TITLE PAGE

MSc in Anthropology, Environment and Development Dissertation

TITLE: "If I preserve the health of nature, I will also preserve my own" - Evaluating the Impacts of Community-Based Ecosystem Restoration on the Well-Being of a Traditional Community in the Pantanal, Brazil.

CANDIDATE NO: XWLQ7
ETHICS APPROVAL N: UCL-ANTH/PGT/22-23/121

Word Count ……..14,710

UNIVERSITY COLLEGE LONDON
DEPARTMENT OF ANTHROPOLOGY

Abstract

Restoration of degraded habitats is considered a main international agenda of the next decade. However, in order to succeed, restoration projects must meaningfully incorporate local communities. Participation within community-based conservation has become tyrannical - often perpetuating existing inequalities. A well-being approach has emerged as a framework to gain a deeper insight into the lives of local communities, thus informing more equitable restoration approaches. An area with increasing attention for large-scale restoration activities is the Brazilian Pantanal, despite this, there is a funding and knowledge gap compared with other Biomes. My research aimed to explore the impact of community-based ecosystem restoration on the well-being of a traditional community, in the Western border of the Pantanal. Informed by Woodhouse et al (2016)'s framework, my research employed a mixed methods approach to explore impacts on material, relational and subjective well-being. Using semi-structured interviews, participatory mapping and a questionnaire, this dissertation first builds a picture of how the local community use and value their environment, using an ecosystem services lens to inform how their well-being is tied to the APA. Then, I examine how the implementation of an alternative livelihoods programme, training courses and participatory monitoring within the restoration project impacted the community's well-being, looking at the differential effects on different stakeholders. The findings reveal that due to the community's high dependence on natural resources, ecological changes through restoration have a high potential to impact well-being. They also illuminated the role of institutions, discussing how inattention to power imbalances can exacerbate inequalities and lead to barriers in participation of projects. Finally, I recommend that the incorporation of a biocultural well-being approach into restoration planning would build upon local knowledge systems, leading to better social and ecological outcomes.

Acknowledgments

I would like to express my sincere gratitude to my supervisor, Dr Rafael Chiaravalloti, for his constant support, humour, and patience, as well as the generosity of his time and knowledge. I am so grateful for the introduction to Brazil, particularly the beauty and mystery of the Pantanal.

Thank you to UCL who awarded me a Global Experience Bursary, which supported me through fieldwork.

I would also like to thank ECOA, who generously accepted to host me, facilitate my access to the community of the APA and participate in my research. Thanks especially to Jaburu and Heitor, who made the research process so enjoyable, and to Raquel and her many pets, for welcoming me into their home.

I would like to express my immense gratitude to my translator and collaborator Giu. Without her translations, advice and knowledge, this research would have not been possible.

To the community of the APA and Settlement 72, who generously gave their time to my research. Thank you for your trust and insights.

I would like to thank my friends and family for their unwavering support and encouragement. My time in Corumbá would have been lonely had it not been for the companionship of Bryony, Jojo and Nina, whose support and laughter kept me going throughout the intensity of fieldwork. Finally, my deepest thanks to Maisie, my closest confidant and best friend, who sadly couldn't be here to see the completion of this dissertation.

List of Abbreviations

CBC - Community-Based Conservation

PLANAVEG - The Brazilian National Plan for Native Vegetation Recovery

MEA - Millennium Ecosystem Assessment

ES - Ecosystem Services

CES - Cultural Ecosystem Services

APA - APA Baia Negra

ECOA - Ecologia e Ação NGO

ECS - Extreme Citizen Science

FUNBIO - Brazilian Fund for Biodiversity

GEF Terrestre - Global Environmental Facility

IDB - Inter-American Development Bank

FMDS - Foundation for the Environment and Sustainable Development of Ladário

UFMS - Federal University of Mato Grosso do Sul

UFGD - Federal University Grande Dourados

UFGD - The Federal University of Grande Dourados

IBAMA - The Brazilian Institute of the Environment and Renewable Natural Resources

IMASUL - The Environment Institute of Mato Grosso do Sul

EMBRAPA - The Brazilian Agricultural Research Company

SSI – Semi- Structured Interviews

NPF - Non-Timber Forest Products

SPU - Superintendence of The Union's Heritage

Index

Chapter 1 - Introduction

Restoration of degraded habitats is considered the main international agenda for the next decades, as shown by The General Assembly of the United Nations (UN) declaring 2021–2030 the "U.N. Decade on Ecosystem Restoration," with the central goal of restoring 350 million hectares worldwide (Tedesco et al, 2023). It has been identified as a key strategy in tackling global challenges such as biodiversity extinction and climate change, whilst promoting the resilience of people living in degraded landscapes (Löfqvist et al, 2023).

Ecosystem Restoration will largely take place in the Global South in peopled-landscapes, involving complex trade-offs between local livelihoods, biodiversity conservation, ES provision, and social and economic needs (Löfqvist et al, 2023, Shennan-Farpón, 2022). The majority of restoration priority areas are in landscapes that are home to diverse small rural communities, who protect over 25% of global ecosystems (Garnett et al, 2018). These landscapes are characterised by the high prevalence's of socio-economic challenges within local communities including poverty and insecure land tenure and access, as well as differences in perceptions and values, and the fragility of public institutions and policies (Meli et al, 2022). These dynamics must be considered within restoration planning.

Effective community engagement is crucial to the success of restoration efforts, both during and after the project period (Reid et al., 2017). Many previous restoration projects have failed partly because they did not adequately consider the human dimension, resulting in ineffective community involvement (Cooke et al, 2019, Egan et al., 2011, Höhl et al, 2020). This lack of engagement led to local communities losing interest in managing and protecting these ecosystems, ultimately causing further degradation even after the project's completion. Despite the development of tools aimed at effectively involving local communities in ecosystem restoration, community engagement remains a significant obstacle to restoration success (den Haan, 2021).

The identities of local resource dependent communities are shaped through their environment. Understanding the diversity of values, needs and capabilities within a community, through a well-being approach, is vital to understand how stakeholders are impacted through conservation initiatives which seek to change the relationship between human communities and their environments (Milner-Gulland et al, 2014).

Within this context, this dissertation aims to explore the impact of community-based ecosystem restoration on the well-being of a local population on the Western border of the Pantanal, Brazil. This perspective will illuminate the linkages between impacts of well-being and barriers to participation in community-based restoration, therefore contributing towards the science and practice of restoration (Shanahan et al, 2017).

Chapter 2 - Literature Review

2.1. Community Based Conservation

People-centred and CBC approaches have emerged as a response to the shortcomings of exclusionary conservation practices, recognizing the importance of social and economic factors in achieving successful conservation outcomes (Ghimire & Pimbert, 1997). CBC initiatives, building upon Freire's seminal work 'Pedagogy of the Oppressed,' gained widespread recognition during the 1990s as a response to conventional research methods and the shortcomings of 'top-down' models. The concept of integrated conservation and development, with the overarching objective of sustainable development, was solidified with the publication of the Brundtland Report (1987) and the UN Conference on Environment and Development (1992) (Roe, 2008).

Through emphasising the significance of local communities in development initiatives, CBC seeks to empower them with greater responsibility, authority, and control over resource management and conservation. Its primary objective being "to enhance the engagement of socially and economically marginalised individuals in decisions affecting their own lives'' (Guijt, 1998:1). It theorises that, through placing trust in the capacity and willingness of communities to collaborate for the common good, initiatives will contribute towards self-sufficiency by enhancing local decision-making processes and the establishment of local institutions (Ostrom, 2015, Chambers, 2012). It is therefore a pluralistic approach to conservation, starting from the ground up with linkages spanning different organisational levels (Berkes, 2007).

In theory, CBC holds the promise of addressing the link between environmental destruction and social justice concerns, often termed as 'win-win' solutions and 'pro-poor' conservation (Adams et al, 2004, Roe, 2008). However, the broad definition through which community conservation can be defined has led to the label being applied to a wide array of conservation projects, even when they only marginally differ from a strictly environmental approach (Dressler et al. 2010). This has been shown by Dressler et al, (2010)'s study in the Philippines, where CBNRM arose in

response to colonial conservation policy, leading to the criminalization of former peasants and replacement of earlier land use. Homewood et al, (2012) further illustrates the shortcomings of CBC in Tanzania and Kenya, where the 'win–win' approaches portrayed by conservation enterprises didn't produce the benefits claimed (Homewood et al. 2012). Through these examples, the potential for 'community-based' conservation to further marginalise communities is illustrated.

2.2. Participation as a 'Tyranny'

Over the past two decades, participation has been labelled as a 'tyranny' by scholars including Cooke and Kothari (2001), often falling short of its intended transformative goals in practice (Hickey & Mohan, 2005). Through viewing the community as a homogenous group, participation seldom takes into account the cultural, spiritual, and personal values of nature for local people, leading to its critique as 'just another tool of neoliberal agenda' (Allen, 2018, Cooke and Kothari, 2001). Frequently, initiatives fail to give voice and agency to excluded and disenfranchised individuals, instead, it can reinforce existing marginalisation and reproduce power dynamics by oversimplifying 'the community' as a socially homogeneous group, masking local power disparities (Campbell & Vainio-Mattila, 2003, Hickey & Mohan, 2005). Studies of community-based organisations consistently reveal that participatory projects tend to be controlled by local elites who have appropriated the resources provided by development agencies (Torres, 2011). Many projects claim to be participatory but fall short of actively involving local communities. Participation is often superficial, merely fulfilling the requirement for community involvement and donor compliance and at worst can be extractive or coercive, rather than inclusive or empowering (Brown, 2002).

2.3. Emerging Trends in Participation

2.3.1. Citizen Science and Community Engagement

Citizen science has emerged as a promising approach to incorporate local communities into conservation, thus addressing participation challenges whilst aligning with locally relevant social justice objectives (Moustard et al., 2021). It aims to foster greater public awareness and support for conservation initiatives, which may enhance the success of projects and build a sense of stewardship among stakeholders. Participants collaborate with researchers on practical and pressing local issues, representing the needs of various organisations and communities (Hidalgo et al., 2021). This approach yields valuable information and knowledge from diverse perspectives (Moustard et al., 2021).

As described by Haklay (2013), there are four levels of participation within citizen science:

1. Crowdsourcing - people participate as sensors and are not aware of how the data contributes to addressing scientific questions.
2. Distributed intelligence - participants carry out cognitive tasks for data interpretation.
3. Participatory science - participants contribute towards defining the problem and collect data.
4. Extreme citizen science [ECS] - participants are deeply involved in the research process through co-creation including identifying the problem, forming the research questions, designing the tools and methods for data collection, and collecting and analysing the data (Chiaravalloti et al, 2022).

Extreme citizen science (ECS), drawing knowledge from Participatory Rural Appraisal, embodies a philosophy of situated bottom-up practices that consider local needs, customs, and practices. It collaborates with expansive networks of individuals to design and construct new tools and processes for knowledge creation, aimed at effecting positive transformations in the world (Skarlatidou et al., 2022, Chiaravalloti et al, 2022). These initiatives specifically aim to democratise scientific tools and methods, making them accessible to all, regardless of literacy levels. ECS advocates for active participation in the entire scientific process, from identifying local issues and cooperating in data collection to utilising results to address and resolve issues identified by the communities themselves (Moustard et al., 2021).

Furthermore, ECS initiatives acknowledge the significance of traditional knowledge that indigenous and traditional communities have accumulated. These initiatives actively seek to incorporate this knowledge into the global sustainability agenda (Skarlatidou et al., 2022). Participants in ECS initiatives are intimately connected to and closely observe local natural resources and the environment in their daily lives. It is hoped that ECS can support small rural communities to take ownership over their knowledge and contribute to improving the relevance of location-specific research questions, making them more valuable to managers and local communities (Cooper et al., 2007).

Whilst new tools aimed at enhancing participation have been proposed, their effectiveness in addressing the challenges of CBC remains uncertain. These tools largely rely on a profound understanding of participation and community identity, which is often lacking among practitioners. To gain a deeper insight into the influence of these tools and conservation efforts on local communities, two frameworks have emerged: Well-being and Ecosystem Services.

2.4. Well-Being

The recent shift away from poverty-centred approaches such as CBC towards measures such as well-being has grown in response to the limitations of one-dimensional poverty measures like income or consumption (Woodhouse et al., 2017). The concept differs from traditional indicators of poverty and development due to its positivistic and multi-dimensional nature, encompassing non-material aspects such as social and cultural factors as well as material needs and wants. This perspective acknowledges that people do not experience well-being as isolated individuals but instead as interconnected members of society (Woodhouse et al., 2017).

The concept of well-being is deeply rooted within the capability approach to development, which was first coined by Amartya Sen in 1979 (Sen, 1980). Sen's work has since influenced a number of studies aimed at capturing the different aspects of human poverty and well-being

(Beauchamp, 2016). A notable example is the World Bank's 'Voices of the Poor' research, conducted across 23 countries (Narayan et al, 2000). This research revealed five primary domains of well-being: material assets, health, security, social relations, freedom of choice and action. Another important contribution towards well-being is the Well-being in Developing Countries Research Group (WeD) at the University of Bath, which conceptualised well-being in terms of three interacting dimensions (subjective, material, and relational) (Gough & McGregor 2007). Central to the WeD understanding is the idea that 'resources' go beyond possession of physical things and have social and cultural implications and meanings attached to their possession (Agarwala et al, 2014).

In conservation and natural resource management, well-being highlights the connection between natural and social dimensions of systems, whilst acknowledging the complexity of individuals' lives, their aspirations, and motivations (Woodhouse et al., 2017). Exploring well-being can shed light on actors' incentives and provide insights into their responses to interventions, as individuals are primarily driven by the improvement of their own well-being in decision-making. While conservation goals often focus on practical benefits and economic incentives, it is important to recognize that well-being is a more intricate phenomenon; people may not always act rationally. Consequently, interventions that foster well-being at the local level have the potential to yield environmentally desirable outcomes. They can achieve this by fostering positive local perceptions, increasing community engagement, enhancing the legitimacy of interventions, and ultimately contributing to their success (Woodhouse et al., 2017). Thus, prioritising well-being within restoration offers a pathway to integrate social and equity related objectives into decision-making (Woodhouse et al., 2017). A notable framework which aims to categorise the links between well-being and the environment is the Millennium Ecosystem Assessment (MEA), which links ecosystem services to five main constituents of well-being (Beauchamp, 2016).

2.5. Ecosystem Services

The concept of ecosystem services (ES) has increased in popularity since the 1990s, following Costanza et al (1997), and Daily et al (1997)'s seminal publications. Defined by the MEA as "the benefits people obtain from ecosystems," ES encompass various categories, including provisioning services like food and water, regulating services that involve managing floods, disease, droughts, and land degradation and supporting services such as soil formation and nutrient cycling (MEA, 2005, Fisher et al., 2009). Fisher et al. (2009) proposed an updated definition of "aspects of ecosystems utilised (actively or passively) to produce human well-being." This expanded definition considers ecosystem organisation or structure, as well as processes and functions, provided they are consumed or utilised by humanity either directly or indirectly.

Economic evaluations of ES cannot capture all dimensions of their value. Other social perspectives may offer a more comprehensive representation of the complexities of human behaviour and the less-visible social and ethical considerations (Chan et al., 2022). In this regard, there is a growing emphasis on the significance of values and culture. This highlights the increasing recognition of the critical role that human-nature relationships play in sustaining well-being and safeguarding biodiversity (Masterson et al., 2019a). Cultural ecosystem services (CES) are the non-material benefits that arise from human-ecosystem relationships, encompassing spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. These benefits also include elements such as knowledge systems, social relations, and aesthetic values (Chan et al., 2022; MEA, 2005).

Scholars including Costanza et al (2014) have noted an important contribution of the widespread recognition of ES is that it reframes the relationship between humans and the rest of nature. It emphasises that humans are an integral part of the ecosystems they inhabit, and their well-being is closely tied to the concept of natural capital - the planet's stock of natural ecosystems and resources (Hernández-Blanco et al., 2022). Human well-being is sensitive to ecosystem change, as the provision of ES is dependent on the condition of the ecosystem, or ecosystem health.

Forms of capital, including social capital (such as social networks, interpersonal connections, traditional knowledge, and trust), human capital (encompassing knowledge, physical well-being, and mental health), and built capital (including infrastructure and other relevant assets), are essential in facilitating the delivery of ES (Hernández-Blanco et al., 2022, Costanza et al, 2014). It is important to recognize that conservation initiatives play a contributory role in shaping ES outcomes rather than directly providing these services. Consequently, given the intricate interplay of social and ecological factors in bringing about ES, the benefits derived from these services also yield both social and ecological consequences (Maseyk et al., 2021).

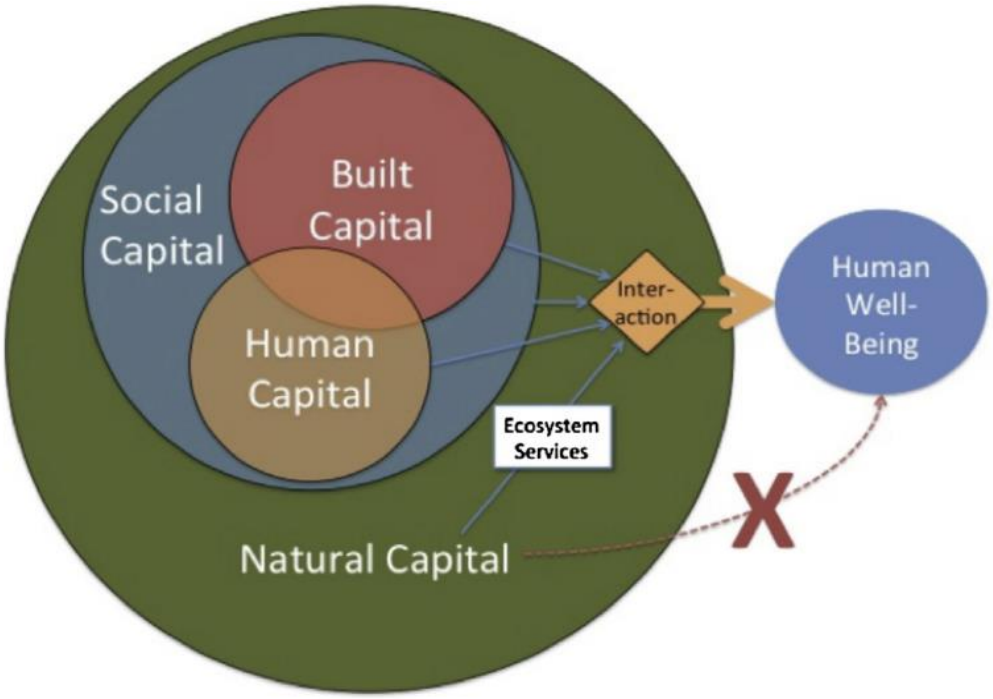

Figure 1. Taken from Costanza et al (2014). This figure displays the interaction between how the interaction between different capitals affect human well-being (Costanza et al., 2014). Sustainable well-being does not flow directly from natural capital, but requires interaction with social, built, and human capital.

While ES can be categorised by their types, it is important to note that these services are intricately interconnected. For example, although CES are identified as an independent category of ES, they can often serve as the lens through which many other ES acquire meaning. In certain social-ecological systems, provisioning services gain particular importance locally because they act as conduits for delivering CES (Chan & Satterfield, 2016). As a result, the outcomes and benefits they produce are often complementary and occur simultaneously (Maseyk et al., 2021).

Trade-offs exist among various ES, meaning that an increase in one may lead to declines in others due to complex social-ecological dynamics (MEA, 2005). Consequently, this can result in situations where some individuals or groups are considered 'winners' while others are 'losers' in terms of deriving well-being benefits (Daw et al., 2011). This is particularly relevant in the context of community-based restoration, as decision-makers must consider the trade-offs in human well-being, particularly with regard to their impact on marginalised stakeholders (MEA, 2005; Coulthard et al., 2012).

An illustration of the dynamics around participation and conservation interventions can be seen in the Western Border of the Pantanal wetland, looking at a community-based ecosystem restoration project as a case study. This project, coordinated by a local NGO, aimed to engage communities, and promote a deeply participatory process of restoration using Sapelli, an Extreme Citizen Science tool.

Chapter 3 - Research Questions

This dissertation sets out to address the question - How did community-based ecosystem restoration impact the well-being of the community in the APA Baia Negra?

To answer this question, I will examine the following objectives:

1. How has restoration impacted the material well-being of the community? (Changes in livelihoods and security)
2. How has restoration impacted the subjective well-being of the community? (Changes in trust and confidence in the future)
3. How has restoration impacted the relational well-being of the community? (Agency and power structures)

Using an ES lens to frame well-being, particularly CES, allowed me to link the non-material dimensions of human-environment interactions and well-being through ecological changes. Due to the interrelatedness of well-being indicators, results are organised by themes that arose through qualitative analysis rather than research objectives, each section covering multiple dimensions of well-being.

Chapter 4 - Study Site

4.1. Brazil

4.1.1 Restoration Agenda in Brazil

Brazil is the world's most biodiverse country and is considered a key country for achieving global restoration goals (Guerra et al, 2020). Brazil's National Plan for the Recovery of Native Vegetation has set forth a national target of restoring 12 million hectares of land by the year 2030 (Guerra et al, 2020). This plan mandates that landowners undertake the restoration of native vegetation in previously converted, environmentally fragile areas, with a particular emphasis on water bodies and alongside riparian buffers (de Souza et al, 2023, Brancallion, 2022).

4.2. Pantanal

4.2.1. The Socio-Ecological System of the Pantanal

The Pantanal is one of the largest and most biodiverse wetlands in the world, with an area of approximately 160,000 km2. The floodplain area alone supports 236 species of mammals, 269 species of fish, 141 species of amphibians and approximately 460 species of birds (Junk et al. 2011). The main environmental feature of the Pantanal is its specific flooding pattern, characterised by a 'flood pulse.' This annual and multi-annual cycle of flooding, driven by the influence of Amazonian rainfall on the northern Paraguay River, determines the extent of terrestrial and aquatic habitats and enables the migration of fish and other aquatic species. This event not only profoundly shapes the ecology of the area, but also determines the cultural traditions of the *Pantaneiros* (the people of the Pantanal) (Schulz et al, 2019).

The Pantanal's Western Border is considered one of the most important areas for conservation in Brazil (Lourival et al. 2009). Due to the altitude variation leading to the presence of different

habitats from wetlands to high-altitude forests, the low deforestation and the variety of vegetation, the area hosts a variety of endangered species. These include jaguars, bush dogs, giant otters, and species (such as the scorpion mud turtle) which rely on the region as a wildlife corridor between the Amazon and the Atlantic Forest (Tomas et al. 2010a).

4.2.2. Degradation in the Pantanal

Wetlands rank highest for the value of ES of all biomes within Brazil, however, are disappearing three times faster than forests (Chiaravalloti et al, 2022, Costanza et al, 2014). Since 1900, between 69 and 75% of all inland wetlands of the world have been lost, making them a particular target for restoration with the potential to yield both ecological and social outcomes (Chiaravalloti et al, 2022).

Historically, the Pantanal has largely been well preserved, with over 84% of its native vegetation still conserved (Chiaravalloti et al, 2022). However, due to agricultural and anthropogenic pressures, it is now undergoing rapid landscape transformation, revealing a 'conversion arc' similar to the arc of deforestation observed in the Amazon (Guerra et al, 2020). In recent years the Pantanal has experienced severe droughts due to reduced rainfall. These are only expected to worsen given the predicted 30% reduction in rainfall and 5–7 C average temperature increase by the end of the 21st century (Martins et al, 2022). In 2020, the Paraguay River experienced its lowest flood level since 1973. This prolonged drought combined with anthropogenic activities resulted in rampant wildfires, which burned approximately 30% of the Pantanal and affected over 17 million native vertebrates, 4 billion invertebrates and uncountable plants (Martins et al, 2022). Despite the Pantanal undergoing rapid land use changes and degradation, the funding gap is still large - only 1% (50,000 ha) of PLANAVEG is targeted in the Pantanal (Brasil, 2017). There is also a clear knowledge gap for restoration within the Pantanal, as it has the fewest number of restoration studies of all biomes in Brazil (Guerra et al, 2020).

4.3. The APA Baia Negra (APA)

My research was conducted in the APA, a small sustainable use protected area on the Western Border of the Pantanal in the municipality of Ladário, Mato Grosso do Sul. The area covers almost 6,000 hectares of Pantanal regions, semi-deciduous dry forest, and large bays on the bank of the Paraguay River. First created in 2010 with a demand from the Federal Public Ministry (MPF) in partnership with the Secretary of Union Heritage (SPU), it is currently the only Sustainable Use Conservation Unit fully inserted within the Pantanal Biome, allowing low impact activities and use of natural resources inside (ECOA, 2019).

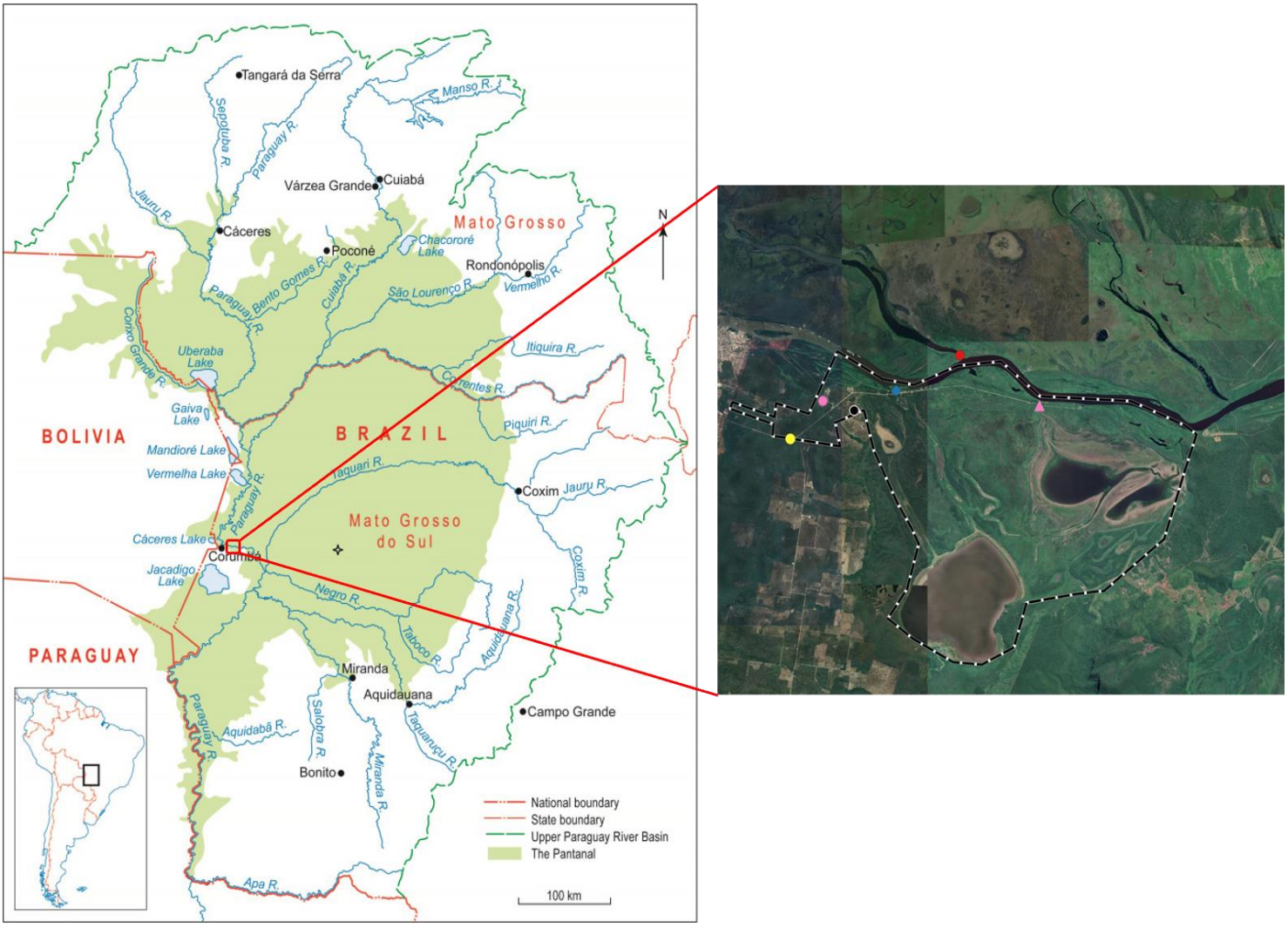

Figure 2. A map of the APA, located on the Western Border of the Pantanal in the municipality of Ladario. The dotted line denotes the boundary of the APA, and the blue dot marks the APA headquarters. Sourced from Schulz et al (2019) and ECOA.

4.4. Participants

4.4.1. The Community of the APA

The APA is home to a traditional *pantaneiro* riverine population of 25 households. Traditional Populations are recognised by the National Policy for the Sustainable Development of Traditional Peoples and Communities, due to their unique cultural, religious, ancestral, and economic identities, social organisation, and territories (Brazil, 2007). The remote and inaccessible environment of the Pantanal, combined with the flood pulse, has moulded the lifestyle of the riverside dwellers. Their identity is rooted in a close relationship with their environment, ecological knowledge, and ancestral practices (Schulz et al, 2019). The population who resides in the Baía Negra APA partake in livelihoods including trail guides, small boat pilots, artisanal fishing, bait capture, as well as the maintenance of small crops, production of sweets from fruits in the main and typical foods (Silva-Melo et al, 2019). As well as subsistence and livelihoods, fishing forms an important aspect of their identity, which will be explored through participant testimonials in later chapters.

Settlements surrounding the APA are home to small-scale agricultural communities. Settled families are involved in pumpkin, corn, and cassava cultivation as well as dairy production which is sold in the nearby city of Ladário. Participants from a nearby settlement (Settlement 72) were included in the questionnaire sample in order to compare quantitative information about people's well-being. Settlement 72 was created in 1999 by the National Institute of Colonisation and Agrarian Reform (INCRA) (Cuyate, 2015).

The history of the area and the way local people use the land will be discussed in more detail in Chapter 5.

4.5. Ecosystem Restoration Project

The ecosystem restoration project in the APA was coordinated by Ecologia e Ação (ECOA), a local NGO who have been working in the region since the 1980s. They are well established and have built relationships within the community of the APA, having helped create the sustainable use protected area, and since its formation have coordinated development projects including female empowerment and fire brigade projects in the region. They also acted as my host organisation, and I accessed the community with the assistance of knowledgeable drivers, facilitated by ECOA, who helped me navigate my field site.

4.5.1. Restoration Project Goals

The overall objective of the restoration project was to implement different ecological restoration projects in a participatory manner on approximately 65.9 hectares within the Baía Negra Environmental Protection Area inserted in the Pantanal Biome. This included four goals -

1. Implement mechanisms for participatory monitoring of ecological restoration
2. Implement active reforestation actions in 3.3 hectares of areas with a history of gravel mining and without a history of regeneration (soil replacement, active planting seedlings)
3. Implement reforestation actions mixing passive and active actions in 7.7 hectares of areas with a history of gravel mining but with passive regeneration
4. Implement restoration actions on 44.7 hectares in areas with more advanced passive regeneration and restoration of springs.

These goals were achieved through three main restoration techniques: the removal of the invasive species Leucena, the clearing and soil restoration of areas previously used for waste disposal and the planting of native seedlings.

4.5.2. Funders

The project was financed by the Brazilian Fund for Biodiversity (FUNBIO), through the agency Global Environmental Facility (GEF Terrestre), under the Conservation, Restoration and Management Strategies Project for Caatinga, Pampa and Pantanal biodiversity, which is coordinated by the Ministry of the Environment and has the Inter-American Development Bank (IDB) as the implementing agency and FUNBIO as the executing agency (Aristides, 2021b).

4.5.3. Sapelli

Sapelli, the Extreme Citizen Science tool, was implemented in the project to monitor the progress of the restoration and possible adaptive management by corrective measures. Community members were trained on the software and its use in data collection by the Reforestation group of the Federal University of Mato Grosso do Sul. In implementation, community members were asked to collect data using three indicators in order to monitor and evaluate restoration efforts:

I - soil cover with native vegetation, in percentage
II - density of native regenerating individuals, in individuals per hectare
III - number of native regenerating species

The aim of Sapelli's implementation into the project was to enable the community to co-produce knowledge and therefore foster greater interaction with restoration, increasing the perception of patterns of ecological data (Cooper et al. 2007).

Chapter 5 - Methodology

5.1. Methodological Framework

To collect and analyse data, my research employed a well-being framework. Well-being research is represented by a diversity of theoretical frameworks therefore when selecting one I focussed on which would best align with my case study and research aims.

My research followed the framework proposed by Woodhouse et al (2016). Based on McGregor and Sumner (2010) and drawing on the World Bank's 'Voices of the Poor' research, this framework conceptualises well-being in terms of three interacting dimensions.

- A material dimension which objectively explores the circumstances of a person's life and the extent to which their needs are met, including livelihoods, housing, and health - 'What you have'
- A relational dimension focusing on how people engage with others to meet their needs and achieve goals, including community networks, social institutions, and empowerment - 'What you can do with what you have'.
- A subjective evaluation of an individual's own life and the meanings and values ascribed to the processes one engages in and the outcomes of those processes - 'How you feel about what you have and what you can do' (Woodhouse et al, 2016, Beauchamp et al, 2018).

This framework was selected due to its attention to well-being as a multi-dimensional concept and its conceptual guidance for measuring the impacts of conservation interventions on human well-being, which is most appropriate to my case study (Beauchamp et al, 2018). The relational aspect acknowledges that definitions of a good life are socially constructed, and individual well-being is pursued in relation to other people. This is a particularly important dimension when understanding how community-based restoration has impacted different stakeholders

(according to differing socio-economic and demographic characteristics) due to the critiques that CBC initiatives obscure power imbalances and are misaligned with local realities (Dressler et al, 2010, Woodhouse & McCabe, 2018).

5.2. Primary Data Collection

My research is based on a mixed methods approach including, semi-structured interviews, participatory exercises, and a questionnaire. In order to accurately report on both objective and subjective measures of well-being, a mixed methods approach was necessary (Daw et al, 2016). Quantitative approaches allow for a concise presentation of well-being indicators whereas qualitative approaches prioritise bottom-up perspectives in conceptualizations of wellbeing and often provide greater detail about experiences of well-being within complex socio-ecological systems (Fry et al, 2017, Loveridge et al, 2020). Mixed methods were also used for triangulation and complementarity. Research was carried out over 8 weeks from May to June 2023.

5.2.1. Sampling

Due to the population size of the APA and nearby settlement, as an intensive case study, all sampling was non-probabilistic (Bernard, 2017). Within the eight weeks I had approached every household in the APA and invited them to participate in my research, often returning at different times of day if members were not at home. I aimed to reach a representative population of fishermen as well as women engaged in alternative livelihoods, and so utilised purposive and opportunistic sampling in order to do so. Purposive sampling was also used when recruiting participants who had been involved in Sapelli data collection or from ECOA, based on their involvement within the project.

5.2.2. Qualitative Data

5.2.2.1. Semi-Structured Interviews

As Woodhouse et al (2016)'s guidance dictates, local perspectives must drive understandings of well-being, as externally derived categories may not have meaning for local people, and therefore will not identify locally significant impacts of interventions. Informed by this framework, my research aimed to develop locally appropriate indicators of well-being. SSI were used to understand and explore indicators of well-being as identified by participants themselves. Open-ended questions allowed participants to speak freely on well-being topics and restoration impacts whilst acting as a rapport-building method between myself, my translator, and my participants (Newing, 2011).

A total of 22 interviews were conducted, 19 of which were with participants from the APA. In total I interviewed eight women and eleven men, but as a significant population of APA households are fishermen living alone, this gender split was representative of the population. Two interviews in the APA were joint with a husband and wife both participating (Interview 14 and interview 7). A further three interviews were conducted, two with employees from ECOA (both male) who were involved in the project and one with a female federal prosecutor, involved in ensuring degraded areas in the municipality are restored. Interviews were facilitated with the help of a translator, recorded, and later transcribed and translated into English.

In order to be reflexive throughout the research process, I tested and edited my interview guide for the first week of fieldwork, until my translator and I agreed that the questions worked well with my research aims and were easy for the community to understand. My final interview guide (Appendix 1) covered three major themes of ES, perceptions of restoration and subjective and relational well-being. A separate interview guide (Appendix 2) was used for interviews with participants from ECOA and government.

5.2.2.2. Participatory Methods

Participatory mapping offers the chance to explore local understandings and uses of the natural

environment, a useful perspective when understanding the impacts of ecosystem restoration (Newing, 2011). I conducted a participatory mapping exercise with a total of 11 participants (five men and six women) from the APA. Participants were shown a map of the APA on Avenza Maps, a digital mapping software, and asked to plot areas of importance to them as well as areas where restoration had taken place and the type of restoration the area had undergone. They were then asked to select areas where they believed restoration should take place and which strategy should be employed.

A ranking exercise was conducted in conjunction with the mapping exercise in order to determine and compare participant's priorities in restoration (Newing, 2011). Participants were given five popular restoration strategies which emerged through SSI (planting native trees, planting fruit trees, removal of Leucena, removal of rubbish and soil restoration) and asked to rank these from most to least important.

5.2.2.3. Qualitative Analysis

Interview length varied from 15 minutes to over an hour. Transcribing and translating interviews took approximately 12 hours per hour recorded (Bernard, 2017). NVivo was used to conduct thematic analysis by identifying, organising, and analysing themes from interviews. Each transcript was codified and organised into analytical categories that were then incorporated into themes.

Maps were analysed by categorising points into three categories: area of importance, area of current restoration, area which participant believes should be restored. This data was then compiled into a single map and compared with maps of the restoration areas supplied by ECOA. This informed knowledge of how the community understands and values the area.

5.2.3. Quantitative Data

5.2.3.1. Questionnaire

A questionnaire was conducted to collect quantitative data on objective and subjective measures of wellbeing including a wealth ranking, food security and support networks, as well as data on natural resource use. The questionnaire was designed using Woodhouse et al (2016)'s framework and with well-being indicators informed by SSI. The final questionnaire covered material, relational and subjective wellbeing topics including wealth, security, trust in organisations, gender autonomy, heath, and social relations (Appendix 3). Subjective well-being data was collected using the Satisfaction with Life Scale, a five-question research instrument where respondents self-report their satisfaction with life as a whole (Loveridge et al, 2020). The questionnaire also included a section on natural resource use, which was developed through identifying the 10 most relevant ES based on information gathered through SSI and a review of the literature. A combination of Likert Scales, Y/N questions and closed lists were used (Newing, 2011). Questionnaires were administered face to face by my translator which enabled explanation over scales (Newing, 2011). 40 questionnaires were collected in total, with 21 households from a nearby settlement and 19 from the APA. Each questionnaire collected represented a different household.

Of the 40 questionnaire participants, nine were residents of the APA who had participated in SSI, two of which participated in all three methods. Eights residents took part in both the SSI and Mapping but not the questionnaire. The total number of participants was 51.

5.2.3.2. Quantitative Analysis

Throughout the text, descriptive statistics of the quantitative data including percentages and differences, are used to better illustrate the qualitative results and emerging patterns.

Well-being is a multivariate construct; it encompasses different aspects of peoples' lives that range from autonomy to livelihood security. I collected data on 33 variables. The statistical approach non-metric multidimensional scaling (NMDS) was used to better understand the data. An NMDS approach is preferred when dealing with datasets with several variables, as it allows the creation of an index that represents the distribution of all the variables analysed. This creates

different indexes using one, two or three axes. The more axes used, the higher likelihood that the index will accurately represent the dataset. As a quality control, good models (or index) are those that have stress (a measure of quality) below 0.20 and r2 above 80%. Should the index be considered a good representation (high r2 and low stress), it allows visualisation of the variables which play the most important role in the index and verifies if there are significant differences within groups (carried out through a multivariate analysis of variance – MANOVA). All analyses were carried out in R using the package vegan (Oksanen et al, 2022).

5.3. Positionality

Due to the short timeframe and sensitive nature of my research, I adopted an approach based around reflexivity and reciprocity in an attempt to minimise the extractive nature (Millora et al, 2020). My position as a white, educated English researcher put me in a position of relative power towards my participants, and this imbalance may have impacted their decision when consenting to participate. In order to reduce the power imbalance, I followed ethical guidelines to ensure participants knew their rights and incorporated participatory exercises into my research (Camfield et al, 2009). My position as a young female researcher with a young female translator may have affected how I was perceived, and the information shared with us (Bernard, 2017).

I spent almost every day of my eight-week research period in my field site and learnt basic Portuguese in order to develop rapport with my participants. Despite this, my interactions were largely mediated through the help of a translator which did impact my ability to connect with community members. However, discussing me and my research offered an opportunity for my translator and participants to develop rapport which may have benefitted my research. Due to my relationship with my host NGO, who were also the NGO coordinating the restoration project, it is likely that I was perceived by residents of the APA as being part of the organisation, despite my emphasis that my research was independent and they should answer freely. This may have influenced some participants' responses when discussing their opinions of ECOA and the restoration project.

My relationship with participants from ECOA was mediated through my dissertation supervisor, who at the time acted as scientific director. My position as his student may have shaped their perception of me, as he is a respected and trusted figure not only within the organisation but in conservation research across the Pantanal. As my host NGO was also the NGO who conducted the restoration project, this likely influenced their responses to me when discussing successes and failures of the project.

5.4. Ethical Considerations

Research was conducted in line with approved ethical procedures and considerations (UCL-ANTH/PGT/22-23/121). My research addressed topics including spirituality and health. Due to the sensitive nature, an overview of the topics covered was shared with each participant before every interview. The participant and interviewer discussed the topics prior to the interview and participants identified any topics they did not wish to cover. Due to most participants being non- or semi-literate and the spontaneous means by which some interviews occurred, all consent was given verbally and then recorded. All data was anonymised.

5.5. Problems and Methodological Limitations

The main methodological limitation to my research is accurately capturing the well-being of a community which I am not a part of, within the limited time constraints of an eight-week fieldwork period. Whilst methods were chosen to ensure appropriate triangulation of themes, in order to understand drivers of well-being within the timeframe, I focussed on changes in well-being which had been brought about directly through the restoration project. Despite this, due to the constraints of fieldwork, opportunities for full immersion within the community was limited and well-being topics may not have been explored in as much depth as ought. Furthermore, impacts from restoration through changes in ES take time to develop - my research has focussed on the community's perception of current and future ES. It was beyond the scope of this dissertation to examine the role governance systems of the sustainable use protected area

play in the lives of the community, and how these interact with well-being and restoration outcomes, although this would be an interesting topic for further study.

My research explored the identities, cultural values, and subjective experiences of my participants - topics which are complex and highly context specific. As I cannot speak the language fluently, I relied on a translator to capture these nuances. Although she had conducted research previously in the area, she was not from a traditional riverine background or the Pantanal so subjective experiences to do with well-being may not have been captured accurately.

Initially, I planned on conducting transect walks with members of the community to better understand how they interacted with their environment, however after testing this method it became clear that the heat and difficult terrain discouraged participation, and I revised my methodology to incorporate a participatory mapping exercise.

Chapter 6 - The APA Baia Negra and its Community

In this chapter, I will outline the history and current way of life of the local population of the APA, exploring three main aspects: isolation, livelihood, and identity. This chapter will serve as the framing for the human-environment interactions and well-being of the local community, through which the impacts of restoration can be explored in Chapter 7.

6.1. History of Occupation

The APA has been inhabited by humans since the early settlement of the Pantanal approximately 8,000 years ago. Accounts from early colonizers in the 16th century depict the region as densely populated by indigenous groups, including the Guató, Kadiwéu and Bororo. However, most of these groups were decimated by the Portuguese and Spanish occupation of the region. Some extended families survived and remained in the region, often merging with other groups who began to occupy the Pantanal. Among these settlers were former slaves who had left mining areas in the Cuiabá region in the late 19th century and Paraguayans who migrated to the Pantanal after the war against Brazil during the same period (Wantzen et al, 2023). This complex history is reflected in the mixed ethnicities of the riverine communities in the Pantanal, including African, Paraguayan, and Indigenous heritage (Chiaravalloti, 2019).

In the 1970s, there was another significant transformation in the occupation and landscape of the APA. During this era, the Brazilian Federal Government initiated infrastructure projects in the Pantanal, primarily aimed at promoting cattle ranching. As part of these developments, roads were constructed across the Pantanal to enhance connectivity and accessibility. Within the APA, the government began building a new road over the flooded areas to connect the cities of Corumbá and Ladário with the eastern Pantanal. This road was also intended to drain a portion of the floodplain for crop production. However, due to a combination of poor planning, corruption, and unpredictable floods in the region, the road was never completed (Wantzen et al, 2023). The construction company abandoned the project, leaving a large artificial mound with an unpaved road leading to nowhere, crossing the floodplain. In the 1980s and 1990s, this unfinished road began to attract tourists from Corumbá and Ladário who sought opportunities

for fishing and leisure activities. Several families settled in the area with the intention of providing tourists with amenities such as boats and fishing equipment. Consequently, lodges, supported by tourism development, began to appear in the region.

Figure 3. The road through the APA. Taken by the Author.

Due to the population growth, the region experienced a surge in deforestation rates. Consequently, environmental NGOs began exerting pressure on the government to better preserve the area, due to its significance for biodiversity. In the 2000s, the Superintendence of The Union's Heritage (SPU) took action by designating a portion of the area as a formal Protected Area, known locally as a Conservation Unit (Tomas et al, 2010b). This move was made in accordance with the Brazilian National Water Resources Policy (Law No. 9433, enacted in 1997), which allows the government to claim ownership of flooded regions and, in collaboration with

local authorities, established the Environmental Protection Area (APA) Baia Negra (Chiaravalloti et al, 2017b).

It's worth noting that the Environmental Protection Area, or APA, is the category of Protected Areas in Brazil characterised by the lowest level of restrictions on resource use and access (Law No. 9985, enacted in 2000). Many APAs encompass cities or mining sites within their boundaries, and some experts view the APA designation more as a zoning regulation rather than a formal Protected Area. For instance, evaluations of deforestation within Protected Areas in Brazil tend to not consider APAs as a category of Protected Area (Nolte et al, 2013). Nevertheless, the local management team responsible for establishing this APA adopted a different approach. They formulated a management plan that prohibited any activities or alterations to the landscape that were not deemed "sustainable" by a team of experts, including practices like ranching or logging. Additionally, they forced the relocation of several families who had migrated to the region during the 1980s and 1990s, resulting in the closure of most lodges. Presently, the APA permits only fishing, the collection of baits, and the harvesting of non-timber forest products (NTFP) within its boundaries.

6.2. Community perception of the APA

6.2.1. Isolation

The history of occupation, displacements, and regulations implemented on resource use and access by the creation of the Protected Areas has left important marks on the way people deal with and interact with the APA. One critical theme that emerged through thematic analysis was isolation, as one participant summarised "*We are forgotten here!*" (I18, F). Local, social, and economic isolation is characteristic of riverine communities in the Pantanal (Junk, 2011). The APA is difficult to access, with only one narrow dirt road running through it. The community is surrounded by mountains on one side and the Paraguay River on the other. The lack of transport links makes locals feel as though "*the people here are very much on their own*" (I14, M). Quantitative analysis revealed the extent of this geographic isolation, as only 36.8% of APA

participants surveyed reported feeling connected to cities, which vastly contrasted 68.4% of participants from a nearby settlement.

Despite this, the community feels supported by institutions. The APA is managed by "Management Council of The Black Bay APA," composed of the Ladário Environment Foundation, IBAMA, the Brazilian Navy, IMASUL, EMBRAPA, UFMS, UFGD, ECOA and the Association of APA Residents. They constantly interact with local communities and other external actors. This is revealed by the results of the questionnaire, in which 47.4% of participants within the APA reported feeling adequately supported by the state, and 42.1% felt supported by local NGOs. This contrasts with participants of a nearby settlement, in which only 9.5% of participants reported feeling supported by the state and NGOs. This support is evident through the difference in services compared to another nearby rural settlement, although there is still a notable imbalance between the APA and the nearest cities. 78.9% of APA participants reported as having access to clean water compared to 52.4% in the settlement, and 73.7% APA felt as though they had access to sanitation whereas only 33.3% of settlement participants agreed.

Despite feeling supported, this support only considers basic human needs, with participants noting "*the municipality brings water only for human consumption*" (I17, M). This lack of access to services above their minimum needs impacts their interactions with their environment, making it challenging to cultivate crops for subsistence and livelihoods, leading to complaints like "*many find it difficult to grow a vegetable garden*" (I17, M). The lack of livelihoods and access has resulted in a high rate of rural exodus from the community, particularly in young people seeking employment elsewhere. Residents lament that "*many older people have passed away, others have left*" (I9, F) and "*many of them don't have anything, they have to leave their families*" (I18, F).

6.3. Livelihoods

As a result of this geographic isolation, the community relies heavily on natural resources. This can be seen through the community's specialised livelihood practices. Men are engaged in traditional fishing livelihoods and utilise specialised techniques to catch tuvira lungfish and the Pantanal crab as bait for tourism (da Costa et al, 2022). NTFPs are of great importance to the

women, who are increasingly diversifying household incomes by producing jam and sweets from locally grown fruit trees including pacu orange and jaracatiá, and artisanal crafts from honey and aguapé fibres. Acting within the regulations of the protected area, this livelihood practice uses native fruit and offers a sustainable livelihood, as women discussed "*we have a lot of native fruit and I used to wonder what we could do with all those sweet smelling fruits, nowadays we make juice, jam, jelly, and we love the idea*" (I19, F) Participants spoke of "*the dream*" of women who work in the community association, to "*make jam to sell in the city*" (I13,F), "*make sweets, others to work with handicrafts, others in the kitchen*" (I19, F). The diversity seen in their livelihoods is possible only due to the range of provisioning ES they have access to in their environment; "*I make candy from the jaracatiá, rapadura, truffles, for example, from the orange trees too. We make baskets with fibre, carpets, we make handicrafts*" (I13, F). This has not only provided a sustainable income source but has also transformed entrenched gender roles within APA, empowering women with newfound financial autonomy and decision-making opportunities. The APA kitchen was identified as a source of community where "*there are the ladies who make sweets, lollies, cakes - that's where we share*" (I14, M) and "*is something of the empowerment [for] the women of the APA, where they hold events to raise money for the community*" (I10, M), emphasising the value and "*importance*" this plays in their lives - "*the women from the community, they need it a lot*" (I18, F).

Locally caught fish are an important local resource, demonstrating the community's reliance on natural resources. In the APA, 89.5% reported that the fish they consumed were caught rather than bought, compared to 31.6% of the settlement, highlighting the importance of fish as subsistence in the community as well as livelihood. However, in recent years ecological changes have made fishing a difficult activity and the community is currently facing high levels of livelihood insecurity. The biggest example of that is the "*decoada*".

The Paraguay river has been in a period of decoada for six years, a significant natural phenomenon of hypoxia which the community associate with a low flood pulse, as one community member explains "*the change is the decoada, it's a cycle. It's been six years since the river flooded*" (I12, M) (Junior et al, 2020). Periods of decoada are associated with the reduction of dissolved oxygen, causing the natural death of fish, and impacting nutrient availability of the

river. Community members discussed how this has changed fish availability, "*when the river is low, the plants grow and then when it goes up, the branches rot and consume the oxygen and the fish suffer*" (I11, M) and "*we are in decoada, so there are no fish. If in five years we get better at cleaning, there will be a lot of fish*" (I1, M). This change in the density, diversity and species of fish observed in the Paraguay river has negatively impacted the traditional fishing livelihoods, with many community members noting how this has exacerbated poverty within the region, "*It is a needy community, with low income…they live off fishing, they have no income*" (19, F) and "*everyone needs to not just live off fish…fishing, it's all ups and downs*" (I9, F).

This insecurity is further highlighted through quantitative analysis, as 52.6% of households surveyed in the APA reported that last month's income, whilst the river was in a period of decoada, wasn't adequate to support their needs. Of the households that reported inadequate income, 80% relied on fishing as the income of the household head. Of the households who reported adequate income, only 11% relied on fishing as a main source of income, with participants reporting *"I work and have my salary, but the others who only live from fishing have a little difficulty*" (I17, M). This unpredictability and difficult conditions in the APA have heightened the existing fractures within the community, as one participant discussed, *"the community is united, but not always. Only when they see things going well"* (I10, M). The APA also reported higher food insecurity with 21.1% of households reporting they had eaten a smaller meal than they felt they needed within the last week and 26.3% reporting they had eaten fewer meals in a day. This contrasted with 4.8% of settlement households reporting these conditions. A further 15.8% of households in the APA reported that they had had no food of any kind at least once and gone to sleep at night hungry within the last week, compared to 0% in the settlement, demonstrating the importance of natural resources on well-being indicators.

6.4. Identity and Connection to the Environment

The identity of the local people is closely linked with the APA. This can be seen through the significant cultural practices the community has developed through interactions with their environment. Traditional fishing practices embody a significant CES and shape their identity and recognition as a traditional people, their relationship to the government and access to support

systems. Participants discussed how *"we depend a lot on the water here. Without water nobody lives here"* (I10, M) and cited how their knowledge has been developed *"I am a riverside dweller! I know everything living from fishing"* (I10, M). ECOA recognises this, with one project member saying *"[the] population work a lot with fishing, they have a very strong relationship with fishing"* (ECOA I2, M). People of the APA express this connection, linking fishing to their subjective well-being as one fisherman discussed, *"Happiness is when the fish are good"* and *"to live well is to wake up here with the birds, go fishing when there are good fish"* (I10, M). Respondents identified *"the river and fishing areas"* (I15, M) as areas which have great importance to themselves and the wider community.

One of the most frequently cited regulating services was disease regulation; it emerged that the community identifies their own health as being linked to that of their environment. Participants reported that *"nature gives me here my health"* (I10, M) and *"away from here I feel sick, stressed, suffocated, I have to take more medicine, and here you have this fresh air, you hear the birds, everything!"* (I18, F). They assert that, despite their limited access to healthcare, the community's overall health is superior to that of city residents. Air quality is particularly highlighted as a key differentiator, with statements such as *"the air that we are breathing here now is medicine"* (I11, M) and *"I can see nature, I breathe clean air"* (I8, F). They directly correlate this to the health of their ecosystem and their way of life, with residents stating, *"the plants breathe, we breathe too"* (I13, F) and *"nature helps a lot [with the] health problems people have, when it depends on nature it helps a lot"* (I17, M). Participants closely related good health with well-being. When discussing what they needed in order to live well, 10 out of 22 participants mentioned good health, and fresh air was mentioned by six people.

Despite sporadic access to healthcare services provided through a doctor visiting the APA headquarters, the community still rely heavily on traditional medicine practices. They assert *"we have natural medicines and foods that are given to us from the plants here"* (I11, M). Of the households surveyed on their use of natural resources, medicinal plants were the most collected resources, collected at least weekly by 42.1% of households in the APA, compared to 28.6% in a nearby settlement. As one resident recounted, *"about 4 years ago I was sick, I went to the doctor and nothing, what saved me was the use of hawthorn, a local plant"* (I10, M), demonstrating the

knowledge the community has of natural resources, and their trust in traditional over modern practices.

Discussions around the community's way of life revealed strong connections between their environment and spirituality, health, and overall well-being. Participants spoke of CES such as the spiritual value of nature, revealing *"everything in nature is spiritual to me, I live with the Agouti. I was brought up in the bush, this world here was only bush"* (I4, F). When discussing the value of the APA, themes of freedom, belonging, and an intrinsic connection to the land emerged, with residents stating, *"I feel a great connection to be part of this nature"* (I14, M) and *"the APA gives a feeling of freedom when I hear the birds and can get in touch with nature"* (I18, F). The most frequently cited CES was *"peace of mind"* (I12, M) - *"I live well here because it's peaceful here"* (I11, M). Participants spoke of the APA as *"a dream, a paradise where I live and I wouldn't change it for anything"* (I19, F). The community directly correlates this to their well-being. When discussing what conditions are needed to live well, peace and calm were the most frequently mentioned conditions, mentioned in nine interviews out of 19, further demonstrating the importance of CES in their lives.

Chapter 7 - The Impact of Ecosystem Restoration on Human Well-being

This chapter will outline the impacts of community-based restoration on the well-being of the local community. I will explore impacts resulting from shifting support systems, internal and external relations as well as land use changes.

7.1. Livelihoods

In an effort to address local people's livelihood insecurity, ECOA implemented an alternative employment program in which APA residents were compensated for producing seedlings to be planted in restoration areas. This initiative aimed to provide short-term employment while encouraging community participation in the restoration project.

By employing local fishers in the seedlings programme, this resulted in the loss of their government subsidy, Bolsa Familia (equivalent to two thirds of the Brazilian minimum wage), with participants reporting *"they went to work with [ECOA], they lost insurance"* (I15, M). This *"brought complications and affected the relationship"* (I15, M) between the community and ECOA. What had previously been a positive relationship with mutual benefits had now resulted in the community being distrustful of ECOA and their projects, as one fisherman reflected *"I had to sign a document and lost my fishing insurance [Bolsa Familia]. So, the guy comes here to do a project to do harm"* (I15, M). The loss of Bolsa Familia affected not only the community's relationship with ECOA but also their relationship with the state as they *"lost the government assistance because of a few days of work"* (I11, M). Participants discussed the impact, *"it harmed the fishermen, they lost more than they gained"* (I14, M), heightening existing inequalities between stakeholders within the APA and affecting participants' material well-being.

Further eroding trust was the delay in the transfer of funds from FUNBIO, the project's main funder. As one ECOA employee discussed, *"there was a setback in the transfer of funds from FUNBIO, so there was a delay. All the actions that were supposed to take place were paralysed for a while"* (ECOA I2, M). Due to these issues with the funder, community members weren't paid for their seedlings and seedlings were later sourced from a nearby city, causing frustration and disillusionment amongst the community, as *"there are many promises from the projects, we are*

exhausted of getting nothing" (I15, M). Participants described how *"a lot of people lost money,"* (I14, M) and how *"it's taking advantage of simple and humble people"* (I10, M).

Through seedlings, the intricate connection between social and ecological goals is highlighted, as the inability to engage community members in the project's maintenance adversely affected ecological project objectives. An ECOA employee explained *"there was planting of seedlings and after you plant you have to do maintenance and we were not able to do it in the necessary time"* (ECOA I2, M). This has further impacted the long-term sustainability of this and future projects in the area, due to the lack of willingness of members to partake in this project, and future projects moving forward, *"we have to try to bring the population together, but it's very difficult because of all the things I mentioned, especially the [Bolsa Familia] issue, so they don't commit to the project when the activities are going on"* (ECOA I2, M). This is likely to have long term impacts on meaningful stakeholder engagement and conservation outcomes in the APA. Community members confirmed this, citing how *"people are already disinterested, discouraged with lies"* (I10, M), with one woman elaborating *"I made so many seedlings! I don't want [to partake] anymore"* (I9, F).

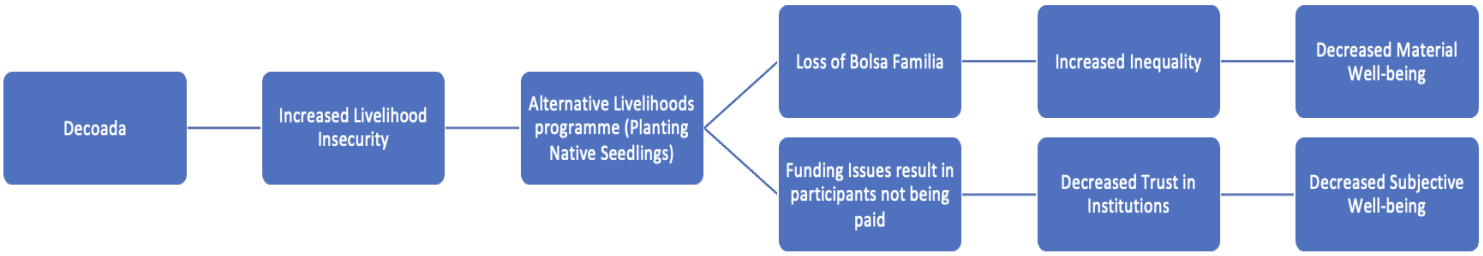

Figure 4. Well-being outcomes of ECOA's alternative livelihoods programme as a response to environmental and livelihood uncertainty.

7.2. Agency

Two aspects stood out in terms of agency: the participatory monitoring programme and the courses held to teach local people about restoration.

7.2.1. Participatory Monitoring Programme

In order to capitalise on the community's close relationship with their environment and utilise

local knowledge the ECS app, Sapelli, was implemented in the project to allow the local community to co-produce knowledge. The objective was to facilitate meaningful participation in the project's data collection and capitalise on the existing knowledge of the community. However, community members who used the app reported that they didn't know why the data was being collected or how it was used, saying *"I take the photo, but I don't keep the photo, it goes to the application. They said that a girl would come who would need this work, so once a month, or every 15 days, I could go there. But no one has ever come"* (I14, M). Extreme Citizen Science methodology is designed to incorporate the local community in project design and the decision making, however in this scenario it was evident that participants didn't know why they were collecting data. This further damaged the relationship between the community and ECOA, as participants reported feeling marginalised in the data collection process.

7.2.2. Courses

In addition to implementing Sapelli, ECOA also aimed to ensure the sustainability of restoration projects by offering courses on topics including restoration, participatory monitoring, seed storage and seedling production. For restoration, participants explored the concept's meaning, the process, its timing, key techniques, and their stages: planning, execution, and monitoring (Aristides, 2021a). The project contributed to knowledge production, and members discussed the advantages it brought to the project and their well-being, "*I learned a lot, I learned to live better with nature*" (I14, M) and "*[my husband] used to destroy things and today he takes care of them! I made him do a course so that he could see how to treat nature and see the benefits it gives him*" (I14, F). As the project integrated knowledge provision with active restoration, it empowered the community to have stewardship over their environment, "*it teaches about legislation and the preservation of the environment*" (I12, F). Members reported that "*the restoration improved a lot, including people's care*" (I13, F) and "*the knowledge that came is about care and awareness of what you can do*" (I15, M).

Restoration, through knowledge provision around conservation, has positively impacted the community's subjective well-being by enhancing their perception of CES including pride and aesthetic value. Participants discussed how restoration has increased "*the thought of wanting to*

improve even more here, to restore more of the environment here" (I6, M). Aesthetic values play a crucial role in defining a sense of place for residents and in preserving their mental and physical well-being. When discussing the impacts of restoration, a local woman discussed how the project impacted her value in the environment, stating "*I started to observe more. I feel proud that I live here*" (I8, F). Participants spoke of the beauty of the Pantanal and how their connection to the region has been strengthened, "*when I walk in the forest, I feel such strong energy coming from nature, so I am there to preserve and care for it*" (I19, F). They referred to the APA as "*our heart, that is everything, that is where we feel we belong*" (I19, F). The largest source of pride came from living in an area of rich biodiversity, and the perception that restoration will help support this, as one resident explained "*the other day a tapir passed by our house with cubs, and I hope to see many more*" (I17, M). When asked what makes them happy and feel fulfilled six out of 22 participants mentioned the biodiversity that could be seen around the APA. There is a shared interest in protecting the ecosystem to support biodiversity, with participants stating, "*we have a duty to take care of our area*" (I19, F). Residents illuminated the link between their subjective well-being and their environment, as one participant summarised "*it is nature that brings happiness, just being here looking at this river!*" (I4, M). They expressed how, after restoration, "*I live my life for nature now, I don't gain anything, just the pleasure of seeing it beautiful*" (I14, M).

Discussions with community members involved in restoration reveals that the project has deepened the community's connection with the environment and, therefore, their confidence in the future through sense of place. Participants discussed how "*the environment means everything to us, right! We have to preserve it*" (I12, M) and "*thinking about the future, I plant not only for me, in the future others will enjoy all this, this has changed the way I see it*" (I13, F). The project has been instrumental in this shift in perspective, with members feeling empowered through the ability to secure their own future, discussing how "*the knowledge that came is about care and awareness of what you can do*" (I15, M). The community not only wishes to conserve their environment, but also wish to pass on these educational experiences to future generations; explaining "*I want to pass on to my children what I experienced there, and they know it. It is my life*" (I19, F) and "*I would like future generations to see the birds, the diversity, and many things*

that we are amazed at" (I10, M).

The impact of the courses is particularly evident in the community's opinion on a key restoration strategy: the removal of the invasive species Leucaena. This represents the loss of a key resource for people in the APA. The community uses Leucaena for firewood, which questionnaire data revealed to be the second most utilised natural resource after medicinal plants in the APA. This is tied to their cultural identity as a traditional community, with one resident explaining "*we don't want the tradition of the wood cooker in the house to die, the Pantaneiro lives off the wood cooker, so when we cut down the Leucaena and see the tree there, it hurts, because we don't want to cut any, but it is invasive in the Pantanal*" (I19, F). Some community members also mentioned its use as a natural medicine, "*Leucaena is a medicine, it was a medicine for covid*" (I18, F). Despite its usage, through educational courses, the community has become aware of its ecological impacts and supports its removal, saying "*before people moved it, it was all around normal. It made a beautiful shade. Now it has spread without control. That's very wrong*" (I10, M). Furthermore, not only has the community become aware of the tree's adverse environmental effects, but they also have opinions on its removal. One participant discussed how "*it is an invasive plant, but there is a mistake in the way they are conducting this process, they are not weeding it, they are making it sprout this way they are doing*" (I12, M). The community's commitment to their environment is illuminated through Leucena, as it reveals how the community prioritises ecosystem's health over individual ES, utilising their own knowledge to aid restoration goals.

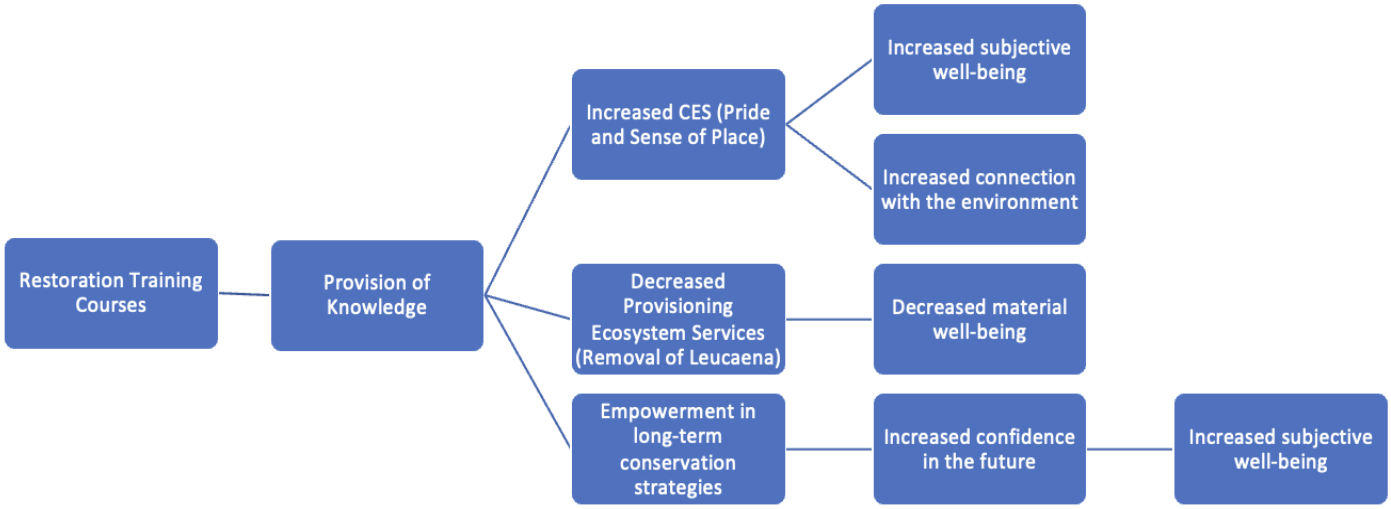

Figure 5. Well-being outcomes of ECOA's restoration training courses

7.3. Decision making

Although the project was successful in providing residents with the knowledge of restoration strategies, it is an important indicator of relational well-being that the community feels as though they have power and agency in order to utilise this knowledge and that their opinions will be heard. Quantitative analysis revealed mixed opinions over involvement in decision making. Of the nineteen APA households surveyed, 52.6% reported that they feel involved in decision making in the APA, however when asked during a participatory mapping exercise, 71.4% of participants reported that they felt as though they had the power to influence decision making within the project specifically. In conversations with community members, they emphasised the positive impact of these interactions, noting "*[the meetings] have a positive impact, we talk a lot. I feel welcome when they ask me for information*" (I1, M) and "*I believe that yes, I am able to influence yes, and I feel heard too*" (I14, F). This suggests that while some community members don't feel agency in their daily lives, the project was largely successful in incorporating them into decision making.

7.4. Gender

When understanding the impacts of restoration on the community, I aimed to capture the experiences of different stakeholders. As women are routinely marginalised in conservation interventions, capturing their experiences and opinions was integral to this goal.

7.4.1. Autonomy

Previously, the community of the APA has grappled with entrenched gender roles and conflict due to the culture of "*machismo*," as an ECOA employee informed me. This cultural context has posed challenges in engaging women in development efforts, as he explained, "*ECOA already had this relationship with the women there in the APA and this bothered some of the men there, so there were scenes of verbal aggression*" (ECOA I2, M).

To understand the autonomy of women in the APA, quantitative data was collected on women's ability to earn and manage capital. Of the married women in the APA, 50% were engaged in

employment alongside the household head, a further 25% were retired. In households where women were employed, 50% of women were allowed to control their own income. An additional 25% of women not only managed their own income but the whole household's income, so in 75% of households where women are employed, they have control over some capital. This shows that despite a culture of machismo, previous development projects have been successful in empowering the women of the APA.

Although previous projects have been successful in increasing female autonomy and transforming gender roles, this project didn't prioritise women by ensuring they participate meaningfully in decision making, could benefit equally from the project and access natural resources in an equitable way. Through only planting native species of trees, the project didn't enhance natural provisioning services provided through fruit trees or strengthen women's financial autonomy thus didn't impact women's material or relational well-being. Prioritising diverse stakeholders through accounting for the different ecosystem services stakeholders value in turn may have encouraged engagement in conservation through fostering women's connection to the environment. This can already be seen in the APA when women discuss their livelihoods, *"the orange tree I didn't care to plant because it was only for bait, now I make sweets and I like to plant them and I also think about the future, because others will enjoy them."*

7.4.2. Differing Priorities in Restoration

When asked about the importance of various restoration strategies, women consistently ranked planting fruit trees as the most or second-most crucial strategy, while planting native trees received lower rankings. Women in the APA explained their choice, stating "*fruit trees are what give health to the ecosystem*" (I8, F) and "*there is already a lot of bush here, why don't you plant fruit?*" (I9, F). They also discussed other benefits of diversifying the species planted, as this strategy would not only improve their livelihood security, but they also perceived that it would support increased biodiversity "*I wish it was with fruit, right? For both people and animals, right*" (I9, F) and tourism, *"planting more fruit trees will attract more tourists, restoring here will bring more people*" (I18, F). This view contrasted with the male residents, who prioritised the planting of native trees. This difference in needs and priorities underscores the importance of

incorporating diverse perspectives in restoration efforts.

7.4.3. Benefits of Prioritising Women in Restoration and Cohesion

CBC initiatives that involve women tend to yield better outcomes. This can be illustrated in the case of the APA through the death of Dona Julia, the previous leader of the APA in January 2022. Since her death the community has failed to unite, leaving fractions and tensions throughout. Participants recanted that "*Julia's death shook relations inside*" (I14, F) and "*When Julia was alive, life was much better, because she was always running after everyone*" (I13, F). This lack of cohesion presented difficulties engaging with the community for restoration, with an ECOA project manager revealing "*we have difficulty in using their labour force for several reasons, interactions between them for example*" (ECOA I2, M).

Despite the community's perceived lack of cohesion in recent years, the restoration project has fostered unity and strengthened the connections within the community, through mutual participation and shared goals. Participants explained, "*I think more united! The project helped with that*" (I7, M). They reported that the project "*changed the connection too. From the moment you work with them collectively, you get to know people as they are*" (I19, F) and "*people have started to get together more. Nowadays I see more people hugging each other as well*" (I7, M). The community views this enhanced cohesion as beneficial to their subjective well-being, as one resident summarised, "*It's having unity with the community, with my neighbour, with my children, friends, and family. I think I'm living well, yes*" (I7, M).

Although the community observed cohesion due to the project, this may have increased if women's participation has been prioritised, as the project would have benefitted from women's social networks. Incorporating women into decision-making in the project would have also supported women's social networks to facilitate information sharing, problem solving and decision-making, positively benefiting the project's ecological goals.

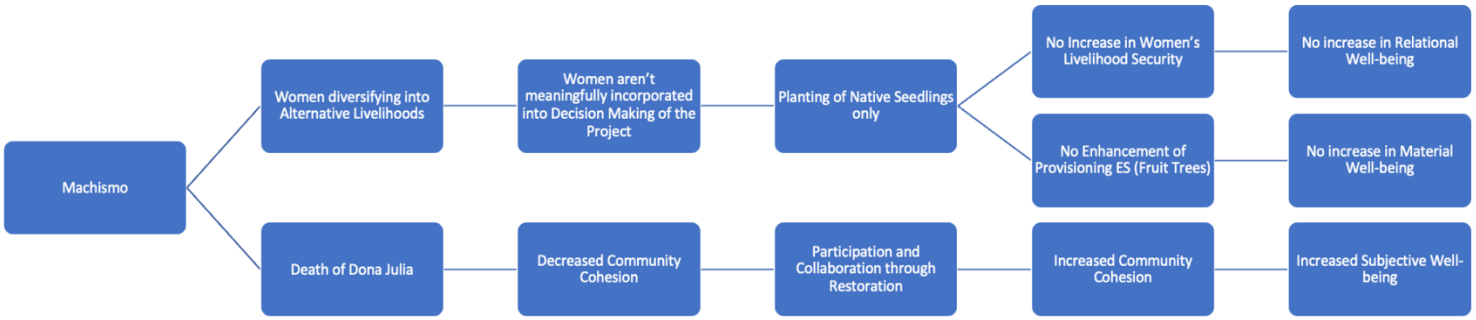

Figure 6. Gender specific well-being outcomes of restoration

7.5. Overall evaluation of well-being

Quantitative evaluation of well-being showed interesting aspects of the drivers that dictate peoples' lives and, especially, the differences from other groups living in nearby settlements. The index created showed a good quality while using a three-axis graph (r2 = 0.97, stress = 0.15) meaning the resident's well-being was well represented through a three-dimensional graph.

Based on the three-dimensional graph, we looked at the variables in well-being that played the most important role in the distribution of the data. We wanted to understand which variables of well-being pushed the index created to one or the other side of the graph. Here, however, I first represent these results through a 2-dimensional graph in order to facilitate the visualisation of the data. The analysis showed that the most important roles in people's well-being were security and confidence in the future (WellB3), support from state (WellB14) and support from NGOs (WellB15), supporting the themes discovered through qualitative analysis. Firstly, the data reveals how both the NGO, through the ecosystem restoration project, and the state, with the regulations on use and access to resources in the APA, are important drivers of people's lives. Also, confidence in the future (focused on the sense of place) stood out in the qualitative analysis as a fundamental aspect of people's lives.

The results revealed that people living in the APA have different well-being from those living in the nearby settlement. Analysis showed that the index created based on the indicators of well-being is significantly (p=0.004) different between the APA dwellers and with the settlement. The 3-D graph clearly displays this separation.

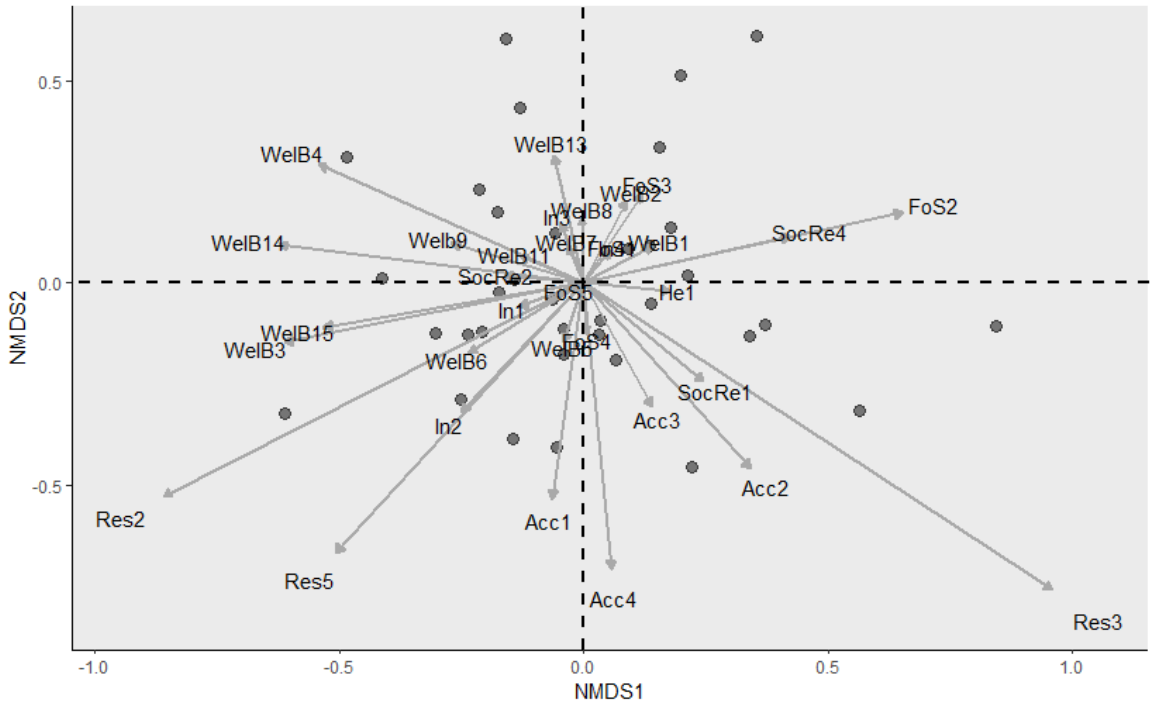

Figure 7: The graph shows the index created for each household interviewed. The index is a representation of people's well-being. The arrows are the role played by each variable analysed.

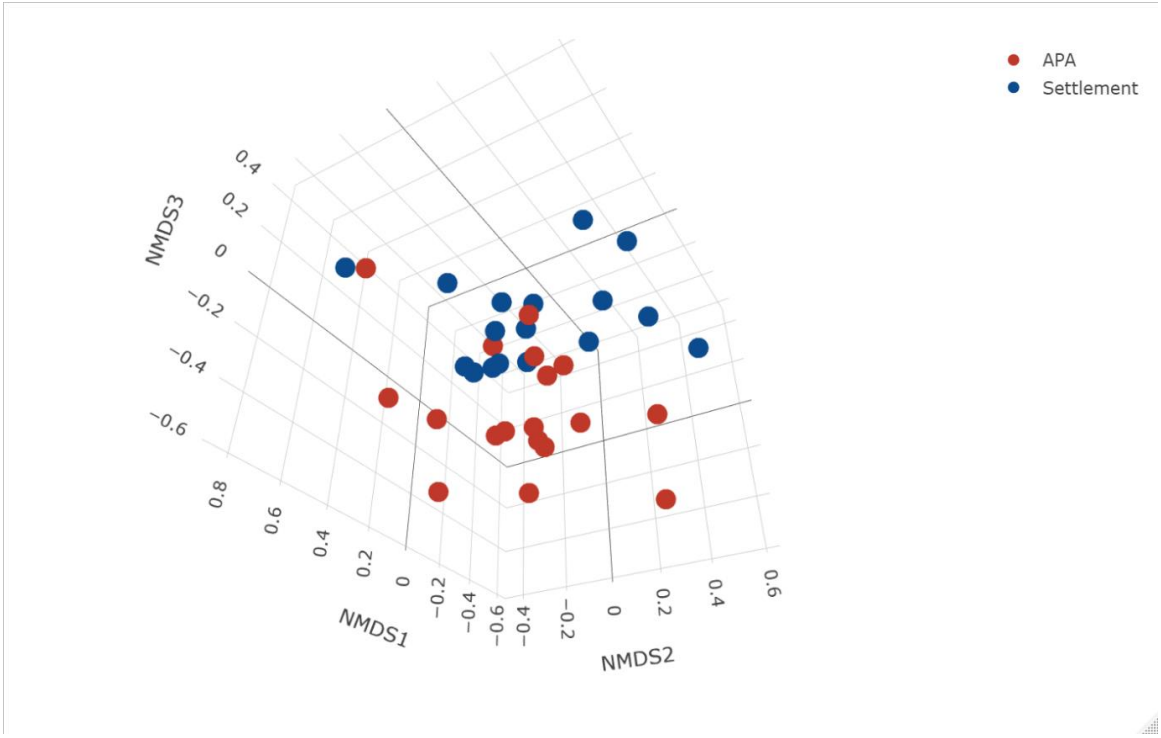

Figure 8: The graph shows a 3-D representation of the index created to represent peoples' well-being. Each point in the graph is a household. In red are the households located in the APA and in blue are those located outside the APA.

Chapter 8 - Discussion

This study aimed to examine the impact of community-based ecosystem restoration on the subjective, material, and relational well-being of a traditional riverine community in the APA. Understanding the impacts of restoration on local stakeholders can illuminate motivations and barriers to participation, therefore informing more equitable and sustainable conservation strategies. Through well-being, the heterogeneous nature of communities can be understood, as defined by communities themselves, thus moving beyond the perception of participation as a form of 'tyranny'.

8.1. "*Living well is the way I live here*" (I11, M)

Through exploring the community's interactions with their environment, my results revealed the extent to which residents' needs and identities are interwoven with the APA. The community depend on natural resources for their livelihoods, food security and health therefore ecosystem change directly impacts their material well-being.

Due to the community's high dependence on natural resources, the impacts of ecosystem change through restoration have a high potential to greatly impact their well-being, both positively and negatively (Fedele et al, 2021). Ecological changes in restoration negatively impacted residents' material well-being through the removal of Leucaena and by only planting native species, it failed to empower women, a key indicator of relational well-being. However, dynamics between different actors are also an important aspect of well-being and therefore the impacts of interventions on relationships and existing power dynamics must also be examined. Although the project damaged subjective well-being through decreasing the community's trust in ECOA, involvement in decision-making seemed to repair this trust. Training courses provided increased subjective well-being by increasing confidence in the future and pride. Overall, the project increased subjective well-being through increased cohesion within the community and relational well-being through giving them a voice within the project.

My results highlight the interrelated nature of well-being impacts. Through their complexity, they emphasise the difficulty of capturing the nuances of well-being within a short timeframe, and therefore the importance of using locally determined indicators.

Table 1. summarises the well-being outcomes impacted through the project, as revealed through qualitative analysis.

Well-being Dimension	**Outcome**	**Impact**
Material Well-being	Access to goods	Decreased through removal of Leucena
	Livelihood security	Decreased through the livelihoods programme No impact on women's livelihoods
Relational Well-being	Voice heard	Increased through perceived involvement in decision making
	Female empowerment	No impact
Subjective Well-being	Trust in institutions	Decreased through the livelihoods programme Increased through enabling voice heard
	Confidence in the future	Increased through CES provision

8.2. Linking Well-Being to Barriers in Participation and Sustainability

Foucault emphasised how action and intention often produce unintended consequences, through interactions with other actions and forces (Dreyfus & Rabinow, 2014, West, 2006). Anticipated benefits of restoration do not always trickle down to local communities. The failed livelihoods programme illustrates the importance of attending to power structures in community restoration. Whilst the programme aimed to increase material well-being through livelihood

security, like many "win-win" conservation projects, it failed to consider different capacities within the local population and how they utilise the area (Masterson et al., 2019b). Impacts were highly heterogeneous (Löfqvist et al, 2023). The project not only failed to provide benefits but also resulted in a loss of income and structural support through Bolsa Familia for fishermen. By reproducing power dynamics, the project further marginalised already vulnerable groups, exacerbating existing inequalities within the APA. As the rules still represent the decisions of external actors rather than local ones, through the project's conformation to bureaucratic regulations developed by the state funder FUNBIO, local actors were merely co-opted into decisions made by the state (Bixler et al, 2015, Mahajan & Daw, 2016).

Failing to account for livelihood considerations and the wider socioeconomic context reduces the adoption and longevity of restoration interventions (Löfqvist et al, 2023). By providing short term employment, ignoring the community's cultural ties to their environment through fishing, the initiative didn't produce long term benefits for the community's well-being. Interventions which don't attend to local livelihood incentives have been shown to be ineffective by Coleman et al (2021), as communities don't engage with culturally distant livelihoods, thus impacting the interventions sustainability. Negative impacts on well-being can erode local support and therefore jeopardise environmental outcomes, as evidenced through the local community's reluctance to participate in future restoration efforts (Woodhouse et al, 2015).

My results further illustrate how understanding different forms of capital are instrumental when assessing changes in well-being through ecosystem restoration. ES do not flow directly from natural capital to human well-being; they are mediated through the presence of human, social and built capital (Costanza et al, 2014). The restoration project improved the community's social capital through community cohesion and human capital through the provision of knowledge within training courses. These increased capabilities improved the community's access to ES, particularly CES, as shown through participants discussing increased perceptions of pride and care after taking part in the training courses and active restoration. In turn, through a strengthened sense of place, participants' confidence in envisioning a future within the APA

improved, which quantitative analysis revealed to be a significant driver of well-being (Masterson et al, 2017, Tuan, 1977).

Andersson et al. (2007) showed that a heightened sense of place is linked to stronger protective norms and greater local ecological knowledge. This underscores the potential of harnessing an individual's emotional attachment to their surroundings as a motivating factor for long-term stewardship strategies (Chapin and Knapp, 2015). Stewardship can be defined as the "actions taken by individuals, groups or networks of actors, with various motivations and levels of capacity, to protect, care for or responsibly use the environment in pursuit of environmental and/or social outcomes in diverse social–ecological contexts" (Church et al, 2023). My results support Chapin and Knapp (2015)'s argument that stewardship can be fostered by place attachments, which are produced by experiences filtered through identity and social context. This aligns with the growing body of work suggesting that paying attention to improving local peoples' well-being, particularly in small rural communities, can enhance sustainability of interventions because individuals can and do act as stewards over the natural resources that contribute towards their well-being (Wali et al, 2017). The importance of benefits conferred through stewardship to achieve restoration through community engagement has been well documented. For example, Wood et al (2017) found that engaging surrounding communities to build long-term stewardship is the most important factor in determining the overall success of restoration projects.

A central aim of community-based restoration is democratising decision making (Agrawal & Gibson, 1999). This research has illuminated the importance of ensuring that community members perceive their agency within decision-making processes, as agency is a key factor in ensuring participants can act upon their local knowledge. ECS methodology has emerged as a framework to incorporate local knowledge systems into research and allow communities to co-create. Whilst Sapelli was incorporated into the project to do this, participant's testimonials showed that in reality the tool perpetuated existing power dynamics between the researchers and local communities. However, discussions with the wider community revealed that the community does feel incorporated into decision making by ECOA. This is likely due to the empowerment through knowledge provision, enabling the community to act upon their

stewardship behaviours.

Despite this, it is clear that there is still a need for more meaningful engagement with key stakeholders. Through discussions with women, this study illuminated the trade-offs between different interests and actors in well-being (Fortnam et al, 2019, Löfqvist et al, 2023). The women of the APA perceive and value different ES to men (Martín-López et al, 2012). Accounting for differences in land use and incorporating opinions of diverse groups into the planning stages, such as women's preference for agroforestry-based restoration, would have led to better well-being and restoration outcomes, as previous studies have shown (Wells et al, 2020). The success of implementing agroforestry alongside natural forest regeneration has previously been illustrated by de Souza et al (2016) in the Brazilian Atlantic Forest. The project enhanced biodiversity and re-established forest cover whilst benefiting local communities through the provision of crops and forestry products that have market and cultural value.

Whilst women play a crucial role in biodiversity conservation, they often face exclusion from decision-making processes and the sharing of conservation benefits (Woodhouse et al, 2022). In order to deliver on the promises of CBC to accurately represent community knowledge, interests and needs, prioritising the involvement and leadership of women across levels of decision making is crucial (Woodhouse et al., 2022). Furthermore, CBC initiatives that meaningfully involve women tend to foster solidarity and collaboration as shown through the previous cohesion under a female leader, increasing social capital and therefore the dissemination of knowledge (Kaeser et al, 2018, Woodhouse et al, 2022). As discussed, the success of conservation initiatives often hinges on the meaningful engagement and empowerment of diverse stakeholders. When initiatives fail to incorporate women, they risk falling short of their goals (Masterson et al., 2019b).

Gomez (2022) found that the participation of local communities in all stages of restoration was fundamental to promoting an integrated and sustainable socio-ecosystem process and fostering greater awareness. Projects need to utilise local knowledge, but this should be through incorporating the community into the planning phase to encourage long term participation. The

APA community's close relationship with their environment, stewardship behaviours and knowledge of restoration strategies, including agroforestry, emphasises the value of their contribution.

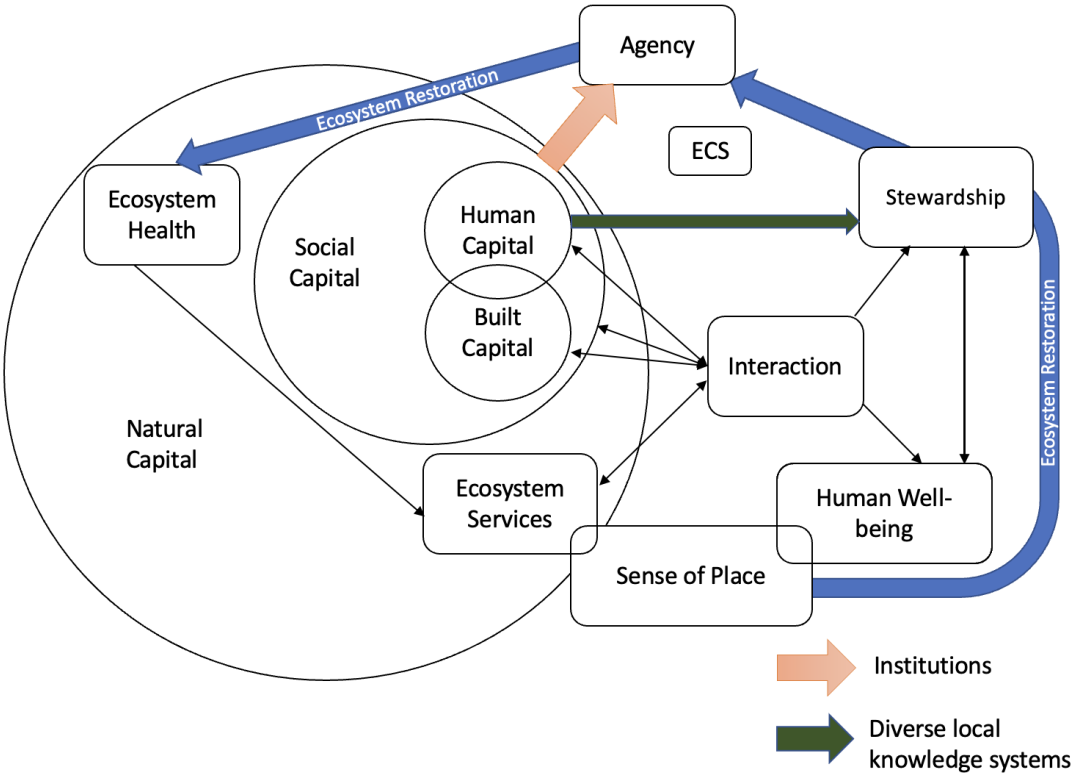

Figure 9. adapted from Hernández-Blanco et al (2022). The role of restoration in socio-ecological systems to produce healthy ecosystems, through interactions with human well-being, ecosystem services and different forms of capital. Ecosystem health can change positively or negatively under different ecosystem stewardship schemes. This figure also denotes the role institutions and ECS play within this system, producing stewardship behaviours through the dissemination of local knowledge and increased agency.

8.3. Recommendations

8.3.1. Towards a Biocultural Well-Being Approach for Ecosystem Restoration

As discussed by Bixler et al (2015), theories of participatory governance should be less generalised and instead grounded within place-based institutional and environmental histories. A human well-being framework offers a potentially powerful approach to incorporating goals

associated with diverse values into the decision-making process, which can also aid in building political support and mobilising funding (Beauchamp et al, 2018). This is particularly relevant in the Global South where there are high rates of biodiversity loss and poverty in areas which are restoration targets (Masterson et al, 2019a, Strassburg et al, 2020).

This dissertation contributes to the literature emphasising the need for context-specific indicators of well-being for restoration interventions. Focusing solely on regional or global scales when developing well-being or resource evaluations may overlook critical indicators vital for local systems, such as knowledge systems and place-based values (Sterling et al, 2019). Incorporating a 'biocultural' approach, which builds on "place-based cultural perspectives – encompassing values, knowledges, and needs – and recognise feedbacks between ecological state and human well-being" into the planning stages of restoration projects may inform decisions to ensure projects work within the existing capabilities of the local community (Wali et al, 2017, Sterling et al, 2019:5). As biocultural approaches recognise linkages between ecosystems and human well-being and include cultural viewpoints such as knowledges, values and needs, they explicitly build upon local knowledge systems (Sterling et al. 2017). Within community-based projects, a biocultural well-being approach holds the promise of illuminating the interconnections and motivating factors behind behaviour that may be overlooked by an external framing of a system, allowing for a complex, holistic understanding of socio-ecological systems (Sterling et al, 2019). Wali et al (2017) proposed using an assets-based approach to conservation and human well-being that operates within a biocultural framework, as it creates a cycle of empowerment. Through improving capabilities and autonomy, it can guide communities towards stewardship behaviour and the long-term sustainability of conservation initiatives (Wali et al, 2017, Burke et al, 2023).

Biocultural perspectives applied to this case study in the planning process of the project may have illuminated the role agroforestry could play in incorporating different stakeholders into restoration and the risk of perpetuating power dynamics through short term culturally distant livelihoods. Through the integration of biocultural well-being indicators alongside objective data, policy makers can develop restoration programs more holistically (Choksi et al, 2023).

Chapter 9 - Conclusion

At the global level, there have been few studies investigating how feedbacks and interactions between ES and well-being contribute towards the longevity of ecosystem restoration, with a significant research gap in the Global South (Masterson et al, 2019a). As 1.2 billion people in tropical countries are dependent on natural resources to meet their basic needs, with many more deriving benefits from ecosystems, neglecting local value and land use in restoration will likely impact a substantial number of people (Löfqvist et al, 2023).

My study has explored how implementing community-based ecosystem restoration is a complex task, which may yield unexpected outcomes. The well-being of a community cannot be separated from the health of its environment; they are inextricably linked. Restorative actions have the potential to both harm and heal, and their impacts resonate across material, relational, and subjective dimensions of well-being.

Understanding these dynamics necessitates a holistic approach that recognizes the interconnectedness of ecological and human systems. Ecosystem restoration efforts should not operate in isolation but should be integrated into the fabric of community life. This requires careful consideration of local knowledge, values, and needs, as well as meaningful engagement with all community members, particularly women who often bear unique perspectives (Löfqvist et al, 2023).

Institutions play a crucial role in the success of projects, reflecting power relations, and influencing the power between different social groups (Mahajan & Daw, 2016). As Berkes (2004:628) said, “communities don’t conserve… at least, they do not act as simple, isolated agents. Rather, they are embedded in larger systems, and they respond to pressures and incentives.” Community restoration projects exist within complex social-ecological systems and are affected by dynamics on multiple scales (Masterson et al, 2019a). Initiatives must be designed

to empower communities, ensuring their agency in decision-making processes. ECS methodologies, while valuable, must be implemented with sensitivity to power dynamics to avoid perpetuating existing inequalities.

This dissertation recommends the adoption of a biocultural well-being approach in restoration planning—a framework that acknowledges the intricate interplay between ecosystems and human well-being, incorporating local values, knowledge systems, and needs. Such an approach aligns restoration efforts with the existing capabilities and aspirations of the community, promoting equity, empowerment, and long-term sustainability.

Bibliography

Adams, W. M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., Roe, D., Vira, B., & Wolmer, W. (2004). Biodiversity conservation and the eradication of poverty. *Science*, *306*(5699), 1146–1149.

Agarwala, M., Atkinson, G., Fry, B. P., Homewood, K., Mourato, S., Rowcliffe, J. M., Wallace, G., & Milner-Gulland, E. J. (2014). A Review of Frameworks. *Conservation and Society*, *12*(4), 437–449. http://www.jstor.org/stable/26393178

Agrawal, A., & Gibson, C. C. (1999). Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation [Article]. *World Development*, *27*(4), 629–649. https://doi.org/10.1016/S0305-750X(98)00161-2

Aguiar, S., Mastrángelo, M. E., Brancalion, P. H. S., & Meli, P. (2021). Transformative governance for linking forest and landscape restoration to human well-being in Latin America. Ecosystems and People, 17(1), 523–538. https://doi.org/10.1080/26395916.2021.1976838

Allen, K. (2018). Explaining the Problem with Neoliberal Conservation. *Conservation and Society*, *16*(3), 243–256. http://www.jstor.org/stable/26500638

Andel, J. van., & Aronson, J. (2012). *Restoration ecology the new frontier* (J. van. Andel & J. Aronson, Eds.; 2nd ed.) [Book]. Wiley.

Andersson, E., Barthel, S., & Ahrné, K. (2007). Measuring social–ecological dynamics behind the generation of ecosystem services. Ecological Applications, 17(5), 1267–1278.

Andrade, M. H. da S., Brandimarte, A. L., Calheiros, D. F., & Súarez, Y. R. (2022). Aspects of a unique natural limnological phenomenon in the Brazilian Pantanal [Article]. *Revista Ambiente & Água*, *17*(5), 1–10. https://doi.org/10.4136/ambi-agua.2870

Andrianandrasana, H. 2016. "Testing the Effectiveness of Community-Based Conservation in Conserving Biodiversity, Protecting Ecosystem Services, and Improving Human Well-Being in Madagascar." PhD thesis, University of Oxford.

Aristides, A. (2021a) "Troca de saberes é realizada para restaurar área no Pantanal - Ecoa." Ecoa, October 27, 2021. https://ecoa.org.br/troca-de-saberes-e-realizada-para-restaurar-area-no-pantanal/. Accessed on 01/10/23.

Aristides, A. (2021b). Ecoa inicia atividades para restaurar 58 hectares degradados da APA Baía Negra, no Pantanal - Ecoa. https://ecoa.org.br/ecoa-inicia-atividades-para-restaurar-58-hectares-degradados-na-apa-baia-negra-no-pantanal/ Accessed on 04/10/23.

Beauchamp, E. (2016). *Seeing the people for the trees: impacts of conservation on human well-being in northern cambodia* [Dissertation]. ProQuest Dissertations Publishing.

Beauchamp, E., Woodhouse, E., Clements, T., & Milner-Gulland, E. J. (2018). "Living a good life": conceptualizations of well-being in a conservation context in Cambodia. Ecology and Society, 23. https://api.semanticscholar.org/CorpusID:49364324

Berbés-Blázquez, M., González, J. A., & Pascual, U. (2016). Towards an ecosystem services approach that addresses social power relations [Article]. Current Opinion in Environmental Sustainability, 19, 134–143. https://doi.org/10.1016/j.cosust.2016.02.003

Berbés-Blázquez, M., Bunch, M. J., Mulvihill, P. R., Peterson, G. D., & van Wendel de Joode, B. (2017). Understanding how access shapes the transformation of ecosystem services to human well-being with an example from Costa Rica [Article]. Ecosystem Services, 28, 320–327. https://doi.org/10.1016/j.ecoser.2017.09.010

Berkes, F. (2007). Community-based conservation in a globalized world. Proceedings of the National Academy of Sciences, 104(39), 15188–15193. https://doi.org/10.1073/pnas.0702098104

Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology*, *18*(3), 621–630.

Betley, E. C., Sigouin, A., Pascua, P., Cheng, S. H., MacDonald, K. I., Arengo, F., Aumeeruddy-Thomas, Y., Caillon, S., Isaac, M. E., & Jupiter, S. D. (2021). Assessing human well-being constructs with environmental and equity aspects: A review of the landscape. People and Nature.

Bernard, H. R. (2017). Research methods in anthropology: Qualitative and quantitative approaches. Rowman & Littlefield.

Bixler, R. P., Dell'Angelo, J., Mfune, O., & Roba, H. (2015). The political ecology of participatory conservation: institutions and discourse. Journal of Political Ecology, 22(1), 164–182.

Brancalion, P. H. S., de Siqueira, L. P., Amazonas, N. T., Rizek, M. B., Mendes, A. F., Santiami, E. L., Rodrigues, R. R., Calmon, M., Benini, R., Tymus, J. R. C., Holl, K. D., & Chaves, R. B. (2022). Ecosystem restoration job creation potential in Brazil. *People and Nature*, *4*(6), 1426–1434. https://doi.org/https://doi.org/10.1002/pan3.10370

Brazil. Federative Republic of Brazil. Decree No. 6,040, of February 7, 2007, establishes the National Policy for the Sustainable Development of Traditional Peoples and Communities. Brasilia: National Congress, 2007.

Brasil, 2017. Brazil's National Plan for Native Vegetation Recovery. In: Environ. Ministry and Agriculture. Livestock and Supply Ministry, Education Ministry, Brasília, MMA.

Brosius, J. P., Tsing, A. L., & Zerner, C. (1998). Representing communities: Histories and politics of community-based natural resource management. Society & Natural Resources, 11(2), 157–168. https://doi.org/10.1080/08941929809381069

Brown, K. (2002). Innovations for conservation and development. Geographical Journal, 168(1), 6–17.

Brownson, K., Guinessey, E., Carranza, M., Esquivel, M., Hesselbach, H., Madrid Ramirez, L., & Villa, L. (2019). Community-Based Payments for Ecosystem Services (CB-PES): Implications of community involvement for program outcomes. Ecosystem Services, 39, 100974. https://doi.org/https://doi.org/10.1016/j.ecoser.2019.100974

Burke, L., Díaz-Reviriego, I., Lam, D. P. M., & Hanspach, J. (2023). Indigenous and local knowledge in biocultural approaches to sustainability: a review of the literature in Spanish. Ecosystems and People, 19(1), 2157490. https://doi.org/10.1080/26395916.2022.2157490

Brundtland, G. H. (1987). Brundtland report. Our common future. Comissão Mundial, 4(1), 17–25.

Camfield, Laura, Gina Crivello, and Martin Woodhead. "Wellbeing research in developing countries: Reviewing the role of qualitative methods." Social Indicators Research 90 (2009): 5-31.

Campbell, L. M., & Vainio-Mattila, A. (2003). Participatory development and community-based conservation: Opportunities missed for lessons learned? Human Ecology, 31(3), 417–438. https://doi.org/10.1023/A:1025071822388

Ceccon, E. (2023). *The importance of social capital for performing participative restoration projects: practice-based knowledge of two contrasting indigenous communities in Mexico*.

Chambers, Robert. (1983). *Rural development: putting the last first.* [Book]. Longman.

Chan, K. M. A., Satterfield, T., & Goldstein, J. (2012). Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics*, *74*, 8–18. https://doi.org/https://doi.org/10.1016/j.ecolecon.2011.11.011

Chan, K. M. A., & Satterfield, T. (2016). Managing Cultural Ecosystem Services for Sustainability [Bookitem]. In *Routledge Handbook of Ecosystem Services* (1st ed., pp. 343–358). Routledge. https://doi.org/10.4324/9781315775302-30

Chapin, F. S. (2021). Social and environmental change in the Arctic: Emerging opp ortunities for well-being transformations through stewardship. Ecology and Society, 26(3).

Chapin, F. S., & Knapp, C. N. (2015). Sense of place: A process for identifying and negotiating potentially contested visions of sustainability. Environmental Science & Policy, 53, 38–46. https://doi.org/https://doi.org/10.1016/j.envsci.2015.04.012

Chiaravalloti, R. (2017a). *Local communities and conservation in the Pantanal wetland, Brazil*. UCL (University College London).

Chiaravalloti, R. M., Homewood, K., & Erikson, K. (2017b). Sustainability and Land tenure: Who owns the floodplain in the Pantanal, Brazil? Land Use Policy, 64, 511–524. https://doi.org/10.1016/j.landusepol.2017.03.005

Chiaravalloti, R. M. (2019). The displacement of insufficiently 'Traditional' communities. *Conservation & Society*, *17*(2), 173–183.

Chiaravalloti, R., Bolzan, F., Roque, F., & Biswas, S. (2022). *Ecosystem services in the floodplains: Socio-cultural services associated with ecosystem unpredictability in the Pantanal wetland, Brazil* [Article].

Chiaravalloti, R. M., Skarlatidou, A., Hoyte, S., Badia, M. M., Haklay, M., & Lewis, J. (2022). Extreme citizen science: Lessons learned from initiatives around the globe. Conservation Science and Practice, 4(2), e577.

Choksi, P., Agrawal, A., Bialy, I., Chaturvedi, R., Davis, K. F., Dhyani, S., Fleischman, F., Lechner, J., Nagendra, H., Srininvasan, V., & DeFries, R. (2023). Combining socioeconomic and biophysical data to identify people-centric restoration opportunities. Npj Biodiversity, 2(1), 7. https://doi.org/10.1038/s44185-023-00012-8

Church, E. K., Wilson, K. A., & Dean, A. J. (2023). Broadening our understanding of what drives stewardship engagement: Relationships between social capital and willingness to engage in nature stewardship. Journal of Environmental Management, 342, 118128.

Coleman, E. A., Schultz, B., Ramprasad, V., Fischer, H., Rana, P., Filippi, A. M., Güneralp, B., Ma, A., Rodriguez Solorzano, C., & Guleria, V. (2021). Limited effects of tree planting on forest canopy cover and rural livelihoods in Northern India. *Nature Sustainability*, *4*(11), 997–1004.

Cooke, S. J., Bennett, J. R., & Jones, H. P. (2019). We have a long way to go if we want to realize the promise of the "Decade on Ecosystem Restoration." Conservation Science and Practice, 1(12), e129. https://doi.org/https://doi.org/10.1111/csp2.129

Cooper, C. B., Dickinson, J., Phillips, T., & Bonney, R. (2007). Citizen Science as a Tool for Conservation in Residential Ecosystems. *Ecology and Society*, *12*(2). http://www.jstor.org/stable/26267884

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'neill, R. v, & Paruelo, J. (1997). The value of the world's ecosystem services and natural capital. *Nature*, *387*(6630), 253–260.

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., Farber, S., & Turner, R. K. (2014). Changes in the global value of ecosystem services [Article]. Global Environmental Change, 26, 152–158. https://doi.org/10.1016/j.gloenvcha.2014.04.002

Coulthard, Sarah, Derek Johnson, and J. Allister McGregor. “Poverty, Sustainability and Human Wellbeing: A Social Wellbeing Approach to the Global Fisheries Crisis.” Global environmental change 21.2 (2011): 453–463. Web.

Cuyate, R. "Fronteira e territorialidade dos camponeses do assentamento 72, Ladário-MS." PhD diss., Dissertação (Estudos Fronteiriços). Corumbá: UFMS, 2015.

da Costa, A. V., Manfroi, M. N., & Chiaravalloti, R. (2022). *The impact of Protected Areas on the Wellbeing of Pantaneiro Riverine Communities // O Impacto das Áreas Protegidas Bem-estar das Comunidades Ribeirinhas Pantaneiras* [Article].

Daily, Gretchen C.. "Nature’s Services: Societal Dependence on Natural Ecosystems (1997)" In The Future of Nature: Documents of Global Change edited by Libby Robin, Sverker Sörlin and Paul Warde, 454-464. New Haven: Yale University Press, 2013. https://doi.org/10.12987/9780300188479-039

Daw, T. I. M., Brown, K., Rosendo, S., & Pomeroy, R. (2011). Applying the ecosystem services concept to poverty alleviation: the need to disaggregate human well-being. Environmental Conservation, 38(4), 370–379. https://doi.org/DOI: 10.1017/S0376892911000506

Daw, T. M., Hicks, C. C., Brown, K., Chaigneau, T., Januchowski-Hartley, F. A., Cheung, W. W. L., Rosendo, S., Crona, B. I., Coulthard, S., Sandbrook, C., Perry, C. T., Bandeira, S. O., Muthiga, N. A., Schulte-Herbrüggen, B., Bosire, J. O., & McClanahan, T. R. (2016). Elasticity in ecosystem services: exploring the variable relationship between ecosystems and human well-being. Ecology and Society, 21, 11. https://api.semanticscholar.org/CorpusID:53385422

de Souza, S. E. X. F., Vidal, E., Chagas, G. de F., Elgar, A. T., & Brancalion, P. H. S. (2016). Ecological outcomes and livelihood benefits of community-managed agroforests and second growth forests in Southeast Brazil. Biotropica, 48(6), 868–881.

de Souza, D. C., & Engel, V. L. (2023). Advances, challenges, and directions for ecological restoration by direct seeding of trees: Lessons from Brazil [Article]. Biological Conservation, 284, 110172. https://doi.org/10.1016/j.biocon.2023.110172

den Haan, S. (2021). The human side of ecosystem restoration: Identifying community engagement strategies that support the long-term success of European wetland restoration projects. IIIEE Master Thesis.

Dressler, W., Büscher, B., Schoon, M., Brockington, D. A. N., Hayes, T., Kull, C. A., McCarthy, J., & Shrestha, K. (2010). From hope to crisis and back again? A critical history of the global CBNRM narrative. Environmental Conservation, 37(1), 5–15.

Dreyfus, H. L., & Rabinow, P. (2014). Michel Foucault: Beyond structuralism and hermeneutics. University of Chicago press.

Ecoa. (2019, May 16). Disponível o Plano de Manejo APA Baía Negra - Ecoa. Ecoa. https://ecoa.org.br/ja-esta-disponivel-o-plano-de-manejo-apa-baia-negra/ Accessed 02/10/23

Egan, D., Hjerpe, E. E., & Abrams, J. (2011). Why people matter in ecological restoration. Human Dimensions of Ecological Restoration: Integrating Science, Nature, and Culture, 1–19.

Fariss, B., DeMello, N., Powlen, K. A., Latimer, C. E., Masuda, Y., & Kennedy, C. M. (2023). Catalyzing success in community-based conservation. Conservation Biology, 37(1), e13973.

Fedele, G., Donatti, C. I., Bornacelly, I., & Hole, D. G. (2021). Nature-dependent people: Mapping human direct use of nature for basic needs across the tropics. *Global Environmental Change*, *71*, 102368. https://doi.org/https://doi.org/10.1016/j.gloenvcha.2021.102368

Fisher, B., Turner, R. K., & Morling, P. (2009). Defining and classifying ecosystem services for decision making. Ecological Economics, 68(3), 643–653.

Fortnam, M., Brown, K., Chaigneau, T., Crona, B. I., Daw, T. M., Goncalves, D., Hicks, C. C., Revmatas, M., Sandbrook, C., & Schulte-Herbrüggen, B. (2019). The Gendered Nature of Ecosystem Services. *Ecological Economics*. https://api.semanticscholar.org/CorpusID:159075249

Freire, Paolo. (1970). Pedagogy of the oppressed. [Unknown]. Penguin Books Ltd.

Fry, B. P., Agarwala, M., Atkinson, G., Clements, T., Homewood, K., Mourato, S., Rowcliffe, J. M., Wallace, G., & Milner-Gulland, E. J. (2017). Monitoring local well-being in environmental interventions: a consideration of practical trade-offs. *Oryx*, *51*(1), 68–76.

Garnett, S. T., Burgess, N. D., Fa, J. E., Fernández-Llamazares, Á., Molnár, Z., Robinson, C. J., Watson, J. E. M., Zander, K. K., Austin, B., Brondizio, E. S., Collier, N. F., Duncan, T., Ellis, E., Geyle, H., Jackson, M. v, Jonas, H., Malmer, P., McGowan, B., Sivongxay, A., & Leiper, I. (2018). A spatial overview of the global importance of Indigenous lands for conservation. Nature Sustainability, 1(7), 369–374. https://doi.org/10.1038/s41893-018-0100-6

Gerolemou, R. v, Russell, J. C., & Stanley, M. C. (2022). Social capital in the context of volunteer conservation initiatives. *Conservation Science and Practice*, *4*(9), e12765. https://doi.org/https://doi.org/10.1111/csp2.12765

Gómez, S. (2022). The Moral and Ethical Baseline of Marine Socio-Ecological Values: the Case of Recreational and Artisanal Fishing in NW Mediterranean Coastal Waters (Catalonia, Spain). Human Ecology, 50(5), 895–910.

Gonçalves, L. M., Tsuge, M. L. T., Borghi, V. S., Miranda, F. P., de Assis Sales, A. P., Lucchetti, A. L. G., & Lucchetti, G. (2018). Spirituality, Religiosity, Quality of Life and Mental Health Among Pantaneiros: A Study

Involving a Vulnerable Population in Pantanal Wetlands, Brazil [Article]. *Journal of Religion and Health*, *57*(6), 2431–2443. https://doi.org/10.1007/s10943-018-0681-4

Gough, I., & Mcgregor, J. (2007). Wellbeing in Developing Countries: From Theory to Research. *Wellbeing in Developing Countries: From Theory to Research*, 1–399. https://doi.org/10.1017/CBO9780511488986

Grandin, A., Boon-Falleur, M., & Chevallier, C. (2021). The belief-action gap in environmental psychology: How wide? How irrational?

Guerra, A., Reis, L. K., Borges, F. L. G., Ojeda, P. T. A., Pineda, D. A. M., Miranda, C. O., Maidana, D. P. F. de L., Santos, T. M. R. dos, Shibuya, P. S., Marques, M. C. M., Laurance, S. G. W., & Garcia, L. C. (2020). Ecological restoration in Brazilian biomes: Identifying advances and gaps. *Forest Ecology and Management*, *458*, 117802. https://doi.org/https://doi.org/10.1016/j.foreco.2019.117802

Hahn, T., Olsson, P., Folke, C., & Johansson, K. (2006). Trust-building, Knowledge Generation and Organizational Innovations: The Role of a Bridging Organization for Adaptive Comanagement of a Wetland Landscape around Kristianstad, Sweden [Article]. *Human Ecology: An Interdisciplinary Journal*, *34*(4), 573–592. https://doi.org/10.1007/s10745-006-9035-z

Haklay, M. (2013). Citizen Science and Volunteered Geographic Information: Overview and Typology of Participation. In D. Sui, S. Elwood, & M. Goodchild (Eds.), Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice (pp. 105–122). Springer Netherlands. https://doi.org/10.1007/978-94-007-4587-2_7

Harriss, J., & de Renzio, P. (1997). “Missing link” or analytically missing?: The concept of social capital. An introductory bibliographic essay. *Journal of International Development*, *9*, 919–937. https://doi.org/10.1002/(SICI)1099-1328(199711)9:73.0.CO;2-9

He, Siyuan, Louise Gallagher, and Qingwen Min. 2021. "Examining Linkages among Livelihood Strategies, Ecosystem Services, and Social Well-Being to Improve National Park Management" Land 10, no. 8: 823. https://doi.org/10.3390/land10080823

Hernández-Blanco, M., Costanza, R., Chen, H., DeGroot, D., Jarvis, D., Kubiszewski, I., Montoya, J., Sangha, K., Stoeckl, N., Turner, K., & van ’t Hoff, V. (2022). Ecosystem health, ecosystem services, and the well-being of humans and the rest of nature [Article].

Hickey, S., & Mohan, G. (2005). Relocating participation within a radical politics of development. Development and Change, 36(2), 237–262.

Höhl, M., Ahimbisibwe, V., Stanturf, J. A., Elsasser, P., Kleine, M., & Bolte, A. (2020). Forest landscape restoration-What generates failure and success? Forests, 11(9). https://doi.org/10.3390/F11090938

Homewood, K. M., Trench, P. C., & Brockington, D. (2012). Pastoralist livelihoods and wildlife revenues in East Africa: a case for coexistence? *Pastoralism: Research, Policy and Practice*, *2*(1), 19. https://doi.org/10.1186/2041-7136-2-19

Huynh, Lam Thi Mai, Alexandros Gasparatos, Jie Su, Rodolfo Dam Lam, Ezekiel I. Grant, and Kensuke Fukushi. "Linking the nonmaterial dimensions of human-nature relations and human well-being through cultural ecosystem services." Science Advances 8, no. 31 (2022): eabn8042.

Joly, Carlos A., Fabio R. Scarano, Mercedes Bustamante, Tatiana Maria Cecy Gadda, Jean Paul Walter Metzger, Cristiana Simão Seixas, Jean Pierre HB Ometto et al. "Brazilian assessment on biodiversity and ecosystem services: summary for policy makers." Biota Neotropica 19 (2019).

Junior, M., Oliveira Junior, E., & Souza, C. (2020). The 'decoada' phenomenon effect on the Paraguay river water quality, Northern Pantanal. *Revista Ibero-Americana de Ciências Ambientais*, *11*, 612–623. https://doi.org/10.6008/CBPC2179-6858.2020.005.0055

Junk, W. J., Bayley, P. B., & Sparks, R. E. (1989). The flood pulse concept in river-floodplain systems. *Canadian Special Publication of Fisheries and Aquatic Sciences*, *106*(1), 110–127.

Junk, W. J. (2011). *The Pantanal: ecology, biodiversity and sustainable management of a large neotropical seasonal wetland* (W. J. Junk, Ed.) [Book]. Pensoft.

Kaeser, A. S., Willcox, A. S., & Panti, N. C. (2018). Attitudes and perceived barriers to women participating in a proposed community-based conservation programme in Belize. Oryx, 52(1), 89–97. https://doi.org/https://doi.org/10.1017/S0030605316000715

Kamelamela, K. L., Springer, H. K., Ku'ulei Keakealani, R., Ching, M. U., Ticktin, T., Ohara, R. D., Parsons, E. W., Adkins, E. D., Francisco, K. S., & Giardina, C. (2022). Kōkua aku, Kōkua mai: An Indigenous Consensus-driven and Place-based Approach to Community Led Dryland Restoration and Stewardship [Article]. *Forest Ecology and Management*, *506*, 119949. https://doi.org/10.1016/j.foreco.2021.119949

King, M. F., Renó, V., & Novo, E. (2014). The Concept, Dimensions and Methods of Assessment of Human Well-Being within a Socioecological Context: A Literature Review. Social Indicators Research, 116, 681–698. https://api.semanticscholar.org/CorpusID:144354453

Lin, P.-S. S. (2019). Building resilience through ecosystem restoration and community participation: post-disaster recovery in coastal island communities [Article]. *International Journal of Disaster Risk Reduction*, *39*, 101249. https://doi.org/10.1016/j.ijdrr.2019.101249

Löfqvist, S., Kleinschroth, F., Bey, A., de Bremond, A., DeFries, R., Dong, J., Fleischman, F., Lele, S., Martin, D. A., Messerli, P., Meyfroidt, P., Pfeifer, M., Rakotonarivo, S. O., Ramankutty, N., Ramprasad, V., Rana, P., Rhemtulla, J. M., Ryan, C. M., Vieira, I. C. G., … Garrett, R. D. (2023). How Social Considerations Improve the

Equity and Effectiveness of Ecosystem Restoration. BioScience, 73(2), 134–148. https://doi.org/10.1093/biosci/biac099

Lourival, R., McCallum, H., Grigg, G., Arcangelo, C., Machado, R., & Possingham, H. (2009). A systematic evaluation of the conservation plans for the pantanal wetland in Brazil. *Wetlands*, *29*(4), 1189–1201. https://doi.org/10.1672/08-118.1

Loveridge, R., Sallu, S. M., Pesha, I. J., & R Marshall, A. (2020). Measuring human wellbeing: A protocol for selecting local indicators. *Environmental Science & Policy*, *114*, 461–469. https://doi.org/https://doi.org/10.1016/j.envsci.2020.09.002

Mahajan, S. L., & Daw, T. (2016). Perceptions of ecosystem services and benefits to human well-being from community-based marine protected areas in Kenya. *Marine Policy*, *74*, 108–119.

Martín-López, B., Iniesta-Arandia, I., García-Llorente, M., Palomo, I., Casado-Arzuaga, I., Amo, D. G. del, Gómez-Baggethun, E., Oteros-Rozas, E., Palacios-Agundez, I., & Willaarts, B. (2012). Uncovering ecosystem service bundles through social preferences. *PLoS One*, *7*(6), e38970.

Martins, P. I., Belém, L. B. C., Szabo, J. K., Libonati, R., & Garcia, L. C. (2022). Prioritising areas for wildfire prevention and post-fire restoration in the Brazilian Pantanal [Article]. *Ecological Engineering*, *176*, 106517. https://doi.org/10.1016/j.ecoleng.2021.106517

Maseyk, F., Doole, M., Shanahan, D. F., & Johnston, G. (2021). Social and Ecological Outcomes from Community-Led Conservation. Collaborative research project prepared for Predator Free 2050 Ltd. The Catalyst Group Contract Report No. 2021/160.

Masterson, Vanessa A., Richard C. Stedman, Johan Enqvist, Maria Tengö, Matteo Giusti, Darin Wahl, and Uno Svedin. “The Contribution of Sense of Place to Social-Ecological Systems Research: A Review and Research Agenda.” Ecology and Society 22, no. 1 (2017). http://www.jstor.org/stable/26270120.

Masterson, V. A., Vetter, S., Chaigneau, T., Daw, T. M., Selomane, O., Hamann, M., Wong, G. Y., Mellegård, V., Cocks, M., & Tengö, M. (2019a). Revisiting the relationships between human well-being and ecosystems in dynamic social-ecological systems: Implications for stewardship and development. *Global Sustainability*, *2*, e8. https://doi.org/10.1017/sus.2019.5

Masterson, V. A., Spierenburg, M., & Tengö, M. (2019b). The trade-offs of win–win conservation rhetoric: exploring place meanings in community conservation on the Wild Coast, South Africa. *Sustainability Science*, *14*(3), 639–654. https://doi.org/10.1007/s11625-019-00696-7

Maxwell, S. L., Cazalis, V., Dudley, N., Hoffmann, M., Rodrigues, A. S. L., Stolton, S., Visconti, P., Woodley, S., Kingston, N., Lewis, E., Maron, M., Strassburg, B. B. N., Wenger, A., Jonas, H. D., Venter, O., & Watson, J. E. M. (2020). Area-based conservation in the twenty-first century. Nature, 586(7828), 217–227. https://doi.org/10.1038/s41586-020-2773-z

McGregor, A., & Sumner, A. (2010). Beyond business as usual: what might 3-D wellbeing contribute to MDG momentum? *IDS Bulletin*, *41*(1), 104–112.

Millennium ecosystem assessment, M. E. A. (2005). Ecosystems and human well-being (Vol. 5). Island press Washington, DC.

Meli, P., Ceccon, E., Mastrangelo, M., & Calle Díaz, Z. (2022). Ecosystem restoration and human well-being in Latin America. Ecosystems and People, 18(1), 609–615. https://doi.org/10.1080/26395916.2022.2137849

Milner-Gulland, E. J., Mcgregor, J. A., Agarwala, M., Agarwala, M., Atkinson, G., Bevan, P., Clements, T., Daw, T. M., Homewood, K., Kümpel, N. F., Lewis, J., Mourato, S., Fry, B. P., Redshaw, M., Rowcliffe, J. M., Suon, S., Wallace, G., Washington, H., & Wilkie, D. S. (2014). Accounting for the Impact of Conservation on Human Well-Being. Conservation Biology, 28, 1160–1166. https://api.semanticscholar.org/CorpusID:16259737

Millora, C., Maimunah, S., & Still, E. (2020). Reflecting on the ethics of PhD research in the Global South: reciprocity, reflexivity and situatedness. *Acta Academica*, *52*, 10–30.

Misiune, I., Depellegrin, D., & Egarter Vigl, L. (2022). Part I: Conceptualizing Human-Nature Interactions [Bookitem]. In *Human-Nature Interactions*. Springer International Publishing AG.

Moustard, F., Haklay, M., Lewis, J., Albert, A., Moreu, M., Chiaravalloti, R., Hoyte, S., Skarlatidou, A., Vittoria, A., Comandulli, C., Nyadzi, E., Vitos, M., Altenbuchner, J., Laws, M., Fryer-Moreira, R., & Artus, D. (2021). Using Sapelli in the Field: Methods and Data for an Inclusive Citizen Science. Frontiers in Ecology and Evolution, 9. https://www.frontiersin.org/articles/10.3389/fevo.2021.638870

Narayan, D., Chambers, R., Shah, M., & Petesch, P. (2000). Voices of the Poor: Crying Out for Change (Vol. 2).

Newing, H. (2011). *Conducting Research in Conservation* [Book]. Routledge. https://doi.org/10.4324/9780203846452

Neuburger, M., & da Silva, C. J. (2011). Riberinhos between ecological adaptation and modernisation. *The Pantanal: Ecology, Biodiversity and Sustainable Management of a Large Neotropical Seasonal Wetland*, 674–694.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our Nature: Exploring Nature Relatedness as a Contributor to Subjective Well-Being. *Journal of Happiness Studies*, *12*(2), 303–322. https://doi.org/10.1007/s10902-010-9197-7

Nolte, C., Agrawal, A., Silvius, K. M., & Soares-Filho, B. S. (2013). Governance regime and location influence avoided deforestation success of protected areas in the Brazilian Amazon. Proceedings of the National Academy of Sciences, 110(13), 4956–4961. https://doi.org/10.1073/pnas.1214786110

Noring, Maria. "Valuing ecosystem services-linking ecology and policy." PhD diss., KTH Royal Institute of Technology, 2014.

Nzyoka, J., Minang, P. A., Wainaina, P., Duguma, L., Manda, L., & Temu, E. (2021). Landscape governance and sustainable land restoration: Evidence from Shinyanga, Tanzania [Article]. *Sustainability (Basel, Switzerland)*, *13*(14), 7730. https://doi.org/10.3390/su13147730

Oksanen J, Simpson G, Blanchet F, Kindt R, Legendre P, Minchin P, O'Hara R, Solymos P, Stevens, M, Szoecs E, Wagner H, Barbour M, Bedward M, Bolker B, Borcard D, Carvalho G, Chirico M, De, Caceres M, Durand S, Evangelista H, FitzJohn R, Friendly M, Furneaux B, Hannigan G, Hill M, Lahti L, McGlinn D, Ouellette M, Ribeiro Cunha E, Smith T, Stier A, Ter Braak C, Weedon J (2022). vegan: Community Ecology Package. R package version 2.6-4, <https://CRAN.R-project.org/package=vegan>.

Oliveira, A. K. M., Oliveira, N. A., Resende, U. M., & Martins, P. F. R. B. (2011). Ethnobotany and traditional medicine of the inhabitants of the Pantanal Negro sub-region and the raizeiros of Miranda and Aquidauna, Mato Grosso do Sul, Brazil [Article]. *Brazilian Journal of Biology*, *71*(1 Suppl 1), 283–289. https://doi.org/10.1590/S1519-69842011000200007

Ostrom, E. (2015). Governing the Commons: The Evolution of Institutions for Collective Action. In Canto Classics. Cambridge University Press. https://doi.org/DOI: 10.1017/CBO9781316423936

Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., Gomez-Baggethun, E., & Muradian, R. (2014). Social Equity Matters in Payments for Ecosystem Services. BioScience, 64(11), 1027–1036. https://doi.org/10.1093/biosci/biu146

Putnam, R. D. (1993). *Making democracy work: civic traditions in modern Italy* (Robert. Leonardi & R. Y. Nanetti, Eds.) [Book]. Princeton UP.

Reid, J. L., Wilson, S. J., Bloomfield, G. S., Cattau, M. E., Fagan, M. E., Holl, K. D., & Zahawi, R. A. (2017). How long do restored ecosystems persist? 1. *Annals of the Missouri Botanical Garden*, *102*(2), 258–265.

Roe, D. (2008). The origins and evolution of the conservation-poverty debate: a review of key literature, events and policy processes. *Oryx*, *42*(4), 491–503.

Ruiz-Mallén, I., Schunko, C., Corbera, E., Rös, M., & Reyes-García, V. (2015). Meanings, drivers, and motivations for community-based conservation in Latin America. *Ecology and Society*, *20*(3). http://www.jstor.org/stable/26270245

Sandifer, Paul A., Ariana E. Sutton-Grier, and Bethney P. Ward. "Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation." Ecosystem services 12 (2015): 1-15.

Schmidt, I. B., de Urzedo, D. I., Piña-Rodrigues, F. C. M., Vieira, D. L. M., de Rezende, G. M., Sampaio, A. B., & Junqueira, R. G. P. (2019). Community-based native seed production for restoration in Brazil – the role of

science and policy [Article]. Plant Biology (Stuttgart, Germany), 21(3), 389–397. https://doi.org/10.1111/plb.12842

Schulz, C., Whitney, B. S., Rossetto, O. C., Neves, D. M., Crabb, L., de Oliveira, E. C., Terra Lima, P. L., Afzal, M., Laing, A. F., de Souza Fernandes, L. C., da Silva, C. A., Steinke, V. A., Torres Steinke, E., & Saito, C. H. (2019). Physical, ecological and human dimensions of environmental change in Brazil's Pantanal wetland: Synthesis and research agenda [Article]. The Science of the Total Environment, 687, 1011–1027. https://doi.org/10.1016/j.scitotenv.2019.06.023

Sen, A. (1980). *Equality of what?*

Senabre Hidalgo, Enric, Josep Perelló, Frank Becker, Isabelle Bonhoure, Martine Legris, and Anna Cigarini. "Participation and co-creation in citizen science." Chapter 11. In: Vohland K. et al. (Eds). 2021. The Science of Citizen Science. Springer. https://doi. org/10.1007/978-3-030-58278-4. pp: 199-218 (2021).

Shanahan D, Maseyk F, Johnston G, Doole M 2021. Social and ecological outcomes from community-led conservation. Collaborative research project prepared for Predator Free 2050 Ltd. The Catalyst Group Contract Report No. 2021/160

Shapiro-Garza, E. (2013). Contesting the market-based nature of Mexico's national payments for ecosystem services programs: Four sites of articulation and hybridization. Geoforum, 46, 5–15.

Shennan-Farpón, Y. (2022). Restoration pathways for Brazil's Atlantic Forest: finding co-benefits for people and biodiversity. UCL (University College London).

Silva-Melo, M. R., Melo, G. A. P., Guedes, N. M. R. (2020). Sustainable Tourism: alternative to the development of the Black Bay APA, Pantanal of Mato Grosso do Sul. Revista Brasileira de Ecoturismo, São Paulo, 12(5): 757-771.

Skarlatidou, A., Fraisl, D., Wu, Y., See, L., & Haklay, M. (2022). *Extreme Citizen Science Contributions to the Sustainable Development Goals: Challenges and Opportunities for a Human-Centred Design Approach*. Springer.

Sterling, E. J., Filardi, C., Toomey, A., Sigouin, A., Betley, E., Gazit, N., Newell, J., Albert, S., Alvira, D., Bergamini, N., Blair, M., Boseto, D., Burrows, K., Bynum, N., Caillon, S., Caselle, J. E., Claudet, J., Cullman, G., Dacks, R., … Jupiter, S. D. (2017). Biocultural approaches to well-being and sustainability indicators across scales. Nature Ecology & Evolution, 1(12), 1798–1806. https://doi.org/10.1038/s41559-017-0349-6

Sterling, E. J., Zellner, M., Jenni, K. E., Leong, K., Glynn, P. D., BenDor, T. K., Bommel, P., Hubacek, K., Jetter, A. J., Jordan, R., Olabisi, L. S., Paolisso, M., & Gray, S. (2019). Try, try again: Lessons learned from success and failure in participatory modeling. Elementa: Science of the Anthropocene, 7, 9. https://doi.org/10.1525/elementa.347

Strassburg, B. B. N., Iribarrem, A., Beyer, H. L., Cordeiro, C. L., Crouzeilles, R., Jakovac, C. C., Braga Junqueira, A., Lacerda, E., Latawiec, A. E., Balmford, A., Brooks, T. M., Butchart, S. H. M., Chazdon, R. L., Erb, K.-H.,

Brancalion, P., Buchanan, G., Cooper, D., Díaz, S., Donald, P. F., … Visconti, P. (2020). Global priority areas for ecosystem restoration. Nature, 586(7831), 724–729. https://doi.org/10.1038/s41586-020-2784-9

Summit, E. (1997). *UN Conference on Environment and Development (1992)*. Department of Public Information, United Nations.

Tarrent, M., Moreu, M., Gibs, H., Haklay, M., Lewis, J., Laws, M., Skarlatidou, A., Moustard, F., & Hoyte, S. (2023). Sapelli [Book]. In Sapelli. Springer.

Tedesco, A. M., López-Cubillos, S., Chazdon, R., Rhodes, J. R., Archibald, C. L., Pérez-Hämmerle, K.-V., Brancalion, P. H. S., Wilson, K. A., Oliveira, M., & Correa, D. F. (2023). Beyond ecology: ecosystem restoration as a process for social-ecological transformation. Trends in Ecology & Evolution.

Telleria, J. (2021). Development and Participation: Whose Participation? A Critical Analysis of the UNDP's Participatory Research Methods [Article]. European Journal of Development Research, 33(3), 459–481. https://doi.org/10.1057/s41287-020-00287-8

Tomas, W. M., Cáceres, N. C., Nunes, A. P., Fischer, E., Mourão, G., & Campos, Z. (2010a). Mammals in the Pantanal wetland, Brazil. *The Pantanal: Ecology, Biodiversity and Sustainable Management of a Large Neotropical Seasonal Wetland*, 563–595.

Tomas, W. M., Ishii, N., Strüssmann, C., Nunes, A. P., Salis, S. M., Campos, Z., Ferreira, V. L., Bordignon, O., Barros, A. T. M., & Padilha, D. R. C. (2010b). Borda oeste do pantanal e Maciço do Urucum em Corumbá, MS: área prioritária para conservação da biodiversidade. 5o Simpósio Sobre Recursos Naturais e Socioeconômicos Do Pantanal.

Torres Vitolas, C. A. (2011). *Social capital in poor communities: a case study from rural northern peru* [Dissertation]. ProQuest Dissertations Publishing.

Tuan, Y.-F. (1977). Space and place: The perspective of experience. U of Minnesota Press.

Valenzuela, R.B, Yeo-Chang, Y., Park, M. S., & Chun, J.-N. (2020). Local people's participation in mangrove restoration projects and impacts on social capital and livelihood: A case study in the Philippines. *Forests*, *11*(5), 580.

van Noordwijk, M., Gitz, V., Minang, P. A., Dewi, S., Leimona, B., Duguma, L., Pingault, N., & Meybeck, A. (2020). People-centric nature-based land restoration through agroforestry: A typology [Article]. *Land (Basel)*, *9*(8), 251. https://doi.org/10.3390/land9080251

Wali, A., Alvira, D., Tallman, P., Ravikumar, A., & Macedo, M. (2017). A new approach to conservation: using community empowerment for sustainable well-being. *Ecology and Society*, *22*(4).

Wantzen, K. M., Girard, P., Roque, F. O., Nunes da Cunha, C., Chiaravalotti, R. M., Nunes, A. v., Bortolotto, I. M., Guerra, A., Pauliquevis, C., Friedlander, M., & Penha, J. (2023). The Pantanal: How long will there be Life in the Rhythm of the Waters? In River culture: life as a dance to the rhythm of the waters (pp. 497–536). UNESCO. https://doi.org/10.54677/dyrd7304

Wells, G. J., Fisher, J., Jindal, R., & Ryan, C. M. (2020). Social as much as environmental: The drivers of tree biomass in smallholder forest landscape restoration programmes. *Environmental Research Letters*, *15*(10), 104008.

West, P. (2006). Conservation is our government now: the politics of ecology in Papua New Guinea. Duke University Press.

Westermann, Olaf, Jacqueline Ashby, and Jules Pretty. "Gender and Social Capital: The Importance of Gender Differences for the Maturity and Effectiveness of Natural Resource Management Groups." World development 33.11 (2005): 1783–1799. Web.

Westerman, K. (2021). Unpacking the perceived benefits and costs of integrating gender into conservation projects: voices of conservation field practitioners [Article]. *Oryx*, *55*(6), 853–859. https://doi.org/10.1017/S0030605320001295

Williams, G. (2004). Evaluating participatory development: tyranny, power and (re)politicisation. Third World Quarterly, 25, 557–578. https://api.semanticscholar.org/CorpusID:143694535

Wood, J. K., Gold, W. G., Fridley, J. L., Ewing, K. & Niyogi, D. K. An Analysis of Factors Driving Success in Ecological Restoration Projects by a University-Community Partnership. Ecol. Restor. 35, (2017).

Woodhouse, E., Homewood, K. M., Beauchamp, E., Clements, T., McCabe, J. T., Wilkie, D., & Milner-Gulland, E. J. (2015). Guiding principles for evaluating the impacts of conservation interventions on human well-being [Article]. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1681), 20150103–20150103. https://doi.org/10.1098/rstb.2015.0103

Woodhouse, E., de Lange, E., & Milner-Gulland, E. J. (2016). Evaluating the impacts of conservation interventions on human wellbeing. Guidance for Practitioners. London: IIED.

Woodhouse, E., Homewood, K. M., Beauchamp, E., Clements, T., McCabe, J. T., Wilkie, D., & Milner-Gulland, E. J. (2017). Understanding Human Well-being for Conservation: A Locally Driven, Mixed Methods Approach [Bookitem]. In Decision-Making in Conservation and Natural Resource Management (pp. 97–122). Cambridge University Press. https://doi.org/10.1017/9781316135938.005

Woodhouse, E., & McCabe, J. T. (2018). Well-being and conservation: diversity and change in visions of a good life among the Maasai of northern Tanzania. Ecology and Society, 23(1).

Woodhouse, E., Moreau, M.-A., Booker, F., Anthem, H., Coulthard, S., Eghenter, C., & Goldman, M. (2022). *Why gender matters for biodiversity conservation* [Document]. International Institute for Environment and Development (IIED).

Yoshida, Y., Matsuda, H., Fukushi, K., Takeuchi, K., & Watanabe, R. (2022). The missing intangibles: nature's contributions to human wellbeing through place attachment and social capital [Article]. *Sustainability Science*, *17*(3), 809–822. https://doi.org/10.1007/s11625-021-01067-x

Appendix 1 - Community Interview Guide

Name:
Profession:
How long have you lived in the Baia Negra APA?
Level of education:

Restoration

1. Do you participate in restoration activities in the region? If yes, how? If yes, how did you get involved in the activity?
2. In the future would you be more or less involved in restoration? - why?

Perceptions on restoration activities

3. What does the word "restoration" mean to you?
4. Do you think restoration is important for the APA? Why do you think so?
5. Do you think that the restoration project should be expanded? Why?
6. Do you think the restoration of the Baia Negra APA brings benefits to the local communities? Please explain the benefits.

<u>Ecosystem Services</u>

7. What are the resources that come from nature that you use in your daily life?
8. Can you think of other things that nature gives you?
9. Do you think any of these services have changed in the last five years? Do you think the restoration activities in the area have affected them?
10. Where do you usually go within the APA that is important for your daily life, and how do you use this place?
11. Do you think that the construction of the APA headquarters was important for the community? Is there a place where you can meet and talk about APA issues?
12. Are there any places that are important for the sense of belonging to the community? How did they become important?
13. Could you name some of the things related to the previous questions that have great importance for you and the community? Why is it important? Has it changed over time?
14. Can you give me an example of something you learned while living in the Baia Negra APA?
15. Are there specific experiences associated with this environment that you hope your children and/or young people from your community will live through? What are these experiences and what makes them important to share with future generations?

<u>Well-Being</u>

1. What brings you happiness or helps you feel fulfilled? List everything that comes to your mind.
2. How would you define "living well" for a person?
4. What do you think you need to have in order to live well in the APA Baia Negra?
5. Do you think that life in your community is getting better or worse? Why or why not?
6. What do you think a healthy ecosystem looks like? Do you have an example to give?
7. Do you think that the health of the Baia Negra APA and your own well-being are connected in any way? If yes, how do you know they are connected? How strong is that connection?

Restoration

9. What do you think of the restoration activities in the region? Do you think they are beneficial?

10. What changes have you noticed in the environment since the restoration activities started? Are these changes positive or negative?

12. Do you know about Leucena? Does Leucena have any uses? What are your views on Leucena?

13. Do you think your well-being has changed in the last 5 years? How? Do you think the restoration has impacted this?

15. Do you think that, in the last five years, the community is more united or less united? Has the restoration project affected this?

16. How has the area restoration project affected the way that you use the environment?

17. Do you think that in the last 2-3 years the way you live have changed? Do you think that the restoration has affected this?

18. Has the restoration affected your relationship with the community? Has it changed how connected you feel to your community? Do you think other people in the community feel the same way?

20. Have you noticed if there are any conflicts between the community and restoration activities in the area? If yes, have they been resolved and how?

21. What do you expect to get back from the restoration activities? How do you expect it to impact you?

22. Has the participation in the restoration affected the way you see the APA Baia Negra and the environment? If yes, how?

24. Are there other things that you feel benefit you as a result of participating in restorative activities, things that are important but not just about what you receive physically?

Appendix 2 - ECOA/Government Interview Guide

1. What is your role within ECOA/other institution? How long have you worked within this role?
2. How are you involved in the restoration project? What are your responsibilities?
3. Could you explain the main goals of the project? Have these been achieved thus far? If not, what in your opinion have been the main barriers to this?
4. What do you understand by a 'community-based' project? Which criteria does a project need to meet to be considered community based?
5. Were you involved in the decision making of which areas are restored? Who was involved? How do you think this process could be improved in the future?
6. Can you describe some of the current issues faced in the community, and how restoration has impacted these? Has the project directly addressed any community needs?
7. I understand that part of this project involved cutting down Leucena trees in the area. How has this impacted the community?
8. Could you explain how Sapelli was implemented in the project? Do you think it was a useful strategy? Do you think it helped people to engage with the project?
9. Were any other strategies implemented to integrate community participation in the design and decision making of this restoration project?
10. In your opinion, what are some potential benefits or drawbacks to the community in engaging in restoration efforts?
11. Have there been any conflicts between restoration efforts and the community? If so, what were these and how were they addressed?
12. Do you think there are any ways in which community involvement in the project could have been improved? How?
13. Are there any specific community needs or priorities that should be considered when designing restoration projects?

Appendix 3 - Questionnaire

Please tell us about all of the members of your household.

Name	Age	Gender	Relationship to household head	Education Level [record if still enrolled in school]	Employment status	Occupation

In the last 5 years - has anybody left your household?

Name	When	Circumstances

1. **Material**

Is the house on stilts or on the ground?	
Wall Material	[ ] Wood [ ] Brick [ ] Bamboo [ ] Clay
Roof material	[ ] Straw [ ]
Number of rooms in the house	
Does the house have the following -	
Bathroom [how many?]	
TV [does it work?]	
TV antenna [does it work?]	
Fan [how many?]	
Mosquito Net [what is the quality? (1-very punctured, 2 -in good condition with some holes, 3-excellent condition)	
Hammock [how many?]	
Mattress [how many?]	
Table [how many?]	
Wooden benches [how many?]	
Wooden chairs [how many?]	

Plastic chair [how many?]	
Radio [how many, do they work?]	
Sound box [type and how many?]	
Computer [how many, do they work?]	
Tablet [how many, do they work?]	
Telephone cell phone [how many, do they work?]	
Generator [type, does it work?]	
Battery [how many?]	
Chainsaw	
Brushcutter [how many, type?]	
Freezer	
Motor pump	
Ax [how many?]	
Hoe [how many?]	
Machete [how many?]	
Estrovenga [how many?]	
Handsaw [how many?]	
Stove [how many? does it work?]	
Cylinder [how many?]	
Wood Stove [does it work?]	
Pressure cooker [how many?]	
Number of boats owned by the household [types, sizes, quantities, length] Number of people of board	
Number of livestock owned	Horse
	Cows
	Pigs
	Hens
Fishing Equipment owned [if owned, how many?]	Tarrafa
	Branch Hook
	Tuvira Screen
	Bucket for storing bait
	Windlass
List all the sources of income received last month. Which were the largest sources of income?	

Who manages the household income?	[ ] All earnings went into a common pot [ ] Everyone kept and managed his/her own earnings [ ] All income is given to household head to manage [ ] All income is given to household head's spouse to manage [ ] Other (please specify)
How satisfied are you with this arrangement? [Ask both the household head and their spouse – record separate answers]	[ ] Very satisfied [ ] Satisfied [ ] Not satisfied
On a scale from 1-3, how adequate was last month's household income? (1- more than adequate, 2 – just adequate, 3 – not adequate).	
On a scale from 1-5, how does last month's income compare with a typical monthly income for your household? (1 – well above average, 2 - more than average, 3 – average, 4 - less than average, 5 - well below average)	
Compared to others in the community would you say you are	[ ] The richest in the community [ ] Amongst the richest in the community [ ] Richer than most households in the community [ ] About average in the community [ ] A little poorer than most households in the community [ ] Amongst the poorest in the community [ ] The poorest in the community

Goods and Services

For the following goods and services, please indicate your access to each from 1 to 5 (1- do not have access to it, 5 – have full access to it).

	Access
Clean Water	
Sanitation	
Electricity	
Transport	

2. Resources

Size of the plot of land used by the household	
Percentage of land used for agriculture [growing crops]	
Is the land (please select one option)	[ ] Owned [ ] Partially owned [ ] Rented [ ] Leased from the state [ ] Other (please specify)
How many times in the last week did you collect the following natural resources? [for each please add a number between 1-7]	Fish ( ) Fruit ( ) Firewood ( ) Bushmeat ( ) Medicinal Plants ( )
In the last week have you used water bodies (rivers, ponds, lakes, etc.) for any of the following [Tick all that apply]	[ ] For drinking [ ] For irrigation [ ] For fishing [ ] For other household use
In the last week have you used trees for any of the following [Tick all that apply]	[ ] For timber [ ] For firewood [ ] For fruit [ ] For other products (sap, leaves, roots etc)

<u>Food Security</u>

Last month, was most of the meat consumed in your household bought or caught/harvested?	
Last month, was most of the fish consumed in your household bought or caught/harvested?	
Last month, was most of the fruit and crops consumed in your household bought or caught/harvested?	
In the past four weeks, have your family members (0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Often)	
eaten a smaller meal than you felt you needed?	
eaten fewer meals in a day?	
had no food of any kind to eat in your household at least once?	
gone to sleep at night hungry?	
gone a whole day and night without eating?	

3. Health

On a scale of 1-6, would you say your family as a whole is in good health? (1 - strongly agree, 2 – agree, 3 – somewhat agree, 4 – somewhat disagree, 5 – disagree, 6 – strongly disagree).	
How many instances of poor health has your family experienced in the last year? [number/never/all the time]	
How long on average do these last? [number of days/months]	

4. Social Relations

On a scale of 1-5, how connected do you feel to the community? (1 - very connected, 2 - somewhat connected, 3 - neither connected nor disconnected, 4 - somewhat disconnected, 5- extremely disconnected)	
How may community meetings have you attended in the last year?	
Are you a member of any cubs, social groups or WhatsApp groups within the community? If so how many?	
On a scale of 1-5, how connected do you feel to the nearest city? (1 - very connected, 2 - somewhat connected, 3 - neither connected nor disconnected, 4 - somewhat disconnected, 5- extremely disconnected)	

5. Subjective Wellbeing

On a scale of 1-5, how happy would you say you are? (1 - very happy, 2 – happy, 3 – neither happy nor unhappy, 4 - unhappy, 5 – extremely unhappy)	
On a scale of 1-5, how happy are you with your occupation?	
If you wish to change occupation, are you able?	[ ] Yes [ ] No [ ] Unsure
Please rank each of the following statements on a scale from 1- 6 (1 being strongly agree, 2 – agree, 3 – somewhat agree, 4 – somewhat disagree, 5 – disagree, 6 – strongly disagree).	
'In 10 years, I will still be living in the same way in the APA Baia Negra/settlement'	
'In most ways my life is close to my ideal'	

'The conditions of my life are excellent'	
'I am satisfied with my life'	
'So far I have gotten the important things I want in life'	
'If I could live my life over, I would change almost nothing'	
'I feel involved in decision making for the APA'	
On a scale from 1-3, how do you find… (1- more than adequate, 2 – just adequate, 3 – not adequate).	
The health care your family receives	
Your children's education	
The suitability of your house	
Support from the state	
Support from local NGOs	