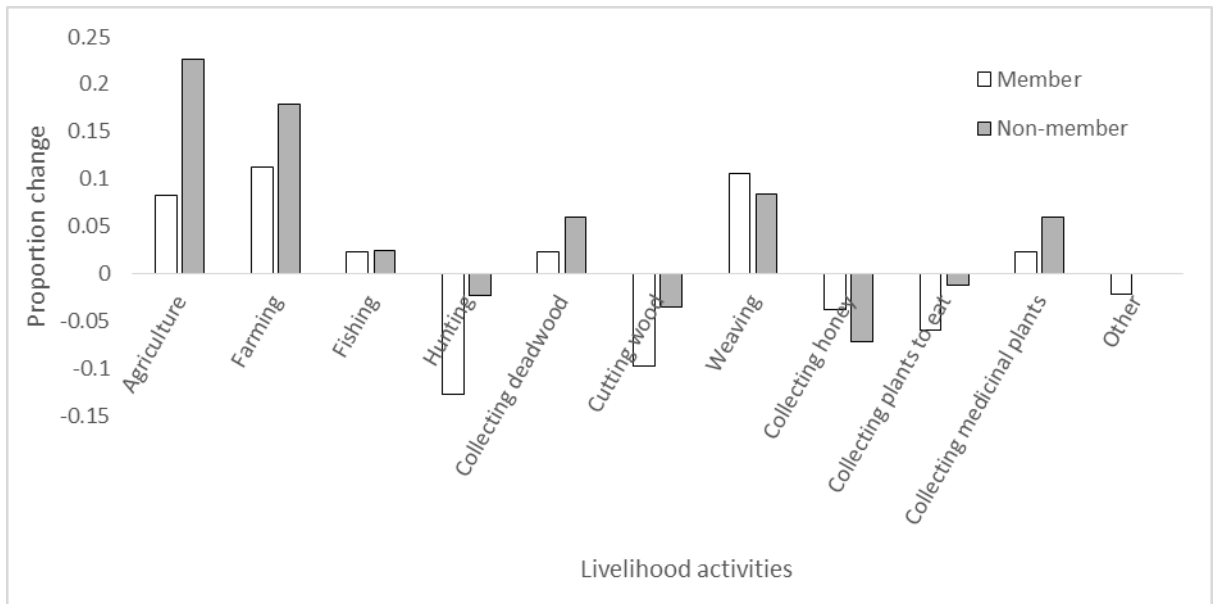


Figure H-8: Perceived changes in subsistence activities since PA establishment (2005-06 to 2015-2016) and VOI membership. Respondents who were VOI members perceived significant decreases in cutting wood ($\chi^2=7.89$, $df=1$, $p<0.01$).

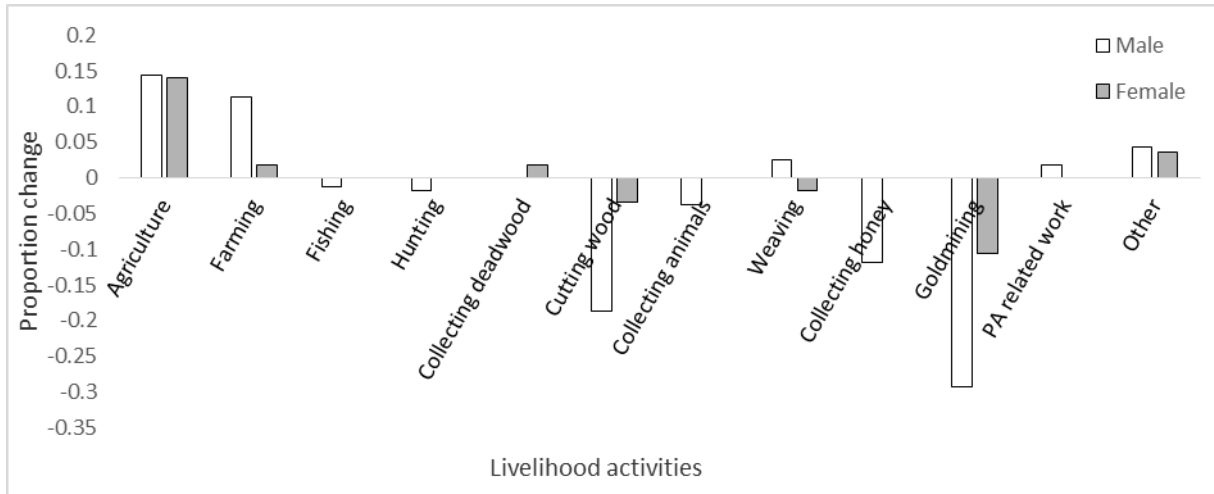


Figure H-9: Perceived changes in income-generating activities since PA establishment (2005-06 to 2015-2016) and gender.

Male respondents reported significant decreases in cutting wood ($\chi^2=25.7$, $df=1$, $p<0.001$) and goldmining ($\chi^2=36.1$, $df=1$, $p<0.001$). Female respondents perceived significant increases in collecting deadwood ($\chi^2=21.7$, $df=1$, $p<0.001$).

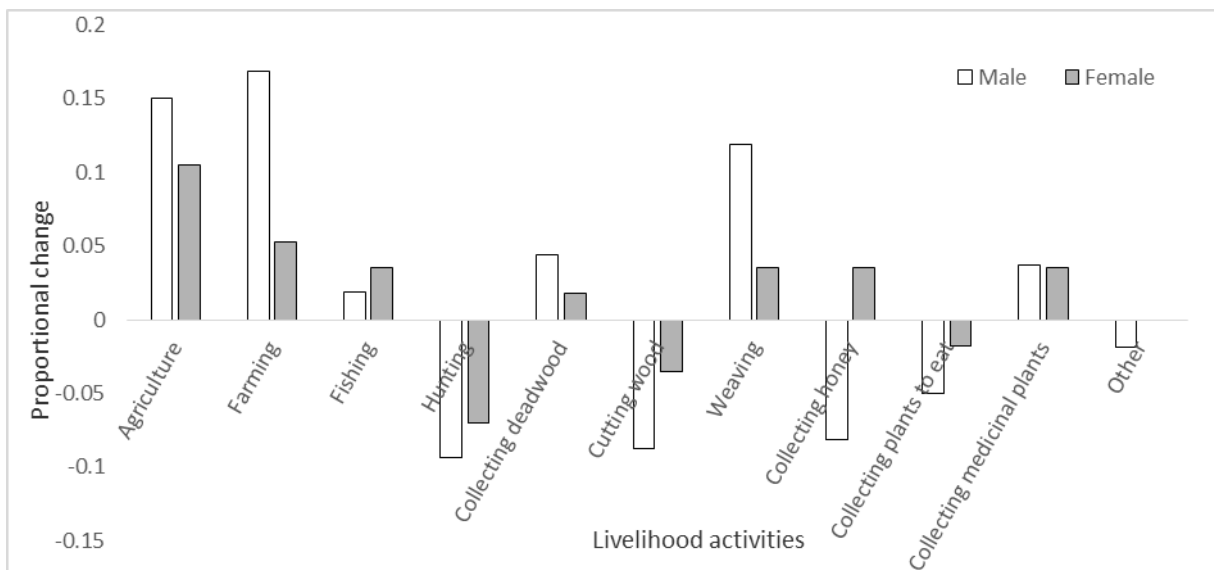


Figure H-10: Perceived changes in subsistence activities since PA establishment (2005-06 to 2015-2016) and gender.

Male respondents perceived significant decreases in cutting wood ($\chi^2=5.08$, $df=1$, $p<0.05$).

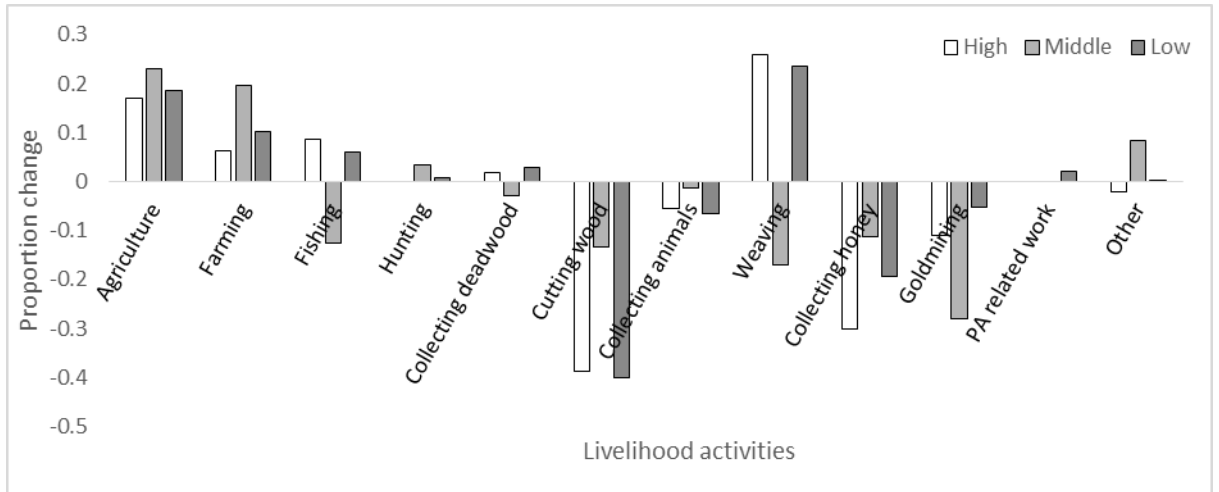


Figure H-11: Perceived changes in income-generating activities since PA establishment (2005-06 to 2015-2016) and wealth.

High and low wealth respondents reported significant decreases in cutting wood ($\chi^2=16.8$, $df=1$, $p<0.001$; $\chi^2=46.8$, $df=1$, $p<0.001$) and goldmining ($\chi^2=3.88$, $df=1$, $p<0.05$; $\chi^2=3.87$, $df=1$, $p<0.05$). High wealth respondents reported significant decreases in collecting honey ($\chi^2=5.85$, $df=1$, $p<0.05$). Low wealth respondents reported significant increases in weaving ($\chi^2=7.03$, $df=1$, $p<0.01$).

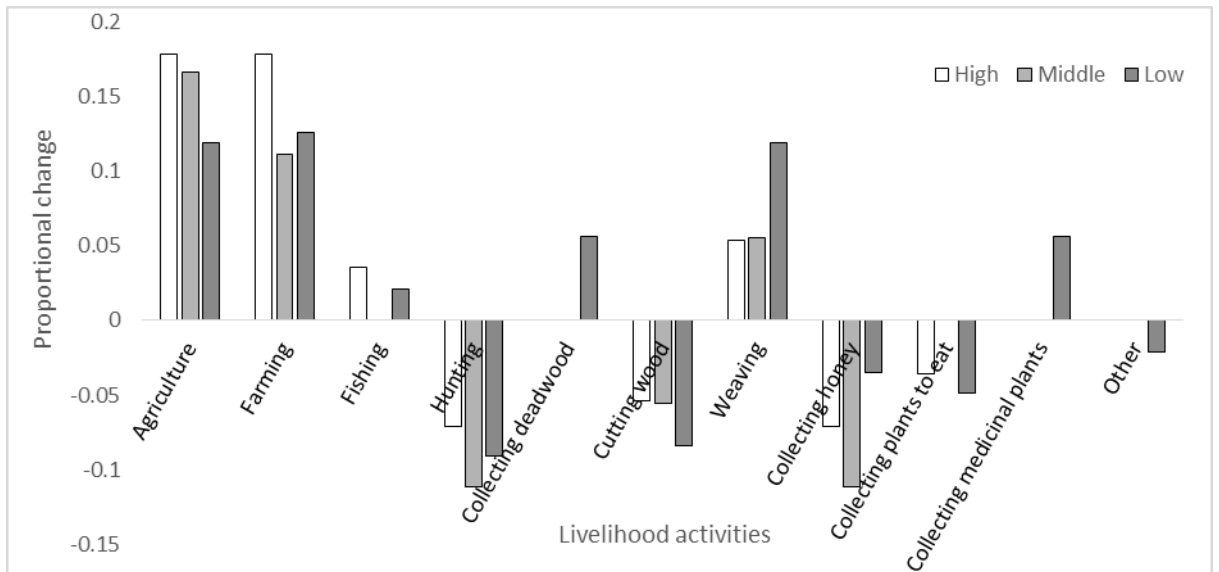


Figure H-12: Perceived changes in subsistence activities since PA establishment (2005-06 to 2015-2016) and wealth.