Norwegian University of Life Sciences
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Philosophiae Doctor (PhD)
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A comparative analysis of the processes, costs and impacts of REDD+. Findings from pilot projects in Brazil and Tanzania.

En komparativ analyse av prosesser, kostnader og virkninger av REDD+. Funn fra pilotprosjekter i Brasil og Tanzania.

Mary Gorret Nantongo

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Paper 2. Nantongo, M., (2017). Legitimacy of local REDD+ processes. A comparative analysis of pilot projects in Brazil and Tanzania. *Environmental Science and Policy,* 78: 81-88

Paper 3. Nantongo, M., & Vatn. A. (2019). Transaction Costs for establishing REDD+. E*cological Economics, 156: 1-11*

Paper 4. Nantongo, M., & Vatn. A. (2018). REDD+: The perfect marriage between conservation and development? A comparative study of the impacts of REDD+ on livelihoods and deforestation in Tanzania (manuscript)

Summary

This thesis is a comparative study that examines how the policy of Reducing Emissions from Deforestation and Forest Degradation (REDD+) was implemented in three pilot sites located in Kilosa and Kondoa districts in Tanzania and the RDS Rio Negro in Amazonas, Brazil. Applying classical institutional theory, the thesis analyses 'what it takes' to establish local governance structures for trading carbon under REDD+. The analyses cover REDD+ implementation from 'start to finish'. The aim has been to obtain a more comprehensive understanding of the establishment of REDD+, which included the processes of implementation, what it costed to establish and apply the relevant governance structures and what the outcomes have been regarding both livelihoods and deforestation/carbon storage. The study employs both qualitative and quantitative approaches, and has produced altogether four scientific papers.

Paper 1 is an in-depth analysis of the process of implementing REDD+ in Kondoa, Tanzania. The focus is on how local people participated in key REDD+ processes, specifically the processes of deciding whether to participate or not, demarcating land and formalizing ownership, and deciding on land use plans and by-laws and on the benefit sharing mechanisms. In trying to understand people's participation, the paper investigates the role of power in enabling or constraining participation in REDD+ processes. My findings reveal that in the villages that agreed to participate in REDD+ and completed all three processes, people took part in and were satisfied with the processes of REDD+ decision-making. Nevertheless, the fact that implementers had privileged access to information as well as a command of a combination of incentives - mainly the promise of environmental conservation and agricultural benefits from improved rainfall and disincentives - a variety of sanctions for non-compliance with the rules for conservation -, also influenced people's decisions to a certain degree. I also find that the REDD+ project and processes of implementation were evaluated less favorably in villages where REDD+ was rejected at the outset and in those where the process had been initiated, but not completed. This was mainly due to the manipulation of processes by local leaders, with the result that communities either refused to join, dropped out along the way, or had very low levels of compliance with REDD+ rules. Based on these findings, I submit that power differences among actors played a key role in the outcomes of participation. The power dynamics notwithstanding, there is also evidence that the Tanzanian systems of decentralization and participatory forest management enhanced the power and ability of local people to control decision-making. The paper therefore ends with a suggestion that

REDD+ has potential to become more genuinely participatory and empowering if the structure of REDD+ governance spanning global, national and local levels can account for the variation in power possessed by actors at different levels.

Paper 2 is a comparative analysis of all three pilots under study, dealing with the issue of how to engage local people, so that decisions made under REDD+ are acceptable to them, i.e., the legitimacy of REDD+ at local level. The paper addresses legitimacy from two perspectives; the normative perspective – which evaluates implementation based on external and general criteria of participation, deliberation, transparency and accountability and equity – and the sociological perspective – which focuses on the views of local people regarding processes and outcomes of REDD+. The normative assessment established that participation was inclusive, representative, and deliberative and that all three pilots attempted to fulfil the criteria of free, prior and informed consent (FPIC). However, there were also challenges relating to inadequate accountability and transparency and powerful actors manipulating processes. Using the sociological perspective – i.e., the assessment of people's own evaluation – a more optimistic picture of REDD+ implementation appears. As such, I found mostly positive attitudes to REDD+ processes and outcomes. There is some variation though, as REDD+ was evaluated most favorably in the villages that accepted to be part of REDD+ in Kondoa, followed by the pilot in Kilosa, the Brazilian pilot[1] and lastly the villages that rejected REDD+ in Kondoa. It is notable that among the communities that took part in REDD+, the pilot in Brazil received the most negative comments, when in fact, the cash payments were higher than in the Tanzanian pilots, and the REDD+ project provided a variety of added benefits. This seems mostly explained by the fact that people felt a sense of powerlessness due to their inability to influence the structure of the project, which led to frustration with the payments and the rules associated with REDD+. In the Tanzanian context, support was higher partly because people were satisfied with the way they were involved in the processes of REDD+. Earlier experiences with prior conservation projects that had been externally induced were negative - especially in Kondoa. Hence, REDD+ represented progress. In addition, forest conservation seemed to be a major reason for supporting REDD+ in Tanzania. So, even though there was some discontent about low payments, people were still optimistic that an improvement in forest cover would increase rainfall and enhance agricultural productivity.

[1] None of the communities in Kilosa and RDS Rio Negro rejected REDD+ project.

The paper concludes with the assertion that people's attitudes to REDD+ were dependent on the quality of decision-making processes. It therefore argues that in order for REDD+ to be more acceptable and equitable, implementers must involve people in discussions, ensure openness and representation, offer balanced and sufficient information and allow flexibility in processes so that local people can contribute to the structuring of REDD+ programs. Like paper 1, in this paper I also highlight how power differences affected decision-making and attitudes to REDD+. To counter these influences of power, I recommend strategies such as improving downward accountability to local communities, allowing locals to obtain various sources of information and transfer of power to lower levels, which in this case was achieved by embedding local decision-making processes within national frameworks.

Paper 3 is a comparative study of the transaction costs of REDD+ in Kilosa and RDS Rio Negro in Brazil. Recognizing that transactions are diverse and operate in a wide variety of circumstances and contexts, the paper builds on the concept of governance structures to suggest a common framework for assessing transaction costs. Results show that RDS Rio Negro had lower establishment costs, while its costs of using the governance structures were higher than in Kilosa. Thus, depending on the discount rate used, establishment costs range between USD 0.5 and 0.6 in RDS Rio Negro and USD 1.7 and 1.9 per ton of CO_2 in Kilosa. The cost of using the governance structures on the other hand range between USD 0.9 and 6.4 in RDS Rio Negro and USD 0.3 and 2.0 per ton of CO_2 sequestered in Kilosa. In this paper, I demonstrate that the level of transaction costs depends on existing institutions in place, the strategy of REDD+ implementation and the chosen governance structure. The Brazilian case did – as an example – not focus at establishing institutions necessary to trade carbon. That was a key aim in the Tanzanian case. The former project had more focus on development of the economy to ensure less dependence on deforestation.

The framework developed in this paper allows for the analysis of transaction costs for a variety of governance structures, including pure markets, hybrids involving market and non-market forms, as well as non-market governance structures. It argues against the common assertion that REDD+ is cost-effective because it is a market-based solution, and instead suggests that REDD+ could not take on the form of a market, while non-market governance structures or a mixture of market and non-market elements could be viable as well.

Paper 4 is also a comparative study, focusing on the impacts of REDD+ on livelihoods and deforestation in Kilosa and Kondoa. The paper uses the 'Before-After/Control-Intervention' research design to quantify the changes in livelihoods and forest status following the implementation of REDD+, and theory-based evaluation to answer why and how the REDD+ intervention caused impacts. Within the time-frame of the projects – 2010 to 2014 – it is found that in terms of total income, REDD+ neither improves nor harms rural livelihoods. REDD+ did not contribute positively to total income because investments in income generation activities were insufficient, compensation payments were low and a drought compromised the benefits that could have come from the investments made in agriculture. Fortunately, REDD+ did not harm people's livelihoods either, because the rules allowed regulated access to forest resources. In fact, the results seem to suggest that forest income – in Kilosa at least – was boosted because the rules were flexible enough (more flexible when compared to Kondoa) in their provisions for how people could harvest forest products. REDD+ moreover also improved forest cover and resulted in increased carbon stocks in both sites, although the recovery was stronger in Kilosa. The recovery in forest cover was a result of better local governance, community engagement, land use planning and training, which led to improved enforcement, regulation of forest access and more appreciation of environmental protection. The results therefore seem to support the idea that REDD+ has a potential to contribute to both social welfare and enhancement in forest cover. For this to happen however, implementation must put as much emphasis on activities that boost livelihoods as those that protect the trees. In this case, there was much more focus on the latter, with the result that the full benefits of REDD+ on livelihoods were not realized.

A theme that I emphasize consistently throughout the papers is that while REDD+ is implemented locally, the processes and consequences are intimately interwoven with broader political, economic, social and institutional forces at all levels of REDD+ governance. I therefore argue that there is a need for REDD+ policy makers at all levels to be cognizant of the fact that external forces do in fact impact on local REDD+ processes and outcomes. This should consistently be accounted for in the design of REDD+ programs. Relatedly, I also highlight the fact that local realities and contexts produce divergent consequences for processes, costs and impacts of REDD+. As such, different localities/locations have particular historical, environmental, socio-economic, political and governance realities, such that a one size fits all approach is unlikely to suffice under all circumstances. The thesis therefore suggests that

implementers must seek to understand and account for these local contexts in the implementation of projects if REDD+ is to be successful and sustainable.

Sammendrag

Denne avhandlingen er en komparativ studie som undersøker hvordan tiltak for å redusere utslippene fra avskoging og degradering av skog (Reducing Emissions from Deforestation and Forest Degradation – REDD +) ble gjennomført i tre piloter. Disse ligger i distriktene Kilosa og Kondoa i Tanzania og RDS Rio Negro i Amazonas, Brasil. Målet har vært å oppnå en helhetlig forståelse av etableringen av REDD+ inklusive prosessene rundt gjennomføringen, hva det kostet å etablere og anvende de etablerte styringsstrukturene og hva resultatene har vært med tanke på både levekår og avskoging/karbonlagring. Studien benytter både kvalitative og kvantitative tilnærminger, og har produsert tilsammen fire vitenskapelige artikler.

Artikkel 1 er en grundig analyse av etableringen av REDD+ i Kondoa i Tanzania. Fokuset er på hvordan lokalbefolkningen deltok i viktige prosesser. I forsøket på å forstå folks deltagelse, undersøker artikkelen hvilken rolle makt har når det gjelder å muliggjøre eller begrense deltakelse. Basert på disse funnene, hevder jeg at forskjeller i makt blant aktørene spilte en nøkkelrolle for resultatene av deltakelsen. Til tross for disse mekanismene, fant jeg også at de tanzanianske systemene for desentralisering og deltakende skogforvaltning styrket makten til og evnen som lokalbefolkningen har til å kontrollere beslutningene. Artikkelen konkluderer derfor med at REDD+ har potensial til å bli mer genuint deltakende og demokratisk hvis strukturen i styresettet for REDD+ som spenner over globale, nasjonale og lokale nivåer, makter å ta hensyn til variasjonene i maktforhold på tvers av aktører og nivåer.

Artikkel 2 er en komparativ analyse av alle de tre pilotene i studien og tar for seg spørsmålet om hvordan man kan engasjere lokalbefolkningen slik at vedtak som blir gjort under REDD+, blir akseptable for dem, dvs. at REDD+ blir gjennomført på en legitimt måte på lokalt nivå. Artikkelen ser på legitimitet ut fra to perspektiver, det normative perspektivet – som evaluerer gjennomføringen basert på eksterne og generelle kriterier for deltakelse, overveielse, åpenhet og ansvarlighet og rettferdighet – og det sosiologiske perspektivet – som fokuserer på synspunktene til lokalbefolkningen om prosesser og utfall av REDD+. Artikkelen konkluderer med at folks holdninger til REDD+ var avhengige av kvaliteten på beslutningsprosessene. Den hevder derfor at for at REDD+ skal bli mer akseptabel og rettferdig, må de som implementerer involvere folk i diskusjoner, sikre åpenhet og representasjon, tilby balansert og tilstrekkelig informasjon og legge til rette for fleksibilitet i prosessene slik at lokalbefolkningen kan bidra i struktureringen av REDD+.

Artikkel 3 er en komparativ studie av transaksjonskostnadene knyttet til REDD+ i Kilosa og RDS Rio Negro i Brasil. Artikkelen påpeker at transaksjoner er av mange ulike typer og skjer under en svært ulike forhold og sammenhenger. Artikkelen utvikler et rammeverk for analyse av transaksjonskostnader med utgangspunkt i begrepet styringsstrukturer. Resultatene viser at RDS Rio Negro hadde lavere etableringskostnader, mens kostnadene ved å bruke styringsstrukturene var høyere enn i Kilosa. I denne artikkelen viser jeg at nivået på transaksjonskostnadene avhenger av de eksisterende institusjonene som er etablert, gjennomføringsstrategien for REDD+ og den valgte styringsstrukturen. Rammeverket utviklet i denne artikkelen gir mulighet for analyse av transaksjonskostnader for ulike styringsstrukturer, inkludert rene markeder, hybrider som involverer markeds- og ikke-markedsformer, samt styringsstrukturer som ikke er basert på markeder.

Artikkel 4 er også en komparativ studie av hvordan REDD+ har påvirket levekår og avskoging i Kilosa og Kondoa. Innenfor tidsrammen for prosjektene – 2010 til 2014 – var funnet at REDD+ verken har bedret eller svekket levekårene i distriktene målt i samlet inntekt. Dessuten har REDD+ bedret skogdekningen og ført til økte karbonlagre i begge områder. Effekten var klarest i Kilosa. Resultatene synes derfor å støtte ideen om at REDD+ har potensial til å bidra til både sosial velferd og bedret skogdekning. For at dette skal skje, må imidlertid gjennomføringen legge like mye vekt på aktiviteter som styrker levekårene som på dem som beskytter trærne. I dette tilfellet var det mye mer fokus på sistnevnte, med det resultat at de fulle fordelene som REDD+ kunne hatt på levekårene, ikke ble realisert.

Alle artiklene viser at mens REDD+ blir gjennomført lokalt, er prosessene og konsekvensene tett sammenvevd med bredere politiske, økonomiske, sosiale og institusjonelle krefter på alle nivåer av styresettet for REDD+. Det er derfor behov for at beslutningstakere vurderer dette i utformingen av REDD+ programmer. I tilknytning til dette fremhever jeg også det faktum at lokale realiteter og kontekster gjør at konsekvenser for gjennomføring, kostnader og virkninger av REDD+ varierer. Avhandlingen foreslår derfor at de som utvikler REDD+ må søke å forstå og gjøre rede for disse lokale kontekstene om gjennomføringen skal bli vellykket og bærekraftig.

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[2] This project started out with 5 REDD+ pilots in Brazil, Uganda, Tanzania, Vietnam and Ghana. The pilot in Vietnam was stopped in 2011 due high opportunity costs resulting from widespread rubber production in the area, which made the idea of a certified voluntary carbon pilot untenable. In Ghana the implementation process was too slow for us to carry out the scheduled studies during the project time frame.

[3] This project involved 6 REDD+ pilots one each in Brazil and Uganda and two each in Tanzania and the Democratic republic of Congo.

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1. Introduction

For many across the world, climate change is a matter of life and death, affecting food production systems, eroding livelihoods and asset bases, increasing food insecurity, causing upward adjustments in food prices and increasing risks to human health. This is especially so among low-income populations from the poorest regions of the world (Ahmed et al., 2009; Karfakis et al., 2012; Warner & van der Geest, 2013). Deforestation and forest degradation are a key part of this problem. This is because cutting forests releases a significant amount of carbon into the atmosphere, thereby increasing the risk of global warming. The intergovernmental panel on climate change estimated that between 2000 and 2009 up to 12% of total greenhouse emissions came from forests and other land uses (IPCC, 2014). Currently, the largest forest area loss is occurring in the tropics, particularly in South America and Africa and mainly due to forest conversion to agriculture and other land uses (FAO, 2016). Given that forests are the most important terrestrial sink of atmospheric carbon dioxide, and that the tropics have the highest carbon densities, conversion of tropical forests is a major source of carbon emissions and an active contributor to global warming.

To respond to this problem, we need innovations that conserve ecosystems and halt or slow down climate change. The global policy to reduce emissions from deforestation and forest degradation (REDD+) in developing countries is one such innovation that has received extensive international attention. REDD+ formally launched onto the international stage at the conference of the parties (COP 13) in Bali in 2007. At this meeting, the members of the United Nations Framework Convention on Climate Change decided to consider policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries (UNFCCC, 2007). Since its inception, REDD+ has received enormous interest from international organizations, in developed as well as from developing country governments and civil society because of its promise to achieve multiple goals. First, REDD+ was thought to be cheaper than other feasible alternatives to mitigate climate change (e.g., Stern, 2007), and it provided developed nations – with high costs of abatement – the opportunity to purchase 'cheap' carbon emission reductions from less developed countries. Secondly, there was the argument that international trade in forest carbon would create large financial flows to support low carbon development in developing countries. Third, REDD+ was claimed to have the potential to generate substantial emission reductions relatively quickly (Stern, 2008). Added to these, REDD+

promised several other objectives including poverty reduction, environmental services provision, protection of biodiversity and protection of human rights (Angelsen & Wertz-Kanounnikoff, 2008).

Despite the varied goals that REDD+ currently espouses, the original idea of the policy was to create a multi-level scheme of payments for environmental services at international, national and sub-national levels. Under this arrangement, buyers (e.g., states, individuals, firms) were to reward providers (e.g., private forest owners, communities, states) for reduced emissions from deforestation and degradation or measures likely to deliver this service (Angelsen & Wertz-Kanounnikoff, 2008). The core was thus a market-based solution whose ultimate goal was to integrate forest carbon into the global carbon market (Stern, 2008).

The point of departure for this thesis is that in practice, REDD+ implementation has shown to be more demanding than expected and we have yet seen little of the originally proposed market arrangement where buyers pay forest owners/users to avoid cutting trees and manage their forests better. Indeed, 10 years after its start, the compliance based market for forest carbon credits is yet to develop, as the anticipated private funding has not come forth, with much of the funding for REDD+ so far coming from public sources (Sills et al., 2014). In addition, stakeholders have different concerns and ideas about how REDD+ ought to be organized, markets being just one of those being discussed (Streck et al., 2009; Vatn & Vedeld, 2013). Furthermore, the drivers of deforestation and degradation are varied, context-specific and dynamic (Kissinger et al., 2012). Given this complexity, the perspective of this thesis, is that REDD+ implementation is primarily about coordinating the actions of diverse actors operating in varying historical, socio-economic, political, institutional and environmental contexts to achieve the ultimate goal of reduced forest-carbon emissions.

This thesis aims to uncover how implementation is unfolding at local level, approaching this as a social and dynamic process conditioned by wider political, economic, social and institutional forces in which REDD+ operates. The approach taken is comparative, involving the study of three REDD+ pilot sites. One of them is located in the Amazon region of Brazil, while the other two are located in Tanzania, respectively in the Kilosa and Kondoa districts. The thesis is structured as follows. Section 2 presents the objectives and research questions investigated. Section 3 and 4 then outline the context into which the REDD+ is implemented in Brazil and

Tanzania respectively. They include a brief overviews of the historical and current status of deforestation and forest degradation, tenure and legal issues related to land and forest use, and a background on the establishment of REDD+ governance structures. The theoretical frameworks that guided the analyses are presented in section 5. This is followed by the research methodology in Section 6. Topics covered here include the philosophical foundations of the research, the procedures for sample selection, data collection and analysis, the research instruments used, the challenges encountered during data collection and the steps taken to ensure validity and reliability of the research. Section 7 provides brief overviews of the research papers that comprise the thesis, while section 8 summarizes the thesis and discusses the significance of the major findings for REDD+ policy and future research.

2. Objectives and research questions

The overall objective of the research is to carry out a holistic analysis of REDD+ implementation at the local level based on a governance perspective. This implies to follow the pilots from 'start to finish' in order to find out how the governance structures have been established, what it has costed to establish and use these structures, and what the outcomes have been regarding deforestation rates/carbon stocks and livelihoods. In other words, the thesis aims to understand 'what it takes' to establish the necessary REDD+ governance structures (actors and institutions) for trading carbon in the three pilots. To meet this overall goal, the study addresses the following research questions, as investigated by the four research papers that constitute this thesis.

- What characterizes the process of implementing REDD+?

In this research question, I investigate how different actors have participated in REDD+ decision-making, how various interests have been involved and taken care of in that process as well as uncovering conflicts and exploring local legitimacy issues. This research question is covered in papers 1 and 2.

- What transaction costs have been incurred in the implementation of REDD+?

Responding to this research question, paper 3 aims to uncover what the established governance structures imply for transaction costs, by quantifying the costs for establishing and running REDD+ pilot projects.

- What are the impacts of REDD+ on social welfare and forest carbon storage?

Covered in paper 4, this section of the research assesses the changes in livelihoods and forest carbon and investigates the mechanisms through which the observed outcomes occur.

3. Country context: Brazil

3.1 General background on deforestation and forest degradation

Brazil is a highly forested nation. With 59% of its total land area covered by forests spanning over approximately 494 million hectares, Brazil ranks second in the world after Russia in forest cover (FAO, 2016). Natural forests constitute the largest category amounting up to 98.7% of the total forest area. Forests are spread over 6 biomes; Amazon, Cerrado, Atlantic forest, Caatinga, Pampa and Pantanal (Brazilian Forest Service, 2009). The REDD+ pilot under study is situated within the Amazon biome, which cuts through nine other countries in South America, with nearly two thirds located in Brazil (May et al., 2010).

Deforestation in the Brazilian Amazon was not widespread until the 1950s. This was because in the late 19th and early 20th century, the area's economy was characterized by boom and bust cycles of extractive commodities, which did not cause a significant reduction in forest cover. The turning point in the rates of deforestation came around the early 1950s, driven mainly by government policies, which encouraged settlement in forest areas. Those policies began with the government prioritizing the construction of highways to integrate both socially and economically, the remote forest areas of the Amazon with the rest of Brazil as well as to maintain territorial integrity. Further, government policies between the 1970s and early 2000s, promoted colonization of the Amazon by smallholder farmers, large-scale cattle ranching, extensive soy-bean production and large scale mining. Acquisition of credit and formalization of land ownership was also tied to proof of 'productive activities' which essentially meant land uses that replaced forests with more 'profitable' activities such as agriculture and cattle rearing. In addition, the opening up of clandestine roads by illegal loggers contributed to further deforestation as the roads facilitated ranchers, land grabbers and squatters to access forests. Ultimately, the rate of deforestation accelerated greatly reaching a peak of approximately 2.9 million hectares in 1995 (May et al., 2010).

In an attempt to reverse the trend in deforestation, successive administrations established a series of legal provisions to manage forest exploitation. Among these, was the Brazilian Forest Code of 1965, which required private landowners to conserve native forests by setting aside 50% of rural properties in the Amazon as legal reserves – implying land to be permanently maintained as forest. Although it remained mostly unenforced until the early 2000s, the Forest Code is so far

the most important environmental legislation regulating forest management on private properties in the different biomes in Brazil. In addition to legislation, a number of environmental agencies were established. For instance, the National Institute of Space Research was established in 1965 to monitor deforestation in the Amazon. Further, an agency responsible for law enforcement and licensing of forests – the Brazilian Institute of Environment and Renewable resources – was created in 1989, while the Ministry of Environment was established in 1992 (McNeish et al., 2011). Despite these changes, high rates of deforestation continued averaging 1.95 million hectares per year between 1996 and 2005 (Nepstad et al., 2009). The main factors that the Brazilian government has cited as causes for these high rates of deforestation include the impunity of environmental offenders, weakness of environmental agencies, expansion of cattle rising activities, illegal occupation of non-allocated public land and poor procedures to verify the legitimacy of land titles (Ministry of Environment, 2009).

Concern about increasing rates of deforestation combined with pressure from civil society groups led the Brazilian government beginning in the early 2000s to institute additional policies, actions and strategies aimed at curbing deforestation. Notable among these was the Plan of action for the Prevention and Control of Deforestation in the Legal Amazon[4] in 2004, the Public Forests Management Law and the Brazilian Forest Service in 2006 as well as the Amazon Fund and the Sustainable Amazon Plan in 2008 (May et al., 2010; Moutinho et al., 2011). Note also that as the federal government implemented these programs, similar developments were taking place in the 9 states that comprise the Legal Amazon (Moutinho et al., 2011). The result of these changes was increased funding for forest protection and an improvement in monitoring, enforcement and implementation of forest law. In addition, the network of protected areas expanded, innovative social programs that promote sustainable development were implemented and there was increased pressure on buyers to avoid sourcing products from suppliers that cleared forests illegally (Gibbs et al., 2016; Nepstad et al., 2009). These initiatives saw deforestation rates fall rapidly by more 80% between 2004 and 2014 (Gibbs et al., 2016). It should be noted however, that even with this impressive decline in deforestation rates, Brazil continues to be the world leader in tree cover loss,

[4] The Legal Amazon is a geopolitical region created for administrative purposes, comprising nine states including those outside the 'true' Brazilian amazon. The states include Amazonas, Para, Mato Grosso, Acre, Tocantins, Amapa, Rondonia, Roraima and Maranhao

having lost 38.34 million hectares between 2001 and 2014 (Hansen et al., 2013) and having an annual net forest loss close to one million hectares between 2010 and 2015 (FAO, 2016).

3.2 Deforestation, land tenure and forest law

Deforestation in the Brazilian Amazon has often been linked to irregularities in land tenure, specifically unbalanced land distribution, tenure insecurity and contested property rights. Such irregularities arose out of a long history of land administration, which favored powerful special interests at the expense of the less powerful. From the colonial period through to the 1950s, successive administrations granted large tracts of land to capitalist interests primarily for extractive commodities notably rubber and Brazilian nut. While these unequal land distributions did not lead to widespread deforestation, they set the stage for enormous conflict between large landholders and the rural poor, which eventually contributed to the clearing of forests in the 1980s and 1990s, as opposing groups attempted to claim rights to land ownership (Aldrich et al., 2012).

Since the previous tenure situation was conducive to land grabbing, encouraged violent land conflicts and undermined government initiatives to curb deforestation in the Amazon, recent policies have sought to regularize land ownership. In 2009, the Terra Legal (*legal or 'good' land*) program started granting land titles to 300,000 smallholders who claim rights to non-designated public land (Oliveira, 2013). Implemented by the Institute of Colonization and Agrarian Reform, together with state-level environmental and agrarian reform agencies, the Terra Legal program sought to align land tenure reform with environmental compliance. As such, receiving a land title was conditional on compliance with the Forest Code (Duchelle et al., 2014). As earlier mentioned, the Forest Code was first created in 1965. However, in 2012 a revised version was passed into law and it requires landowners in the Amazon biome to maintain 80% of their property as a legal reserve. In addition, this law requires property owners to conserve areas that provide important environmental functions such as preventing soil erosion or protecting water sources, also known as Areas of Permanent Preservation. It is noteworthy that while the Forest Code was meant to deter deforestation, it remained, as already mentioned, largely unenforced until the early 2000s when the government started stepping up measures for compliance. This move triggered resistance from landowners who viewed the Forest Code as a barrier to agribusiness development. Moreover, controversy around the Forest Code continues, with some criticizing the Forest Code of 2012 for

its amnesty provisions, which they argue, encourage additional deforestation (Soares-Filho et al., 2014).

In addition to the Forest Code governing the management of forests on private lands, there exists legislation to regulate the management of publicly owned forests at federal, state and municipality level. The commonest form of management for public forests is the protected area system regulated by the National System of Conservation Units. Public Protected Areas are divided into Conservation Units and Indigenous Lands. While the federal, state and even municipal governments can create and manage Conservation Units, Indigenous Lands are under the full jurisdiction of the federal government. Conservation Units are further categorized as (i) Full-protection Units, which are strictly protected areas that discourage extractivist resource use and human settlement and (ii) Units of Sustainable Use which allow for controlled resource extraction, human settlement and land use change. Full-protection Units include ecological stations, biological reserves, national, state or municipal parks, natural monuments and wildlife refuges. Units of Sustainable Use include national or state forest extractivist reserves, Wild Life Reserves, Areas of relevant ecological interest, Environmental Protection Areas, Natural Heritage Private Reserves and Sustainable Development Reserves (Brazilian Forest Service, 2009). The current study area falls within the latter category.

3.3 Establishing REDD+ governance structures in Brazil

As with other tropical countries, Brazil's policy on REDD+ has developed within the global context for the need to tackle climate change under the leadership of the UN and the arrangements under the UN Framework Convention on Climate Change (UNFCCC). Nevertheless, the steps taken regarding REDD+ have largely been a continuation and (or) improvement of the country's former policies and strategies. For instance, the Brazilian Forum on Climate Change that was established in 2000 continued to be the overarching structure overseeing the REDD+ policy process. Headed by the president, the role of the forum was to "raise awareness and mobilize society to discuss and make decisions about the impact of green-house gas emissions" (Government of Brazil, 2008 p. 24). In line with this role, the president of Brazil issued a decree no. 6.263/2007 in November 2007, which created the Inter-ministerial Committee on Climate Change. Coordinated by the office of the president, the committee comprises seventeen federal bodies (sixteen of these are federal ministries) and the Brazilian Forum on Climate Change.

The committee was given the duty of preparing the National Policy on Climate Change and the National Climate Change Plan. Responsibility for preparing the National Climate Change Plan was placed on the executive of the Inter-ministerial Committee, which is led by the Ministry of Environment and includes six other federal ministries (Government of Brazil, 2008). In December 2008, the National Climate Change Plan was launched. The plan outlines a broad range of tools to address climate change of which reducing emissions from deforestation in the Amazon is a key component. According to the plan, Brazil aims to reduce deforestation rates in the Amazon by 80% by the year 2020 taking the average deforestation rate for the 1996-2005 as the baseline (Government of Brazil, 2008; Ministry of Environment, 2009, Moutinho et al., 2011). To achieve the above targets in emission reductions, Brazil hoped to place REDD+ as one of the key components of climate policy. The executive of the Inter-ministerial Committee on Climate Change was put in charge of drafting the National REDD+ Strategy and to oversee monitoring, reporting and verification, REDD+ financing and coordination between relevant national and international actors.

The country's REDD+ strategy was established in December 2015, with the National REDD+ Committee as the overarching body to implement the strategy and the ministry of environment as its executive secretariat. Composed of representatives from eight ministries together with invited representatives of state governments, civil society and municipalities, the committee is responsible for coordinating, overseeing and monitoring the implementation of the strategy. The committee is supported by thematic advisory boards composed of specialists from civil society, public and private sector entities. REDD+ technical working groups provide technical inputs for Brazil's submissions to the UNFCCC on climate change and forests, and are composed of experts from universities and federal agencies. Note however that while Brazil took steps to establish cross-sector dialogue during the development of its REDD+ strategy, there have been concerns that processes at the national level exhibited challenges in coordination. For example some have noted that the private sector were largely isolated from the process, several ministries were on the peripheries of the REDD+ debates and there was divergence of thought between the federal and state levels on how to design regulation, management and distribution of REDD+ resources (Fatorelli et al., 2015).

Overall, the Plan of action for the Prevention and Control of Deforestation in the Legal Amazon mentioned earlier formed the basis of actions for the REDD+ policy. This plan aimed to expand and scale up forest cover monitoring, land use planning and titling, inspection and enforcement as well as promotion of sustainable use of natural resources (Ministry of Environment, 2009). Monitoring of forest cover changes continues to be coordinated by the National Institute of Space Research following four systems of monitoring: The PRODES (Project for Deforestation Monitoring in the legal Amazon) uses annual Landsat images to detect deforestation from clear cutting i.e., above 6.25 ha. The DETER system (Rapid Detection System) is an almost real time deforestation detection program that is used to detect deforestation above 25 ha every fortnight. These two systems are complemented by DEGRAD which monitors degradation and TERRACLASS (Land Classification System) which allows for confronting drivers of deforestation by detecting which land uses are driving deforestation. All satellite data and deforestation reports are freely available on the website for the National Institute of Space Research (McNeish et al., 2011; Ministry of Environment, 2009).

Another important element of the Brazilian REDD+ governance structure is the Amazon Fund. Created in 2008, the fund is meant to attract and allocate national and international funds to activities and measures that reduce deforestation. The resources of the fund are administered by the Brazilian Development Bank. The Amazon Fund also has a steering committee composed of government agencies and civil society and is supposed to provide guidance to the bank on how the funds should be allocated. A technical committee validates emission reductions submitted by the National Institute of Space Research and for which payment should be made (McNeish et al., 2011; Moutinho et al., 2011).

3.4 The RDS Rio Negro REDD+ pilot project

The Rio Negro Sustainable Development Reserve (RDS Rio Negro) is located in the state of Amazonas on the banks of the Black River (Rio Negro), within the Brazilian Amazon (Figure 1). It is situated in the municipalities of Manacapuru, Iranduba and Novo Airão, 100 km northwest of state capital, Manaus. The reserve covers approximately 103,000 hectares of mostly tropical rainforests spread over 19 communities. It is one of the 15 reserves under the Forest Conservation Allowance program (Bolsa Floresta Program/BFP), whose aim is to reward forest peoples for sustainable use of the forests.

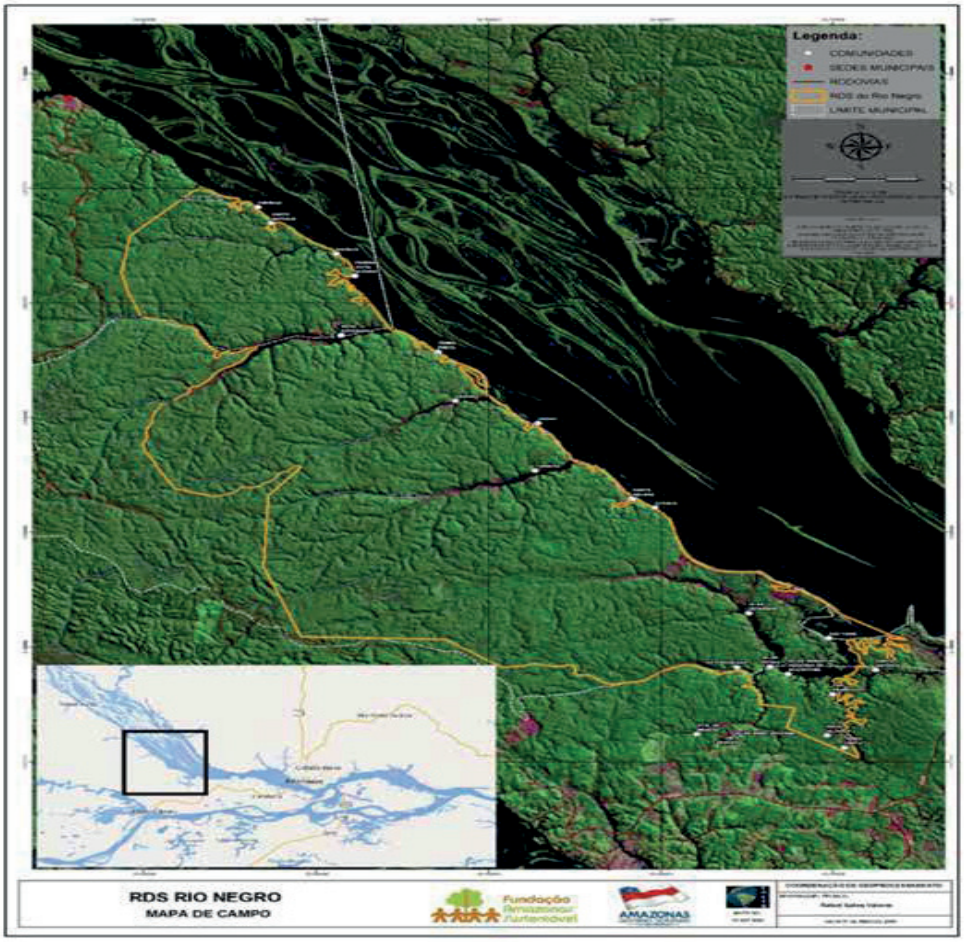

Figure 1. Map of Rio Negro Sustainable Development Reserve
Source: Foundation for Sustainable Amazonas, 2009
Note: Yellow outline shows the boundaries of the reserve; white dots locate communities

As of February 2013, there were 524 households registered in the RDS with an average family size of four (Vatn et al., 2013). People generally have poor access to basic services such as health and education. Their primary productive activities are agriculture, fishing and extraction of timber and non-timber products. Agriculture and fishing are, however mostly for subsistence, as the population, driven by their history of settlement as rubber tappers during the rubber boom, remain mainly

extractivists. Apart from extractive activities, government transfers, wages and remittances also constitute important sources of cash income.

Figure 2. Picture of a typical settlement in Rio Negro Reserve
Households typically reside along riverbanks surrounded by vast areas of forest
Source: Picture from fieldwork, RDS Rio Negro, May 2016

As with the other forested areas in the state of Amazonas, the rates of deforestation in RDS Rio Negro are low. By 2010, only 2% of the forest area was deforested. These low rates of deforestation are partly because of the isolated nature of the forest landscape and difficulty in transportation, which is mainly by small boats. The other reason is historical and related to the state's development policy that began in the 1960s, with the creation of the Manaus Free Trade Zone. This policy, which was driven first by commerce (1960s and 1970s) and later high tech industries (1980s onwards), concentrated economic activity in the state capital, inadvertently taking the focus away from agricultural expansion and helping to maintain a high forest cover (Viana, 2010).

Despite its vast vegetation, the state government of Amazonas was in many respects a forerunner for climate and forest policy change in Brazil (Vatn et al., 2013). According to Viana (2010), the rationale for the state's actions was to anticipate and prevent deforestation before it actually happened to any greater extent. This was at the backdrop of negative experiences from other Amazonian states, which had previously lost much of their forest cover to deforestation. May et al., (2010) also notes that state governments were filling a policy vacuum as processes at federal level had been slow – except with the establishment of the Amazon Fund. Changes began with the establishment of the State Secretariat for Environment and Sustainable Development in 2003. The flagship sustainability policy for the secretariat was the Zona Franca Verde (Green Free Zone) which was a set of cross-sectoral policies for promoting sustainable development through creating employment from the sustainable use of forests, rivers and lakes.

The subject of this research – the Bolsa Floresta Program – was conceived within this policy of the Green Free Zone. This process began early in 2007 with the drafting of Law no. 3.135 on climate change, environmental conservation and sustainable development and Complementary Law no. 53 on the State system of conservation areas. These laws provided a legal foundation for the creation of the Bolsa Floresta Program. Specifically, the laws gave the government the mandate to support and fund a non-profit organization to work on climate change, conservation and sustainable development (Viana, 2008). The non-profit organization would have the responsibility to conserve forests and improve the quality of life of forest-dwelling peoples in public protected areas, where people were engaged in sustainable land and forest uses. Accordingly, the state government in 2008 created the Foundation for Sustainable Amazonas (FAS) as the entity[5] responsible for implementing the BFP. The government also provided 20 million reais, through the Amazon Fund as initial funding for the program, with Bradesco bank contributing another 20 million (Vatn et al., 2013).

Along with the Bolsa Floresta Program, the state instituted several related measures between 2003 and 2007. These included a substantial increase in the coverage of protected areas, a move presided over by the State Secretariat for Environment and Sustainable Development under the State Centre for Protected Areas (CEUC)[6]. Protected areas thus increased by over 135%

[5] FAS terms itself an NGO. Nevertheless it could be better be described as a Trust Fund since they have public representatives on their board.
[6] CEUC is a state agency which regulates activities and enforces compliance in all protected areas in Amazonas state.

between 2003 and 2008 (Viana, 2010). Within this initiative, RDS Rio Negro was established as a Sustainable development Reserve (RDS) in January 2009. This move was an upgrade – meaning stricter regulations – from its former category of an Environmental Protection Area, a status it had held from 1995 until 2008 (see Brazilian Forest Service, 2009) for a detailed description of the various forest protection categories in Brazil). In addition, forest management and enforcement of forest laws improved. Note that prior to 2003, most protected areas existed only on 'paper', while in reality protection was very weak. Finally, new state agencies such as the Amazonas Land Tenure Institute were created while others such as the Amazonas Environmental Protection Institute were reformed (Viana, 2008; 2010).

The BFP was the first of its kind in Brazil. The program is based on a signed contract between FAS and the household represented by the female head of the household. The contract guarantees a monthly payment of 50 Reais[7] per month to female heads of households under the so-called Bolsa Familiar component of the BFP. In return for this payment, the contract requires households to comply with Bolsa Floresta rules. The rules are: a) complying with the rules of the reserve management plan b) regularly paying the reserve association fee and being an active member of the association c) implementing fire breaks in the vicinity of secondary forests and informing the community when fire is used for land preparation d) ensuring that children of school going age are registered and attending school and e) maintaining the size of agricultural areas no larger than in the year when the community joined the BFP and not expanding to primary areas (Börner et al., 2013). It is noteworthy that communities may continue to cut timber for their own use such as for boats, and home construction as well as engage in commercial logging following an approved forest management plan.

Depending on the number of households that have signed the contract, the communities receive additional compensation under the BF-Social, BF-Income and BF-Association components. The funds are distributed as follows: The Bolsa Floresta Social or social component makes investments to improve education, health, communication and transportation amounting on average to R$350 per family per year. Investments include community schools, radio systems, ambulance boats and transportation boats. The social component also supports cultural and sports

[7] The value of 1 Reais was about 0.43USD as at 31 December 2008

programs. The Bolsa Floresta Associação or association component is concerned with strengthening community associations through participatory forest governance, empowering communities and capacity building programs. It corresponds to 10% of the allowances paid out in the family component. The Bolsa Floresta Renda or income component aims at supporting production activities in line with the state regulations for resource use in the reserve. Activities include sustainable timber production, poultry, handicrafts and tourism. Communities receive R$396 for each family participating in the program. The total investment to the communities corresponds to over R$1300 annually.

4. Country context: Tanzania

4.1 General background on forest deforestation and degradation

With approximately 33,428 million hectares of forest in its mainland[8], Tanzania has the largest share of forest resources in the East African region comprising Uganda, Kenya, Burundi, Rwanda and Tanzania. Forests cover around 40% of the country's land area with woodlands occupying more than two thirds of this. The rest are mangrove forests, montane forests, small patches of coastal forests and plantations of softwood and hardwood. Of the total forest area, 16 million hectares are reserved forests under central or local government and 2 million ha are forests in national parks which puts the total area of forest land that is under some form of state regulation to about 54%. The remaining 15.4 million ha (46%) are in Village and General Land subjected to open access and heavy pressure of deforestation and or degradation from competing land uses (Vice-President's Office, 2013).

The rate of deforestation in Tanzania is high. With an annual net loss in forest area of 372,000 hectares between 2010 and 2015, the Food and Agricultural Organization places the country in 5th place worldwide in forest cover loss, just three places behind Brazil (FAO, 2016). Moreover, unlike Brazil, there seem to be no trend towards a reduction. The National REDD+ Strategy identifies a number of drivers of deforestation and degradation. These include the conversion of forestland to agricultural land - caused by reduced productivity on already established agricultural lands -, increasing population and market expansion. The other drivers cited include the harvesting of forests for charcoal and firewood, as these form 90% of the country's energy sources for domestic and industrial use. Overgrazing and nomadic pastoral practices are also important drivers of deforestation and degradation due to the increasing animal population in the country. Others include unsustainable and illegal harvesting of forest products, forest fires, infrastructure development, settlement and resettlement as well as introduction of alien and invasive species. These direct causes are indirectly driven by market and policy failures, rapid rural settlement expansion, urbanization and poverty (Vice-President's Office, 2013).

Forest management policies have evolved over the years from being very centralized during colonial times and the period following independence in 1961, to decentralized forest

[8] Zanzibar has another 63,908 ha of forests

management in the 1990s (Akida & Blomley, 2007). These changes emerged as public confidence in the ability of government to manage natural resources appropriately reduced, and were catalyzed by the global shift towards decentralized forest management. Thus by the early 1990s, the forest policy in Tanzania was undergoing a major review leading to new legislations such as the National Forest Policy of 1998, the Local Government Act of 1999 and the Forest Act of 2002. Common to all these legislations was the transfer of the responsibility of managing resources to local communities, making Participatory Forest Management (PFM) emerge as the central element of Tanzania's forest policy (Blomley & Iddi, 2009). PFM can take the form of either Community Based Forest Management (CBFM) or Joint Forest Management (JFM). Under CBFM, villagers through their village government, specifically a Village Natural Resources Committee, own and manage forests on village or private land using a forest management plan. On the other hand, JFM takes place on Reserved Land. Under JFM, villagers living adjacent to state forests enter into formal agreements with central or local government authorities to share forest management and revenues (Vice-President's Office, 2013).

4.2 Land tenure

For most of Tanzania's recent history, land tenure was in many aspects a reflection of the Land Ordinance of 1923 a piece of legislation instituted in the colonial days. Accordingly, in most of the land laws[9] before and after independence, land tenure was characterized by centralized administration[10], non-existent or minimal recognition of customary ownership and central authorities having the right to acquire and redistribute private land to others who would occupy and develop it. For example between 1967 to 1973 the villagization program relocated about 80% of the rural population to 5,528 villages with the aim of establishing large collective farms and modernizing agriculture. In the mid-1980s, new government policies to liberalize the economy and promote foreign investment led to large-scale acquisitions of land by local, national and foreign investors. This historical landscape coupled with increasing centralized land administration and inefficient state bureaucracy fueled widespread rural discontent, confusion on land tenure, conflict and insecure land tenure (Landesa, 2010).

[9] Land Ordinance Amendment of 1928, the Freehold titles and government Leases Act of 1963, The Rights of Occupancy Act of 1963 and the Rural Farmland Act of 1965, the Customary Leaseholds Act of 1968 and the Government Leaseholds Act of 1969

[10] Before independence land was administered by the colonial governor and after independence by the president

In 1991, a Presidential Commission of inquiry into land matters was instituted leading to the country's first ever National Land Policy (1995/1997) and to enactment of the before-mentioned new land legislation: the Land Act of 1999 and the Village land Act of 1999 which came into force in May 2001. These laws marked a significant departure from the Land Ordinance of 1923 by giving all Tanzanians above 18 the right to acquire and own land, and recognizing all existing property rights including customary land titles. The law, however, retains several original aspects, notably that ultimate ownership of land still belongs to the state with the president as trustee for all Tanzanians. The Commissioner of Lands administers the land on behalf of the president (Landesa, 2010).

Three categories of land are currently recognized: General, Reserved and Village Land. The Land Act is concerned with General and Reserved Land while the Village Act deals with Village Land (Seir, 2005). Reserved Land (28%) denotes all land that is set aside for special purposes like conservation, construction of public utilities and highways, hazardous land and land designated under the Urban Planning Act No. 7 of 2007. Village Land (70%) is managed by Village Councils elected by a Village Assembly and includes all land that in one way or another belongs to a village, e.g., registered villages, agreements between neighbouring villages or land which villagers have been occupying for the last 12 years. General Land, however, is defined differently in the two land laws. In the Village Land Act, General Land is the 'residual category', i.e., land which is not Village or Reserved Land. In the Land Act, the definition is extended to include unoccupied or unused Village Land. As most villages in Tanzania are unregistered, these differences in the definition have caused considerable confusion, conflict and tenure insecurity especially for land held under customary tenure arrangements which forms the majority of land in Tanzania (Landesa, 2010). The National REDD+ Strategy acknowledges these weakness in legislation, and promises to increase land and forest tenure security through participatory land use planning, implementation of land reforms and issuing of Customary Certificates Rights of Occupancy.

4.3 Establishing REDD+ governance structures in Tanzania

Tanzania began on its REDD+ initiative in 2008 after signing a letter of intent on a Climate Change Partnership with the Norwegian Ministry of Foreign Affairs through the Norwegian Embassy in Dar es Salaam. Together with the support received from the United Nations REDD+ program

(UN REDD+), Tanzania then started on its REDD+ readiness process. This process started with the establishment of coordination mechanisms beginning with a National REDD+ Task Force and a REDD+ secretariat. Later, Technical Working Groups on legal, governance and safeguards, measurement, reporting and verification, financial mechanisms, agriculture and energy drivers were formed. The country also embarked on developing a National REDD+ Strategy through raising awareness, studies on REDD+ related issues, stakeholder consultations and piloting activities. For the pilots, the Norwegian Ministry of Foreign Affairs decided to direct funds to civil society organizations as opposed to the government, because of allegations of past mismanagement of Norwegian donor funds by the Tanzanian government. As a result, nine civil society organizations were selected to implement REDD+ pilots and to provide lessons for the national strategy development. The National REDD+ Strategy together with its action plan was endorsed by the government in March 2013.

The REDD+ Strategy sought to integrate REDD+ governance into existing governance structures. First, the country chose to implement REDD+ by expanding and scaling up PFM approaches. Further, the Division of Environment in the Vice President's Office was mandated by the Environmental Management Act, 2004 to coordinate all climate change issues. The government also put in place a National Climate Change Steering Committee. This is an inter-ministerial committee comprising of permanent secretaries from the Vice President's Office together with several sector ministries, which provides overall governance and supervision on the implementation of REDD+. In addition, a National Climate Change Technical Committee was established, including directors of ministries represented in the National Climate Change Steering Committee, a representative from the private sector, as well as higher learning and research institutions. The National Climate Change Technical Committee oversees the technical issues of climate change including REDD+ implementation. A National Carbon Monitoring Centre was also established to facilitate carbon monitoring. Plans to have a National REDD+ Fund under the country's climate finance mechanism were not completed partly due the UNFCCC's negotiations regarding Fund versus Performance based financing options. At regional and district levels, the coordination of REDD+ activities adheres to the existing local government institutional structures with the Regional Administrative Secretariat being the link between the ministries and district councils.

4.4 REDD+ pilots in Tanzania

In the following section, I present a background of the two sites of study in Tanzania – the Kilosa and Kondoa REDD+ pilot projects (see Figure 3 for the location of the pilot sites). For each pilot, I will first detail the conditions under which REDD+ is implemented and thereafter briefly explain the strategy for establishing the project.

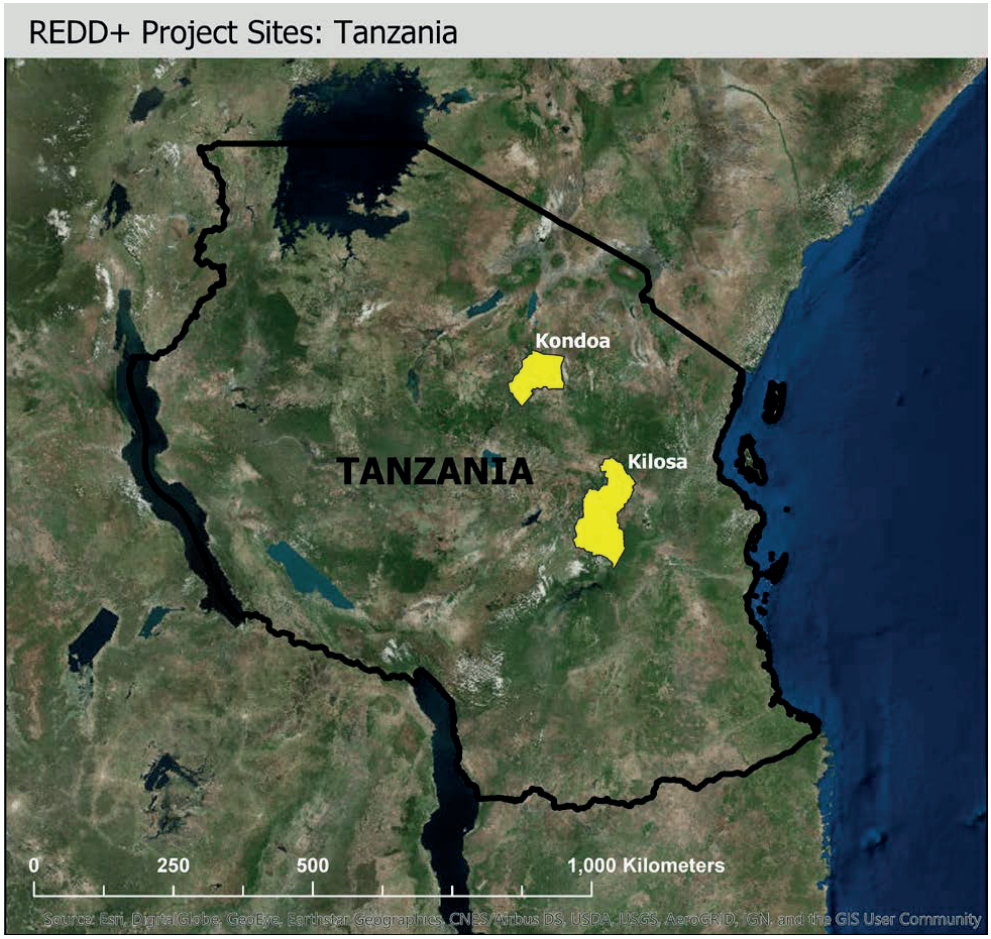

Figure 3. Location of Kilosa and Kondoa REDD+ pilot sites
Source: Chapman, 2017

4.4.1 The REDD+ pilot in Kilosa

Kilosa district is located in east-central Tanzania, about 300 km west of Dar es Salaam, the largest city in the country (see Figure 4). The district is situated in Morogoro region and covers about 1.43 million hectares, which is approximately 20% of the land area in the region (Kilosa District Council [KDC], 2000). The climate is semi-arid with an average annual temperature of 25^0C. Mean annual rainfall ranges between 1000 mm to 1400 mm from low to highlands (Mutabazi, et al., 2014). The district has three topographic zones. The flood plains at altitudes of about 550 m, the plateau at 1100 m and the mountainous or upland zones at 2200 m above sea level. This topography presents different agro-ecological zones that relate to the various land uses pursued by the population. In the central part of the flood plains, the soils are poorly drained cracking clays that are subject to seasonal flooding. This part is mostly inhabited by Maasai pastoralists. The western side of the flood plains has black fertile loams where people cultivate various crops, while the plateau also has moderately fertile soils suitable for crop growing. Most of the forests are located in the highlands, which are part of the Eastern Arc mountain range, a chain of mountains that runs from Kenya down through Tanzania. Three of these Ukaguru, Uvidundwa and Rubeho mountains are located in Kilosa district (KDC, 2010).

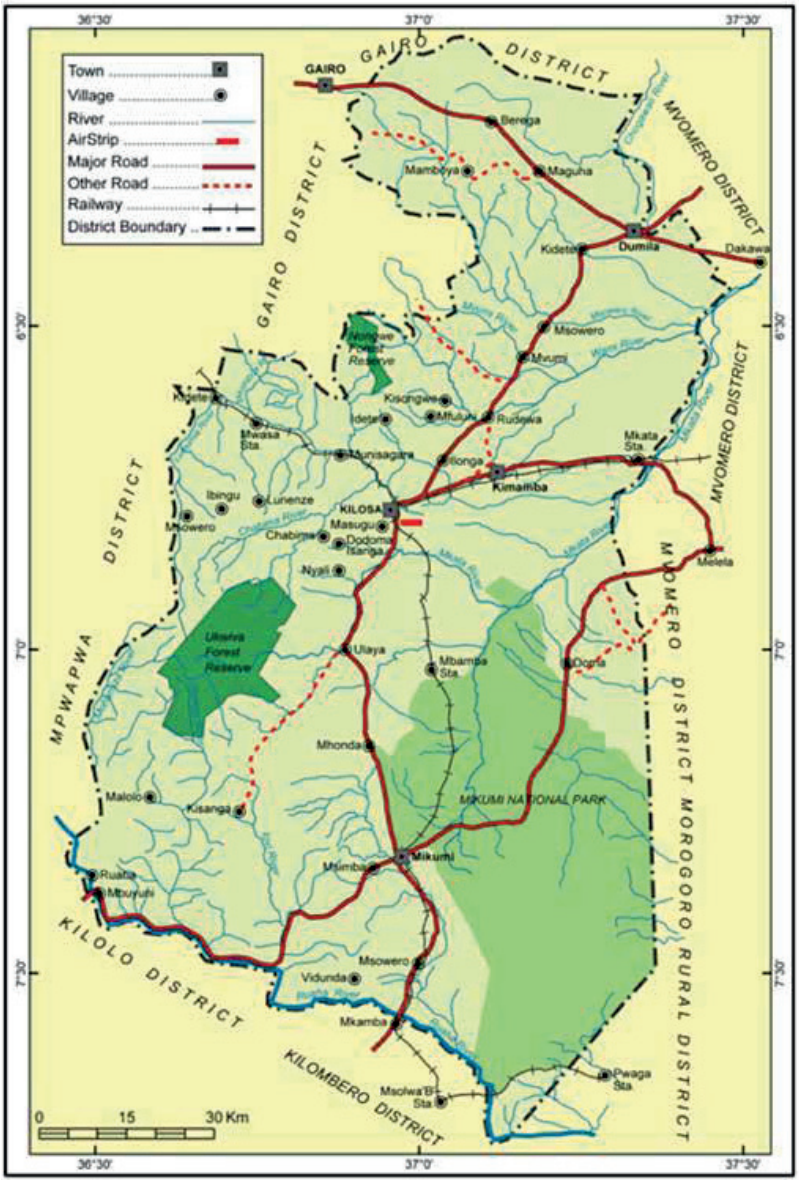

Figure 4. Map of Kilosa District
Source: Ministry of Land and Housing (2013)

The causes of deforestation in the district have changed over the years. In the pre-colonial period, large-scale trading of agricultural products took place in Kilosa, with the resulting resource use pressure leading to open landscapes. The colonial period saw extensive land taken for commercial plantation agriculture in particular sisal and cotton. Commercial farms still exist in the district, although on a much smaller scale. In the post-colonial period, infrastructure developments including highways, pipelines, hydroelectric power plants and transmission lines caused an increased depletion of forests both directly and indirectly by making Kilosa more accessible to external markets. The villagization program of the 1970s, which was implemented to provide services to rural areas, concentrated people into larger villages also caused increased pressure on forest areas. Moreover, when the village system was relaxed after 1985, new farms and settlements spread into forests, while cultivation into forests continued to take place in the previously planned villages (Strömquist & Backéus, 2009).

Figure 5. Picture of the agricultural landscape in Kilosa
Farmed hillslopes with forests in the background
Source: Picture from fieldwork, Kilosa, January 2016

Today, agriculture is one of the major forces driving deforestation in the district. As a majority of the people are smallholders who use limited amounts of inputs, expansion into forestlands is often seen as the way to improve farm productivity when soil fertility decreases (KDC, 2010). The extraction of biomass for energy (charcoal and fuelwood) is another driver of deforestation. In addition, timber production and forest fires are important causes. Moreover, the good transport network coupled with the proximity of Kilosa district to urban markets such as Morogoro and Dar es Salaam exacerbates the problem (Mutabazi et al., 2014).

The REDD pilot was implemented by two local NGOs; the Tanzania Forest Conservation Group (TFCG) in partnership with the Tanzanian Community Forest Network (MJUMITA). TFCG was established in 1985 for the purposes of protecting forests in Tanzania while MJUMITA was created in 2000 as a national network of community groups working with participatory forest management. Together, TFCG and MJUMITA received financial assistance of NOK 41.4 million from the Norwegian Ministry of Foreign Affairs to implement a 5-year REDD+ project for the period of September 2009 to August 2014. The project titled 'Making Reduced Emissions from Deforestation and Forest Degradation (REDD) Work for Communities and Forest Conservation in Tanzania' was implemented in two districts, Lindi and Kilosa (Deloitte, 2012a). This research focused on the site in Kilosa, where 14 communities were originally selected for piloting REDD+. One of these, (Masugu) was later excluded because it was included into the Kilosa township thereby presenting ambiguities over forest tenure, while another (Munisagala) dropped out of the project because there was strong opposition to REDD+.

Farming is the primary economic activity, on average contributing about half of income to each household – both cash and subsistence (Movik et al., 2012). According to Kibuga & Samweli (2010), most people had permanent farms by the time the project started in 2010. Therefore, although some still expanded their agricultural lands, new farms were mostly opened to cater for the rising population. Nevertheless, small holder agriculture was still found to be the major driver of deforestation and forest degradation in the project area. Fires are similarly a key driver of deforestation. Households also keep livestock particularly poultry and small animals like goats and pigs. Cattle is mostly owned by the Maasai ethnic group. These pastoralists were claimed to also cause forest loss because they burn forests to encourage growth of grass for their animals. Harvesting of forest products including charcoal, timber, poles and fuelwood was also found to be

an important driver of deforestation and forest degradation. On average, these contribute about a third of the total household income (Movik et al., 2012). Markets for agricultural and forest products are available, as villages are generally accessible since they are located at an average of distance of just 36 km from the district center – Kilosa town (Mwampamba, 2012). Although this market access increases the demand of products, thereby contributing to forest loss, the hilly terrain of the area renders some of the forests inaccessible. This has limited the destruction of some of the forests in the highland areas.

The strategy of TFCG/MJUMITA for implementing REDD+ was based on establishing PFM and carrying out land use planning within the project villages. As outlined in the national PFM guidelines, this process involved engaging district, village leaders and ordinary members of communities, establishing village natural resource committees, demarcating village and forest boundaries, developing village management plans and bylaws for forest resource use (MNRT-FBD, 2007). As TFCG/MJUMITA excluded public forests from the project area, PFM in this case proceeded in the form of CBFM, with the NGOs assisting communities to convert general land into formal village land. Note that prior to REDD+, a few villages had village natural resource committees as required by Tanzanian law. These were, however, not operational and there were no restrictions on any forms of land use in village forests. The coming of REDD+ facilitated the villages to carry out land use planning and adopt by-laws for the use of resources. Rules included requirements for permits before harvesting timber, charcoal or clearing land for agriculture in use areas. Fines and penalties for non-compliance were also put in place.

4.4.2 The REDD+ pilot in Kondoa

The pilot project was implemented in the Kolo hills located in Kondoa district, Dodoma region in north-central Tanzania (Figure 6). The Kolo hills, also referred to as the Irangi Hills after the largest ethnic group in the area, the Rangi people, extend northwards from the central part of the district and occupy an area of approximately 130,000 hectares. At altitudes of between 1000 and 1500 m, the hills form part of the topography of the district, composed of a rolling and hilly zone dissected by fault scarps, which are crossed by seasonal rivers and streams. The other part of the topography are plains located at between 500 and 1200 m above sea level. The plains are undulating with a few isolated hills and large swamps and the area has relatively fertile soils (Dejene et al., 1997).

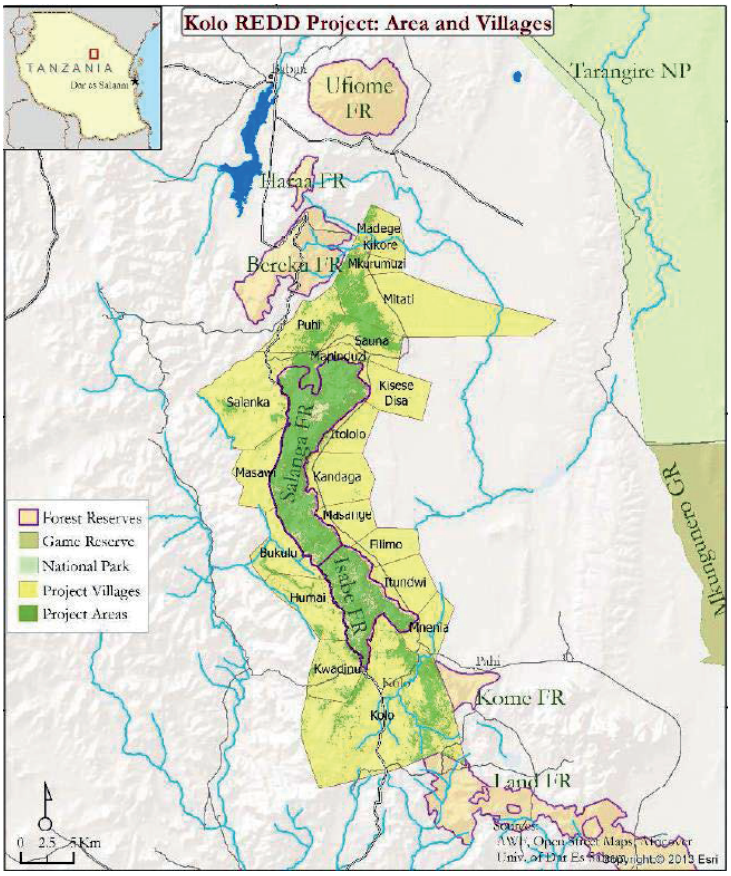

Figure 6. Map of Kondoa REDD+ pilot
Source: Loubser et al., 2014

Kondoa district has a semi-arid climate, with average annual rainfall ranging between 500 to 800 mm and an average temperature of between 16 and 29ºC (Kangalawe, 2012). In particular, the Kolo hills are relatively wet, registering rainfall of over 750 mm/year. The hills are however less fertile than the plains and more vulnerable to erosion because of relief (Dejene et al., 1997). The district is characterized by two marked seasons. The hot dry season between June to December and cool wet season between December to May. Rainfall is, however, highly variable, unreliable and falls in short, highly erosive storms (Dejene et al., 1997). The district has, moreover, high evapotranspiration rates that double the rate of precipitation (Kangalawe, 2012).

A defining feature of the Kolo hills is the severe land degradation that affected the area in the early 1970s. The most affected area was the Kondoa Eroded Area, a region covering 125,600 hectares, about 10% of the total area of the district (Kangalawe, 2012), and included some of the current study villages located in the southern part of the REDD+ target area. The World Bank once described the Kondoa Eroded Area as "probably the most eroded area in the country" (Dejene et al., 1997 p.11). Extreme soil erosion has been blamed on the long history of extensive clearance of vegetation coupled with increasing population, overgrazing and natural processes (Lane, 2009; Mugasha & Nshubemuki, 1988; Östberg, 1986). Consequently, the Kolo Hills have been subjected to several interventions to control erosion and deforestation. Between the 1940s and 50s measures included ridge cultivation, construction of contours on uncultivated land, reduction of livestock numbers, rotational grazing and control of gully erosion (Kangalawe, 2012). The forest reserves in the study area were gazzeted around this time; Salanga in 1941 and Isabe in 1954 (Charnley & Overton, 2006), followed by the establishment of forest laws like the Forest Ordinance of Tanzania (1957). In addition, local bylaws that made it compulsory to have grazing permits were passed in 1968 (Östberg, 1986). These conservation strategies were, however, largely unsuccessful in reversing the trends of soil degradation.

The most prominent intervention was the HADO project (Hifadhi Ardhi Dodoma or Conserve the Land of Dodoma) implemented by the Tanzanian government in 1973. In the initial years of HADO, most efforts were towards land conservation (for example the construction of contours) and afforestation. HADO also resettled people from more degraded to less degraded areas to reduce population pressure. In 1979, the HADO project management with the support of political leadership in Kondoa and the Tanzanian government decided to remove all livestock from the Kondoa Eroded Area, in a bid to control the effects of overgrazing. This move was complimented by raising tree nurseries, free distribution of seedlings and the establishment of tree planting demonstration plots (Madulu, 2001). In addition, by-laws to guide settlements, land use and environmental conservation were amended or enacted by the district. HADO resulted in an impressive regeneration of the vegetation. A 1994 study revealed that soils that were bare, were once again covered with grassland, woodland as well as immature secondary forest (Backeus et al., 1994).

Currently, the drivers of deforestation in the Kolo hills include expansion of farms and extraction of fuelwood, charcoal and timber. Residents also keep large numbers of livestock especially cattle, goats, sheep and donkeys. In some cases, these animals graze in the forest, which accelerates degradation through trampling of young seedlings and deforestation as trees are removed to construct cowsheds. Moreover, the area has high incidences of drought, which entrenches reliance on forest resources (Loubser et al., 2014).

Figure 7. Picture of the agricultural landscape in Kondoa
Livestock grazing in the semi-arid area
Source: Picture from fieldwork, Kondoa, December 2015

The REDD+ project was implemented by the African Wildlife Foundation (AWF), an NGO that was founded in 1961, with a focus on conserving wildlife in Africa. To implement the REDD+ project, AWF received NOK 14.43 million from the Norwegian Ministry of Foreign Affairs for a three-year period - January 2010 to December 2012 (Deloitte, 2012b). The project 'Advancing REDD in the Kolo Hills Forests (ARKFor)' was later extended to December 2013. Kolo hills has a population of about 62,000 and 14,000 households, whose primary economic activities are crop cultivation (70.2%), agro-pastoralism (27.4%) and salaried employment (1.4%) (AWF, 2012; Matilya, 2012). The target area covered some 19,924 hectares of community and government land, of which 10,114 hectares are inside forest reserves. Adding the reference area and leakage belt, the total project area was 71,632 hectares (Matilya, 2012). There are two government forest

reserves; Salanga (8,337 ha) and Isabe (4,249 ha), all falling under the jurisdiction of Tanzania Forest Service Agency.

Initially, AWF planned to work with 21 villages. However, three of these – Itololo, Mitati and Kisesedisa – opted out of REDD+ during project implementation. Similar to Kilosa, AWF's strategy for implementing REDD+ was based on establishing PFM within the project villages. In the case of Kondoa however, PFM was carried out on both government and community land implying that a combination of JFM and CBFM approaches were used depending on the type of tenure that existed in a particular village. It is important to point out that AWF began implementing PFM in the Kolo Hills in 2007 before REDD+ was established, starting with four villages namely; Kolo, Itundwi, Kandaga and Mnenia. REDD+ was thus a continuation and upscaling of the earlier JFM activities. Specific REDD+ activities included seeking the consent of participating communities, land use planning, making payments and deciding on benefit sharing arrangements as well as facilitation of income generation activities.

5. Theory

To explain and (or) predict how people will act when subject to REDD+ policy, analyses should be based on a good understanding of how individuals behave and make decisions under diverse circumstances. This section therefore starts with a conceptualization of human-behavior and decision-making. Then, building on sections one and two, where I noted that I would be approaching the research from a governance perspective, I elaborate the concept of governance, with a specific focus on environmental governance. I begin by explaining why environmental governance theory is an appropriate framework for analyzing REDD+ and resource use questions more generally. Next, I present the building blocks of governance structures (actors and institutions), where I include brief discussions on the theory relating to participation, power and the relationship between governance structures and transaction costs. Finally I delve into theory on outcomes of governance structures focusing mainly on reduced emissions, pro-poor development and good governance.

5.1 Understanding human behavior in the context of REDD+

At the outset, reducing emissions from deforestation and forest degradation appeared like a fairly simple goal to achieve. As summarized by the former prime minister of Norway, *"The technology is well-known and has been available for thousands of years. Everybody knows how not to cut down a tree". (Jens Stoltenberg, COP 13, 2007).* The dilemma for REDD+, however, is twofold. First, increase in the atmospheric stock of carbon emissions arises from actions of individual actors, but the resulting problem of climate change affects everybody. Secondly, the cost of taking actions to effect change would unequally fall on some, yet reducing emissions would benefit all. Ultimately, decisions taken independently affect everyone, a typical example of a collective action problem (Ostrom, 2010). The objective of REDD+ policy is therefore to build a system where individual actors from across the globe make decisions that contribute to reducing emissions from deforestation and forest degradation.

In order to design an adequate REDD+ policy, it is therefore important to understand how people behave and make decisions under different contexts. The rational choice theory is one of the most powerful theories that has guided contemporary understanding of human action and decision-making. This theory assumes that individuals (i) have stable preferences, implying that choices are unaffected by societal contexts or processes, (ii) are perfectly rational in the sense that

they maximize their individual utility based on this fixed set of preferences and (iii) are self-interested meaning that people's choices are solely motivated by their individual interests without regard to the interests of others (Gsottbauer & van den Bergh 2011). The implication for human behavior regarding public goods – goods characterized by non-rivalry and difficulty to exclude others (such as undisturbed air/climate in the REDD+ case) – is that independent decisions of self-interested short time maximizers will lead to short term individual benefits (e.g., profits from selling timber), but suboptimal social outcomes (e.g., increased emissions leading to climate change). This theory then predicts that no one is independently motivated to make contribution to the provision of a public good because others in the group will benefit without contributing any efforts, i.e., free ride (Ostrom, 2014). Therefore, individual actors will not attempt to reduce emissions. To solve such environmental problems, the individualist-utilitarian ideology underlying rational choice theory advocates for market-based solutions such as taxes on polluters (Pearce & Turner, 1992; Pigou, 1920; Tobey & Smets, 1996) or facilitates market exchanges of ecosystem services. The latter strategy is the primary principle behind payments for ecosystem services like REDD+ (Wunder, 2005) and markets for ecosystem services (Bayon, 2004).

While the rational choice theory, has been the mainstream theory for understanding human action, other theories that attempt to recognize its limitations are gaining increasing support. First, there is a development coming out of the neoclassical school itself named behavioral economics that challenges assumptions like the assumption of perfect rationality – e.g., Ostrom, 1998. Second, we have various strands of institutional economics. This thesis adopts the classical institutional theory – which recognizes the relationships between institutions and human behavior (Vatn, 2015; 2017). This theory questions the core assumptions of the individual-utility-maximization model. First, it submits that people's preferences are not stable, but are culturally formed and depend on societal context. Secondly it assumes that people do typically not possess all the information necessary to maximize their individual utility. Rather decisions are made under bounded rationality – a point as mentioned, is also taken on board by behavioral economists. Finally, it acknowledges the existence of plural rationalities. Hence, rationality is not purely individual but can also be social, in the sense that people's decisions also account for what is right to do for the group (Fehr & Fischbacher, 2002; Gsottbauer & van den Bergh 2011; Hodgson, 2007). So, while the rational choice theory is individualist, classical institutional theory has social constructivist foundations.

The classical institutional theory views, institutions as the basis for human interactions by defining the type of rationality that is appropriate in a given context. In some contexts, institutions support choices based on individual interests/rationalities as in markets, while in other contexts, institutions may support social rationalities (Vatn, 2015). The latter situation is most likely when there are interdependences involved such as when managing common resources. As noted earlier in this section, individual actions resulting in the state of the air/climate is a typical example of human interactions characterized with interdependencies, making classical institutional theory an appropriate conceptual model for analyzing REDD+. Given the interdependencies involved, this sort of analysis first and foremost warrants an understanding of the actors involved and the institutions governing their interactions, the conflicts arising from these interactions and whose interests are protected by the institutions. Taken together, these themes takes us to the issue of governance, the subject of the next section.

5.2 Environmental governance

REDD+ presents two challenges inherent in interactions between humans and our environment. As I have elaborated, the first is the challenge of interdependence and the following need for coordinated action (Vatn, 2005; 2015). Interdependence arises because the final goal of reduced emissions depends on the different stakeholders doing their part. We have the local communities that need to coordinate their day-to-day management of the forests. We have the governments in the global south that have to provide the necessary institutional framework to support such coordination and the actions of the global north, which is expected to provide financial resources. We also have the civil society which usually provide the normative basis for action.

The second challenge for REDD+ is that it will reshape rights structures and hence economic opportunities. While this is an effect of almost any change in governance structures (Bromley, 2006), REDD+ is specific in its emphasis on redefining access to forest resources. Given that people depend on these resources to a different degree, there is high potential for conflict around both engaging in REDD+ and regarding what the new rules should look like. The various stakeholders will try to defend their interests and conflicts may arise (Hiraldo & Tanner, 2011).

Following from the above, the overarching theory used in this research is the theory of environmental governance, which concerns how humans coordinate their actions to attain environmental goals that are set in an environment of conflict (Evans, 2012; Vatn, 2015). Such

coordination is critical given the challenges of REDD+ including the making of rules for forest use and management, the setting of reference levels of payments and the rules regarding their distribution. At national and international levels, we also have the issue of agreeing on rules for monitoring, reporting and verifying reductions, ways of raising funds as well as strategies for ensuring permanence and handling leakage. Hence, REDD+ involves multiple actors across local, national and global scales (Angelsen, 2008).

This diversity of actors is what differentiates governance from government, as the former extends beyond the state to include also non-state actors like NGOs, businesses and communities (Arts, 2003; Lemos & Agrawal, 2006; Stoker, 1998). Governance is hence about handling conflicts, facilitating cooperation and collective action among these diverse actors. It encompasses both processes and structures through which diverse actors can contribute in making decisions of common concern (Leach et al., 2007; Plumptre & Graham, 1999). The process aspect refers to how the actors decide on priorities, acknowledge and resolve conflict as well as coordinate resource use, while structural aspect refers to the rules involved in administering and organizing these processes.

Environmental governance focuses on the interaction between actors and institutions as the basis for analyzing resource use problems. The following sections elaborate these two elements as understood within the theory of environmental governance.

5.2.1 Actors

Studying governance one may identify three categories of actors. First, there are economic actors, who own/use the resources for productive purposes. Secondly, there are political actors, either elected, appointed or customary. These have the rights, responsibilities and power to define rules of access to the resource as well as rules on how political decisions should be made. The last category of actors is the civil society being important for forming the normative basis for human action (Vatn, 2015).

As I alluded to earlier, all three types of actors exist at local, national or international levels of social organization. Economic actors at local level could for instance be individuals, households, firms, communities or local governments owning/using forests. There are however also economic actors at higher levels such as national and multinational companies, and national governments when operating as producers of goods and services.

Political actors at the local level, include community/village councils, district councils or holders of customary positions such as clan leaders. At the national level, they include members of parliament, cabinet ministers and other political administrators. Political actors at the global level include international government organizations such as the United Nations, the World Bank, the Global Environment Facility and other donor agencies. Civil society actors also span local, national and global levels.

Civil society includes the media, research institutions/scientists and non-governmental organizations (NGOs). In all the three REDD+ pilots that are included in this study, non-governmental organizations (NGOs) were the primary actors engaging with local communities to manage forests. Civil society actors have also been active in national and international REDD+ processes (Di Gregorio et al., 2012; 2013; Thompson et al., 2011).

As we have seen, actors in REDD+ are inherently heterogeneous in terms of their goals or motivations, capacities, rights and responsibilities. Given these differences, a key analytical issue of the research was agency – the ability of actors to act on the goals that matter to them. So apart from investigating who the actors were, I also explored the extent to which they were able to shape policy options and outcomes of REDD+ processes. Actors may exercise agency either directly (by taking decisions themselves) or indirectly (by influencing the decisions of others) (Biermann et al., 2010). Understanding agency therefore required delving into issues of participation. Here, I followed the typologies of participation by (Arnstein, 1969) and (Pretty, 1995). These typologies are hierarchical ladders representing the level of participation that could be achieved by actors in decision-making processes. Accordingly, actors can be involved in decision making either by 1) being told of what is going to happen or has already happened, 2) being invited to give inputs or feedback but without the opportunity to influence outcomes 3) Providing inputs to externally defined problems and solutions with opportunity to influence outcomes 4) Being empowered and given decision making authority.

The fourth point above – on empowerment – points to power as another important aspect to be investigated when trying to understand participation. In conceptualizing power, this thesis follows the three dimensional view of power as articulated by Lukes (2005). The first dimension regards power as exercised through decision making. Popularized by authors such as Dahl (1961) and Polsby (1963), this approach sees power as being spread pluralistically across interests, such

that any contests within the community will provoke an interest group to push their issues through decision making arenas. As conflicts of interest are assumed visible in public spaces, studying power according to the first dimension is limited to observable behavior in decision making over issues where there is observable conflict. The second dimension of power is a critique of the first, emphasizing that not all conflicts of interest are observable in public spaces, because powerful actors might suppress what makes it to decision making arenas (Bachrach & Baratz, 1962; 1963). The final dimension suggests that power may also be exercised by preventing conflict from emerging in the first place, through shaping people's beliefs such that they accept the status quo (Lukes, 2005). The three dimensional account of power implies, therefore, that empowerment can only occur when people overcome both visible and invisible forms of suppression. As such, empowerment is not only about agency, but also the ability of actors to overcome political, economic, social and cultural barriers (Dutta, 2011). Thus, empowerment encompasses both agency and structure.

5.2.2 Institutions

The concept of institutions has evolved over time and is understood differently in literature. There is therefore no common understanding of the theory, as the scholars from the various disciplines define institutions differently depending on the way they interpret human behavior (Vatn, 2005). Broadly, the concept can be distinguished as having grounding from the social constructivist and individualist ontologies and epistemologies, and the related theory lies on a continuum between these two extremes. Scholars with a social constructivist understanding of institutions view human behavior as being formed by the social/cultural world in which individuals are raised (Berger & Luckmann, 1967; Veblen, 1919). They both constrain and liberate (Bromley, 1989). The individualists do, however, see humans as autonomous. Hence, institutions are not forming man. Rather, institutions are external rules that only constrain human choices (e.g., North, 1990;1991).

For the purposes of this research, institutions are defined as "conventions, norms and formally sanctioned rules of a society. They provide expectations, stability and meaning essential to human existence and coordination. Institutions support certain values, and produce and protect specific interests" (Vatn, 2015 p. 78). This definition adheres to the above perspective seeing institutions not just as constraints, but they also form humans and enable their actions. In the context of REDD+ therefore, institutions may constrain access and use of forest resources, yet they

might also enable actors to coordinate and thereby minimize conflicts. Approached in this way, I distinguish between three types of institutions: 1) resource regimes defined as institutions which order the actions of those using natural resources (Young, 1982); 2) rules governing the political process including constitutional and collective action rules; and 3) the rules of civil society.

Following (Vatn, 2015), resource regimes are further categorized into two main aspects. This includes rules governing access to resources and those that govern the interaction between and within actors that use the resource or those that are affected by the decisions taken regarding the resources. The first set of rules covers property rights such as private, common and state property or open access. Worth pointing out is that property rights here include not only formal rules from the state, but also from customary law, norms and conventions of a particular society. Turning to interaction rules, there could be a) trade rules where actors exchange goods (resources) against a payment; b) rules based on command structures such as state or customary rules; c) community rules based on cooperation and reciprocity and finally; and d) a situation where there are no rules. Moving on to rules governing the political process and rules of civil society, we note that these regard for example how leaders may be elected or appointed and how actors may make decisions regarding use and access to resources, rights and responsibilities. The rules of political processes however, differ from rules of civil society in a way that the latter are sometimes less formalized.

By capturing the variety of human interactions, the governance framework provides a conceptual basis for identifying and quantifying transaction costs in environmental governance. In this regard, the thesis views transaction costs as including costs of economic interactions (trade, command or cooperation), costs of political interactions (including costs for specifying property rights, public monitoring, enforcement or elections) and costs of civil society interactions (among the civil society itself and between civil society and political actors through elections, dissemination of information, political debate, advocacy or mediation). This understanding is much inspired by Commons (1931) original conceptualization where he distinguishes between bargaining, managerial and rationing transactions.

My conceptualization therefore expands the understanding of transaction costs beyond the costs of economic interactions as in neoclassical economics which focuses on only costs of market

exchange through trade and the new institutional economics which in addition to costs of trade, includes also costs of command (Allen, 1999; Williamson, 2000). Thus, theorizing transaction costs through the lens of governance structures has the strength of ensuring that analyses of transaction costs include all relevant costs of actor interactions and institutional arrangements – even those that are outside the narrower economic sphere, while important for its functioning. Such an understanding is moreover quite appropriate for REDD+, which although originally construed as an economic transaction involving trade in carbon, has in practice included political and civil society transactions.

Conceptualizing transaction costs through the framework of governance structures, implies therefore, that these costs will largely depend on the actors involved, their interactions and the institutional arrangements that govern those interactions. Moreover, as we have detailed throughout the preceding sections, all these elements – i.e., actors, institutions and human interactions are diverse. This leads us to the next analytical issue explored in the study, where I pose the question; Given the actors and institutional landscape as well as the actor interactions and cost of those interactions, what could the outcomes of REDD+ be?

5.3 Outcomes

In its early stages, the primary objective for REDD was to reduce emissions from deforestation and forest degradation. However, as negotiations at the conferences of the parties to the UNFCCC progressed, it was recognized that REDD could also offer non-climate outcomes also termed as 'co-benefits' (Brown et al., 2008; TheREDDdesk, 2016). These co-benefits have been defined as including poverty alleviation (pro-poor development), supporting good governance and human rights, biodiversity enhancement, as well as environmental co-benefits including soil and water quality and availability. The thesis focuses on three types of outcomes, that is: reduced emissions, pro-poor development and good governance.

5.3.1 Reduced emissions

The two 'Ds' in the REDD+ acronym stand for two sources of carbon emissions. The first 'D' is deforestation, defined as the conversion of forest to a non-forest land use. This is usually through clear cutting and burning of entire forest landscapes. The second 'D' is degradation and refers to the disturbance of forested landscapes where the forest variables such as canopy cover remain

above the threshold. Degradation results from activities such as selective logging, fuelwood removal, grazing and burning (Asner, 2009). As REDD+ is a performance-based policy, payments are meant to be made on basis of cutting emissions from these two sources. Moreover, these emission reductions must have been measured, reported and verified subject to reference levels or baselines.

The literature advises that two types of measurements are necessary to estimate emissions from forests; changes in the forest cover due to deforestation (deforestation rate) or degradation and changes in the amount of stored carbon (forest carbon stocks) arising from deforestation and degradation processes (Goetz et al., 2015; Herold et al., 2011). Combining forest cover change and forest carbon data is necessary because not all forests have the same carbon content and emissions will be higher if deforestation/degradation occurs in a landscape with high carbon stocks (Goetz et al., 2015).

Carbon stocks depend on the amount of carbon stored in the various biomass components namely; aboveground biomass, belowground biomass, litter, dead wood and soil organic carbon. However, in tropical forests, 70%–90% of carbon is concentrated aboveground (in the trees) (Cairns et al., 1997). Since the aboveground component is also the one most susceptible to disturbance, this thesis concentrates on measuring forest cover changes above the ground.

5.3.2 Pro-poor development

Pro-poor development or growth has been defined as the type that "enables the poor to actively participate in and significantly benefit from economic activity" (Kakwani & Pernia, 2000 p. 3). Pro-poor development thus relates to poverty reduction, which is about improving the human well-being of poor people in particular. Within REDD+, poverty reduction has received a great deal of attention because of the costs that REDD+ carries for local communities (Ghazoul et al., 2010). As REDD implies land use changes from extractive to more conservation-oriented types of land uses, the policy will require local people to change from for example agriculture, livestock grazing and logging to carbon sequestration services. To put into perspective the costs that such restrictions would imply for local people, (and why REDD+ has emphasized efforts to tackle poverty alleviation), we need to consider the following empirical findings regarding the importance of forests to forest-based communities. First, forest resources contribute to the livelihoods of 90% of the 1.2 billion people living in extreme poverty (Wasiq & Ahmad, 2004). Secondly, studies have

shown that a sizeable portion of total household income in forest-dwelling communities comes from forests (Cavendish, 2000; Kamanga et al., 2009; Nakakaawa et al., 2015; Vedeld, 2004). Third, areas that have large shares of natural forests also tend to have high incidence of poverty (Sunderlin et al., 2007). Moreover, even among these already impoverished people, the poorest are the most dependent on forests (Angelsen et al., 2014). Against that background, there is real worry that REDD+ like former exclusionary policies will further reduce the welfare of poor people, a discussion that has been the subject of a long and heated debate (Roe, 2008).

The sustainable livelihoods framework (SLF) provides a useful analytical framework to understand the welfare of rural communities. The framework is based on an understanding that rural livelihoods are diverse, complex, dynamic, socially differentiated and mediated by several contextual variables including the economic, political, social, ecological and institutional environment (Ellis, 2000). According to Sunderlin et al. (2005) the concept of livelihoods encompasses the assets, activities and access to these, which together determine the living gained (outcomes) by individuals or households. Thus, the term is more concerned with the means rather than the result. It tries to highlight not only what people do to make a living, but also the resources available to them, the risk factors that they must consider in managing their resources and the institutional and policy environment that either facilitates or incapacitates them in their search for improving their standard of living (Ellis & Allison, 2004).

In the livelihoods approach, resources are referred to as assets or capitals and they include human capital (skills, education and health), physical capital (produced investment goods), financial capital (money, savings, loan access etc.), natural capital (land, water, trees etc.) and social capital (networks and associations). Activities on the other hand, are what people do to earn a living while the vulnerability context are the risks associated with making a living.

Another relevant concept in the livelihoods approach is diversification. According to Kamanga et al., (2009 p. 615), diversification strategies are "dynamic adaptation processes through pressures and opportunities by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and improve their standards of living". In practice, most rural people cannot obtain sufficient income from a single livelihood strategy and hence engage in a range of livelihood strategies in order to reduce risk and to survive. That is to say; forest dwelling households are not only agriculturalists, but also obtain a substantial portion of their income from

non-farm activities such as forest resources and transfers from urban areas or abroad (Sunderlin et al., 2005). Some studies have revealed that between 40-50% of the total income of rural households in developing countries is from non-farm income (Bryceson & Jamal, 1997; Ellis & Mdoe, 2003). Forest income in particular constitutes about 20% to total household income in many parts of Africa, Asia and Latin America (Angelsen et al., 2011).

5.3.3 Good governance

If REDD+ proposes to promote good governance, we face two analytical questions. The first is: what is good governance? Secondly: how do we know if REDD+ has contributed (or not) to good governance? Earlier, I mentioned that governance is about facilitating cooperation and collective action among diverse actors. This, however, is a broad definition that neither defines good governance nor shows direction about how to assess it. Development agencies address this issue by taking a normative stand about principles (criteria) that define good governance, although these have so far been controversial and subject to much debate (Graham et al., 2003; Graham et al., 2010; Grindle, 2004; Kaufmann et al., 2011; Plumptre & Graham, 1999).

Assessments in the field of environmental governance use the general criterion of legitimacy to evaluate governance. Nevertheless, conceptions of legitimacy vary because scholarship draws from diverse disciplines (Bernstein, 2004; Vatn, 2015). The recent involvement of non-state actors in governance has moreover challenged some of the existing conceptualizations and theoretical understandings of the concept of legitimacy (Beisheim & Dingwerth, 2008; Bernstein, 2004). Despite this, most authors share the view that legitimacy is about acceptance and justification of authority (Biermann et al., 2010; Bodansky, 1999; Bäckstrand, 2006; Vatn, 2015). In the traditional forms of governance, which emphasized the role of the state, legitimacy has been associated with democracy. However, with the increasing involvement of non-state actors, there are calls for conceptualizations that extend beyond legitimacy derived through electoral and constitutional representation. (Biermann & Gupta, 2011; Corbera & Schroeder, 2011).

With the objective to move beyond the 'ballot box' in assessing legitimacy, current scholarship follows Scharpf (1997)'s conceptualization by distinguishing two types of legitimacy. The first, called input legitimacy concerns assessing the quality of the process used to reach decisions. Input legitimacy refers to whether the procedures for decision making are appropriate and acceptable. This demands that processes conform to demands such as participation,

representation, responsiveness, transparency and accountability. The second aspect of legitimacy, called output legitimacy, is about assessing the quality of results. The criteria used for assessing output legitimacy are the famous 3Es, proposed by Stern (2008). Effectiveness asks how well the defined goals has been achieved, efficiency relates to whether the goals have been achieved at minimum cost while equity is about distributive justice i.e., whether the costs and benefits have been fairly distributed among actors.

6. Methodological considerations

Every research undertaking implicitly or explicitly adopts a philosophical stance about the nature of reality (ontology) as well as the nature of knowledge and how it is to be acquired (epistemology). Although these philosophical views are largely hidden from the 'face of research', the assumptions that they bring to the inquiry influence how issues or objects are studied (methodology) and ultimately the results (Slife & Williams, 1995). Regarding social science, one may distinguish between two contrasting philosophical worldviews – those of empiricism/positivism on one hand and constructivism/interpretivism on the other. According to Creswell (2013), empiricists rely mainly on quantitative methods while constructivists employ qualitative methods. This thesis chooses, instead, a middle ground between the two positions embracing both quantitative and qualitative methods with a philosophical underpinning from critical realism (CR) and the corresponding mixed method approach.

The ontological position for CR is that there exists a reality (intransitive domain) and that this reality exists independently of our conceptualizations of it. Epistemologically, CR holds that the production of knowledge (transitive domain) through either ideas, theories, language, models, established facts or techniques is a social process and depends on our conceptualizations (Archer et al., 1998; Bhaskar, 1975; 1978; 1989). CR further stratifies reality into three ontological layers: the real, the actual and the empirical. The real is the objective reality (objects and issues under study) with potentials that can be triggered. The actual are mechanisms (events, behaviors or processes) which may or may not be visible and may trigger the potentials of the real. The empirical is our observations and perceptions of the objects and issues.

Thus, although CR upholds that an objective reality exists, it first of all emphasizes that reality is an emergent property that depends on interactions between various involved potentials. Secondly, it accepts some degree of methodological relativism where social structures, relations and the values influence the process of knowledge production. This however, does not mean that all knowledge is fallible. Because knowledge is open to reasoned critique, CR maintains that the production process can provide explanations and theories that approach the intransitive domain with more in-depth understanding as well as accuracy (Vatn, 2015).

Five methodological implications follow from the philosophical worldview espoused by CR (Pawson & Tilley, 1997; Westhorp, 2014; Zachariadis et al., 2013). First, both material and social worlds are real as they can have real effects. Thus, social constructs like class, gender, political and economic systems and social programs do have real effects on people. Second, there is no such thing as final or objective truth as all knowledge production is through human activity and depends on the social processes through which it is produced. Nevertheless, we can strive towards a better understanding of reality. Third, social systems are open systems where ideas, resources and people move in and out. Also, political, social and cultural systems interact with and affect each other. Thus, our methods should bear in mind that systems are dynamic and complex. Forth, there are underlying, usually non-observable processes (mechanisms) that influence the things we observe. Although, mechanisms are not necessarily always observable, they may still exist whether they are exercised or not exercised. Also, mechanisms exist as part of the whole system and will only operate if the other conditions are right. Lastly, our methods should help us understand the context of the research. Context matters because it changes the processes through which mechanisms will operate, if they will operate and for whom.

From this perspective, CR offers a philosophical basis for mixed methods, thereby enabling researchers to integrate quantitative and qualitative approaches. That is to say, with CR, we can move beyond events observed through empirical observation (measurement, experiment and statistics) to the underlying mechanisms that explain what is observed. This approach is particularly helpful in the field of environmental governance that encompasses aspects of both ecological and social science.

To an empiricist, however, the worldview at the ontological level is such that there exists a common objective reality to which everybody can agree. That is, objects and social issues exist independently of how we conceptualize them. At the epistemological level, the empiricist then believes that we obtain knowledge through observation and measurement of that 'objective reality' that exists out there and that our observations are not influenced by our conceptualization that reality. Functioning from that perspective, empiricists' methodological approach rests on finding facts (causes and outcomes) through measurement, experiment and statistics (Chalmers, 2013).

Constructivists on the other hand, refute the notion that there is an objective reality. Rather, their ontological position is that all truth depends on our conceptualizations of issues and objects. Thus, individuals develop subjective meanings of their experiences. Further, these meanings are conditioned historically and socially (interactions with other individuals) through cultural norms. The epistemological position that follows from that ontology is that we derive knowledge through interpreting meanings that others have about the world. Methodologically, constructivists use qualitative techniques including case studies, personal experiences and interviews. The methods also aim to understand the research contexts, specifically how historical and cultural settings affect peoples' experiences (Bryman, 2008; Easterby-Smith, 2002).

As presented above, empirisim and constrictivism are opposites. Note however, that since the 1980's researchers from either orientation increasingly use both approaches. (Newman & Benz, 1998). Thus, it more useful to view research methodology as located on a quantitative-qualitative continuum. This enables the researcher to combine the strengths from both approaches. Strengths of quantitative methods include the ability to precisely measure entities, gauge general trends and generalize from sample to population. Qualitative methods on the other hand, 'put some flesh on the bones' helping one to understand the social, cultural, political and economic context underpinning the quantitative results (Creswell, 2013).

While combining approaches is in itself a positive development, some writers are concerned that it happens only at data collection. Sometimes researchers may also borrow a few concepts from another discipline. Other than that, integration through the conceptual, sample selection, data collection and analysis stages is minimal. This seems to be the case because researchers with a particular ontological/epistemological orientation find it difficult to accept the analytical frameworks from where they borrow the data collection methods and concepts. The result is inconsistent application and interpretation of concepts as well as skepticism towards research findings (Bamberger, 2000). In my view, the reason why many researchers are reluctant to integrate approaches throughout the research process is differences in ontology and epistemology. As we have seen, empiricism and constructivism are contrasting positions with little common ground, hence, there is weak ground for integration. Fortunately, CR as a middle position provides a more nuanced philosophical view that can enable research to navigate between the extremes of empiricism and constructivism (Zachariadis et al., 2013).

6.1 Research approach

Hanson et al. (2005) and Creswell (2013) provide detailed discussions on the typologies of mixed-method research designs in which they identify two broad classifications. In the sequential research designs, the researcher collects and analyses one form of data either qualitative or quantitative first, then followed by the other. On the other hand, the two types of data may be collected and analyzed at the same time. This is called concurrent research design, the kind that is used in this research.

The reader is reminded that my overall research approach is comparative. The primary criteria for selection of the study areas was that the district or area had been selected to pilot REDD+. Secondly, the area had to be typical (representative) of the country or region where they were selected. Criteria for representativeness were factors like the forest type, drivers and level of deforestation and degradation, forest resource dependency, proximity to markets and other infrastructure as well as land tenure. In addition, project sites where proponents had plans to complete the REDD+ process - from consent to payments -, were more likely to be selected. In some areas however, these criteria could not be followed, in which case practical considerations like ease of access or having a sizeable number of households on which to run surveys also became important. In view of the variation in contexts, the comparative studies provided interesting insights about how REDD+ outcomes differ under different circumstances, providing evidence for the most appropriate policy instruments to adopt under different scenarios.

The research progressed in three phases. The first phase (before or baseline phase) was conducted in 2010 and 2011 just before REDD+ implementation started in all pilots. The second phase took place between 2013 and 2014 after the pilots had been operational for about 3-4 years while the third (after phase) was done in 2015 and 2016. In the before and after phases, we studied pilot sites (sites where REDD+ was to be implemented) and control sites (sites where REDD+ was not to be implemented). Hence, we followed a 'before-after-control-intervention' (BACI) methodology where data from the first and third phases were used to assess the impacts of REDD+ on livelihoods and forest carbon storage (the third research question), while the second phase was used to gather data regarding the REDD+ processes and the costs of REDD+ implementation (research questions one and two).

Following the concurrent research design described earlier, quantitative and qualitative data were collected simultaneously for each phase. For the impact studies – i.e., the first and third phases – quantitative data were collected using questionnaires while qualitative data were collected from document reviews as well as focus group discussions and resource person interviews using semi-structured interview guides. Documents, questionnaires and semi-structured interview guides were once again the instruments used for the process studies while the cost studies used official accounts (quantitative), documents and semi-structured interview guides (qualitative). A mixture of purposive and random sampling procedures were used at all three stages.

Note that each of the four papers that this thesis is comprised of, do not always include data from all the three pilots. This was done partly for the purposes of keeping the workload within manageable limits, but it also depended on the aim of the paper and the quality of the data obtained from the each site. Table 1 below shows the focus of study for each paper and the pilots covered in each case.

Table 1. Overview of the focus of study and pilots included in each paper

	Type of study	Kilosa	Kondoa	RDS Rio Negro
Paper 1	Process study		X	
Paper 2	Process study	X	X	X
Paper 3	Transaction cost study[1)]	X		X
Paper 4	Impact study	X	X	

1) Data on transaction costs was also partly collected in Kondoa. However, the process was not concluded because when the research team returned to collect additional data, the relevant project staff meant to facilitate data collection were no longer AWF staff, because the project was coming to an end.

Similarly, my participation in the different stages of the research was different, depending on my availability (e.g., some steps were conducted before I started the PhD), my competence in a particular subject (e.g., I did not have the technical knowhow to conduct GIS analyses), the workload, and discussions with my supervisors. Table 2 summarizes my engagement, where the X refers to full participation, P means partial participation, while the blank space indicates no involvement on my part in that part of the research for the particular pilot site.

Table 2. Overview of my participation in the research

REDD+ pilot	Data collection	Analysis	Writing
Process study (paper 1 and 2)			
Kilosa		P	X
Kondoa	X	X	X
RDS Rio Negro	P	P	X
Transaction cost study (paper 3)			
Kilosa		P	X
Kondoa[1)]	X	X	
RDS Rio Negro	X	X	X
Before phase of impact study (paper 4)			
Kilosa		X	X
Kondoa		X	X
RDS Rio Negro		X	X
After phase of impact study (paper 4)			
Kilosa	X	X	X
Kondoa	X	X	X
RDS Rio Negro	X	P	
Forest cover change studies (paper 4)			
Kilosa			X
Kondoa			X
RDS Rio Negro			

1) See note to Table 1

In the following sections, I detail the methodology used to answer each research question including the selection of communities and respondents, data collection, the instruments and software used and how the two data types – quantitative and qualitative – were integrated and analyzed. To achieve a logical flow of the presentation, I start with the third research question – that on impacts. This is because the process for collecting data related to this research question took place in the first and third phases of the research i.e., data collection for the third research question started at the beginning of the research process.

6.2 Impacts of REDD+ on livelihoods

6.2.1 Selection and sampling procedures

As earlier noted, the impact study followed the BACI methodology, which necessitated that treatment (pilot) villages and control villages be selected. Note that we selected more pilot than control villages to mitigate the risk that some pilots could drop out during implementation. Pilot villages were selected to cover as well as possible variations in the key variables such as livelihoods, distance to markets etc. Controls were purposefully selected to match characteristics of the pilots. For respondents to the questionnaires, households were chosen following random selection procedures. This was done by randomly selecting households from a sampling frame such as the village register or any other inclusive list provided by the authorities or NGO.

Participants in the resource person interviews were selected purposefully for their knowledge of the issues surrounding forest use, livelihoods and general information about the village. For that reason, we talked to community leaders – both political and technical (if applicable) – leaders on natural resource issues, district or regional agricultural and forestry staff as well the NGO responsible for managing the REDD+ pilot. For the focus group discussions, the plan was to have a separate group for men and women involving 5-10 people. However, in some communities in Rio Negro, women and men attended the same focus group discussion as the population of communities was low.

The effectiveness of the BACI method heavily relies on achieving comparability between pilots and controls. It is important to point out that although the selection procedure tried to achieve comparability, it could not ensure complete identity of control and treatment areas. Therefore, apart from using econometric strategies to attempt to correct for this bias, qualitative information was very important for providing a deeper understanding of the differences and similarities.

6.2.2 Research instruments

Household questionnaires were the primary instrument used to collect quantitative data. The questionnaire nonetheless also included a number of open-ended follow up questions after some of the quantitative questions to allow us to explore the reasoning behind a particular numerical response. To allow comparability, the questionnaire retained the same structure in the both rounds of data collection and across the three pilots. Nevertheless, in the after round, it was edited to

reduce length and to accommodate new information that we had gained from the first round as well as the implementation phase. The questionnaire was subdivided into sections, the first covering demographics, land ownership, physical assets, savings, social assets and vulnerability (shocks). This was followed by a section mapping livelihoods and related constraints where data was collected on agricultural and livestock production, forest resource use as well as income from other sources including business and transfers. The next section mapped out ownership, management and use rights to forestland and other forest resources. This section also sought people's views on management systems and the rules defined for use rights. Next was a section on perceptions, attitudes and norms about forest conservation and finally one about perceptions on compensation in return for forest conservation.

The instruments used for resource person interviews were semi-structured interview guides, also discussing similar issues as those in the questionnaire. These included general livelihood conditions, market conditions, immigration patterns, forest status, weather and forest conditions and rules on resource use. Semi-structured interview guides were used also for focus group discussions. Here, the issues discussed were income, food security, technological changes, shocks and coping strategies, prices and price changes, gender division of labor and weather conditions. Through focus group discussions we also sought to understand the institutional structure for collective decision-making, rules and practices on resource use.

6.2.3 Data collection

The baseline data from the treatment (REDD+) and control sites were collected in 2010 and 2011. A total of 237 and 240 surveys were done in Kondoa and Kilosa respectively in the first round. In the second round, we followed the same households as had been interviewed in the first. However, some households dropped out of the second round leading to 158 and 150 respondents in Kondoa and Kilosa respectively. We did not carry out an after study in one village in Kilosa as it was excluded from REDD+ because it attained township status during the course of implementation.

On the qualitative side, resource person interviews, focus group discussions and document reviews were used to triangulate the information from the questionnaires and to gain understanding about the factors that might mask REDD+ impacts. During the interviews, writing of field notes was supplemented with voice recordings. This relieved the interviewer from concentrating on

writing to allow him/her engage more in the discussions. The interviews were done with the help of a translator.

6.2.4 Data management and analysis

Checking and cleaning of quantitative data started in the field. At the end of every working day, the field team checked the questionnaires for wrong answers, missing entries and other inconsistencies and corrected the information. On returning from fieldwork, a codebook was prepared. Open-ended questions in the questionnaires were transformed into relevant categories and coded with numerical codes. The data was then entered in a Microsoft access template which minimizes mistakes by restricting the type of information entered. Descriptive analyses and multivariate regressions from the quantitative data were produced using Stata version 12/13 software.

As previously indicated, field notes for qualitative data were taken in as much detail as possible during interviews. On returning from the field, the data were then transcribed into Microsoft word. During this process, the transcripts were checked against the audio recordings for accuracy and amended where necessary. The first step in the analysis of the qualitative data was carefully reading and re-reading through the transcribed material to identify patterns and interconnections within the data. This gave a preliminary summary of data, a kind of descriptive analysis from qualitative data, helping to provide initial understanding of the results. Next, the responses from the broad research themes were categorized and coded. Recall that the structure of the interview guides included sections that mirrored those in the questionnaires, with each section covering broad themes that had been theoretically identified as important for explaining the phenomena under study. Finally, a theoretical analysis was conducted, where the particularities discovered in the data were fed back towards broader concepts within the theoretical frameworks to generate explanations for the results from the statistical analyses. This stage of analysis also involved extensive review of relevant documents as well as published work, reports and master theses that had earlier on been published as part of our two consecutive projects – 'Poverty and sustainable development impacts of REDD+ architecture; Options for equity, growth and the environment (POVSUS_REDD+)' which ran from June 2010 and ended October 2013 and 'Man and forests – an evaluation of management strategies for reduced deforestation' which ran from 2014 to 2016.

6.3 Collection and analysis of forest cover and carbon data

Data collection and analyses covered all REDD+ pilot villages and a similarly sized control area. Estimating land cover changes involved using GIS data and Landsat imagery for the years 2000, 2007[11], 2010 and 2015 and supplementing these data with field observations in 2015. Remotely sensed data were captured on the basis of Landsat 5 TM and Landsat 7 ETM satellite-based sensors. Following the BACI methodology, we then compared the differences in forest cover in treatment (REDD+) and control villages, before and after the intervention to try to isolate any impacts of REDD+ on deforestation and carbon storage trends. Five land cover classes[12] were distinguished in the analyses and used as a basis for calculating changes in carbon stocks associated with the land use changes as follows:

Carbon (tons/ha) = Biomass (tons/ha)*0.47*Area covered by forest (ha).

6.4 Process studies

The objective of the process studies was to understand the process of REDD+ implementation, exploring issues like institutional change, participation, power, actors and people's perception of the process.

6.4.1. Selection and sampling procedures

To avoid over burdening people with too many research rounds, the communities selected were different from those in the impact assessment. This was necessary to ensure that the data are of good quality, as 'over-researched' people/communities may suffer from 'research fatigue'. The communities visited to collect process data were selected to achieve a variation in the level of engagement in the REDD+ process. For example, we randomly selected some communities that had participated in REDD+ and then purposely selected a few communities to reflect a gradation in the level of conflict during the process. This was done to unravel the complexities regarding for example, why some communities accepted REDD+ while others did not, why some communities dropped out and the causes for dissatisfaction and (or) conflict.

[11] The year deviates from the 5 year interval due to lack of data from 2005 and the problem of cloud cover in the 2006 images.
[12] The land classes were: closed woodlands, open woodlands, bushlands, grasslands and cultivation areas.

Selection of respondents to questionnaires was in Tanzania based on participation in REDD+ related meetings. As such, we randomly selected 75% of people that had attended REDD+ meetings from the attendance sheets of meetings and 25% of those that did not attend from another list such as the village register. The rationale for this was to understand the perceptions of both those that participated and those that did not. No such stratification was done in RDS Rio Negro because people joined REDD+ on an individual basis, and almost everybody in the community joined. As with the impact analysis, here we also purposefully selected resource persons for their knowledge of how the REDD+ was implemented. We also held focus group discussions.

Again, the research instruments used were questionnaires as well as semi-structured interview guides. The questionnaires sought to understand whether a particular respondent participated or not in the different activities of REDD+ as well as their perceptions of the process and the actors involved. The questionnaire also assessed knowledge and compliance with REDD+ rules and by-laws. 200, 125 and 100 respondents responded to the questionnaire in Kondoa[13], Kilosa and RDS Rio Negro respectively. For their part, the interview guides sought to get a deeper understanding of perceptions and peoples' reasons for participating or not. Resource person interviews and focus groups also explored issues that are not easily captured within questionnaires such as power issues.

6.4.2 Data management and analysis

The quantitative data were entered using excel or SPSS software and later transferred to Stata for analysis. Similar procedures as those used in the before and after phases for data checking, cleaning and analysis were used. In the same way, procedures for recording, transcription and analysis of qualitative data followed very closely those used in the before and after phases of the research.

6.5 Transaction cost studies

The main data source were audited accounts from the different NGOs implementing REDD+ in the study areas. Nevertheless, it was important to understand the context under which costs were incurred as this would help explain the variations in costs. Therefore, we also obtained data on the

[13] Kondoa had a comparatively higher number of respondents, because we purposely selected three additional villages to represent villages with higher levels of conflict. This was done in order to understand more deeply the sources of conflict. In Kilosa and RDS Rio Negro, conflict levels were more evenly spread, therefore no extra villages were included.

organizing and running of activities in the pilot. This was done through interviews with NGO staff and community leaders as well as through focus groups with villagers. Costs included were mainly costs to the implementing NGOs and local communities.

It is important to point out that the original strategy for collecting transaction cost data was aimed at collecting cost data from all actors active in REDD+ activities at the local level. This, however, turned out to be a very demanding process due to the number of actors involved, a problem especially in Brazil, where the NGO collaborated with a broad range of partners. In Tanzania, it did not present a major challenge because the implementing NGO and participating communities were the main actors involved and in the few necessary cases, the staff in the NGOs could assist with estimating other actors' costs.

Village level costs were calculated as opportunity costs of time for engaging in REDD+ activities. At the outset, the plan had been to carry out a few household interviews in the communities. This was done in Kilosa. However, by the time we collected data from RDS Rio Negro, it had become apparent that most costs for households could be obtained from focus groups discussions and interviews conducted with community leaders. This was because most REDD+ activities were on a collective not individual basis. Hence, no questionnaires were used in RDS Rio Negro. Instead data on for instance on number of people attending meetings and length of meetings were obtained from resource person interviews and focus group discussions. The data was analyzed using Stata and Excel software.

6.6 Reliability and validity

Generally, reliability is about the stability of data and about whether repeated application of the methods under similar conditions will yield consistent results (Bryman, 2008). In relation to quantitative data, reliability is often linked to the precision and accuracy of methods used in sampling and measurement in order to strengthen claims on which to make generalizations to the wider population (Cohen, Manion & Morrison, 2007). The issue of reliability was of particular concern in this research as the different research teams could have diverse interpretation of questions contained in the research instruments and concepts related to the study.

As a first step towards enhancing the consistency of research findings, the projects maintained manuals for each research theme i.e. process, transaction cost and impact studies. These manuals had previously undergone back and forth discussions through face to face meetings

and (or) other methods of remote communication including emails and skype sessions between research teams. Research instruments were developed in the same way. These processes helped to build similar understanding and interpretation of all concepts and questions among those engaged in the research. In addition, the triangulation of data through the use of multiple methods helped enhance the consistency of data. Moreover, my main PhD supervisor and I (to the extent I was available), were consistently involved in all pilots throughout the research process including conceptualization, development of instruments, data collection and analysis. Our close involvement served as a link for all teams through all the stages of the research thereby improving the stability of the data. Put together, these procedures strengthen my claim to the reliability of data and findings arising from this research.

Validity concerns the trustworthiness of research findings. In quantitative terms, validity broadly refers to whether an indicator of a concept accurately measures that concept (Bryman, 2004) and can refer to the accuracy of sampling, measurement and analysis of the data (Cohen et al., 2007). Qualitative methods on the other hand focus on the depth and richness of data as a way of demonstrating its validity. Further categorizations for validity are internal and external validity, where the former relates to extent to which the findings reflect an accurate account of phenomena while the latter is about the generalizability of research findings – a key objective within quantitative research.

In this case, measures taken to ensure internal validity included pretesting of research instruments, training of research teams prior to data collection, triangulation and thorough data checking and cleaning. Further, the fact that pilot sites were visited several times at different stages of the research facilitated the building of rapport with respondents which helped us to revise and refine ideas, understandings and explanations. Also, having permanent research partners in the different countries gave us the opportunity to contact them several times to clarify on local issues. In addition, co-authored publications allowed our partners to use their in-depth understanding of the local situations to comment on drafts and correct any misunderstandings. Finally on external validity, we used quantitative techniques which by their nature have an inbuilt advantage of achieving generalizable findings. Moreover, the comparative nature of the research also contributed in this regard as findings could be compared across different areas.

7. Summary of papers

The previous sections have laid the background for the four papers presented in the thesis. This section now presents a summary for each paper, in which I respond to the research questions as defined for the thesis. Overall, the thesis asks the question; 'What does it take to establish local level governance structures for trading carbon under REDD+?' Papers 1 and 2 approach this question from the perspective of the implementation process and correspond to research question 1. Specifically, these papers identify the actors involved in establishing REDD+ governance structures, as well as actor interests, the conflicts arising from REDD+ engagements and the legitimacy of REDD+ processes. Going further, paper 3 responds to the overall guiding question from the cost perspective and corresponds to research question 2. Thus, paper 3 answers the question; What does it cost to establish and run REDD+ governance structures? Finally, paper 4 responds to research question 3. This paper wraps up the thesis, by interrogating the outcomes of the established governance structures in terms of their effects on livelihoods and deforestation.

Paper 1. All that glitters is not gold. Power and participation in processes and structures of implementing REDD+ in Kondoa, Tanzania.

Community participation has been advocated as a key pillar through which communities can influence and share control over decisions and resources in the implementation of REDD+ initiatives. Paper 1 is an in-depth study of the pilot project in Kondoa, Tanzania documenting how local communities have participated in REDD+ processes. It covers processes of deciding whether to participate, demarcating land and formalizing ownership, deciding on land use plans/by-laws and on the benefit sharing mechanisms.

The paper focuses on how local level actors interact during REDD+ processes, how power is exercised by the different actors as well as how diverse interests are negotiated and protected given the prevailing institutions and wider social-economic context. In studying the REDD+ processes, we categorized three different types of communities depending on how they participated. The first category are those that accepted REDD+ and completed all three processes. The second were those that opted out of the project either at the outset or along the way. Finally we had one community that joined and completed all REDD+ processes, but did not receive compensation due to poor performance.

Methods combine quantitative and qualitative approaches, allowing us to gain a more nuanced understanding of the processes in ways that a single methodological approach would not. In particular, quantitative data made it possible to create numerical estimates regarding how people evaluated the decision-making processes, while qualitative methods enriched our understanding of quantitative results and allowed us to investigate variables that could not be quantified.

Overall, results reveal that for communities that joined and completed all REDD+ processes, people generally took part in decision-making and were satisfied with how the project was implemented and the information they received prior to making critical decisions at the various stages of the project. However, information came exclusively from the coordinating NGO, the district officials and their partners. These implementers used their privileged access to information, to convince them that REDD+ was in their (communities') best interest. Therefore, although we find that these communities supported REDD+, we also note the power wielded by the implementers over the local communities in influencing outcomes within the participating communities. In the villages that opted out of the project, powerful interests – specifically local leaders – vehemently blocked information about REDD+. Instead, they used rumors to scare residents into believing that the forests would be sold off if they accepted to join the REDD+ project. Finally, in the village that joined the project, but that was not paid due to poor performance, the village leaders kept information about REDD+ to themselves. The result was that people in this village had very little knowledge about the project and the rule compliance became very low. In addition to information, the paper also finds that a combination of incentives - particularly the promise of environmental conservation and agricultural benefits from improved rainfall -, as well as disincentives, - a variety of sanctions for non-compliance with the rules for conservation -, were also important sources of power used to influence REDD+ processes.

The paper therefore points outs that as an initiative from outside the communities, REDD+ often enters a landscape characterized by power asymmetries. So, outcomes on participation are influenced by the dynamics of power spanning international to local levels. The paper therefore confirms the notion that participation may not lead to empowerment and genuine control if the structures and processes of participation reinforce underlying power differentials among the actors. Nevertheless, the findings in this study also offer a ray of hope. There is evidence that participatory forest management and decentralization systems in Tanzania supported locals in Kondoa to

counter some of the power by higher level actors. The paper therefore concludes on an optimistic note, suggesting it is possible for REDD+ to be truly participatory and empowering if global and national policy can ensure that the structure of REDD+ governance accounts for the variation in power possessed by actors at different levels. Setting up downward accountability systems that are responsive to local needs and interests, and providing communities with various sources of information to counter information asymmetries, are some of the strategies suggested that can enhance the power of local people to influence REDD+ processes.

Paper 2. Legitimacy of local REDD+ processes. A comparative analysis of pilot projects in Brazil and Tanzania

The basis for REDD+ is the actions of local communities towards controlling deforestation and forest degradation. As such, local acceptance (legitimacy) of REDD+ is important for the success of REDD+. Paper 2 examines the issue of how to engage local level actors so that REDD+ decisions can be seen as broadly acceptable to them, considering that REDD+ also comprises actors at national and global levels, all having diverse interests and perspectives. The paper thus contributes to the REDD+ discussion by interrogating how early REDD+ pilot projects have fared, when evaluated against the principles of normative and sociological legitimacy. It thus adopts a two dimensional approach, by taking both the normative assessment – which evaluates how pilots have involved local communities based on the general criteria of participation, inclusiveness, transparency, accountability and equity – and the sociological assessment – which is based on communities' perception of the pilot operations and outcomes.

The paper compares all three pilots; Kilosa and Kondoa in Tanzania and Rio Negro in Brazil, with the comparative approach helping to examine how legitimacy outcomes may differ under various governance, historical, physical, and economic contexts. This paper is similar to paper 1 in the sense that it also uses classical institutional theory to investigate actor interactions, although the focus this time is on how actors could interact in order to bring about legitimate REDD+ processes. Also, once again, quantitative data are used to create numerical estimates regarding actor perceptions, while qualitative methods deepen our understanding of the quantitative results and allow investigations into variables not amenable to quantification.

Analyzed from the normative perspective, results show that participation was inclusive and representative, issues were deliberated and all pilots attempted to conform to standard procedures for agreeing to participate in REDD+ (the Free Prior and Informed Consent (FPIC) criteria). There were, however, challenges such as powerful actors manipulating REDD+ processes in Kondoa, limited local participation in program design in RDS Rio Negro and exclusion of pastoralists in Kilosa. In addition, transparency and accountability was inadequate in all three pilots and although the distribution of benefits was egalitarian in all cases, the distribution of costs was unequal. The sociological perspective in contrast paints a more optimistic picture of REDD+ implementation, finding mostly positive attitudes to REDD+ processes and outcomes. REDD+ was most positively evaluated in Kilosa, followed by Kondoa, while the rating for RDS Rio Negro was the least positive. In Kilosa and Kondoa, people cited the importance of environmental conservation as their main reason for supporting REDD+. As mentioned, the process in Kondoa was marred with overt conflict in some of the villages, due to the actions of powerful actors. To a large extent, these conflicts were the cause of the negative perceptions in Kondoa, while the dissatisfaction in RDS Rio Negro, seems to have resulted from the fact that that people did not participate in the structuring of the Bolsa Floresta program. This led to frustration over the level of payments and rules for participation.

Overall, the cases demonstrate that quality of decision-making in terms of local participation, balanced representation, openness and sufficient information increase local acceptability of REDD+. However, it is necessary for REDD+ implementation to account for power asymmetries between actors with diverse interests and values, as these asymmetries may constrain the positive benefits of participation. Further, as REDD+ enters different governance, historical, physical, and economic contexts, all of which bear on the legitimacy of decision-making processes, implementers must seek to understand and account for these particularities in the implementation of projects.

Paper 3. Estimating transaction costs of REDD+

Reducing emissions from deforestation and forest degradation (REDD+) is generally believed to be a cost-effective mitigation strategy against climate change. Some suggest, however, that costs of REDD+ are underestimated because many studies either exclude or undervalue transaction costs. In order to compare across studies, it is vital to have a common framework and methodology

for assessing costs. The challenge, however, is that methods and definitions of transactions costs are different because transactions are so diverse and operate in a wide variety of circumstances. This makes it difficult to compare results across studies. Drawing upon the concept of governance structures, paper 3 aims to suggest a framework and methodology that is applicable to various types of transactions and contexts. The paper further exemplifies the methodology by estimating transaction costs incurred for REDD+ pilots in Rio Negro, Brazil and Kilosa, Tanzania. In this paper, quantitative methods are used to estimate costs while qualitative methods explain the underlying reasons driving the costs.

The application of institutional theory in paper 3 is in analyzing local level transaction costs of engaging in REDD+. In doing so, we begin with the argument that transaction costs imply costs of human interactions and that these interactions are defined by institutions. Therefore depending on the institutions, actors may trade, command (e,g., through legal means, taxes or subsidies), donate, cooperate or reciprocate. We refer to these types of interactions as economic transactions. Actors may further interact politically. These are termed political transactions and include specifying property rights, public monitoring, enforcement, and litigation, elections, contracting of government services and other interactions between the public leadership at various levels. Finally, there are civil society transactions involving interactions among civil society and between civil society and political actors through elections, dissemination of information, political debate, advocacy or mediation. Based on this discussion, we argue that REDD+ is not a purely economic transaction, where resources/payments are transferred between 'buyers' and 'producers' of carbon, but also has aspects of political and civil society transactions. Therefore, identifying and calculating transaction costs calls for an inclusion of all the costs arising from the diverse actor and institutional arrangements (governance structures).

We thus define transaction costs as the costs of establishing, maintaining, changing and using a governance structure. Based on this definition, we propose an analytical framework that distinguishes between two broad categories: 1) Costs of developing (establishment, maintenance and change costs and 2) costs of using a governance structure. Within these two broad classes of costs, we propose further categorizations based on, for example, the tasks performed (e.g., obtaining information and developing actors and institutions), the actor that bears the cost (e.g., communities, NGOs or public bodies), the level at which costs occur (i.e., local, national or

international), and budget categories (such as personnel, consumables and travel). In the empirical example, we categorize based on tasks/activities performed i.e. costs of establishing and (revamping) actors and institutions, costs of defining objects of transfer such as monitoring, reporting and verification costs, costs of resource transfer processes such as costs of making payments, costs associated with general planning and decision-making and finally costs on information and communication programs. Regarding the two broad categories (developing and using costs) we were limited to analyzing costs of establishment and use due to the format of available data and the fact that REDD+ the pilots were in a stage of establishment so there was yet no costs for maintaining and changing governance structures.

Results show that depending on the discount rate used, establishment costs range between USD 0.5 and 0.6 in RDS Rio Negro and USD 1.7 and 1.9 per ton of CO_2 in Kilosa. Use costs on the other hand range between USD 0.9 and 6.4 in RDS Rio Negro and USD 0.3 and 2.0 per ton of CO_2 sequestered in Kilosa. RDS Rio Negro therefore had lower establishment costs, while its costs of using governance structures were higher than in Kilosa. In addition, the percentage of costs incurred on resource transfer processes, planning and decision making, and information and communication programs were higher in RDS Rio Negro than in Kilosa, while the costs on establishing institutions and actors were higher in the latter pilot. Cost differences were a result of the different types of transactions in Kilosa and RDS Rio Negro, which required varying governance structures and had to be organized through different processes. Specifically, the Kilosa pilot was built with the major objective of trading carbon on the international market, while in RDS Rio Negro, the governance structures support more of a conservation and development program, where communities are compensated for following certain rules. Ultimately, the cost of building a carbon trade – as in Kilosa – is different from the cost of paying people according to agreed rules, but without the need to abide by the rules of the carbon market – as was the case in RDS Rio Negro.

Based on these results, the paper concludes by arguing against the common assertion that REDD+ is cost-effective because it is a market-based solution. Instead, the paper submits that the efficiency of REDD+ depends on the governance structure REDD+ adopts, either a market, i.e., direct trade between buyers and sellers, a nonmarket governance structure e.g. transfers between governments or a mixture of market and non-market elements.

Paper 4. REDD+: The perfect marriage between conservation and development? A comparative study of the impacts of REDD+ on livelihoods and deforestation in Tanzania

REDD+ promises to conserve forests and compensate local people for their losses from protection. Against the backdrop of past development and conservation approaches that have had disappointing outcomes on either forests or the livelihoods of communities residing in or around protected areas, balancing forest protection and social welfare is critical for REDD+ policy makers. Paper 4 investigates whether REDD+ can simultaneously improve forest carbon storage and social welfare. The research was carried out in two REDD+ pilot sites located in the districts of Kilosa and Kondoa in Tanzania.

The study uses the Before-After/Control-Intervention research design to quantify the changes in livelihoods and forest status following the implementation of REDD+, and theory-based methods to answer why and how the REDD+ intervention caused (failed to cause) impacts. Descriptive results show that in both study areas, mean total income reduced in pilots as well as in controls in the year 2015 – the period following REDD+ – compared to 2010 – before the project started. This reduction was mainly due to the drought experienced in that year. We, however, find a broad consensus in both study areas in controls and pilots alike, that living conditions were getting better between 2010 and 2015. Nevertheless, these improvements were mainly due to expansion of public investments by the government of Tanzania rather than REDD+ activities.

The multivariate regressions show that in terms of total income (income from livestock, crops, forests, off-farm businesses and remittances), REDD+ neither improved nor harmed livelihoods in both study areas. REDD+ did not improve total income because payments were low, NGOs did not invest enough in income generation and the drought in the 2014/2015 agricultural season compromised benefits that could have been realized from investments in agriculture. REDD+, moreover, did not harm livelihoods because rules provided for regulated access to forest resources. We find evidence however, that REDD+ contributed positively to forest income in Kilosa. Reasons for this included improved enforcement, regulated access and improved awareness about forest protection, which together may have slowed down deforestation and forest degradation, making some forest products more available to people in REDD+ villages. No effect of REDD+ on forest income was realized in Kondoa however, because the dominant tenure (public ownership) meant stricter regulations on access to forest resources. In contrast, the tenure in Kilosa

(community ownership), allowed for flexibility in rules governing access to forest resources resulting in a large increase in forest income, which also became an important shock absorber during the 2014/2015 drought period. REDD+ also improved forest cover and carbon storage in both sites, although the recovery was stronger in Kilosa. REDD+ seems to have improved forest cover through emphasizing local governance, community engagement, land use planning and training, which led to improved enforcement, regulated forest access and more appreciation of environmental protection leading to recovery in forest cover.

Overall, the role of context in influencing livelihood and forest cover outcomes is emphasized, which underlines the significance of understanding and addressing the local realities in which REDD+ is to be implemented. In this case, such local realities that influenced outcomes included tenure, environmental conditions and the wider economic context in the country. The results also suggest that REDD+ proponents ought to give equal attention to both conservation and development during REDD+ implementation, if REDD+ is to achieve positive outcomes in both aspects. For this study, the results indicate that REDD+ managed to improve forest cover, but posted limited success on income because the strategy of the implementing NGOs in both study areas, prioritized strengthening institutions and forest governance while focusing less on income generation and compensation. Moreover, considering that there were no measures to ensure continuation of payments in the event that carbon markets did not materialize, the long term effects of REDD+ on livelihoods could become negative. This is because communities are still formally bound by the strict regulations limiting their use of forest resources, while there are no carbon payments to compensate for the losses.

8. Conclusion

The thesis has employed a governance perspective to carry out a holistic analysis of REDD+ implementation at local level, comparing three REDD+ pilot sites located in the Amazon region of Brazil, and in Kilosa and Kondoa districts in Tanzania. By following the pilots from the period prior to REDD+ through to the final processes of implementation, the four separate, but interrelated papers presented, apply classical institutional theory to analyze 'what it takes' to establish local level governance structures for trading carbon under REDD+. As such, the papers explore how REDD+ governance structures have been established, including local people's participation and evaluation of the process, what it costs to establish and use these structures and what the outcomes from REDD+ – in terms of impacts on livelihoods and deforestation – have been. The strength of using a governance framework, is that the thesis avoids the assumption that REDD+ is a purely market-based arrangement, which would imply a narrow, utilitarian analysis focusing only on economic interactions. Instead, I take a broader and more realistic view, considering all potential governance structures for REDD+. Approaching the research from a governance perspective as such, enables exploration of the broader issues inherent in REDD+ processes such as distributive issues, political and institutional processes as well as historical, environmental and socio-economic contexts. Moreover, using mixed methods in all four papers adds value to the analysis since some of these issues are better understood using either quantitative or qualitative methods while in some cases supplementing with one of the methods improves understanding. For instance, quantitative methods allow precise measurement of costs and livelihood impacts of REDD+ while understanding the underlying factors influencing costs and impacts requires qualitative methods.

Overall, the thesis finds that local governance structures for REDD+ do not always reflect the original market-based idea where carbon was meant to be traded between buyers and producers. Rather, governance structures are diverse, conditioned by wider political, economic, social and institutional forces in which the policy unfolds. The pilot in Kilosa came closest to establishing a market-based arrangement, by creating a carbon-cooperative to connect local actors to the global carbon market. This process was, however, not completed by the end of the project period (for details, see also Vatn, et al., 2017). Kondoa had the intention to create governance structures for trading carbon. However, the pilot did not progress very much towards the creation of governance structures necessary to meet the market objective. As such, some basic elements for

carbon trade were put in place, such as engaging locals in the process of agreeing to participate in REDD+, formalizing property rights and instituting benefit sharing mechanisms, although the latter were essentially not market-like as payments were based on following certain rules, not on measured carbon. In RDS Rio Negro, the governance structures set out to establish a development and conservation program, but without the goal of trading in carbon. So, the objective was to reward local people for following certain rules (including rules to reduce deforestation), not to exchange measurable carbon with payments per se.

The above observations indicate that creating tradeable carbon under the REDD+ policy is not as simple as it was first envisaged to be. As it turns out, the necessary actors and institutions (governance structures) in Kilosa and Kondoa were inadequate or non-existent, so they had to be established before payments could be made, while RDS Rio Negro did not even attempt to build structures that facilitate carbon trade. Moreover, as REDD+ is about reallocating economic opportunities among diverse actors with varied interests, it is, inevitably a source of conflict. This means that creating a carbon market under REDD+ is a complex political, social and context dependent process that requires creating new or adapting existing governance structures. It is, therefore, demanding in terms of the financial, time and technical resources required. It is notable that in the studied pilots, financial resources were not a limiting factor. Nevertheless, establishing the governance structures necessitated plenty of time as exemplified by the failure to complete the processes in the two Tanzanian pilots. In addition, technical capacities for such issues as measuring carbon, defining property rights and making payments are in many instances weak and have to be developed.

In particular, the findings from the process studies, illustrated that all three pilots sought to be participatory, involving local communities both in the activities and decisions regarding REDD+. Nevertheless, power asymmetries both within participating communities and between communities and REDD+ implementers were largely overlooked in the design of the projects. Empirical findings have illustrated that in all three pilots, NGOs and their implementing partners such as municipal/district authorities successfully used their privileged access to information to influence the decisions in their favor. There is also lack of mechanisms for NGOs to be accountable to local communities. The papers also show that in Kondoa and RDS Rio Negro, local leaders used the power vested in them to influence decisions within their communities. These events caused

substantial conflict in a number of villages in Kondoa, while in RDS Rio Negro, there is evidence that the actions of local leaders lowered the support of REDD+ within some communities. Major concerns in Kondoa and Kilosa were fears about loss of land and income from agriculture and forest products while in RDS Rio Negro the main worry related to loss of income timber. Despite these shortcomings however, REDD+ projects seems to have support in the participating communities. In addition, there is evidence that REDD+ can be truly participatory and empowering for local actors, if the structures of governance, including at global and national levels, account for power differences among actors. For instance, the local people in the Tanzanian pilots, were able to have a degree of influence over the REDD+ processes, due through the support of the participatory forest management and decentralization systems in that country.

In terms of costs, the results indicate that the RDS Rio Negro had lower establishment costs, while its running costs were higher than in Kilosa. Accordingly, establishment costs range between USD 0.5 and 0.6 in RDS Rio Negro and USD 1.7 and 1.9 per ton of expected reduced CO_2 emissions in Kilosa. Running costs on the other hand range between USD 0.9 and 6.4 in RDS Rio Negro and USD 0.3 and 2.0 per ton of expected CO_2 sequestered in Kilosa, depending on the discount rate used. Costs are influenced by the type of transaction, the institutions as well as actions of actors and actor characteristics. There are several uncertainties involved in the analyses – first off all regarding the estimated expected emission reductions. All taken together, it is my assessment that costs are 'conservative', that is underestimated.

Impact studies were undertaken in the two Tanzanian pilots in Kilosa and Kondoa. Results indicate that in both control and pilot communities, total income reduced in all areas in 2015 (the period following REDD+) compared to 2010 (before REDD+). However, the reduction was more drastic in Kondoa than in Kilosa because of the severe drought that hit Kondoa in 2015. Kilosa also experienced drought, but this was milder than in Kondoa. In terms of total income, REDD+ appears not to have harmed or improved livelihoods in both study areas. REDD+ however, increased forest income substantially in Kilosa, and this became an important shock absorber during the 2014/2015 drought year. REDD+ also improved forest cover and forest carbon in both sites, although the recovery was stronger in Kilosa. While this five-year analysis did not find any negative effects of REDD+ on livelihoods, there could be negative effects in the long run as communities are now formally bound by the restrictions regarding forest use, whereas the

anticipated international carbon market has not materialized. Moreover, there were no measures put in place by either the project proponents or the Tanzanian government to ensure that compensation continues after projects ended.

One theme that is consistent throughout the papers is that while REDD+ is implemented locally, the processes and consequences are intimately interwoven with broader political, economic, social and institutional forces at all levels of REDD+ governance. The thesis thus identifies the need for REDD+ policy makers at all levels to be cognizant of the fact that external forces do in fact impact on local REDD+ processes and outcomes. This should consistently be accounted for in the design of REDD+ programs. Relatedly, the thesis also highlights the fact that local realities produce divergent processes and consequences for REDD+. Thus, different places have peculiar historical, environmental, socio-economic, political and governance realities, such that a one size fits all approach is unlikely to suffice under all circumstances. The thesis therefore suggests that implementers must seek to understand and account for these peculiarities in the implementation of projects if REDD+ is to be successful and sustainable.

Finally, there is a tendency for analysts to be biased towards either qualitative or quantitative methods in the study of social processes. As the thesis shows however, REDD+ projects as all other social programs, are implemented in extremely complex environments. For this reason, over-reliance on a single approach may be ill suited to understand all the nuances surrounding a particular social program. The thesis therefore supports the argument that the study of social processes would benefit from expanding the scope to include both qualitative and quantitative methods.

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Paper 1

All that glitters is not gold;

Power and participation in processes and structures of implementing REDD+ in Kondoa, Tanzania

Abstract

Proponents argue that REDD+ (reducing emissions from deforestation and forest degradation) has the capacity to empower and benefit the poor through increased participation in community-based conservation. REDD+ is however, initiated from outside these communities and often enters a landscape characterized by power asymmetries. This paper documents a case-study from Kondoa, Tanzania and finds that even when local people seem to be generally in control of decision making, one may seriously question if there is true empowerment and real citizen control. The paper explores local participation in the various stages of establishing REDD+; i.e., deciding whether to participate, demarcating land and formalizing ownership, deciding on land use plans/by-laws and on the benefit sharing mechanisms. Results reveal that participation may not lead to empowerment and genuine control if the structures and processes of participation reinforce the underlying power differentials among the actors. The study further shows how the broader governance structure spanning from the international to the local level influences REDD+ processes at the local level, and recommends that global and national policy should account for the various forms of power of the actors operating at different levels.

1. Introduction

Community participation is advocated both as a virtue in itself and as a critical component for the success and long-term sustainability of REDD+ policies. Participation can be seen as an important safeguard against potentially negative impacts of REDD+ and as a way to ensure enhanced social benefits and human rights. Moreover, it can be understood as an instrument to ensure effective forest management and conservation (Agrawal & Angelsen, 2009; Ostrom, 1990; Peluso, 1992; Rey, Roberts, Korwin, Rivera, Ribet, & Ferro, 2013; Wade, 1994).

Whether seen as safeguard and a right or as an instrument, both perspectives focus on the engagement of participants in creating desired outcomes. As a safeguard, REDD+ participants are

more likely to claim their rights if they can influence the decisions that affect their lives, either by being represented in public spaces or by attending themselves (Bolin & Tassa, 2012; Lawlor, Madeira, Blockhus, & Ganz, 2013; Lyster, 2011). Consequently, it is argued that if communities and indigenous groups participate 'fully and effectively', the risk of being manipulated and marginalized by REDD+ is reduced and the potential benefits are enhanced (Chhatre et al., 2012; Moss & Nussbaum, 2011; Rutt, 2014; UNFCCC, 2011). Along the same vein, participation as an instrument for conservation suggests that when people participate in crafting organizational structures, monitoring, sanctioning and conflict resolution systems, rules become better adapted and have higher legitimacy. Hence, they will be abided by to a greater extent and forest management is improved (Ostrom, 1990).

The centrality of community participation to REDD+ is best understood within the historical context of conservation approaches in Tanzania and developing countries more generally. From the 1940s to the 1980s, both colonial and post-colonial governments pursued protectionist approaches to conservation (Roe, 2008). Over time, however, these exclusionary approaches faced increasing opposition because exclusion did not produce the expected ecological outcomes and was associated with negative consequences for local people (Brockington, 2002; Brockington & Igoe, 2006). By the late 1980s, community-based conservation and management was growing in popularity in Tanzania. In terms of achieving genuine participation, the literature has, however, highlighted several pitfalls within the country's participatory approaches for conservation. These include powerful economic and political interests compromising implementation and exacerbating land use conflicts and poverty (e.g Bluwstein et al., 2016; Igoe & Croucher, 2007; Mariki, 2013; Mustalahti & Lund, 2009; Walwa, 2017), and problems related to corruption and mismanagement (Lund et al., 2017). With specific reference to forest conservation, others have argued that

participatory forest management (PFM) does not foster economic and democratic empowerment because the processes of forest management require professional expertise, which leads to the exclusion of the majority of people in the communities, leaving only a few trained individuals and development workers or forestry staff to participate (Green & Lund, 2015; Lund, 2015; Scheba & Mustalahti, 2015). Despite these shortcomings, PFM in Tanzania has been lauded for its progressiveness in terms of putting in place the necessary legislative frameworks, as well as recovery and (or) maintenance of forest cover (Blomley & Ramadhani, 2006).

Given the low funding to scale up PFM (Blomley & Ramadhani, 2006), the Tanzanian government hoped to use the 'massive' financial resources expected from REDD+ to scale up PFM (URT, 2013). Indeed, in 2008, the country managed to secure a significant amount of initial funding to begin on its REDD+ readiness process. Although the flow of funds did not continue after this initial period, Tanzania obtained sufficient finances to support the implementation of nine REDD+ pilots across the country. At that time however, there were concerns about the possibility that REDD+ could mirror the negative effects of past conservation approaches including a return to evictions and displacement of forest dependent communities (Beymer-Farris & Bassett, 2012), government recentralizing control over forest land, private interests leasing or buying large areas of forest land at the expense of communities (Phelps et al., 2010) and elite capture of REDD+ benefits and processes by local village leaders (URT, 2013).

The designers of REDD+ in Tanzania were therefore aware of and eager to avoid these past mistakes observed under PFM (URT, 2013). In fact, a number of safeguards were put in place also in Tanzania. It is however, unclear whether these have protected local communities or not. We still do not know whether REDD+ as a new policy, has learnt from past experiences and overcome power issues observed under PFM. In that respect we note that REDD+ is based on a global

initiative to be implemented locally and actors are heterogeneous, often with conflicting interests (Brockhaus, Di Gregorio, & Carmenta, 2014; Ostrom, 2010).

Some studies on REDD+ implementation have analyzed the level of participation only in decision-making especially related to consenting to REDD+, systems for benefit sharing and land tenure (Haugen, 2014; Krause, Collen, & Nicholas, 2013; Lyster, 2011). Yet, while participation in decision-making is important, an exclusive focus on this may easily overlook that significant exercises of power may occur outside public arenas or operating in forms that are not easy to observe. Actors have varied interests and may conceal information and in this way shape the outcomes of decision-making (Gaventa, 2006; Kothari, 2001; Svarstad & Benjaminsen, 2017). Power may moreover also be structural, operating through formal and informal rules; the institutions of a society (Cleaver, 1999; 2012).

Our main objective is therefore to explore how actors participated in decision-making in a REDD+ pilot project implemented by the African Wildlife Foundation (AWF) in 21 villages in Kondoa district, Tanzania. Doing so, we also try to unravel the power relations involved, thereby contributing to a literature – e.g., Benjaminsen, 2014 and Scheba & Scheba, 2017 – that has examined power struggles within local REDD+ processes in Tanzania. We follow three processes; the decision whether to embark on REDD+, the demarcation and formalization of land rights (land use planning), and finally how benefit sharing mechanisms were decided upon and payments introduced. The analysis proceeds in two steps. First, we investigate how actors participated in decision-making including how they exercised power to influence which issues were discussed. We further conducted an analysis of how participants evaluate their involvement. Proceeding this way, we demonstrate how decisions taken in the public arena of a seemingly rather successful

project (NIRAS, 2015) were influenced by exercises of power – both visibly and invisibly – through actors both within and outside the community.

The paper is structured as follows. In section two, we discuss relevant theoretical concepts on power and participation. Section three sets the scene for the study, while details on methods are in section four. Finally, results are presented in section five and discussed in section six.

2. Theories on participation and power

The UNFCCC emphasizes full and effective participation of all stakeholders in REDD+ implementation (UNFCCC, 2011). REDD+ enters, however, a complex landscape of existing interests and institutions. As noted above, participation may not by itself ensure that outcomes are 'good, 'balanced', 'efficient' or 'legitimate'. The structure of REDD+, as externally initiated, may frame processes significantly. A key issue regards the process of consenting to REDD+. On what basis can one actually say that a 'yes' or 'no' reflects the interest of the involved communities? This is about the quality of the process, including what kind of power is exercised. It concerns the relationships between communities and the external initiators of REDD+ (e.g., the NGO and the involved district authorities) as well as the internal power relations in the communities.

One may argue that if the process of entering REDD+ or not has involved local communities properly, the decision is 'good'. Arnstein (1969) uses the eight rung hierarchical ladder where each rung represents a certain quality of citizens' participation in and control over decision-making. At the lower end of the ladder, there is 'non-participation' where power holders only 'educate' and 'cure'. Then there are rungs emphasizing consultation where people can also voice their concerns, while still lacking the power to ensure that these are taken into account. Only at the highest rungs of participation – 'delegated power' and 'citizen control' is participation genuine in the sense that

citizens have real power to influence the goals made and the decisions taken. Pretty (1995) and White (1996) suggest similar systems for 'ranking' participation; seeing participation as a continuum from a purely instrumental end-means participation process to a rights-based, self-empowerment participation approach where planning, decision-making and implementation is placed with the local people/citizens.

Common to these typologies is the view that increased participation efforts are empowering because citizens have real influence over the processes. However, while this mainstream view still dominates engagement for participation, it has also attracted widespread criticism, emphasizing that it fails to adequately account for the importance of power in participation (Cooke & Kothari, 2001). This is because, for empowerment to occur, individuals and groups must not only be able to exercise agency – the ability to act on behalf of the goals that matter to them – but also to challenge structural barriers such as broader political, economic, social and cultural forces and structures that shape, constrain and enable agency (Dutta, 2011). Therefore, studies of empowerment should capture both agency and structural dimensions.

By emphasizing access to decision-making arenas, standard typologies regarding participation reflect a rather limited perspective of power similar to those emphasized by Dahl (1961) and Polsby (1963). These authors see power essentially as exercised through decision-making. Power is, moreover, seen as pluralistically spread across interests. Any issue that is important in the community could therefore provoke an interest group to push their grievances through the decision-making arenas in order to be heard. Because conflicts of interest are seen as revealed by political participation, non-participation can be thought to reflect satisfaction or even consensus. Such analyses would cover what transpired in the decision-making process by asking questions like: Who participated, who did not and why? What were the key issues or conflicts? How were

they resolved? Many studies usually argue that opening up of decision-making processes empowers the less powerful by reducing the power of elites.

While these are important issues, not all conflicts of interest might be openly included in the decision-making processes (Bachrach & Baratz, 1962; 1963). On the contrary, powerful actors might block what makes it to the official arenas through 'mobilization of bias', referring to a set of dominant beliefs, values, rituals and institutional procedures that operate to systematically benefit what is usually a minority elite group. Therefore, consensus or non-participation may not necessarily indicate absence of conflict – i.e., the conflict is covert. Akbulut & Soylu (2012), Soylu (2014) and Aguilar-Støen (2014) document examples of exercises of agenda setting power, the latter in a PES project.

Finally, Lukes (2005) adds a third dimension when formulating his three-leveled account of power. Power is not only the capacity to influence decisions (Dahl), or to block what comes on the agenda (Bachrach & Baratz). Power may also be exercised in terms of preventing conflict from emerging in the first place through shaping people's perceptions and preferences, so that they accept their role in the existing order. That is, one may exercise power by influencing the very wants of others. So, while the perspectives of Dahl and Bachrach and Baratz are behaviorists in their foundations, Lukes' third dimension adds a social constructivist perspective to power emphasizing structural dimensions of hegemony and ideology.

It follows therefore, that a significant part of power is invisible. To address these concerns, Krott et al (2014) suggest a framework that aims to make power empirically observable. Unlike Lukes' three-leveled account, which conceptualizes power in terms of the capacity of an actor to make another do something that they would otherwise not do (power as domination/"power over''), Krott's framework places more emphasis on power as the potential to do something (power

as property/"power to"). Accordingly, there are three sources of power, with which actors can alter the behavior of others. These include, *coercion* through for example regulation, physical action or threat of force, *(dis)incentives* in form of advantages or disadvantages and *dominant information*, which regards altering the behavior of others using misinformation or information that is unverified or blindly trusted (Krott et al 2014, Prabowo et al 2016, Wibowo and Giessen 2015).

Against this background, a typological view of participation, concentrating only on agency through meetings and representation may miss important aspects regarding if empowerment is taking place. It does not capture the structures that may accentuate empowerment or disempowerment (Cleaver, 1999). Participation must be studied as situated within the broader context of people's social life. This implies a need to understand the organizational structure, the characteristics of actor arenas and how power, resources and authority are distributed among people. Key here is how institutions, both formal and informal, influence these aspects (Vedeld 2002, 2017). Accounting for structure is therefore important to understand the local context in which individuals and groups exercise agency, including heterogeneity within and between village commons (Adhikari & Lovett, 2006; Poteete & Ostrom, 2004; Vedeld, 2000).

So, accepting or rejecting REDD+ locally may depend on complex relationships between interests, institutions and power. In a case like REDD+, the linkages across scales – i.e., local, national and international – are also important (Gaventa, 2006; Mohan & Stokke, 2000). The international level is crucial for the framing of the context within which REDD+ is to be instituted locally – e.g., the creation of carbon as a commodity to be traded.

3. Context of the study

Below, we present the study areas, the NGO responsible for implementing the project and we give some general information about forest governance in Tanzania.

3.1 The study site

The pilot project operated in Kolo/Irangi hills, in Kondoa district, Dodoma region in north-central Tanzania. Kondoa district consists of 28 wards[1]/sheias with a total population of about 270.000 (Kajembe et al., 2016; NBS, 2013). The district has a semi-arid climate with an average temperature between 16 and 29^{o}C and an average annual rainfall of 500-800 mm. Rainfall is variable, erratic, and falls in short, highly erosive storms (Kangalawe, 2012). Soils are highly erodible, sandy loams with low content of clay and organic matter (Mgeni, 1985). The district is divided into two topographic areas; the Kolo hills with altitudes between 1000 and 1500 m and the surrounding plains at between 500 and 1200 m above sea level. The plains are undulating with a few isolated hills and large swamps while Kolo hills is a rolling hilly zone (Dejene, Shishira, Yanda, & Johnsen, 1997). Kolo has a population of about 62,000 (14,000 households). The main economic activities are crop cultivation (70.2%), agro-pastoralism (27.4%) and salary employment (1.4%) (African Wildlife Foundation [AWF], 2012; Matilya, 2012).

The project area covers 19,924 hectares of community and government land, of which 10,114 hectares are forest reserves. Adding the reference area and leakage belt, the total project area was 71,632 hectares (Matilya, 2012). There are two government forest reserves – the Salanga, a central government reserve, that falls under the jurisdiction of the Tanzania Forest Service and Isabe, a local government forest reserve managed by the district. 15 out of the 21 villages border the government forests. Five have forests on community/village land, while one village has both

own forests and border a government forest – see Figure 1.

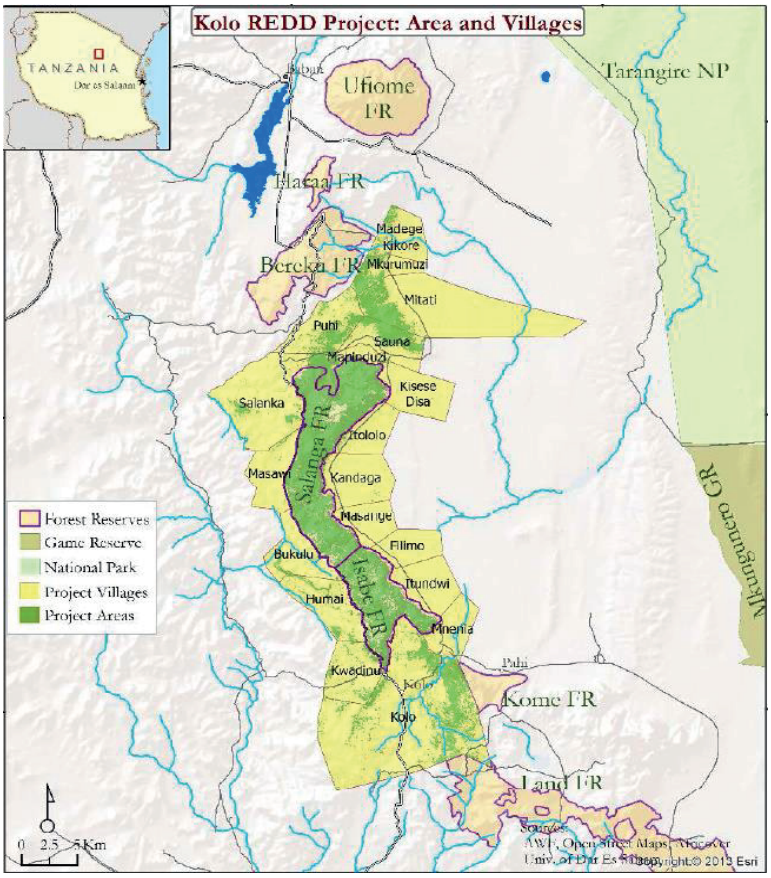

Figure 1: Location of project villages and government forest reserves
Source: Loubser, D., Knowles, T., & Boardman, P. (2014)
Red dots indicate the location of study villages

Kondoa has a long history of deforestation and land degradation with subsequent losses of productive land. Both colonial and postcolonial regimes have over the years initiated several interventions to fight environmental degradation and restore land productivity. Already in the 1850's and 60's there were obvious signs of erosion, although these historical records also describe the area as being well-vegetated. Widespread forest cutting however, began in the early 1900's.

Kondoa, being a vibrant production and trade center at the time, was facing increasing demand for agricultural land to feed caravan traders and German troops during the First World War (Östberg, 1986). Moreover, the area was infested with tsetse flies and in 1927, the British colonial government started undertaking large-scale forest clearing programs to combat tsetse. These campaigns would continue through the 1930s and 40s, ending in 1949 (Mugasha & Nshubemuki, 1988). Yet, extensive land degradation in the 1940s also meant that many families were increasingly becoming dependent on famine relief, which prompted the colonial government to carry out further forest clearings to provide land for families from the severely degraded areas. This period also saw forced resettlements of people to the newly established settlements and attempts to reduce livestock, both of which met with local opposition (Östberg, 1986). Given the torrential rains, undulating topography and erodible soils, such forest clearances made Kondoa one of the most eroded areas in Tanzania.

Several conservation measures were instituted in the 1940's. These promoted new production methods, as well as compulsory reduction of livestock and resettlements (Lane, 2009). These actions were associated with colonial force and met strong opposition from local people (Kangalawe, 2012). The forest reserves in the study area were also gazzeted around this time; Salanga in 1941 and Isabe in 1954 (Charnley & Overton, 2006), followed by the establishment of forest laws like the Forest Ordinance of Tanzania (1957).

Starting in the 1940s, the opposition to conservation programs was becoming part of the wider opposition to colonial rule and by the late 1950s it was practically impossible to implement conservation programs. Consequently, by the time the country gained independence in 1961, the intervention programs had ceased to exist. The post-independence government shifted its focus to agricultural production, paying less attention to conservation issues. Throughout the 1960s,

therefore, forest reserves were in practice open to local people despite being legally under a protection status. As a direct consequence of these political changes, and the fact that previous conservation strategies had been largely unsuccessful in reducing soil degradation, many areas had no vegetation cover left by the early 1970s (Backeus, Rulangaranga, & Skoglund, 1994). This prompted the Tanzanian government to take action and in 1973, the HADO project (Hifadhi Ardhi Dodoma or Conserve the Land of Dodoma) was introduced. HADO covered the three districts of the region, with a main focus on Kondoa, specifically the Kondoa Eroded Area (KEA) which covered 1256 km^2, or about 10% of the total area of the district (Kangalawe, 2012; Mugasha & Nshubemuki, 1988). Villages in the southern part of the REDD+ target area were either within or very close to the KEA. Within the KEA, land degradation was perceived so dire that in 1979, the project completely removed livestock from all villages. This move was complimented by raising tree nurseries, free distribution of seedlings and the establishment of tree planting demonstration plots. Although destocking was unwelcome to many local people (Mug'ong'o, 1991), it resulted in an impressive regeneration of the vegetation (Backeus, Rulangaranga, & Skoglund, 1994) and HADO seems to have been (partly) favorably evaluated by the people in terms of its association with improved rainfall and more fodder for their animals (Östberg 1986).

The most recent external intervention prior to REDD+, was the USAID funded PFM project implemented by AWF in four villages of Kondoa from 2007. Although this project also involved controlling the use of forest resources, its participatory nature was meant to represent a radical departure from past projects that had mainly been coercive and non-inclusionary. Key aspects included providing local people with opportunities to consent to or reject participation in the project, as well engaging them in land use planning and formulating forest use bylaws. The

REDD+ project which started three years later was, essentially, a continuation and scaling up of this – USAID funded – project.

3.2 Overview of the study villages

Seven villages were selected for the analyses – Kisesedisa, Kolo, Mapinduzi, Masange, Mitati, Mnenia and Puhi. Four of these were selected randomly out of the 17 villages which, by the time of data collection had completed the REDD+ process. The other three were purposely selected out of the four which did not complete the process to give insights on issues and on sources of conflict and to better understand variations between villages in these processes. To avoid revealing the identity of people involved in these three villages, we will refer to them as village 5, 6 and 7 in the results and discussion sections.

As shown in Table 1, the forests in Kisesedisa, Mapinduzi, Masange and Mnenia, are on government land. Puhi and Mitati have forests on village land, while Kolo has both a village forest within its boundaries and borders a government forest. On paper, local people have no rights to access government owned forests except when they have a joint forest management (JFM) agreement with the owning authorities. As previously indicated, four of the 16 villages with government forests including Kolo and Mnenia[2] launched a JFM project in 2007 working with AWF and the district. In Mapinduzi, Masange, Kisesedisa, the practice was *de facto* open access before REDD+.

Table 1: Characteristics of study villages, Kondoa District, Tanzania, 2014

Village	Forest ownership	Previous experience with PFM (JFM)	Walking distance from village center to the forest (min.)	Walking distance from village center to local market (min.)	Distance from village to Babati (min. by car)	Persons/ha of forest land[a)]
Kolo	Government and community forest	Yes	10 (for both forests)	0	90	1.0
Masange	Government	No	10	5	80	4.1
Mapinduzi	Government	No	15	8	60	1.5
Mnenia	Government	Yes	15	3	90	5.2
Kisesedisa	Government	No	15	10	45	4.1
Mitati	Community	No	45	15	35	4.5
Puhi	Community	No	35	15	30	2.6

[a)] Population numbers are from the national census of 2012. Different sources present different figures for forest sizes. We chose to use figures from the project note submitted by AWF to the Plan Vivo Foundation (Loubser, Knowles, & Boardman, 2014) because it is the only source that had numbers for both village and government forest areas. Results should therefore be interpreted with caution. Figures for agricultural land in the village and total village land were unavailable for Kolo, Puhi, Mitati and Kisesedisa because they had not completed land use planning by the time of the survey.

Forests are easily accessible as most of the villages (except Puhi and Mitati) are within 15 minutes walk from the forest. Local markets are also quite close. Additionally, all villages have relatively easy access to external markets, the furthest being about 90 minutes by car from Babati town, the major regional center.

3.3 The conditions for implementing REDD+

The project implementer – AWF – is an NGO established in 1961 with a focus on conserving wildlife in Africa. In December 2009, AWF signed a contract with the Norwegian Ministry of Foreign Affairs (NMFA) (NOK 14.43 million) to implement a three-year REDD+ pilot project from January 2010 to December 2012. The project 'Advancing REDD in the Kolo Hills Forests (ARKFor)' was later extended to December 2013. Kolo Hills is one of altogether nine REDD+

pilot sites in Tanzania. This pilot was chosen because it had prior experience with participatory forest management (PFM), which according to the Tanzanian national REDD+ strategy was the basis for advancing REDD+ in the country (URT, 2013). Moreover, the vegetation is mostly of Miombo woodlands, a dominant type of forest in Tanzania and was therefore representative of the country.

The project was part of an initiative by the Norwegian government to facilitate REDD+ internationally. While being linked to the UN and World Bank engagements in the same process, Norway was the largest financial supporter for REDD+. It looked at REDD+ as an efficient strategy to curb climate gas emissions (Norwegian Prime Minister's Office, 2007).

Because of ongoing accountability issues[3], NMFA decided to direct REDD+ funds to the NGO sector instead of going through the Tanzanian government. Hence, the pilot projects were established independently of the national structures and processes[4] regarding developing governance structures for REDD+. This also implied that AWF reported to the NMFA and was accountable to it. The contract emphasized capacity building as a key responsibility for AWF (NMFA, 2009).

Forests in Tanzania are either placed under government responsibility – as forests reserves, national parks and general land – owned directly by villages (village land) or in a few cases also owned by individuals. There are substantial debates in Tanzania regarding the distinction between general land and village land (URT, 2013). There are also disputes regarding villagers' access to resources in government reserves. To ensure successful conditional payments under REDD+, land rights need to be clarified. Next, as village forests are under common ownership, one may face issues regarding internal distribution of costs and benefits related to a REDD+ contract.

AWF developed the project within the Tanzanian system of local governance, and land and forest management. Three elements are of particular importance. First, the Local Government Act (URT, 1982) defines the responsibilities of the village council to convene a "meeting of the village assembly to discuss and decide upon any matter of extraordinary public importance" (Section 103, sub-section 3). Second, there is a system for establishing village land as outlined in the Village Land Act (URT, 1999). Lastly, there are procedures for PFM as formulated in the Forest Act of 2002 (URT, 2002). PFM implies the opportunity to establish joint forest management (JFM) between villages and the government for government forest reserves and community based forest management (CBFM) in village forests. A key element of the PFM policy is land use planning.

The three elements above formed the basis for the overall strategy followed by AWF in implementing REDD+. Specific interventions included seeking the consent of participating communities, land use planning, making payments and deciding on benefit sharing arrangements. Income generation activities, although present, were not yet widely spread in the communities by the end of the project period.

AWF engaged locals though a series of separate meetings for making decisions related to each of these processes. In addition, the NGO worked with the Kondoa District Council and the District Forestry Office to ensure local legitimacy and to fulfill formal requirements regarding PFM. They also engaged consultants from private companies such as Clean Energy for Carbon Assessment, research institutes like Institute of Resource Assessment for socio-economic surveys, Selian Agricultural Research Institute for implementing livelihood activities, and the National Land Use Planning Commission for land use planning.

4. Methods and data collection

Data were collected between January and February 2014, while supplemented with information obtained in 2010 and 2015, as part of our study also of the costs and impacts of REDD+. We combined quantitative and qualitative approaches allowing us to get an understanding of the case that single methodological approaches would not ensure. The quantitative data were basis for numerical estimates regarding how people evaluated the decision-making processes. Qualitative methods enriched our understanding of the quantitative results and allowed us to investigate issues that were not amenable to quantification

We had two main sources of qualitative data – focus group discussions (FDGs) and resource person interviews. Two FGDs were conducted in each village. They involved semi-structured interviews with five to eight people – one with men and another with women who had attended meetings on REDD+ in the village, but that held no leadership positions. In addition, semi-structured interviews were undertaken with resource persons; one meeting with the village chairperson (political leader) and the village executive officer (technocrat employed by government). Another meeting was held with the chair and vice chair of the village natural resource committee. In addition, we had separate meetings with the district natural resource officer, the district forest officer, the district chairman (political head) and staff from the African Wildlife Foundation (AWF). Some informal interviews were also conducted during the fieldwork. In addition, we reviewed project documents from AWF and Tanzanian policy documents on local governance, forest governance and REDD+.

Quantitative data were collected through surveys undertaken among altogether 200 respondents spread across the seven villages. Closed ended questions in the survey instrument were followed by open ended questions to better understand the motivation behind people's quantitative

responses. 75% of the sample were randomly selected from attendance lists of REDD+ meetings and 25% from those that did not attend. The stratification was done because attendance in meetings was rather low, and we wanted to have good coverage of those attending meetings.[5]

The quantitative data on participation was assessed on a categorical scale. That is; we used 'Yes' and 'No' responses to questions about whether a respondent had attended meetings relating to REDD+ and whether a community had completed the REDD+ process. To capture perceptions, we used Likert scale variables on the impression of meetings, and information offered at meetings (on a scale of 1 to 5, e.g., 'Very bad', 'Bad', 'Satisfactory', 'Good' and 'Very good'). Finally, for participation we also gathered qualitative data – i.e., data regarding people's experiences and the reasons why they participated or not. In the case of power, we only used qualitative data – e.g., information on roles/positions, actions and various structures regarding decision-making and information flows.

5. Results

5.1 Participation and power in decision-making

In this section, data from interviews with resource persons and focus group discussions is used to explore the different phases of instituting REDD+. We detail people's participation at each stage and describe how different actors exercised power to influence REDD+ discussions.

5.1.1 Phase 1: Consenting to REDD+

The process started with an introductory meeting between AWF and the village council in each village. AWF then launched REDD+ in January 2010, in a meeting where the district, ward and village leaders and Members of Parliament from the district were invited. Information was given about the project and questions were answered. Next, AWF met with the village councils once again and if the council agreed, they called a village general assembly where AWF and district

officers introduced the idea to the regular villagers. At the general assembly, AWF and the district officials emphasized issues like environmental conservation, climate change, how REDD+ could help to mitigate it, what the contributions of and benefits for the villagers could be as well as suggesting alternative income generating activities. The village assembly decided to join or not by following a majority vote, either through raising voices or by show of hands. It seems clear that potential risks and uncertainties of the project were not much emphasized.

Of the 21 villages, there was at this stage serious opposition in five – including two of the villages selected for this study[6]. In village 5, the fear for loss of livelihoods seemed to be the main reason for discontent as illustrated by a statement made by one of the participants in the FGD with men as a response to why their village refused to be part of REDD+.

> *"In the beginning, we worried about what we had heard over radio and seen on television happening in other parts of the country where there were REDD+ pilots. It was very difficult for people to get anything from the forest. No firewood, no poles and no timber. So, we told AWF to give us three years to observe how they (AWF) would implement the project. We did not refuse the project. We only told them to give us some time to observe."*

Several members of the village council – after having met with AWF – urged people to reject REDD+. Ultimately, at the introductory meeting, AWF and the district officers were given little chance to present their case because the meeting became chaotic, prompting the technocrats to leave unceremoniously. This village never consented to participate in REDD+.

In village 6, some members of the village council disagreed with embarking on REDD+ during their second council meeting with AWF. The leaders received information from AWF and agreed to call residents for meetings, but they chose not to relay this information to the rest of the villagers. This prompted the district commissioner to write a letter to the village chairman asking

him to cooperate. After this letter, the leaders very reluctantly invited people for meetings and the village decided to join the project, although the information about the meetings was not well spread. Villagers cited corruption within the village council as reason for the behavior of leaders. In an informal interview, one elderly woman asserted:

"The rules are very strict in the villages that joined REDD+. Now, everybody comes to our village to make charcoal. You see, half the village council is corrupt. As long as you can pay a bribe to the chairman, you can enter the forest. That is why they (leaders) did not want us to know about the project."

5.1.2 Phase 2: Land Use Planning (LUP)

The next step was to undertake land use planning. LUP meetings were convened in each of the villages accepting the project, where each village elected two representatives – a male and a female – to the village land use planning team. This team worked with a technical committee from the district – the participatory land use management team – to carry out land use planning.[7] The process began with training village land use planning teams and village leaders on land use planning and REDD+ concepts. The land use teams from the village and district together with village leaders then demarcated the village boundaries, next divided it into agricultural, forest and grazing land[8], residential areas, burial places, land for schools, etc. In the meantime, the villagers – facilitated by AWF – drafted bylaws to govern resource use. For village forests, bylaws were drafted by the village council and then approved by the general assembly. For villages bordering government forests, each village council drafted bylaws, which were approved by village general assemblies and signed by an inter-village council (JUHIBECO). Mandated by the law to enable joint management of forests, the inter-village council was established as part of the REDD+ process and was composed of two elected representatives from each village bordering the government forests.

After the bylaws were set up and the demarcation completed, land use plans were prepared by the land use team from the district, taken to village general assemblies for approval and then sent to the district council for comments and further approval. They were finally forwarded to the Ministry of Lands for legal gazettement. The bylaws restrict the type and extent of production activities permissible and suggest an amount of fines for breaking the rules. For the most part, these by-laws were a revival or adaptation of the old rules that existed within the communities since the times of the HADO project. As such, they were already familiar to the communities.

Village 7 opted out at the LUP stage. A counselor from the ward development committee, who was rich and influential, spread rumors that the forest would be sold if people accepted REDD+ and urged them to reject it. An FGD respondent expressed fear about loss of the forest in the following way:

> *"If there is carbon (hewa ukaa) everywhere, why don't they (the Europeans) first buy from themselves? What is so special with our forest? We have heard that some leaders want to connive to sell our forest. But, in this village we will never agree to that."*

Due to the rumors, some had their minds made up to reject the project by the time of the general assembly deciding on the LUP. These people disorganized the meeting, created chaos and forced AWF and public officials to leave. By doing that, they restricted the rest of the villagers from getting information other than the rumors they had already spread. Focus group discussions revealed several reasons for why the councilor acted as he did. First, he had a direct interest in income from the forest because he was one of the biggest charcoal makers in the village. The other reasons were political. The councilor had run his campaign with a promise to protect the forest from being taken away from the community, so he was (in fact) following up on his promise.

5.1.3 Phase 3: Benefit sharing and payments

This process began with drafting criteria for making payments. Three criteria were developed by the village councils, facilitated by AWF and the district officials and then taken back to the village assemblies for final approval. The first criteria was governance, for example how often the village council called village meetings; the second, compliance with reducing deforestation assessed by for example counting the number of tress cut; and the third was how well the villages were following rules in the bylaws, such as zero grazing and conservation agriculture. Hence, the criteria were based on governance and rule compliance and not on changes in the forest carbon status.

With the exception of village 6, all participating at this stage fulfilled these criteria – albeit to different degrees. Therefore, trial payments varied to some extent. The village with the highest payment got – 7.937.201 Tsh – and the lowest – 6.124.282 Tsh.[9] All payments were made to the community as a whole. The village council met to propose ideas on how to allocate the money to community projects like the village office. These proposals were then approved at a general assembly where the villagers also had the chance to propose new ideas. At the time of data collection, the benefit sharing process was finished in all villages that fulfilled the payment criteria except in one village where the village council had not yet agreed upon how to apportion the money to community projects.

5.2 Local evaluation of REDD+ implementation

Given the above, how did people evaluate the processes? Basing the analysis mainly on the survey data, supplemented with resource person interviews and focus group discussions, we will present people's opinions about the REDD+ project, the way meetings were conducted and the quality of the information offered.

5.2.1 Overall perception of the REDD+ project

About 75% of respondents (N=195) reported a positive or very positive view of the project. This translates to an average score of 3.8 on a 5 point Likert scale. In the villages that completed all processes, the average score was 4.2 compared 3.2 in those that did not complete or engage in REDD+. Therefore, opinions varied across villages, with those that completed all REDD+ processes having a more favorable perception. A Chi-square test further supported this finding by showing a significant[10] relationship between attitudes to the project and completion of the REDD+ process (χ^2 =49.7, df=4. P=0.000). The most important reason given for positive attitudes was environmental protection (84%, N=141). Focus group discussions and resource person interviews revealed that people associated deforestation with the recurrent droughts in Kondoa, and believed that the conservation of forests could have positive effects on rainfall with the subsequent increases in crop and livestock outputs. For those with indifferent or negative attitudes (N=42), limited knowledge about REDD+ (55%) and loss of land (40%) were the most important reasons given. Here, qualitative interviews made it clear that the actions by leaders to block (or spread) certain types of information, largely contributed to this lack of knowledge and the perception that REDD+ would lead to land loss.

5.2.2 Perception of the decision-making processes

Overall, the respondents reported positive attitudes on the three decision-making processes – i.e., the decision on whether or not to join REDD+, land use planning and benefit sharing. This was especially so in the villages that went for REDD+. For instance, when asked about how free the decision to participate was, 82% (N=139) indicated that the decision to join or not join the project was made freely. 94% (N=69) felt that they were not coerced into accepting or rejecting to carry

out LUP in their village. Also, 98% (N=41) stated that they freely accepted the payment formats decided upon. There are variations in number of respondents (N) for the three processes because some of the villages did not participate in all of them.[11]

The results further indicate a very positive view of the meetings arranged for the three processes. 83% (N=148), 96% (N=72) and 98% (N=52) of the participants considered the introductory, land use and payment meetings to be satisfactory, good or very good respectively. It seems clear from these results that people were least impressed with the introductory meetings where at least 17% of the participants reported a bad or very bad impression. This could be explained by the differences in samples – i.e., that villages with opposition did not get to or complete the other processes. Fisher's exact test indicated a statistically significant relationship (p=0.000) between completion and impression of meetings. Thus, respondents from non-completing villages were less satisfied with introductory meetings compared to their colleagues in the villages that completed the REDD+ process (Figure 2).

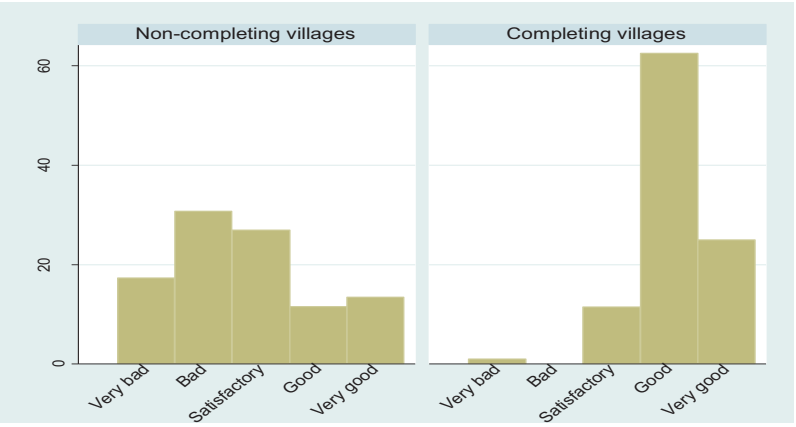

Figure 2: Perception of introductory meetings, REDD+pilot Kondoa district, Tanzania 2014

The reasons provided for the positive attitudes towards the meetings on payment were that people considered them to have been very open and peaceful. Similarly, the majority thought that LUP meetings had been open. The few who were not content were mainly from village 7 where the LUP meeting turned chaotic. These reported that top-down communication was the reason for their discontent. Note that there were no such meetings in villages 5 and 6.

Respondents were also generally happy with the information they received during all meetings. At least 81% (N=149) reported that the information given in the consent meetings was either satisfactory, good or very good. Again, there is a significant relationship between completion and opinion about the information offered at meetings with a p-value of 0.000 (Figure 3).

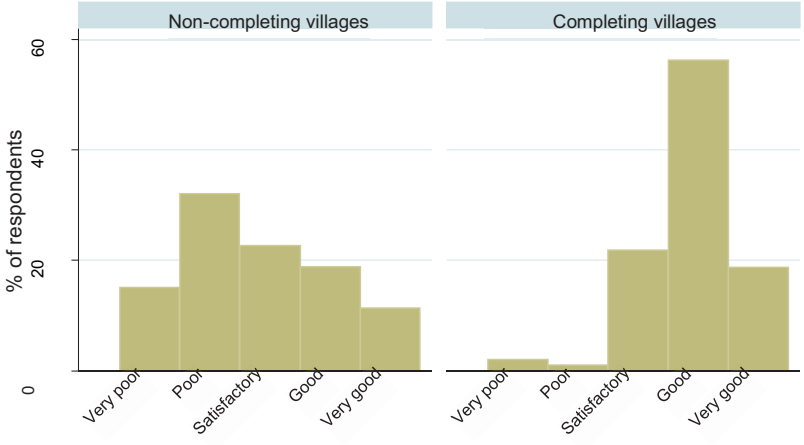

Figure 3: Perception of information offered at introductory meetings, REDD+pilot, Kondoa district, Tanzania 2014

Further, 98% (N=54) and 93% (N=70) thought that information in payment and LUP meetings respectively was satisfactory, good or very good. Reasons are similar to those discussed earlier with variations arising from opting out or into the program. Focus groups and resource person interviews further confirmed the finding that the participatory approach was largely responsible for the positive evaluations of REDD+ processes. Generally, people appreciated AWF's strategy of involving communities in the decisions regarding REDD+, as opposed to the forceful methods employed by previous conservation programs.

6. Discussion

Discussing our findings, we emphasize the interconnections between participation, interests, and power through examining the way actors exercised agency within the broader governance structure – spanning from the international to the local level – in which REDD+ unfolds.

Participation enabled villagers to gain some control over most decisions. We find that communities were consulted and provided with information for all three processes. At the general assemblies, residents were given the chance to make changes to proposals. Community representatives also played a leading role in demarcating land, developing bylaws and criteria for payments as well as selecting income-generating activities (similar observations are made regarding a REDD+ pilot in Kilosa; see Vatn et al. 2017). In communities that joined REDD+, the overall attitudes to the project and the decision-making processes were positive. Moreover, in some communities, people rejected participating in REDD+. We attribute these achievements to the Tanzanian PFM and decentralization systems that emphasize engagement of communities in decision-making. These institutions provided for and permitted leaders to call meetings for people

to decide on whether to join REDD+, discuss the issues, contribute ideas and follow the implementation of the entire process.

Therefore, based on an assessment of people's participation in public processes, one could conclude that REDD+ was participatory as people were in charge of the decisions concerning how to engage in REDD+. However, reverting to the links between participation and power, there are reasons to question whether participation in this case was genuinely empowering. To this end, we find that an interpretation going beyond just 'access to decision-making arenas' is necessary.

Lukes' second level of power – referring to Bachrach and Baratz (1962; 1963) – posits that the powerful may confine decision-making to relatively safe issues. In this study, this type of power (agenda setting) was evident among some village leaders, as well as AWF and district officials creating barriers against discussion of certain issues concerning REDD+. For instance, using their mandate to convene meetings, some leaders used the meetings to deliver information in line with their interests – as in village 5 and 7 – or refused to call meetings entirely – as in village 6. Residents felt that leaders had private economic interests going against REDD+, such as charcoal revenue or income from bribes or they had political interests including re-election in the then upcoming 2015 general elections. The leaders mobilized public support for rejecting REDD+ using issues of concern to the masses for example loss of livelihoods or forestland. Mustalahti & Rakotonarivo (2014) also observe local leaders using power and information imbalances to influence the consent decision elsewhere in Tanzania.

AWF and the district officials also exercised agenda setting power. The contract between AWF and the NMFA was the main instrument used to set the agenda for what was to be discussed. Accordingly, it outlined capacity building among both communities and district forest staff as one of the major mandates for AWF. This contract further required AWF to account upwards to NMFA

and the national actors regarding risks and successes of REDD+. In sharp contrast, neither the contract nor the national level guidelines such as PFM[12] required a similar downward accountability to the communities, an observation made also by Mustalahti & Rakotonarivo (2014) and Nuesiri (2016) in their analyzes of REDD+ piloting.

Thus, AWF and the district officials were mandated to provide information, but had flexibility concerning the type of information that they would disclose to local people. We note that AWF and the public officers generally did not discuss issues that could cause conflict or doubt among participants during the meetings. For example, the fact that there was lack of a global agreement and hence an uncertain future for REDD+ financing and political support was not much mentioned, if at all – see also Fosci (2013). In addition, vital information regarding how to share benefits and costs between government and communities did not feature in discussions with the villagers. This is especially important in the villages where REDD+ is implemented as Joint Forest Management (13 out of the 21 villages). While there were suggestions from AWF and the public officers of an 80% share of benefits for communities, these suggestions were not discussed during the village general meetings. Instead, the focus during payment meetings or indeed with community leaders was on devising criteria for making payments and on how to allocate the money to the various community projects. In the meantime, the NGO pointed out the lack of clarity regarding benefit sharing in higher level fora such as national and international conferences where donors, government officials and technocrats were likely to be present (Matilya, 2012). Note that at national level, legislation is silent on how benefits and costs in joint forest management arrangements should be shared, even if the Ministry of Natural Resources and Tourism has made some suggestions (Blomley & Iddi, 2009). This legal uncertainty made it extremely difficult for AWF and the district officials to clearly inform the villagers on this issue.

The third level of power, 'invisible power', as suggested by Lukes, relates to shaping people's opinions to accept their role in the existing order. Here again, the contract between AWF and the NMFA supported AWF and the district officials to exercise this form of power over local people. Since the contract required AWF to build local capacity, detailed information at general meetings and through targeted trainings was provided on conservation, climate change and REDD+ concepts, forest management and land use planning, forest law and enforcement, carbon measurement, and sustainable income generation. After the long history of deforestation in Kondoa, this message was familiar to what people saw as reasonable measures for protecting their environment, in line with local values and norms. This was, in part, because of the colonial and post-independence policies concerning land use, soil erosion, deforestation and degradation processes. Over the years local people had been exposed to a number of external-actor and state policy interventions as well as local and internal initiatives to control and limit land and other resource uses. These interventions influenced and partly formed local people's knowledge and skills over time, but also their attitudes, values and norms towards both external interferences in general and also the more concrete practical content and consequences of interventions. For example, the HADO project, which had been undertaken previously in the area, had led to the perception that forest conservation could enhance rainfall, an important factor in the agricultural-based economy of Kondoa. Therefore, HADO had managed to enhance people's understanding of the need to conserve – although the project was very undemocratically run. Combined with AWF's more persuasive as well as inclusive approach, communities became more open to the idea of conservation.

It seems less surprising therefore, that over 80% of the respondents gave conservation as the main reason for why they thought positively about the REDD+ program. Proponents framed

REDD+ within the conservationist discourse developed over many years, a finding that resonates with Agrawal's point regarding how new discourses may over time change actors understanding of self and their environments (Agrawal, 2005). Ultimately, REDD+ in Kondoa exemplifies how the structures of hegemony and ideology at international and national levels of governance could influence decision-making at the local level.

The foregoing discussion makes it clear that *dominant information* was an important source of power through which AWF and district officials convinced local communities to participate in REDD+. As important were the *incentives* provided to the communities, most importantly, the promise of environmental conservation, but also payments and trainings. This notwithstanding, we also find some modest enhancements in power status of local people (see also Schusser, 2015). This is because *coercive power* in terms of regulations enshrined in the PFM and decentralization systems – to some extent – helped to counter the power held by AWF, the district and community leaders. Since locals generally took part in deciding on the bylaws, payments, land use plans and choosing leaders, they gained some control of the decisions being taken. This, in itself, is an important finding considering that similar studies of power have pointed out that local participation in forest management (including REDD+) has done little to counter the negative exercises of power over local people (e.g Benjaminsen, 2014; Devkota, 2010; Maryudi, 2011; Schusser et al., 2013). As previously mentioned, this rather positive result can be attributed to the fact that community participation was embedded in the PFM guidelines and decentralized systems of the Tanzanian state. So, in this case, coercive power was in fact helpful for improving the situation of local people.

7. Conclusion

In this paper, we have employed theoretical perspectives on participation and power to investigate how actors participated in decision-making in a REDD+ pilot project in Kondoa, Tanzania. Combining theories this way, we provide a deeper understanding of how REDD+ was implemented, bringing to the fore nuances that would have perhaps been obscured by relying on each theory independently.

Based on an analysis of the visible exercises of power, i.e., participation in meetings, one may conclude with a rather optimistic view that REDD+ implementation was genuinely participatory, due to the observations that people participated in public arenas and have mostly a positive judgement of the project and REDD+ processes. Yet, analyzing the case based on the more hidden forms of power, a different picture emerges. It not only becomes clear that people's decision to accept or reject REDD+ was based on unverified rumors or misinformation, but also that participation partly took the form of legitimizing the interests implicit in REDD+ as an external intervention. This is because in communities that accepted REDD+, information came exclusively from project proponents and their partners, who successfully convinced the communities that it was in their best interests to join the REDD+ project, while not disclosing all relevant information – especially about the risks. Yet, in communities that opposed REDD+, we observed that powerful local actors manipulated processes through either spreading rumors to scare residents or deliberately refusing to convey information about REDD+.

We further find that incentives and disincentives were an important source of power used to influence REDD+ processes. The most important incentive was the promise of environmental conservation and the expected agricultural benefits from improved rainfall, while disincentives were mainly a variety of sanctions for non-compliance with the rules for conservation. Given the

historical context of forest conservation, this message of conservation was familiar to local people, portraying conservation as important for maintaining vital livelihoods. Moreover, as past interventions had been undemocratic, the participatory approach used by AWF made REDD+ more acceptable to people.

The study thus points out a key weakness with participatory processes that has been previously highlighted elsewhere. That is, that participation may not lead to empowerment and genuine control if the structures and processes of participation reinforce the underlying power differentials among the actors (e.g., Chomba, Nathan, Minang, & Sinclair, 2015; Mosse 2001; Nightingale & Ojha, 2013; Ribot & Larson, 2012). However, our results also point to a conclusion that if global and national policy can ensure that the structure of REDD+ governance accounts for the variation in power wielded by the actors operating at different levels (see also Hayes & Persha 2010), it is possible for REDD+ to be truly participatory and empowering. In this case, for instance, the PFM and decentralization systems in Tanzania indeed helped locals to counter some of the power by higher level actors, by enabling them to decide on their preferred rules and generally how the REDD+ program should be organized. The challenge however, was that PFM and decentralization did not effectively deal with the underlying power dynamics (especially regarding the problem of dominant information) with the result that local people did not gain genuine control over decisions that affected them.

So, we caution against the popular view that community participation under REDD+ will safeguard local people's rights by for example giving them a right to say no. Instead, we call for a deliberate effort for participatory processes to deal with the various forms of power held by the various actors. One way is to support downward accountability systems so that stakeholders at all levels are responsive to local needs and interests. Secondly, community access to various sources

of information may help to counter the challenge of information imbalances and ensure that people can make decisions with full and accurate information. With such information, local people are more likely to hold leaders accountable thereby facilitating a balance of powers in REDD+ implementation. This is vital given the high potential for conflict due to the variation of interests inherent in REDD+ policies.

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NOTES

1. Tanzania is administratively divided into regions, districts and then into sub-districts and further into wards/sheias. The wards are finally divided into streets for urban wards and villages for rural wards.
2. Two other villages Itundwi and Kandaga also started implementing JFM with AWF and the District in 2007.
3. At the time, the Norwegian government had an issue regarding mismanagement of funds previously transferred to the Ministry of Natural Resources and Tourism.
4. The government of Tanzania was at the time of the pilot developing a national REDD+ strategy (see Vatn, A., Kajembe, K. Silayo, D. A. & Vedeld, P. 2016). This process did, however, not influence the pilot project in Kondoa. It is also notable that the strategy was finalized first in 2013 (URT, 2013).

5. Out of an estimated adult population of between 900 to 2000 people per village, attendance of meetings typically ranged from about 100 to 250.
6. By end 2015 when we returned to the study site, one of these villages had joined REDD+, citing good experiences in the other villages that had joined REDD+, as the reason they had accepted the program.
7. Land use planning is mandated by law and is meant to be a government process, but since it had not been done in the project area, AWF took up the task of funding (about USD 8000 per village) and coordinating between village, district and ministry to facilitate the process.
8. Due to shortage of land, only two villages were able to allocate land for grazing, the rest decided that they would only practice zero grazing.
9. A US dollar was at the time about 1600 Tanzanian shillings.
10. A significance level of 5% is used throughout the paper
11. Introductory meetings were held in 6 of the villages (excluding Puhi), and LUP meetings were held in 5 (Mapinduzi, Masange, Mitati, Mnenia and Puhi). Payment meetings were held in only 3 (Mapinduzi, Masange and Mnenia). Note moreover that some questions were only relevant for those attending meetings, hence, the low sample sizes (N) especially for payment meetings.
12. It is important to note that much of the regulation on forest management predates REDD+ and thus some of these challenges could not have been foreseen.

Paper 2

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Legitimacy of local REDD+ processes. A comparative analysis of pilot projects in Brazil and Tanzania

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ABSTRACT

This paper compares the legitimacy of pilot projects in Kilosa and Kondoa districts of Tanzania and the Amazon region in Brazil. The analysis is both normative – i.e., based on external criteria – and sociological – i.e., based on local people's perceptions. Results show that the quality of decision-making in terms of local participation, balanced representation, openness and sufficient information increases local acceptability of REDD+. The research also suggests that power asymmetries may undermine legitimacy if not dealt with. Finally, the paper reveals that legitimacy outcomes differ under various contexts, which calls for REDD+ processes to be flexible.

1. Introduction

The emerging regime to reduce emissions from deforestation and forest degradation (REDD+) comprises multiple actors operating at local, national and global levels. Accordingly, actors have diverse interests and perspectives. This implies a need for them to negotiate in order to formulate and implement decisions that can be broadly accepted (Forsyth, 2009). As REDD+ transcends national boundaries, operates at various scales and involves diverse actors, it is argued that governments are ill suited to meet the challenges posed by this emergent form of governance (Corbera and Schroeder, 2011). Specifically, traditional forms of legitimacy derived through electoral and constitutional representation are inadequate since decisions are legally non-binding beyond borders.

Given the foregoing challenges of governance, participation of stakeholders in REDD+ processes now features very strongly as a prerequisite for legitimacy (Thompson et al., 2011). Legitimacy of REDD+ at local level is particularly important, because direct actions to reduce deforestation and forest degradation have to be taken by local communities. We know that forest resources contribute considerably to the livelihoods of local people (Angelsen et al., 2014; Kamanga et al., 2009; Vedeld et al., 2007). We also know that forest dwelling people have historically faced and waged struggles against human rights abuses including forceful evictions, marginalization and torture from exclusionary conservation policies (Brockington and Igoe, 2006; Neumann, 1998; Schmidt-Soltau and Brockington 2007). In this context, communities may be reluctant to engage in REDD+ unless the forms of managing forest resources proposed and implemented are agreeable to them (Benjaminsen, 2014). Indeed, past high-level negotiations on REDD+ saw indigenous peoples actively demand that REDD+ takes into account their interests and have sometimes outright opposed it (Tauli-Corpuz et al., 2009).

This paper investigates the extent to which local implementation of REDD+ adheres to principles of legitimacy, distinguishing between the input and output dimensions of normative and sociological legitimacy. In terms of normative legitimacy, the analysis is based on general or 'objective' criteria regarding participation, deliberation, transparency and accountability (input legitimacy) and equity (output legitimacy). Sociological legitimacy on the other hand, assesses how people themselves evaluate the decision-making processes (input dimension) and perceptions about the ability of rules to improve social welfare (output dimension). Legitimacy is compared across three pilot sites located in Kilosa and Kondoa districts of Tanzania and in the Amazon region of Brazil.

The paper is structured as follows. Section 2 conceptualizes legitimacy. In Section 3, I give an overview of the pilots under study. Thereafter I explain the methods used in Section 4. Results are presented in Section 5 and discussed in Section 6 before concluding in Section 7.

2. Conceptualization of legitimacy

Legitimacy is at the center of the REDD+ debate due to its focus on issues of justice and equity. There is concern that the neoliberal approach espoused by REDD+ could have perverse outcomes for local communities and contention about who should be accountable for past, present and future hazards of human-induced climate change (Fairhead et al., 2012; Humphreys, 2008). Therefore, to make REDD+ legitimate

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is to bring justice and fairness to what could otherwise become an unfair transfer of the burden of curbing emissions from those who historically and presently bear responsibility for the global stock of greenhouse gas emissions to those who do not, particularly developing countries and forest dwelling communities within those countries.

Besides, REDD + enters a landscape characterized by underfunding, insufficient staffing, legal pluralism and bureaucratic corruption within the forest sector (Larson and Ribot, 2007; Lyster, 2011; WorldBank, 2006). This complicates the task of implementation because authorities have limited opportunities to enforce regulations. This situation implies that local interests must be well accounted for in order to foster compliance. Within such a context, intrinsic motivation to follow rules becomes vital to achieving the goal of reduced emissions from deforestation and forest degradation. Indeed, as several authors have noted, actors tend to follow institutions once they perceive them as being legitimate (Biermann et al., 2010; Franck, 1988; Klosko, 2000; Quack, 2010)

Legitimacy is the acceptance and justification of a shared rule or institution by a community (Bernstein, 2004; Biermann et al., 2010; Vatn, 2015). This definition embraces two conceptual perspectives namely: normative (democratic) and sociological (empirical) legitimacy. Justification, relates to the normative perspective of legitimacy. According to Bernstein (2004), this perspective is about the reasons that justify the authority of institutions. It emphasizes that what is legitimate has to abide by some general standards or principles. Acceptance on the other hand, relates to the sociological dimension of legitimacy, which holds that an institution is legitimate if it is widely believed to be binding. Hence, sociological legitimacy highlights the importance of the perceptions of actors about the appropriateness of authority, based on some socially and historically constructed systems of values, norms, beliefs and definitions. In simple terms therefore, 'sociological' legitimacy is evaluation from 'the inside' implying assessment by the participants themselves, while 'normative' legitimacy implies to observe from the outside and evaluate against external criteria.

Normative assessments are based on elements of democratic theory including participation, deliberation, transparency and accountability. The aspect of participation holds that legitimacy develops from inclusion of a broad range of stakeholders. Note, however, that participation in itself does not guarantee legitimacy. Rather, it must be inclusive of all stakeholder interests, participants must relate on a fair basis and where there is representation, participants must be sincere and legitimate representatives of their constituencies. Deliberation regards the opportunities available for all participants to present their arguments and critically appraise those of their opponents. Transparency and accountability is about opportunities for actors to hold each other responsible for their actions by demanding that they report on their activities (Beisheim and Dingwerth, 2008).

Typically, normative legitimacy is evaluated in terms of accountability to constituencies through elections and democratic representation. Unfortunately, this traditional view of legitimacy falls short when applied to situations involving non-state actors (Beisheim and Dingwerth, 2008; Bäckstrand, 2006; Corbera and Schroeder, 2011). For example, how do REDD + communities hold actors who are not subject to local elections accountable? How do local and national governments legitimatize transnational REDD + activities to their constituents, activities over which they have no state authority? In trying to respond to such issues, various multilateral organizations and national governments have developed principles aimed at improving the legitimacy of REDD + governance among other functions. One key principle is the requirement of Free Prior and Informed Consent (FPIC). The FPIC criteria demands that communities give their consent to REDD + projects without coercion, intimidation or manipulation, before commencement of project activities and with access to necessary information.

While it is true that participation, deliberation, transparency, accountability and adherence to the specific principles of FPIC can address the legitimacy problems inherent in REDD + processes, an important caution regards how easy it is for all interests to engage. This relates to the concern that power asymmetries may lead to elite manipulation of decision-making through agenda control or shaping of perceptions and preferences (Lukes, 2005). So, what might seem normatively legitimate 'at distance', may still not be so when looking in-depth at local processes.

The elements described above relate to input legitimacy (Scharpf, 1997; Vatn, 2015). Also known as procedural equity, input legitimacy is about fairness in political processes and relates to participation and inclusion of different views in decision making. Scharpf (1997) also proposes a second categorization of legitimacy named output legitimacy, which focuses on the capacity of institutions (rules) to solve problems. For REDD +, such issues include the distribution of costs and benefits, reducing deforestation and forest degradation and effects on social welfare. Normatively, output legitimacy can be evaluated based on the criteria of equity – related to the fair distribution of costs and benefits – effectiveness – concerned with the capacity of rules to meet set goals such as reducing deforestation and forest degradation or improving social welfare – and efficiency – the ability to meet goals at least cost. In this case, I limit the focus of output legitimacy to concern the criterion of equity.

The literature identifies three common dimensions for analyzing equity: The procedural dimension described earlier, as well as contextual and distributive equity. Contextual equity proposes that what is equitable depends on the particular context in which decisions are made and emphasizes taking a contextualized assessment of people's needs in decision making processes. Distributive equity refers to the allocation of outcomes and their impacts of different stakeholders in terms of costs, risks and benefits. Equitable distribution of benefits can be justified according to several principles with the egalitarian principle that distribution must be equal regardless of effort or need being most relevant to our case (see Luttrell et al., 2013).

From the sociological perspective, input legitimacy concerns how people evaluate the procedures of rule setting – whether they are seen as acceptable or not. On the other hand, the sociological dimension of output legitimacy is about acceptance of a rule because of its perceived ability to solve problems and thus revolves around how actors perceive the effectiveness of the rules in solving problems (Bäckstrand, 2006).

3. The context of the study

In this section, I provide a brief background about the project proponents, funding and the organization of the pilots. Additional information about location of pilots, the physical conditions as well as the history and present situation concerning deforestation and forest degradation is contained in the Supplementary material.

3.1. Kilosa REDD + pilot project

Project proponents are the Tanzania Forest Conservation Group (TFCG) in partnership with the Tanzania Community Forest Conservation Network (MJUMITA), both Tanzanian NGOs (TFCG, 2008). Funding came from the Norwegian Ministry of Foreign Affairs starting 2009 and ending 2014. Project implementation followed participatory forest management (PFM) linking it to the national strategy of decentralization. Hence, TFCG/MJUMITA cooperated with district and village authorities, who are formally responsible for establishing PFM. As national benefit-sharing systems between the government and communities were not yet established, TFCG chose to implement REDD + only in forests on village lands implying that villages bordering government reserves were excluded. 14 villages were originally selected, but the project later operated in 13 because one village was merged with Kilosa town early in the REDD + process. The population in the 13 project villages was about 25,400.

As REDD + took place on village lands, PFM in Kilosa took the form of community based forest management, turning customary village

forests – considered general land – into statutory village forests. According to the guidelines (MNRT-FBD, 2007), this demands creating village natural resource committees, establishing titled village forest reserves, forest management plans, village land-use plans and bylaws defining rules for forest resource use. In addition, income-generating activities were part of the strategy to reduce pressures on forests. The project moreover included the development of a carbon enterprise, functioning within MJUMITA, to enable members to aggregate emission reductions and sell them on the international carbon market.

3.2. Kondoa

The REDD+ project was implemented by an NGO – the African Wildlife Foundation (AWF). Since 2007, AWF had been facilitating PFM in four villages, which were later part of REDD+. REDD+ operated in 19 communities with a population of about 58 000. As in Kilosa, the Norwegian Ministry of Foreign Affairs (NMFA) funded the project (2010–2013) and implementation followed Tanzania's systems of decentralized governance and PFM. Similarly, alternative income generation was part of REDD+ activities.[1] There was one key difference to Kilosa as the Kondoa project was implemented in both government and village owned forests. PFM therefore involved establishing joint forest management between villages and the government for government forest reserves and community based forest management in village forests.

3.3. RDS Rio Negro

RDS Rio Negro is one of the 15 reserves under the Bolsa Floresta program (BFP). The program was created in 2008 through a public-private partnership between the state government and the Foundation for Sustainable Amazonas (FAS) – a Brazilian NGO.[2] The reserve covers 19 communities with a population of approximately 2100. The pilot was managed by FAS and is partly funded by the Amazon Fund, which implies that it is considered a REDD+ project. Unlike the Tanzanian pilots, funding to the RDS continues, supported by the Amazon fund and private corporations.

BFP is organized around four components. The BF-Social, BF-Income and BF-Association are community-based payments while the BF-Family is a cash payment to families that have joined BFP. The social component invests in education, health, communication, transportation, sports and cultural programs. The income component invests in alternative production activities or improving current ones in line with the state regulations for resource use in the reserve. The association component is concerned with strengthening community associations including participatory forest governance, empowering communities and capacity building.

4. Methods

The study followed a comparative research approach, implying similar approaches for data collection and analysis across all three pilots to ensure consistency. The comparative strategy allowed us to explore how the context – environmental, governance, historical and economic – might have influence legitimacy. Moreover, choosing two pilots from the same country made it possible to somewhat control for differences in the national contexts. We had two criteria for the selection of study sites. The first was that the pilot was implementing a REDD+ project. Secondly, that it emphasized participation of local communities.

For RDS Rio Negro and Kilosa, the data for this study were collected in January and February 2013, more than three years after both projects had started. In Kondoa, data collection took place early 2014, after four years of operation. By then, all projects were well established. It is notable that this study is part of a larger project following the pilots from 2010 through 2015. Hence, I have had access to a much wider set of data with relevance to this analysis.

The methodology included both qualitative and quantitative methods. This strategy allowed better understanding of the processes and eased comparison. The qualitative methods helped deepen our understanding of the quantitative results and allowed investigations into variables not amenable to quantification while quantitative data were used to create numerical estimates regarding how people evaluated the decision-making processes.

Qualitative methods included semi-structured interviews with community leaders, public officials and representatives of the implementing NGOs. These interviews covered the roles of these key resource persons and those of ordinary villagers in the implementation of projects including the decisions to consent to or reject REDD+, land use and benefit sharing and perceptions towards these processes. Other issues included the relationships between various stakeholders, the participation of various groups including women, youth and marginalized groups and how conflicts were handled. Qualitative methods included also focus group discussions and informal interviews with ordinary members of communities. These sought to understand the locals' knowledge and attitudes about the projects and NGOs implementing them, their involvement in the consent or rejection of projects, how decisions regarding land use and benefit sharing were taken, people's attitudes about these processes, the participation of various groups and power dynamics. Voice recordings and transcripts of interviews were taken in the field. We also reviewed official project documents, as well as national and international documents on REDD+.

The quantitative part was based on structured questionnaires, which for triangulation purposes covered the same topics as those in focus group discussions. The questionnaire was divided into several subsections, with the first covering demographics, followed by a subsection on general knowledge and views about the project, subsections on the processes of introducing REDD+, land use planning and establishing criteria for benefit sharing, and finally a subsection on rules for participating in the project. Under each subsection, we covered participation, the information offered, people's involvement in deliberations, decision making and perceptions of the specific process. Most of the issues concerning legitimacy were assessed on a categorical scale. These included 'Yes' and 'No' responses to questions about whether a respondent had attended meetings relating to REDD+, whether processes were inclusive, if the respondent agreed with the decision that had been taken by the collective or had knowledge of a particular issue or not. The questionnaire also included questions answered on a three-point scale, which assessed the extent of villagers' involvement in the deliberations, transparency of proceedings and openness to villagers' views. For instance, we had a question about whether "villagers offered proposals concerning the content and organization of the project" to which the responses were 'No proposals', 'A few proposals' and 'Many proposals'. Questions that solicited for perceptions were answered on a Likert scale, a five-point scale which allowed respondents to rate a particular issue such as residents' impression of meetings, information offered at meetings and the REDD+ project in general, as for example 'Very bad', 'Bad', 'Satisfactory', 'Good' and 'Very good'. Quantitative data were analyzed using STATA software.

The samples were selected through purposive and random sampling procedures. First, communities were selected purposively to ensure representativeness of the study area and variation in the variables of interest. Thus, in Kondoa, we had seven study villages. Four villages were chosen to represent the 17 where REDD+ had proceeded smoothly and three to represent the four with varying levels of conflict. In Kilosa and RDS Rio Negro we selected five and ten communities

[1] In both Kilosa and Kondoa, income-generating activities were not fully developed by the time of data collection, so not enough data was available to allow a detailed analysis.

[2] While FAS terms itself an NGO, it could maybe be better be interpreted as a trust fund since they have public representatives on their board.

respectively to represent all participating because the conflict levels were more evenly spread.[3] Respondents were selected randomly giving sample sizes of 125 in Kilosa, 200 in Kondoa and 100 in RDS Rio Negro. The plan was to have good coverage of those attending REDD+ meetings. Hence, in Kilosa and Kondoa, where attendance rates were low (about 20% of the village population had attended meetings), we stratified the sample aiming for 80% of the sample to comprise individuals that had attended meetings. In RDS Rio Negro, the decisions were made individually, and we did not need to stratify.

5. Seeing the establishment of the REDD+ projects from 'the outside'

In this section, I will present how REDD+ was established – as seen from 'the outside'. In doing this, I have the normative criteria set in mind, but an explicit evaluation against these comes first in the discussion.

5.1. Consenting to REDD+

The process of establishing REDD+ in Kilosa started in September 2009 with meetings at which TFCG/MJUMITA officials introduced the project to district representatives. A REDD+ facilitation team comprising of district officers and TFCG/MJUMITA staff was formed. This team then met with village councils informing them about the REDD+ project. Next, sub-village meetings were held. Here, the community was informed about the meaning and benefits of REDD+ and the need to establish a village natural resource committee (VNRC) to head the process of doing PFM. Participants in sub-village meetings proposed a member of the VNRC. A third of the VNRC members had to be women. A village general assembly was then held, where the village decided to accept or reject the project by majority voice rising and endorsed the members of the VNRC that had been proposed at the sub-village meeting.

In Kondoa, AWF first contacted each village council during proposal development, informing them about REDD+. After AWF launched REDD+ in January 2010, they once again met with the village councils. If the council consented to start a process of joining REDD+, a general assembly was convened where AWF and district officers introduced the idea to the villagers. So, in this case, there were no meetings at sub-village level. As in Kilosa, the decision to join or not was by majority vote at a general assembly.

Establishing the BFP in RDS Rio Negro started in 2009 with a socio-economic survey and registration of families. Community members then attended an introductory workshop organized by FAS where information about the BFP and climate change was given. At the end of the meeting, households that wanted to join – represented by the female head − signed an individual agreement with FAS regarding participation. Communities could not contribute to either the contents or organization of the program at the stage of introduction. Participation was limited to receiving information, seeking clarification and deciding whether to join or not. Apart from those not present in the communities at the time of these meetings, almost all of the people agreed to join the BFP. People also joined later. Contracted families committed to follow the regulations stipulated in the reserve management plan. In addition, they committed to following 'BFP rules' which included sending their children to school, supporting the activities of the reserve association, restrictions on the size of agricultural land and rules regulating conversion of forest to agricultural land including procedures on the use of fire to clear forests. In return, FAS makes a monthly payment of 50 Reais (16 USD)[4] to the female head of the household.

5.2. Land use planning (LUP)

In Kilosa, LUP was done by the VNRC and TFCG/MJUMITA staff. These demarcated the land into zones including village forest reserves, agricultural land etc. TFCG/MJUMITA, VNRCs and the village councils then drafted a proposal of village boundaries, a land-use plan and REDD + by-laws. A village assembly was again called to amend – if the villagers found it necessary – and approved the draft proposal. The proposal was then forwarded to the district council and next the national land-use commission for formal approval.

In community owned forests, Kondoa also followed similar processes for LUP involving elected village representatives - who had to include women -, the district and general assembly. However, in villages bordering government forests, an inter-village council (JUHIBECO) was created. The bylaws developed were signed by JUHIBECO and state representatives after approval by general assemblies in the villages that bordered government forests.

The state government established Rio Negro as a sustainable development reserve in January 2009. The state also has sole ownership of the forest and developed a reserve management plan ahead of REDD +, with regulations on forest use. In addition, 'BFP rules' were instituted by FAS. Local people did not participate in these processes.

5.3. Benefit sharing and payments

As mentioned, TFCG/MJUMITA planned for the inhabitants in Kilosa to enter the carbon market. To facilitate that, rules for the distribution of carbon payments were needed. In Kilosa this process began with a general assembly, where villagers chose between three options of benefit sharing arrangements a) the individual dividend for everybody older than 6 months b) payments to community projects and c) payments to VNRC projects. All villages decided on the individual dividend arrangement, but included the option of remitting back a certain amount for village projects. A village general assembly was again convened to decide on the by-laws for payments specifying who was eligible to be paid, what fraction of the payment should be used for projects and instituting a REDD+ revenue sharing committee. A so-called trial payments was initiated in 2011 with the revenue sharing committee making the payments at a sub-village meeting. Payments in the five villages varied between 2 and 46 USD per household − due mainly to large variations in forest area per person. Because the goal was to sell carbon to international carbon markets, payments to each village mimicked a performance-based system where carbon storage was estimated based on the size of REDD+ forests and how well villages followed up on by-laws.

In Kondoa, the criteria for payments were developed by the village councils, facilitated by AWF and the district officials and approved at village assemblies. Three criteria were accepted, all based on governance and rule compliance and not on the changes in forest carbon status. Unlike Kilosa, all payments were made to the community with proposals for projects made by each village council and approved at a general assembly. On average, 3000 USD were paid out to each village completing the REDD+ process translating to less than 5 USD per household.

The structure for sharing benefits under the BFP program was designed by FAS and presented to communities. However, associations were formed for each of the communities and at the RDS level, through which residents could make choices under the BF-Income and BF-Social components. Communities meet annually to decide and plan for their preferred investments. Thereafter elected representatives are sent to annual reserve level meetings – for all 15 reserves under BFP – to discuss the plans. Taken together, the payments from the four components amount to about 400 USD per participating household per year.

[3] We covered more communities in RDS Rio Negro because the population in each was very low.

[4] Exchange rate as at February 2017 (1BR = 0.32USD)

5.4. Conflicts encountered during implementation

In Kilosa, there were a few conflicts during land demarcation. In three of the 13 villages, households were forced to relocate in order to demarcate the area as a village land forest reserve – amounting to about 1.7% of the total number of households. While offered new land, they were very negative to vacating the fertile highlands. In one village, there were strong disagreements between charcoal makers and other villagers about the size of land to be demarcated for REDD+. In yet another, the villagers expressed mistrust about the intentions of TFCG because an Arab investor had earlier 'grabbed' land for a sisal plantation. There was also a border dispute between two of the villages. Most disagreements were resolved through negotiation. It should be mentioned that one project village opted out at the stage of land-use planning due to fears of potential land loss and cultural beliefs that the dead had to be buried on family land and not a common cemetery as the land-use plan suggested. Note also that pastoralists were not consulted throughout the REDD+ process although this did not result in any observed conflict. This is significant given that pastoralists have a long history of land conflicts with the farmers in Kilosa (Benjaminsen et al., 2009).

Implementation also faced conflicts in four of the 19 villages in Kondoa. Here, village leaders manipulated the process by withholding information or offering information in line with their own interests. Fronting popular fears like potential loss of land or income from alternative land-uses, leaders urged constituents to reject REDD+. Ultimately, two villages opted not to join REDD+ at the introductory general assembly, another opted out during land-use planning while the forth was not paid due to poor performance.

In RDS Rio Negro, disagreements came mostly from areas in the reserve where people were most dependent on logging for their livelihoods, and to a small extent where people wanted to expand agricultural lands. Their argument was that payments were too low to cover for the costs incurred from following the rules.

5.5. How was REDD+ perceived among the villagers?

Turning to the 'inside' conceptions of the REDD+ projects, the overall attitude towards the REDD+ project varied across the pilots. Starting with Kilosa, the general evaluation was positive, with an average score of 4.12 (N = 125) on a 5-point Likert scale (5; very positive).[5] Environmental conservation was the most important reason given for the positive attitudes. Similarly, 87% (N = 114) stated that they felt free to decide on joining REDD+. Reasons were that meetings were open to everyone, people felt free to ask questions and that questions were answered. There were also high levels of satisfaction for meetings and information regarding land-use planning and payments. Respondents attributed these positive attitudes to the fact that meetings were well attended and that the processes had provided them with knowledge, created awareness and emphasized village development.

In Kondoa, the general perception of the REDD+ project in the four sample villages where implementation was relatively smooth, was similar to Kilosa – an average Likert score of 4.2 (N = 115). As in Kilosa, conservation was the main reason for positive attitudes. Further, 94% (N = 89) of the respondents in these villages stated that the decision to join REDD+ was made freely. People also thought that meetings for introducing REDD+, land-use planning and making of bylaws as well as benefit sharing were open to villagers' views and that everybody was free to participate. They were also happy with the information received during meetings. In the three sample villages which experienced conflict, the average Likert score was much lower – i.e., 3.2 (N = 80). At the same time, a considerable percentage – 40% (N = 50) – thought decision to reject REDD+ was not made freely. As explained earlier in the section on conflict, the situation arose due to the actions of leaders and other influential people in the villages (Author in review).

With an average Likert score of 3.3, RDS Rio Negro was, somewhat surprisingly, the pilot where local people rated the REDD+ project the lowest. Negative attitudes regarded not least dissatisfaction with the level of payments, considered by many to be very low despite being much above what was received in the Tanzanian case, even if we correct for existing income levels.[6] Regarding the decision to join the BFP, 81% (N = 96) reported that they had joined the program freely. The rest felt that there had been some coercion to join. This pressure appeared to have come from community leaders. This may be so because the more families joining, the more resources would flow to the community as the level of community benefits depended on the number of people enrolled. The overall assessment of the meetings were positive. Most people 77% (N = 76) felt that the information offered was satisfactory, good or very good. Respondents also noted that participants were active during meetings and questions were extensively discussed. Nevertheless, a substantial number (20%) felt that information had been unclear.

Concerning investment decisions under the BF-Social, BF-Income and BF-Association, 55% (N = 90) reported that they had participated in none or just a few decisions. The reason provided was that investment meetings were limited to asking questions about proposals and then deciding to support or not to support a particular investment. The contents were not much discussed. There was, however, a high degree of trust in the leaders making proposals.

6. Discussion

This section identifies the key issues arising from the analysis and their relevance for the legitimacy of REDD+.

6.1. Normative evaluation

Starting with how the pilots perform against the participation criteria, inclusiveness and representation are key aspects. On inclusiveness, the study finds that NGOs made deliberate attempts to involve all local groups. For instance, ensuring gender equality was paramount. In RDS, women were the signatories to the contract and the direct recipients of the cash payment on behalf of the family, while in Kilosa and Kondoa women sat on all committees. Moreover, in all pilots the locals directly elected representatives. Therefore, when evaluated against the criteria of participation, REDD+ appears legitimate. Yet, when the analysis accounts for power asymmetries, the finding is that some powerful local actors manipulated processes in Kondoa, participation of locals in program design was limited in RDS Rio Negro and in Kilosa, a minority had to relocate. Further, in Kilosa, a major stakeholder group – the pastora–lists – was not invited due to differences in access to land. In Tanzania, carbon rights have been tied to land ownership either through direct ownership of village lands or agreements with public authorities who own the land (Vatn et al., 2017). While pastoralists graze in parts of the Kilosa forests, especially in the dry season, they were not considered part of the 'community' that owns the land. Considering that farmer/pastoralist interactions have historically been characterized by conflict and that the district has recently seen an influx of Sukuma and Masaai pastoralists (Mwakalobo et al., 2011), their exclusion presents a potential risk for future REDD+ sustainability.

Regarding deliberation, the NGOs together with public officials

[5] The content of the scale is the same in all the sections that follow, i.e., 1 very negative and 5 very positive – see also the Methods section

[6] In 2010, average annual income per household (including subsistence and cash income) was around 6000 USD in Brazil, compared to approximately 1000 USD in Tanzania. Incomes in Brazil are from APA Rio Negro, a reserve located on the other side of the river, opposite RDS Rio Negro. So, income was assumed to be similar. The Tanzanian estimate is from Kilosa (Movik et al., 2012). Income was slightly higher in Kondoa as households own more livestock.

convened several meetings in all pilots to discuss REDD+ issues. In addition, conflicts were largely resolved through communication and negotiations while persuasion rather than coercion dominated the processes. Nevertheless, for the related issues of transparency and accountability, there were no measures for NGOs to account downwards to communities (see also Mustalahti and Rakotonarivo, 2014). Also, full information about REDD+ was not provided prior to consent (see also Krause and Nielsen, 2014), although NGOs were open about rules for engagement and payment. Information about the benefits and risks of engaging in REDD+ were not fully communicated partly due to lack of independent sources of information, but also due to uncertainty regarding future REDD+ policy and carbon markets. With such uncertainty, project proponents not only lacked all information to effectively communicate, but were also reluctant to raise community expectations regarding future risks and benefits.

On equity, the distribution of benefits suggests that all pilots pursued an egalitarian solution. However, the distribution of costs was unequal. Some groups such as charcoal makers, loggers or those who had agricultural lands in forest areas had relatively higher opportunity costs. Payments were nevertheless, not based on these costs. In addition, local communities in RDS Rio Negro were simply informed about pre-defined types of benefits and benefit-sharing systems. Although there was an early social-economic study to assess the livelihoods of local people, there was no consultation with the locals about their preferences regarding benefits. Therefore, the benefit sharing process fell short of procedural equity because participation was passive (see Pimbert and Pretty, 1994). Where processes are interactive, local actors define the rules together with project proponents and implementers resulting in processes capable of accommodating different interests. This points to the importance of flexibility. The lack of flexibility in the design of benefit-sharing systems partly explains the conflicts observed in Kilosa and Kondoa. To the extent that groups with high opportunity costs were able to exercise agency, they managed to block REDD+ from being implemented in their areas. In RDS Rio Negro, while conflicts were covert, the low ratings for the BFP could be an indication of the dissatisfaction of those with high opportunity costs.

As we have seen, achieving normative legitimacy can be challenging. What then does the above discussion imply for how REDD+ processes stood against the FPIC requirement? It is fair to say that communities were simply persuaded to join REDD+, but were not fully equipped with all information to decide on REDD+. The latter is especially pertinent in Tanzania where REDD+ funding was for a limited period, because the decision to engage in REDD+ should have taken into account such information. It is true that NGOs in Kilosa and Kondoa, sought communities' consent before starting REDD+ and decisions were fairly free of coercion. In addition, FAS sought consent in RDS Rio Negro, through the signing of individual contracts. However, no information was offered about risks such as the lack of a global climate agreement, hence uncertainty of political and financial support. The lack of independent sources of information led to insufficient communication about the risks by public officials and the NGOs (see also Gebara, 2013; Krause et al., 2013). This risks future viability of REDD+ because of its implications on trust and local expectations, which compromises opportunities for continued collaboration of project proponents with local actors.

6.2. Sociological evaluation

The study demonstrates that for REDD+ programs and decision-making processes to get the support and acceptance of local stakeholders, they must involve local people in discussions, ensure balanced representation and openness to the various stakeholders, offer sufficient information and allow people to suggest and make amendments to proposals. According to Newig and Fritsch (2009), people are more likely to be receptive of outcomes when they accept the processes through which decisions have been made. This holds even when the outcomes do not correspond to actors' expectations. The positive attitudes to REDD+ in Kilosa and Kondoa, is evidence that quality decision-making (input legitimacy), increases acceptability of outcomes (output legitimacy). Despite the low payments, support for REDD+ is high partly because local people were satisfied with their involvement in the processes of consenting to REDD+, land use planning and mechanisms of benefit sharing. On the other hand, support was lower in RDS Rio Negro. This seems due to the non-flexible structure of the BFP which lead to frustration over the level of payments and rules associated with the BFP. Even though the BF-Social and BF-Income components of the BF program provided a variety of added benefits and communities had some control over decisions made under these two components, people were still dissatisfied with the program as a whole. The implication for REDD+ is that local people must engage with the entire process including design, implementation and monitoring and not simply some stages of the process.

There are also indications that if REDD+ overly focuses on incentives (rewards and punishments) while neglecting other avenues such as good governance, that may be as relevant for reducing deforestation, there could be negative effects on sociological input and output legitimacy. The reason is that extrinsic incentives may – under certain circumstances – have the unintended effect of crowding out intrinsic motivations for engaging in the desired social behavior like environmental conservation (Corbera, 2012; Gebara and Agrawal, 2017; Gneezy and Rustichini, 2000; Gneezy et al., 2011). Indeed, the literature suggests that prioritizing governance rather than quick compensation and payments creates greater local incentive for participation, facilitates collection action and stronger institutional frameworks (Clements et al., 2010; Tacconi et al., 2013). Evidently, the Tanzanian pilots prioritized strengthening of local institutions, forest governance and capacity building before rolling out payments, while the BFP focused on incentives. In fact, for RDS Rio Negro regular compensation began as soon as households signed the BFP contract. Nevertheless, people felt a sense of powerlessness due to their inability to influence decisions. Ultimately, this difference in approaches seems to have contributed to greater acceptability of REDD+ in Tanzania.

This research also suggests that the context within which REDD+ is implemented plays a key role in determining whether decisions can be sociologically legitimate. This indicates that a contextualized assessment of people's needs is necessary to design programs that are acceptable to local people. In this case, it appears that where the communities perceived that they were reliant on the forest resource for their livelihoods, REDD+ was more likely to lead to positive attitudes. For instance, for Tanzanian communities, which were dependent on rain fed agriculture for their livelihoods, it was important to conserve forests – due to their perceived role in the production of rain. Hence, there was other motivations than the payments. Also, where the resource was perceived to be under pressure, attitudes to REDD+ seemed to be more positive as there was a certain degree of urgency to conserve. It should moreover be mentioned that the expectations concerning payments might have been higher in the Brazilian context due to historical and other factors. It has, however, not been possible to make an explicit evaluation of this.

7. Conclusion

Sustainability of REDD+ depends on the legitimacy (acceptability) of REDD+ initiatives by local people because their actions are directly responsible for reducing deforestation and forest degradation. This paper has aimed to investigate the legitimacy of local REDD+ processes by comparing REDD+ pilots from Kilosa and Kondoa in Tanzania and Rio Negro in Brazil. The central question addressed was: How does REDD+ implementation in the pilots stand against the principles of normative and sociological legitimacy? Thus, the paper took a two dimensional approach by investigating legitimacy both from 'the outside' – the normative assessment – which evaluates REDD+ based on the

general criteria of participation, deliberation, transparency and accountability and equity and from 'the inside' – the sociological assessment – which is based on the perspectives of local people on the processes and outcomes of REDD+.

From the normative evaluation, participation appears to have been generally inclusive and representative. Even then, local powerful actors manipulated processes in Kondoa, participation of locals in program design was limited in RDS Rio Negro and pastoralists were excluded in Kilosa. All pilots offered opportunities to deliberate REDD+ issues. There were however, issues with transparency and accountability as NGOs withheld information on REDD+ risks and downward accountability from NGOs to local people was virtually absent in all pilots. Finally, the distribution of benefits was egalitarian in all pilots while the distribution of costs was unequal. The study also finds that all pilots attempted to fulfil the FPIC criteria. Project proponents sought consent of communities before embarking on project activities and decisions were fairly free of coercion, while full information was not provided across all three sites.

Following the two dimensional approach to evaluating legitimacy, it became clear that what may seem normatively legitimate may not be so from the sociological standpoint and vice versa. As our results reveal, the sociological perspective paints a more optimistic picture of REDD+ implementation. Attitudes to REDD+ were positive in Kilosa with an average Likert score of 4.12 on a 5-point Likert scale. For villages joining REDD+ in Kondoa, REDD+ was also positively evaluated with an average score of 4.2. In RDS Rio Negro attitudes were also fairly positive with a Likert score of 3.3 and similar for villages rejecting the project in Kondoa, with a score of 3.2.

The cases demonstrate that attitudes towards REDD+ processes are influenced by the quality of decision-making processes. This implies that people should not simply be informed of what has already been decided (see Pretty, 1995). Rather, implementers ought to make deliberate efforts to involve people in discussions, ensure balanced representation and openness, offer sufficient information and allow flexibility such that locals can contribute to the structuring of REDD+ in ways that are relevant and appropriate to them. In this way, actors will be more receptive of REDD+ outcomes. Moreover, when local people actively engage in the designing REDD+, there are higher chances that outcomes are equitable both in the distribution of benefits and costs and in the procedures followed.

Nevertheless, the paper also makes clear that power dynamics could influence decision-making if elites manipulate REDD+ processes. REDD+ actors operate at multiple levels and have diverse interests and perspectives. How then can local actors be involved in REDD+ in ways that more just and fair – i.e., legitimate? Downward accountability systems to ensure responsiveness to local needs and interests and community access to various sources of information may help counter challenges caused by power asymmetries. So far, mechanisms to facilitate accountability to local communities are lacking. For these mechanisms to take hold, there is need for actors at higher levels to share or better still, transfer power down to lower levels. As seen in Tanzania, embedding local decision-making processes within national legal frameworks is one way to achieve such power transfer. Moreover, streamlining REDD+ decision-making within national frameworks also has the added advantage of making REDD+ adaptable to national and local contexts (Pham et al., 2015).

Context matters because REDD+ enters different governance, historical, physical, and economic contexts, all of which bear on the legitimacy of decision-making processes. Flexibility is therefore vital. For successful processes, implementers must seek to understand and account for peculiarities in the implementation of projects. A one-size fits all approach is inadequate for REDD+.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.envsci.2017.09.005

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Paper 3

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Estimating Transaction Costs of REDD+

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ABSTRACT

Reducing emissions from deforestation and forest degradation (REDD+) is generally believed to be a cost-effective mitigation strategy against climate change. Some suggest, however, that costs of REDD+ are underestimated because many studies either exclude or undervalue transaction costs. A major challenge in this field of research is the absence of a common framework and methodology for assessing such costs. This paper uses the notion of governance structures to suggest a generic definition and methodology for measuring transaction costs. The methodology is subsequently used in an analysis of transaction costs for REDD+ pilots in RDS Rio Negro, Brazil and Kilosa, Tanzania. Results indicate higher unit costs – costs per ton of reduced CO_2 – of establishing the REDD+ governance structures in Kilosa, while unit costs of using those structures are higher in RDS Rio Negro. The results also show that while REDD+ was originally conceived as a market i.e., a direct trade between buyers and sellers, it could also take on a non-market governance structure or a mixture of market and non-market elements. These different forms of governance structures have implications for transaction costs.

1. Introduction

There is widespread support among economists for the idea that reducing emissions from deforestation and forest degradation (REDD+) is a cheap mitigation strategy when compared to other options (e.g., Stern, 2007). Yet, while cost-effectiveness or efficiency is at the heart of REDD+ policy, there is concern that cost studies rarely give a complete coverage of all costs[1] involved, because most either exclude or underestimate transaction costs (Fosci, 2013; Pearson et al., 2013; Rakatama et al., 2017).

In empirical work, the concept of transaction costs has been widely applied to public policies (Wang, 2003). With specific reference to environmental policy, transaction costs are believed to be relevant for the design and selection of policies (Paavola, 2002; McCann, 2013) Even then, economists still grapple with the basic conceptual aspects of transaction costs, particularly what they are and how they should be measured (Wang, 2003). Since there is considerable variation in the methods and definition of concepts used in empirical analyses, it is difficult to compare across studies (Dawkins, 2000; Antinori and Sathaye, 2007), which complicates the task for policy makers to select between competing policies.

In this paper, we suggest that a possible reason for the ambiguity in transaction cost measurement is that transactions are so diverse and operate in a wide variety of circumstances. The aim of the paper is therefore to suggest a definition of transaction costs that can be used across different contexts. Based on that, we present a methodology for measuring these costs and exemplify it using data from two REDD+ pilots in Brazil and Tanzania. Our focus is on transaction costs for REDD+ at the local level, but the methodology developed should also be relevant for analyses at other levels as well as fields of study outside REDD+.

2. Defining Transaction Costs

2.1. A Complex Field of Definitions and Perspectives

Conceptualization of transaction-cost traces back to Coase who argued – in sharp contrast to conventional environmental economics at the time – that carrying out market transactions carries costs (Coase, 1937). Commenting on Pigou (1920), Coase further argued that if market transactions were costless, assigning private property rights was enough to trigger private trades, through which victims of pollution would price out the polluters and ultimately lead to the elimination of environmental problems. However, because market transactions do in fact entail costs, resource allocations may sometimes need to be resolved through means other than markets including government

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[1] The costs for REDD+ can be divided in three categories. They include opportunity costs – the value foregone from alternative land use – production costs – costs of activities that directly lead to increase in forest carbon storage like gap filling and nursery establishment – and transaction costs.

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regulations, taxes, subsidies, standards (Coase, 1960; Dahlman, 1979).

Although Coase's contributions have been greatly influential across a variety of economic disciplines, they have also been a source of tremendous controversy and diversity in interpretation (Allen, 1999; Wang, 2003). At the root of the problem are the two dominant schools – the neoclassical and the new institutional economics positions. The standard neoclassical model assumes zero transaction costs and private property rights for all goods. Further, property rights are always completely defined, allocated and enforced (De Alessi, 1983). Hence, neoclassical scholars have typically omitted transaction costs from analyses. Yet, there is currently wide acceptance also among neoclassicals that trading carries costs, and as a result a recognition that property rights may sometimes be incomplete. Increasingly, therefore, analyses do treat the subject of transaction costs (and their links with property rights). When included, however, this tradition deals with the two concepts only in the context of trade. Thus, transaction costs would typically be defined as costs that occur in the transfer of property rights between firms or individuals through market exchange (e.g Demsetz, 1964; Niehans, 1987). Further, cost categorization is based on activities aimed at overcoming imperfect information and uncertainty in market exchanges. Examples include search, approval, negotiation/bargaining, decision-making, insurance, monitoring and enforcement costs (Stavins, 1995; Dudek and Wiener, 1996). Therefore, only costs which are external to market participants are relevant. Internal costs such as administrative or enforcement costs within firms are not considered (Allen, 1999).

The approach of new institutional economics expands beyond focusing only on trade to include also costs of command within hierarchies like firms, public entities, and households (Pollak, 1985; Williamson, 2000). When analyzing the costs of market exchange, for example, studies consider both participants' external costs of overcoming imperfect information and internal costs of organizing trade (as long as they are not costs of production) as transaction costs (e.g., Wallis and North, 1986). A typical definition in the new institutional tradition would be the costs of defining and maintaining property rights (Allen, 1999; McCann et al., 2005). According to this literature, all aspects of allocating property rights are costly. Markets may not always be the option with least transaction costs. Therefore, the goal of analysis is to decide which governance structure should be chosen based on the criteria of economizing most on transaction costs – i.e., efficiency (Williamson, 1981; Dawkins, 2000).

The new institutional school has found a considerable audience among scholars of society and economics. This is understandable because by widening the scope of transaction cost analysis and including broader forms of property rights and other institutions (North, 1992), new institutional economics circumvents some shortcomings of the neoclassical paradigm. Nevertheless, it maintains core aspects of this approach (Eggertsson, 1990), particularly the rational choice model (Gsottbauer and van den Bergh, 2011). Within this individualist-utilitarian ideology, policy prescriptions always gravitate towards welfare-based solutions – minimizing cost and maximizing benefits.

For those of us concerned with transaction costs, this is problematic, not least in the context of environmental policy. One issue regards the extent to which one could rely on efficiency as the only criterion for the selection and design of policies (Dawkins, 2000), when it is increasingly understood that equity, effectiveness and legitimacy may be equally important (Colby, 2000; Buitelaar, 2004; Vega and Keenan, 2014). A related concern is that institutional economists have conceptualized determinants of transaction costs (asset specificity, frequency, and uncertainty) within a market context (Williamson, 1985). We observe, however, that analysts have had to adjust this framework in order to cater to the unique aspects of environmental goods and to explain better what influences transaction costs in arrangements that deviate from 'pure' markets (Ruiter, 2005; Antinori and Sathaye, 2007; Rørstad et al., 2007; Coggan et al., 2010; Coggan et al., 2013; McCann, 2013; Phan et al., 2017).

So, due to the 'rather uneasy' extension from neoclassical to new institutional economics, there is considerable ambiguity and inconsistency regarding the transaction cost concept, which has made it extremely difficult to compare results, as different studies include or exclude different types of costs as well as include or exclude different types of transactions. Perhaps an all-encompassing framework would help resolve the issue.

2.2. Transaction Costs as Costs of Establishing and Using Governance Structures

From the above, we observe that the definition of transaction costs varies because of different system delimitations – i.e. what kind of human interactions that are included. Progress towards a shared definition demands a common platform with a delimitation of transaction costs that captures all types of transactions that are relevant for economic activities. We find that the conceptual framework of a governance structure serves such a purpose. A governance structure (GS) may be defined as consisting of:

a) the actors involved – e.g., individuals, communities, public bodies/agencies, firms, non-governmental organizations (NGOs) or intergovernmental organizations (IGOs) – with different forms of rights and responsibilities.
b) the institutions defining the rights and responsibilities of these actors and facilitating the interactions between them (Vatn, 2015).

Actors may interact in different ways. We have already noted trade and command. Actors may however also donate, cooperate or reciprocate. Taken together, there may be numerous governance structures – hence, forms of transactions (Vatn, 2010, 2014). When there is direct interaction between producers and buyers in the form of trade, the resulting governance structure is the simplest form of a market – see GS1 in Fig. 1. However, producers and buyers often do not interact directly. We observe intermediaries such as wholesalers and brokers. In this case, the resulting governance structure would often be a series of trades – see GS2c. However, also public bodies and NGOs could act as intermediaries. Then we may face a mix of market and non-market elements as in GS2a, or purely non-market transactions as in GS2b.

The actors involved are defined by their rights and responsibilities. Rights to resources – property or use rights – are important aspects. Various responsibilities are typically also defined and exist as characteristics of actors. Some of these structures are formal while others are informal. Both kinds are important when characterizing actors.

While the above emphasizes economic interactions, governance also regards political interactions – i.e., the transactions, which define rights and responsibilities in the economic sphere. They cover public monitoring, enforcement, and litigation. They also cover contracting of government services to private actors or civil society actors (Moe, 1990). They finally regard establishment of political actors, electing leaders/political bodies and the interactions between different levels of public leadership – e.g., the state, district, municipal, village council, clan leaders etc. (Vatn 2015). There are also transactions among civil society and between civil society and political actors regarding dissemination of information, political debate, advocacy or mediation.

2.3. Operationalization of the Framework

Based on the above, and in agreement with Marshall (2013), we define transaction costs as the costs of establishing, maintaining, changing and using a certain governance structure.

We thus propose a framework that distinguishes between two broad cost categories: 1) costs of developing and 2) costs of using a governance structure. The first category encompasses establishment, maintenance and change costs of actors and institutions comprising the governance structure. These costs arise out of activities such as

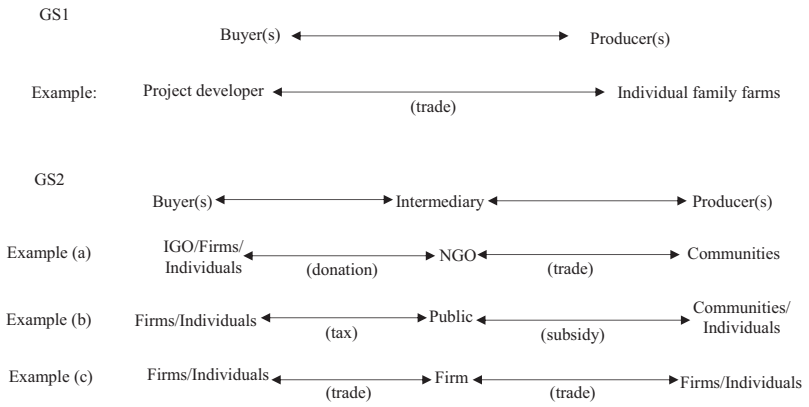

Fig. 1. Examples of governance structures.

obtaining information about the problem, defining the problem, seeking consensus about how to respond, instituting the necessary legislation and developing organizations to tackle the issue. The costs of using a governance structure on the other hand, relate to making and implementing plans and decisions based on the governance structure created. These costs could therefore be generated by activities inherent in market transactions (e.g., searching for trade partners, negotiating deals and transferring resources or property rights) or could be of a more public (e.g., costs of monitoring and enforcing compliance and conflict resolution) or civil society nature (e.g., costs of cooperation, reciprocation and advocacy) in non-market or mixed-market governance structures. Then, there are costs that are important for both the development and use of a governance structure including costs of administration as well as planning and decision-making. It may be demanding to split these on the other activities specified and we refer to these as general support. Table 1 offers an attempt to summarize these cost categories. Irrelevant combinations/cells are marked grey.

The approach pursued here is similar to proposals by Buitelaar (2004), who distinguishes between transaction costs of creation and use of institutions and Hanna (1995) who distinguishes between costs of describing the resource context, designing, implementation and enforcement of a particular program. However, by distinguishing between costs of establishment and costs of maintenance and changes, (see also Paavola, 2007), the framework explicitly highlights the fact that policies are never implemented in a vacuum. There will always be an existing governance structure. While it will not be logical to include the costs of establishing these when calculating the costs of introducing a specific policy, describing well the governance structures into which it is placed is important. Costs of establishing a certain governance structure depends not least on what 'is already there'. As an example, costs will vary dependent on whether property rights are already clarified or not. Also, the existing governance structure is likely to have cost implications for establishing new ones as has been demonstrated by Marshal (2013) discussing the effect of path dependency.

More importantly, however, this framework has a major strength in that it generalizes across costs generated and incurred by a broader range of actors and institutions. As such, it avoids a priori exclusion of costs accruing to certain types of actors and interactions. Previously, most frameworks have been specifically targeted to a particular context and subject of investigation (see also Galik et al., 2012). Thompson (1999) and McCann and Easter (2000) have for example been concerned with public costs of environmental policy, Stavins (1995), Dudek and Wiener (1996), and Antinori and Sathaye (2007) with private costs, while Abdullah et al. (1998) investigated transaction costs in the case of a fisheries co-management system. While there have also been attempts to account for both market and non-market elements (e.g., McCann et al., 2005 and Milne, 1999), overall the current frameworks are largely dependent on a research context, which limits their analytical usefulness in other types of governance arrangements. Therefore, a framework that is generic enough to capturing variation and complexity is more likely to encompass broader forms of interactions. This is particularly important as environmental governance, in recent decades, has progressed from being majorly state-led – with top-down processes – to becoming more participatory – involving also market actors and civil society at different spatial scales (Bäckstrand, 2006; Lemos and Agrawal, 2006; Paavola, 2016).

Distributing costs on various actors may therefore also be of interest (see also McCann et al., 2005). This is important both regarding distributional effects and to make coherent efficiency analyses. We often encounter that costs of planning and establishing new institutions are covered by public authorities, while efficiency analyses do not include these costs. Finally, it is important to be clear about the level at which one wants to focus. While establishing a policy at the local level may demand institutional change at higher administrative levels, it is still meaningful to look at costs at the local level only. It is, however, important to clarify which changes at higher levels have been necessary to make the policy at the local level work in a meaningful way – i.e., which costs are relevant, but not included in the specific analysis.

In summary, we have suggested to operationalize the framework of analyzing transaction costs by using the notion of governance structures. We have recommended breaking down the costs into two broad generic categories of *developing* (establishing, maintaining and changing) and *using* governance structures. Within these two broad classes of costs, there could be further categorizations based on, for example, the tasks performed (e.g., obtaining information and developing actors and

Table 1
A generic structure of transaction costs categories.

Cost category	Developing the governance structure			Using the governance structure
	Establishing	Maintaining	Changing	
1. New institutions				
2. New actors				
3. Existing institutions				
4. Existing actors				
5. Operations by actors				
6. General support				

Note: Shaded areas are not relevant categories.

institutions), the actor that bears the cost (e.g., communities, NGOs or public bodies), the level at which costs occur (i.e., local, national or international), and budget categories (such as personnel, consumables and travel).

2.4. Transaction Costs in the Context of REDD+

The core idea of REDD+ was to design an economic transaction – a performance-based system where local communities were meant to deliver carbon storage against a payment. While some seem to have thought of carbon as an already defined commodity, it soon became clear that creating a tradable entity was a complex process of mobilizing communities and defining rights. Included in that were issues related to protecting the integrity of local communities including the decision whether local communities want to participate – often referred to as 'free, prior and informed consent (FPIC)' – and designing of benefit sharing systems. Putting plans/decisions into practice also implied the establishment of new actors like national REDD+ agencies and committees at village level or making adaptations to existing ones. Institutional changes were also necessary – e.g., defining property rights and new management practices for forest resources – e.g., maps, bylaws and signposts. Added to these concerns, issues related to developmental and distributional effects of REDD+ became important. Finally, biodiversity protection also became a key issue (Angelsen et al., 2009). Given this multiplicity of interests and hence actors, REDD+ exhibits economic, political and civil society aspects of transactions albeit at varying degrees depending on the context in which it operates.

REDD+ therefore implies a kind of institutional change that shows the importance of thinking in terms of governance structures as defined above. Decisions affecting use of environmental resources – and hence carbon sequestration – are influenced not only by prices and formal institutions, but also informal institutions such as norms and conventions (Ostrom, 1990; Jones et al., 2008). Equity issues are key (Stern, 2008; Di Gregorio et al., 2013). Moreover, collective action is at the heart of most REDD+ arrangements as forest resources in most developing countries are appropriated communally or in collaboration between local people and the governments (Berkes, 2007). This makes it necessary to account for not only political, but also civil society processes. The governance approach allows us to explore aspects inherent in such wider political processes defining distribution of decision-making power – roles and responsibilities, rules and procedures (Kalu, 2012; Marshall, 2013; McCann, 2013). These issues are the heart of REDD+ implementation, but are usually left out in studies of transaction costs.

3. Application of the Framework to REDD+ at Local Level

Applying the proposed framework to the two REDD+ pilots – RDS Rio Negro in the state of Amazonas, Brazil and Kilosa in east-central Tanzania, we begin with a description of the methods used for calculating the transaction costs. Thereafter, we present the governance structures and transaction cost generating activities for the two pilots (details in the Appendix). We then present the findings regarding transaction costs in the two cases including a breakdown regarding establishing and using the governance structure, both as total and unit cost estimates.

3.1. Methods

The pilots were part of a wider research project also studying REDD + processes and impacts and involving seven sites across four countries (see Vatn et al., 2016). The selection criteria were; a) that the site had been chosen to pilot REDD+, b) was representative of the country or region and c) had plans to complete the REDD+ process – from consent to payments. Of the seven pilots, we ultimately selected Rio Negro and Kilosa because they had 'close to' complete data on transaction costs.

Data were collected in 2012 and 2013. Costs in RDS Rio Negro cover the periods from March 2009 to November 2012 while in Kilosa the period covered runs from September 2009 to February 2013. While the original strategy was to collect data from all actors active in REDD+ activities at the local level, this plan did not materialize because of the large number of actors involved. This was especially a problem in Brazil where the NGO organizing the project collaborated with a broad range of partners, but was less important in Tanzania, as the involved NGOs and communities were the main actors and the NGO staff could assist with data to estimate the costs of other actors.

The main source of cost data were audited accounts from the NGOs implementing REDD+. We also conducted semi-structured interviews with two project managers, three field coordinators and the accounting officer in Kilosa, and two field coordinators, two accounting staff and the research coordinator in RDS Rio Negro. Because they were operating several pilots other than our study sites, costs such as general administrative costs and staff time, had to be specified for our pilots. The NGO staff helped to define fractions regarding the amount of time and resources spent for our pilots. Other costs such as field costs and costs to the residents that were specific to our sites of interest were taken directly from the accounts. Both common and specific costs were further split into fractions and assigned to the different cost categories where applicable. This was, for example, the case when a member of staff carried out activities that covered more than one cost category such as when they facilitated training as well as payment programs.

Added to data obtained through the NGOs, interviews (using translators) were also made with community leaders and members of newly formed committees to get data on costs at community level. We visited four communities in Kilosa and six in Rio Negro and conducted two focus group discussions in each. These costs were calculated as opportunity costs for the time used when engaging in REDD+ activities. All costs were adjusted for inflation. To understand the context under which costs were incurred, we also obtained data on the organization and running of activities in the pilot. An in-depth understanding was, moreover, obtained from other components of the project – as we also have studied the process of establishing the REDD+ projects and its impacts.

Establishment and use costs are summarized as both total and as unit cost estimates. The latter are presented in terms of dollars per ton of avoided greenhouse gas emissions measured as carbon dioxide equivalent (CO_2e). Estimates of reduced CO_2e were provided by the NGOs. Estimation was conducted by independent consultants contracted by the NGO (in RDS) and by NGO staff (in Kilosa). The planning horizon was 40 years. These estimates are highly uncertain, but the only basis existing to make comparisons.

The method used for calculating unit costs is the flow summation method, which calculates the unit cost by dividing the total present value of costs by the total amount of carbon expected to be sequestered. A discount rate of 5% is used, supplemented by a sensitivity analysis with discount rates of 7% and 2%. Note that the flow summation method discounts only costs and not the physical carbon. This may be seen as a weakness because it attaches the same value to carbon sequestered in different years. An alternative method would have been the levelization method, which discounts both costs and carbon (see Boscolo et al., 1998; Newell and Stavins, 2000). However, the data available precluded the use of this method because we did not have data on the expected flows of carbon. Instead, as mentioned, the implementing NGOs provided estimates of expected total reductions.

Establishment costs cover the whole setup phase of the pilots, which took approximately four years. The total cost of using the governance structures was estimated by multiplying the 'use cost' in the final year of data collection by the planning horizon of 40 years. We used data from the final year of data collection because the pilots took some time to establish (especially in Kilosa), so there were no or minimal 'use costs' in the early years. Alternatively, the 4-year average could be multiplied by the planning horizon if the pilots had been 'running' for

the whole period covered by the data. Note that this extrapolation assumes a constant annual stream of 'use costs' through the 40 years.

3.2. Governance Structures

The Bolsa Floresta Program (BFP) in RDS Rio Negro was created as part of the sustainability policy (the Zona Franca Verde or Green Free Zone) for the state of Amazonas. The processes began in 2007 with the drafting of legislation that created the Foundation for Sustainable Amazonas (FAS) as the implementing entity for the BFP in 2008 and the upgrading of the Rio Negro reserve from an environmental protected area to a protection category with stricter regulations, the sustainable development reserve (RDS) in 2009. The state government also provided 20 million Reais[2] as initial funding for the program through the Amazon fund,[3] with Bradesco bank contributing another 20 million (Vatn et al., 2013). As a state protected area, all rules for forest use continue to be formulated by the state. In addition, forest management, monitoring and surveying are the responsibility of the state. Similarly, all land is state owned, although communities are recognized as having the right to occupy and use the land subject to state regulations.

The BFP is organized around four payment components. The family component is a monthly cash transfer to the female heads of families and the social component aims to improve education, health, communication, and transportation and supports cultural and sports programs. The income component, on the other hand, supports production activities in line with the state regulations for resource use in the reserve, while the association component strengthens community associations through participatory forest governance, empowering communities and capacity building programs. This payment system was set up by FAS for all 15 reserves under FAS's operations, although some programs are implemented in partnership with public or private agencies – e.g., Amazonas state health and education departments and private firms.

The project in Kilosa was implemented by the Tanzania Forest Conservation Group (TFCG) in partnership with the Tanzania Community Forest Conservation Network (MJUMITA) (TFCG, 2008). MJUMITA is a national network of community groups involved in participatory forest management (PFM) and its role in this case was to assist communities to develop a carbon enterprise through which they could aggregate carbon emissions and sell them on the international carbon market.

Implementation followed the national guidelines for participatory forest management and the decentralization system. Therefore, TFCG/MJUMITA worked closely with village and district authorities, entities that are legally responsible for implementing PFM. PFM involved creating village natural resource committees, establishing titled village forest reserves, forest management plans, village land-use plans and bylaws defining rules for forest resource use. The NGOs and communities also held meetings to decide on the payment system, by-laws to guide distribution of payments and to set up a revenue sharing committee. The process of setting a carbon enterprise (through MJUMITA) was started, but not complemented within the project time-frame. Similarly, systems for monitoring, reporting and verification (MRV) were set up, but not used because the pilot never made any market sales of carbon. Nevertheless, there was one trial payment. Finally, income-generating activities were part of the strategy to reduce pressures on forests.

Table 2 is a summary of the cost generating activities for establishing and using the above governance structures. We are limited to analyzing establishment and use costs because the pilots were in a stage of establishment so there was yet no costs for maintaining and changing the governance structure. There were, however, some costs related to bringing existing organizations and institutions 'alive', although we were not able to distinguish these from the cost of establishing new ones.

Table 2
Adapting the generic structure of transaction costs categories to the analysis of REDD+ pilots in Brazil and Tanzania.

Cost category		Establishing the governance structure	Using the governance structure
1. New and existing institutions	Defining land rights, setting up monitoring systems etc		
2. New and existing actors	Establishment of new associations at local level		
3. Operations by actors	3a. Certifying objects of transfer; monitoring, reporting and verification		
	3b. Processes of resource transfer		
4. General support	4a. Planning and decision making		
	4b. Information/ communication programs		

The cells in grey indicate irrelevant combinations/categories.

Category (1) – establishing institutions – concerns costs of defining necessary land rights, developing by-laws for land-use, setting-up of monitoring, reporting and verification (MRV) systems, as well as costs for designing benefit sharing systems and related rules. Costs related to establishing actors (2) regard establishment of new associations or modification of existing ones such as community associations, natural resource committees and cooperatives. Category (3a) regards costs incurred when using the monitoring, reporting and verification system to ascertain adherence to payment criteria, e.g., actual emission reductions. Costs related to resource transfers (3b) include those incurred on using the created payment systems to transfer resources like cash payments or trade in timber. In our case, examples include costs for facilitating the transfer of cash payments and in-kind compensation as well as costs for processing and renewing of legal documents for forest resource use such as forest management plans. Illustrating how demanding it may sometimes be to allocate costs on (establishing) institutions and actors, we had to add a category called 'general costs' (4). These are costs covering planning and decision-making (4a) as well as costs for negotiations leading up to the decision to accept or reject REDD+, discussions on how components of the project should be organized, and consultancies to produce strategy documents and technical plans or surveys. They also include costs on information and training programs (4b) like information campaigns for communities and authorities including the costs of public relations and disseminating information. This category also includes what could be termed advocacy costs – i.e., costs incurred by the involved NGOs to influence the REDD+ debate. It should be noted that the project carried some general administrative costs – overhead costs including salaries and allowances for administrative staff, costs for auditing, fees and taxes, office costs and capital costs. We have distributed these on the other cost components relative to their size.

3.3. Costs of Establishing and Using the Governance Structure

Table 3 offers an overview of the costs of establishing and using the governance structure broken down on the previously defined cost categories.

3.3.1. New and Existing Institutions

RDS Rio Negro did not have any local costs for building or adjusting institutions because the state government had earlier on put the necessary institutional structures in place. The state government for

[2] The value of 1 Reais was about 0.43USD as at 31 December 2008

[3] The Amazon fund was created by the Brazilian government in 2008 to raise and manage financial resources for reducing deforestation in the Brazilian Amazon.

Table 3
Cost breakdown for establishing and using the REDD+ governance structures.

Cost category[a]	RDS Rio Negro				Kilosa			
	Establishment costs (USD)	Use costs (USD)	Total (USD)	%	Establishment costs (USD)	Use costs (USD)	Total (USD)	%
New and existing institutions					851,001		856,404	32.8
New and existing actors	338,247		328,673	11.0	334,860		336,986	12.9
Defining objects of transfer; monitoring, reporting, etc.								
Resource transfer processes		898,550	910,789	30.5		245,084	235,303	9.0
Planning and decision making	335,009	552,855	885,913	29.7	456,476	47,352	504,837	19.3
Information & communication programs	295,404	561,403	856,094	28.7	611,513	66,173	678,927	26.0
Total	968,662	2,012,808	2,981,469	100	2,253,849	358,609	2,612,458	100

[a] Administrative costs are distributed across all cost categories relative to their size.

instance set up the system and rules for use of forest resources such as the requirements and procedures for developing reserve and timber management plans, established rules and procedures for monitoring and enforcement and gazetted the reserve as a sustainable development reserve.

In contrast, the cost of building new and adjusting existing institutions is the largest cost in Kilosa – covering 33% of the total. In Kilosa, this category includes establishing PFM, designing payment systems and establishing MRV mechanisms. PFM include costs of establishing land use plans and corresponding bylaws. They also include the costs of establishing village forest management plans and bylaws. Costs for establishing the payment mechanism included those for organizing village assemblies for selecting the preferred mode of payment and facilitating village council meetings that defined the rules of eligibility for payment. Turning to MRV, the TFCG/MJUMITA project developed the MRV system in accordance with two standards: The Voluntary Carbon Standard and the Climate, Community and Biodiversity Standard. Following the Voluntary Carbon Standard, establishing the MRV system included costs of establishing project baselines using remote sensing and ground measurements consistent with voluntary carbon procedures. They also covered costs of training project staff and the village natural resource committees on ground monitoring and reporting procedures. Costs for setting up the social and biodiversity baseline included costs of training project staff on performing social impact assessments, costs of the village visioning exercise and the costs of carrying out in-depth biodiversity studies.

3.3.2. New and Existing Actors

This accounts for about 11% in RDS Rio Negro and 13% in Kilosa. In RDS Rio Negro, this cost was incurred to establish or revamp community associations and establish an association at the reserve level. This includes the costs organizing association meetings, facilitating the election processes and training of community leaders. In Kilosa, the cost was for revamping village natural resource committees and MJUMITA activities such as their annual meetings and board meetings and building MJUMITA networks (carbon enterprise) at village level.

3.3.3. Defining Objects of Transfer – i.e., Monitoring, Reporting and Verification

In both pilots, we observed no costs of 'using' the MRV system. In Kilosa, this was so because no trade in carbon actually took place before the project ended, while RDS Rio Negro was designed for social development and avoiding deforestation and forest degradation, but not to trade in carbon.

3.3.4. Processes of Resource Transfer

For RDS Rio Negro, costs of making resource transfer include those of delivering the cards to families as well as the cost of delivering and installing of in-kind payments such as radio communication systems, boats, radios, ambulances as well as expenses for meetings, workshops and trainings related to payments. They also include costs for using institutions built to trade timber including the development of timber management plans, costs for processing licenses and for the carrying out of forest inventories. This cost thus comprises the cost of assisting the communities to process timber management plans, including logistical expenses for meetings, workshops and trainings on the plans. The license fee as well as the transport expenses incurred by the communities in preparing the necessary documentation is also included. In Kilosa, costs on resource transfer regards those for undertaking the trial payment as well as establishing and running income projects including agricultural activities, bee keeping and improved cooking stoves. Transaction costs for resource-transfers amounted to about 31% in RDS Rio Negro and 9% in Kilosa.

3.3.5. Planning and Decision-Making

RDS Rio Negro incurred a higher fraction (30%) as compared to Kilosa (19%) on this cost category. The bulk of these costs in the RDS were expenses for organizing meetings where community members planned and decided (mostly) on how to allocate resources to the BF-Income and BF-Social components. Some costs were also associated with the preliminary socio-economic survey and costs for the consent process such as those related to the workshop where the female head of the household signed the contract with FAS to join the project. The latter costs were, however, rather low. In Kilosa, the category includes consultancy costs for selecting of REDD+ sites, preparing evaluation plans and planning the setting up of REDD+ baselines, MRV programs and performance indicators etc. In Kilosa, the consent process involved initial consultations between TFCG/MJUMITA and the local district officials and residents.

3.3.6. Information Programs and Communication

This category accounts for 29% of the total cost in RDS and 26% in Kilosa. In RDS Rio Negro, it includes the cost for training communities and successive workshops aimed at informing residents about the BFP. Training programs are mainly related to income generating projects such as handicrafts, tourism, agriculture, aviculture etc. This also includes the cost of advertising and public relations. In Kilosa, on the other hand, this category includes costs of training programs, TV and radio programs, policy briefs and newsletters. We have also included costs for advocacy. These costs were mostly for participation in international and national REDD+ advocacy events and REDD+ related meetings.

3.4. Unit Costs for Establishing and Using the Governance Structures

Unit costs for establishing and running the REDD+ pilots are presented in Table 4. At a 5% discount rate, the establishment cost was 0.5 USD per ton of expected reductions in carbon emissions in RDS Rio Negro and 1.8 USD per ton in Kilosa, while the use cost was 2 USD per ton in RDS Rio Negro and 0.6 USD per ton in Kilosa. Thus, the cost of

Table 4
Unit costs for establishing and using the governance structure.

	RDS Rio Negro			Kilosa		
Discount rate	7%	5%	2%	7%	5%	2%
Establishment cost (USD/tCO_2 e)	0.5	0.5	0.6	1.7	1.8	1.9
Use cost (USD/tCO_2 e)	0.9	2.0	6.4	0.3	0.6	2.0
Total	1.4	2.5	7.0	2.0	2.4	3.9

establishing REDD+ in Kilosa was more than three times the cost incurred in RDS Rio Negro, while the using cost for Kilosa was about a third of that in RDS Rio Negro.

Overall, the total cost was estimated at 2.5 and 2.4 USD per ton in RDS Rio Negro and Kilosa respectively, at 5% discount rate. Results from the sensitivity analysis show that as the discount rate decreases from 7% to 2%, the unit using cost increases from 1 to 6 USD per ton of carbon in RDS Rio Negro and from 0.3 to 2 USD per ton in Kilosa. Similarly, total unit costs increased 5 times in RDS Rio Negro and about two times in Kilosa as the discount rates decreased from 7 to 2%.

To put our findings in context, the prevailing price on the voluntary carbon market for REDD+ projects that protect forests from smallholder threats[4] is about 5 USD per ton[5] (Hamrick and Brotto, 2017). Three caveats are important as we interpret and draw conclusions from these results. First, the amount of reduced carbon is very uncertain, as the actual quantity sequestered will depend on the extent to which the pilots are able to implement the expected management practices in the future. As such, the costs could increase or decrease depending on how REDD+ is eventually implemented/enforced. Relatedly, since estimated carbon reductions were provided by the NGOs, it is probable that the methods used were different in the two pilots and carbon estimates incomparable. Then, the carbon enterprise in Kilosa had not started selling carbon by the time we collected the data. For this reason, the results underestimate the using cost in Kilosa. Finally, while the summary estimates are based on carbon, we note that benefits in the Brazilian case are much broader, as the pilot also offers social development programs.

4. Discussion

In order to have a holistic assessment of transaction costs, we have recommended a conceptual framework based on governance structures. Below we discuss the findings from using the proposed framework to analyze transaction costs of implementing REDD+. Before we start on that endeavor, keep in mind that there were establishment costs incurred by public authorities prior to implementation. In RDS Rio Negro, the BFP with its administrative actors and the institutions around the RDS were already set up, while the Kilosa pilot drew on already established guidelines for PFM and decentralization systems.

We found that the unit cost of establishing REDD+ governance structures was higher in Kilosa, while RDS Rio Negro had a higher unit cost of using the governance structures. That is, establishment costs were in the range of USD 1.7 and 1.9 in Kilosa and USD 0.5 and 0.6 in RDS Rio Negro per ton of expected reduced CO_2 emissions, depending on the discount rate used. On the other hand, using costs ranged between USD 0.9 and 6.4 in RDS Rio Negro and USD 0.3 and 2.0 per ton of expected CO_2 sequestered in Kilosa.

The cost variations in the two pilots seem to come from the differences in the types of transactions pursued. REDD+ in Kilosa was primarily directed at organizing an economic transaction, aimed to position the pilot as a participant in the global carbon market. Effecting the carbon trade nevertheless demanded first political and to some extent civil society processes, defining who owns the carbon, how performance is to be monitored and verified and how payments should be made. Thus, added to the selection of REDD+ sites, it necessitated the defining of property rights, preparation of baselines and building of the carbon cooperative, all of which had to be set up from 'scratch'. In contrast, the state of Amazonas founded the BFP in RDS Rio Negro mainly as a social development and conservation program, without the goal of trading carbon. There were, however, aspects of an economic transaction as communities were to receive transfers in return for following certain rules including those aimed at reducing deforestation and forest degradation. Moreover, BFP also exhibited political and civil society transactions as the state government established FAS, constructed the legal basis for the BFP and made a monetary contribution to start the program. As important was the designation of the project area to a sustainable development reserve. Consequently, the costs for establishing the BFP in RDS Rio Negro were heavily subsidized by the state government.

Analyzing transaction costs based on governance structures, therefore, implies a recognition that all three types of transactions entail transaction costs. While some analysts consider only expenditures necessary to facilitate participation in the carbon market, results from this study show that this approach excludes a significant portion of costs generated by political and civil society transactions. Transaction costs of projects like REDD+ should, therefore, not only include search, negotiation, enforcement, monitoring, reporting, verification and certification costs (e.g., Pagiola and Bosquest, 2009; White and Minang, 2011; Merger et al., 2012). Also costs of collective decision-making, developing or changing institutions/rules and actors, election of representatives, capacity building, advocacy, conflict resolution as well as administration costs to support these processes (e.g., Thompson et al. 2013; Mrutu et al., 2016) should be incorporated.

Our approach also enables a better understanding of the distributive aspects of environmental policy, because it maps all costs incurred by the various actors involved. In this case, we find that the contribution of the state government in setting up the project heavily subsidized the costs for establishing the BFP in RDS Rio Negro resulting in the unit establishment cost in RDS Rio Negro being less than 1/3 of that in Kilosa. An exclusive focus on economic transactions would preclude such a realistic assessment of transaction costs. For instance, Luttrell et al. (2018) found that most official budgets of REDD+ initiatives cover only costs of deciding on participation, monitoring, reporting and verification and direct payments to host communities, while costs of administration, institutional arrangements and enforcement that are borne by national and sub-national actors are generally not covered. The authors suggest that the exclusion of the latter costs, compromises the design and sustainability of REDD+.

Acknowledging the existence of the different types of transactions also has implications for our understanding of the factors that influence transaction costs. Currently, most analysts refer to Williamson's framework, citing transaction characteristics, transactor characteristics and institutional environment as important determinants of transaction costs. While this approach has provided useful insights, it has also been limiting because its orientation towards explaining the organization of economic activity, may not be seamlessly extended to the public sphere (Ruiter, 2005). The key transaction characteristics, asset specificity, frequency and uncertainty may for example not be the most relevant for environmental policy (McCann et al., 2005). A more appropriate approach would be to distinguish between the unique attributes of economic, political and civil transactions that influence transaction costs as the characteristics of the three transaction types maybe different, the characteristics of actors not necessarily similar, and the institutions guiding interactions could also differ.

[4] Smallholder threats refer to activities such as subsistence agriculture, livestock grazing, collection of fuelwood charcoal, illegal logging, and small-scale extractive activities.

[5] Ideally, this price should be compared to the total cost i.e. sum of transaction, production and opportunity costs. We, nevertheless, could not compare the carbon price to the total cost because we lacked any reliable data on production and opportunity costs.

Regarding actor characteristics, Gallemore et al. (2015) have for example demonstrated the role of political power and trust in influencing political transaction costs of REDD+ policy. Scartascini (2007) also suggests that strong political power may reduce transaction costs by enabling leaders to bypass negotiation and bargaining. Indeed, our results seem to support these arguments as we also find that the power wielded by the Amazonas state government was in part responsible for reducing the transaction costs of establishing the BFP in RDS Rio Negro. Unfortunately, our findings elsewhere (Nantongo, 2017; Vatn et al., 2013, 2017) also indicate that the process of project implementation in RDS Rio Negro was less legitimate than in Kilosa, which means that the transaction cost saving observed here, could have been achieved at the expense of legitimacy in terms of the quality of decision-making processes. It implies therefore, that it is important to address equity issues. Although this may entail higher transaction costs in the set-up stage, it might decrease using costs through increasing compliance and reducing leakage, thereby contributing to the long-term sustainability of the policy.

This highlights a fundamental issue, which is how to deal with the potential tradeoffs or synergies between efficiency and other policy goals such as equity and effectiveness (see Hanna, 1995). Within the neoclassical and new institutional traditions, the focus is on obtaining least-cost solutions. This, complicates the task of investigating tradeoffs or synergies. We suggest that governance is a more helpful approach because it recognizes that actors could have diverse interests, values and motivations so that the choice of governance structures is not always only a matter of efficiency, but also effectiveness and equity considerations (Paavola, 2007). Several studies of market-based instruments have acknowledged the role of participants who do not (traditionally) carry out market functions and the prevalence of non-market policies (e.g. Stavins, 1995; Dudek and Wiener, 1996; Milne, 1999; Carrington, 2000; Cacho et al., 2013; Vega and Keenan, 2014). In such situations, motivations other than efficiency may be prevalent. Vega and Keenan (2016) have for example found that self-determination, resource control and political representation are among the motivating factors for participants in commercial community forestry. In the same vein, this study also finds that distributive equity was a key policy goal for the BFP as the state government of Amazonas aimed to reverse social underdevelopment among communities in the Amazon. This had consequences for transaction costs because the development focus of the program required a broad human resource base in education, health, forest management, child development etc. to cater for all four components of the BFP. Moreover, in addition to the human resource needs of FAS, the communities also had to be trained in a broad array of social investments. The result was an increase in the unit costs of using the governance structures in RDS Rio Negro. In comparison, Kilosa had a narrower focus on carbon and as such, REDD+ implementation needed a narrower staff base with specific knowledge on carbon measurement, cooperative management and building alternative incomes. These differences lowered the unit using costs in Kilosa.

Relatedly, the diverse payment package in RDS Rio Negro raised using costs. This is reflected in the high decision-making costs of community meetings to decide on the alternative social investments and high resource-transfer costs for managing the wide portfolio of transfers. Kilosa on the other hand had a less demanding payment structure, resulting in lower costs for using the governance structure. Moreover, while RDS Rio Negro had monthly and yearly payments, a trial payment was made only once in Kilosa. Note, however, that since there are no costs for MRV and transacting via the carbon enterprise, using costs are underestimated in Kilosa.

Concerning the effect of the institutional environment on transaction costs, we note that new institutional economics already has a deep enough framework to facilitate the analysis of both formal and informal institutions in the economic, political and civil society spheres (North, 1992; Williamson, 2000). Our analysis, however, concludes that these various institutions exist not only to shape economic performance, but also to support a variety of interests in the political or civil spheres. It also means that institutions for regulating markets may be different from those necessary for either political or civil transactions. This has important ramifications for transaction costs. In the Brazilian case, for example, the goal was not to trade carbon so there was no need of defining property rights. Instead, the political and civil society processes identified, the issue of preventing the growing economic activity from encroaching on the reserve as the most pressing institutional concern (Viana, 2010). To address this challenge, the state government instituted legislation, resulting in the upgrading of the reserve from an Environmental Protection Area (APA) to a Sustainable Development Reserve (RDS), establishing FAS and the BFP and financing part of the start-up cost. Kilosa, however, faced a challenge of unclear land ownership between the central government, the district and the villages. Yet as an economic transaction, land tenure had to be formalized in order to qualify for payments on the carbon market. There was, therefore, a dire need for land demarcation through creating village forest reserves and land use plans. Consequently, the Kilosa project had a higher unit cost of establishing REDD+ compared to the project in the RDS, as costs in the latter had earlier on been met by the state government.

Moreover, to meet the key objective of trading on the carbon market, TFCG/MJUMITA had to develop a comprehensive 'package' of institutions such as an MRV system for monitoring performance and defining property rights. There were also meetings to draft and approve bylaws for forest use and training of forest patrol teams to enforce them. In contrast, RDS Rio Negro did not employ the strict procedures for enforcement, monitoring and verification seen in Kilosa. As the goal was to simply curb deforestation and degradation, the BFP instead opted for free satellite imagery from the National Institute of Space Research to monitor changes in deforestation and leveraged the State Centre for Protected Areas and the community to patrol forests for illegal activity. Therefore, there were no local level costs for institutional building in RDS Rio Negro. The result was an upward effect on establishment in Kilosa and a downward effect in RDS Rio Negro.

Finally, we point out that the cost estimates are uncertain due the costs not included – partly because of investments already made before the programs analyzed were started (e.g., the costs of setting up Bolsa Floresta in the first place) and partly because of incomplete development of the programs. The latter refers specifically to Kilosa where there was only a trial payment. The verification process was not completed and no trade of carbon was in the end made. To facilitate comparisons between the projects, we also estimated some per unit costs. Here, the lack of actual data on emissions – having to use a prognosis for the expected reductions – creates a great uncertainty. While no alternatives exist for such a strategy, we believe the problems it causes are more important for the absolute levels of estimated transaction costs and less problematic regarding the comparison between the two cases.

5. Conclusion

REDD+ is suggested as an inexpensive strategy for mitigating climate change. Nevertheless, some have questioned whether this assertion is true arguing that transaction costs are excluded or undervalued in cost studies. In this paper, we argue that since transactions are diverse and operate in a wide variety of circumstances, the lack of a common framework and methodology for assessing transaction costs, may be a key explanation for this fact. We thus propose a framework that we believe suits various types of transactions and contexts and exemplify it by estimating transaction costs incurred for REDD+ pilots in Rio Negro, Brazil and Kilosa, Tanzania.

We build this framework upon the concept of governance structures, with actors and institutions as the building blocks. Given this, we define transaction costs as the costs of establishing, maintaining, changing and using a governance structure. Depending on the kind of institutions, actors interact in different ways resulting in different types of

transactions either economic, political or civil society transactions. In economic transactions, actors interact mainly through trade and command, but they could also donate, cooperate or reciprocate. In political transactions, interactions include specifying property rights, public monitoring, enforcement, and litigation, but also elections, contracting of government services and other interactions between the public leadership at various levels. Finally, civil society transactions involve interactions among civil society and between civil society and political actors through elections, dissemination of information, political debate/communication, advocacy or mediation. The diverse types of interactions give rise to different governance structures.

Results indicate higher unit costs – costs per ton of reduced CO_2 – of establishing the REDD+ governance structures in Kilosa, while unit costs of using those structures are higher in RDS Rio Negro. We think this conclusion is robust, while the absolute levels calculated are uncertain. This is mainly because the data on emission reductions are based on estimates made at the time of starting the projects. Given these estimates, establishment costs were in the range of USD 0.5 and 0.6 in RDS Rio Negro and USD 1.7 and 1.9 per ton of expected reduced CO_2 emissions in Kilosa. Alternatively, using costs ranged between USD 0.9 and 6.4 in RDS Rio Negro and USD 0.3 and 2.0 per ton of expected CO_2 sequestered in Kilosa, depending on the discount rate used. Total transaction costs were between USD 1.4 and 7.0 in RDS Rio Negro and USD 2.0 and 3.9 in Kilosa, around the same magnitude as the prevailing carbon price of 5 USD per ton of carbon. Considering that costs have been underestimated (especially in Kilosa), these transaction cost estimates seem to indicate that REDD+ is probably not as low-cost as was originally hoped. In the end, the cost-effectiveness of REDD+ will depend not least on how successful projects will be at curbing deforestation. This is, however, difficult to assess at present.

Cost variations in the two pilots arose mainly from the differences in the types of transactions pursued in the two pilots, as the transactions required different institutions and actors and demanded to be organized through different processes. Thus, while REDD+ was earlier envisaged as an economic transaction – a performance-based system where producers were meant to deliver carbon storage to buyers against a payment, – in practice REDD+ has exhibited also political and civil society transactions at varying degrees depending on the context in which it operates. Ultimately, what it takes to build carbon trade – as in Kilosa – is different from what it takes to pay people according to agreed rules, but without the need to abide by the rules of the carbon market – as was the case in RDS Rio Negro.

Therefore, common assertions that REDD+ is cost-effective because it is a market-based solution may be misleading. REDD+ could take the form of a market, e.g., direct trade between buyers and sellers, a non-market governance structure e.g., transfers between governments or a mixture of market and non-market elements. It is therefore more appropriate to consider the efficiency of REDD+ based on the governance structure that it adopts.

Although the framework developed here is used in the context of REDD+ and with a focus on local costs, it is suitable for assessing transaction costs for environmental policies more generally and can be used at various levels of socio-economic organization. The framework, we believe, is an important contribution at the conceptual level. Use costs have for instance not been a common object of analysis, yet as we show, they can be substantial, at times perhaps larger than set-up costs. Moreover the relative sizes of the two cost categories (establishment and use costs) could be important for understanding important trade-offs (synergies) between equity, effectiveness and efficiency. Empirically however, the format of available data may not permit splitting costs with respect to the defined categories. This is moreover a general problem, independent of the framework. It is more dependent on data collection methods. Gathering data during policy planning and implementation offers further opportunities to split costs than if one – as in our case – had to build the analysis on various types of records. One should also be cognizant of the limitations surrounding the empirics in the concrete case. These include (i) the fact that the carbon figures used are only estimates, not actual emission reductions, (ii) that methods for calculating carbon estimates could be different in the two pilots and, (iii) that costs in Kilosa could be underestimated because we do not fully capture MRV costs and costs for making resource transfers. All these present uncertainties for the final cost estimates and imply a cautious interpretation of the results.

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Appendix A. Appendix

REDD+ implementation in RDS Rio Negro

FAS began implementing[6] REDD+ in the Rio Negro RDS at the beginning of 2009 – a few months after the state government upgraded the reserve – implying stricter regulations - from an Environmental Protection Area (APA) to a Sustainable Development Reserve (RDS). The process of establishing the BFP in the area started with a socio-economic survey and registration of families. Community members from the three Polos then attended a joint introductory workshop organized by FAS where information about the BFP, REDD+ and climate change in general was given. At the end of this meeting, households that wanted to join, represented by the female head, signed a contract with FAS – i.e., BF-Family. The FAS field team later returned to the communities on different occasions to deliver the BFP membership cards – which are also used as ATM cards – to the families. From then on, families began to receive their monthly payment of the BF-family. The money is withdrawn from a Bradesco bank ATM machine in the nearest town. In order to minimize transportation costs, community members reported that they either collect the money when they make trips for other duties in the town or they can ask a family member or friend that may be going to the town to collect the money on their behalf.

Between May 2009 and June 2010 5 more workshops were held, sometimes jointly or for specific communities. On average, each workshop lasted 3–4 days. At the first workshop, which was attended by members from all three Polos, the communities formed an organization at the RDS level. The process was facilitated by FAS. Community members also elected a board for the association and made decisions on its rules. The rules had been drafted by community leaders prior to the workshop. Decisions on investment priorities for the BF-social and BF-Income were also made at this workshop.

Two other workshops on forest management plans were held. At these workshops, the communities received training on how to develop and use the forest management plans for legal extraction of timber. These plans have to be approved by IPAAM – the Institute of Environmental Protection of the State of Amazonas (a government agency) – and a license is then issued to the community. The licenses are to be renewed every two years. A point to note here is that this

[6] For details and evaluation of the process of introducing REDD+ in RDS Rio Negro, refer to Vatn et al. (2013)

institutional development involves multilateral cooperation between FAS and its partners. For example at the workshops, training is given by FAS together with technical agencies such as IDAM – the Institute of Agricultural Development and Sustainable Forestry of the State of Amazonas –or state government bodies like CETAM – the Center of Technological Education of Amazonas – and IPAAM. These bodies also provide technical support for carrying out forest inventories. Similarly, FAS, together with a private firm Camargo Correa Institute, covers some of the costs involved in the process of obtaining the licenses for wood management that would have been incurred by the community.

The two final workshops were mainly concerned with use and management of the assets that had been received by the communities under the BF-Social.[7] Here, information on the rules of use for the assets were given. In addition to these introductory workshops, FAS organizes at least 5 workshops in each Polo and a community-level association meeting annually. The Polo level workshops include capacity building workshops for community leaders and members, trainings on income activities and meetings to make investment decisions.

A.1. REDD+ implementation in Kilosa

The process of introducing REDD+ started in September 2009 with meetings at which TFCG/MJUMITA officials introduced the project to representatives of the Kilosa district authorities. As an outcome of these meetings, a REDD+ facilitation team comprising of district officers and TFCG/MJUMITA staff was formed. The next step was to invite villages to engage in REDD+. This started with meetings between the facilitation team and the village council informing about the REDD+ project. Next, sub-village level meetings were held where members of the community were informed about the meaning and benefits of REDD+ and how it could be implemented in the village. Participants at sub-village meetings also suggested representatives for the village natural resource committee. A village general assembly was then held. Here the village decided to accept or reject the project by a majority voice rising. The village assembly then endorsed the members of the village natural resource committee that had been proposed at the sub-village meeting.

Formalising property rights was important for trading carbon. Yet, while villages had customary rights to the land, village boundaries were not defined. Therefore, land rights had to be formalized and land use plans established. Implementing REDD+ in the Kilosa REDD+ pilot was therefore based on establishing PFM in the villages. This was done through a process defined by national PFM guidelines (MNRT-FBD, 2007). Land use planning was carried out by members of the village natural resource committee and TFCG/MJUMITA staff. Then, TFCG/MJUMITA, village natural resource committees and the village councils drafted a proposal of village boundaries and REDD+ by-laws on the use of resources from the forest. A village assembly was again called to amend – if the villagers found it necessary – and approve the draft proposal. If endorsed, the proposal was then forwarded to the district council. Finally, the proposal was sent to Commissioner of Land for final approval. At the same time, TFCG/MJUMITA began to facilitate the establishment of income generation activities such as improved agricultural practices, beekeeping, chicken rearing and use of improved stoves. Decisions on which activities to prioritize were again made at a general assembly.

The process of introducing payments as compensation for lost livelihoods was carried out next. At a general assembly, the villagers chose between 3 options of benefit sharing arrangements a) the individual dividend for everybody older than 6 months of age b) payments to community development projects and c) payments to village natural resource committee projects. A village general assembly was again convened to decide on the by-laws for payments specifying who was eligible to be paid, what fraction of the payment should be used for development projects and instituting a REDD+ revenue sharing committee. A so-called trial payment was made in 2011 with the revenue sharing committee making the payments at a sub-village meeting. Because the goal was to enter the carbon market, the trial payment mimicked the payment system on the carbon market. Thus, calculation of the level of payment was made by TFCG/MJUMITA by taking into account factors such as the historical deforestation rate and the potential avoided deforestation, interventions put in place to avoid deforestation, the likelihood for leakage and estimated price of carbon (Mosi, 2013).

[7] Some further training on management plans was given

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Paper 4

REDD+: The perfect marriage between conservation and development? A comparative study of the impacts of REDD+ on livelihoods and deforestation in Tanzania

Abstract

This paper investigates the impacts of REDD+ in two pilot sites in the districts of Kilosa and Kondoa in Tanzania. We pose two questions: First: What are the impacts of REDD+ on social welfare? and second: What are the impacts of REDD+ on forest carbon storage? The study employs the Before-After/Control-Intervention research design and a mixed method approach to draw conclusions on REDD+ impacts. A theory-based evaluation is then used to understand the underlying causal mechanisms driving the observed changes. We account for potential selection bias by matching pilot and control villages on factors likely to influence selection and outcomes and by using fixed effects, random effects and difference-in-difference panel data models. Results suggest that in terms of total income, REDD+ neither improves nor harms livelihoods in the two pilot areas. REDD+ however, increased forest income in the Kilosa pilot. REDD+ also increased forest carbon in both Kilosa and Kondoa. We discuss what could explain these seemingly contradictory developments. The study moreover shows that mechanisms that cause changes operate differently depending on the context in which REDD+ is implemented.

1. Introduction

The global program to reduce emissions deforestation and forest degradation (REDD+) gained popularity in part because of its promise to simultaneously conserve forests and compensate local people for their losses from protection. Accordingly, balancing forest protection and social welfare is critical for REDD+ policy makers (Coad et al., 2008). The United Nations Convention on Climate Change has developed the so-called 'REDD+ safe guards' aimed at protecting forest dwelling communities from potential negative impacts of REDD+ (Rey et al., 2013). Additionally, there are the Climate, Community and Biodiversity standards that aim to ensure that land management projects such as REDD+ balance biodiversity conservation, climate change mitigation and support for local communities (CCBA, 2013).

There are, however, skeptics who maintain that the dream of a perfect marriage between conservation and development should simply be abandoned. Their argument is that the two aims are incompatible. 'Win-win' outcomes are difficult to achieve and ultimately, trade-offs must be acknowledged and managed (McShane et al., 2011). Evidence on the balance achieved by win-win approaches, has so far been mixed. Persha et al., (2011) found that 60% of the 84 forest protection sites studied in East Africa and South East Asia, exhibited trade-off relationships between forest-based livelihoods and ecological outcomes of forest systems. Similarly, Kusters et al., (2006) also found that trade in non-timber forest products did not balance forest conservation and livelihood improvements in a study of 55 sites from Africa, Asia and Latin America.

Consequently, the debate on how to reconcile conservation and development has been heated and long, spanning over 50 years of evolving policy. There is hope, however, that REDD+ could foster consensus between proponents for development and conservationists. As climate change endangers both forest-based livelihoods and conservation outcomes, both camps have an interest in finding solutions for its mitigation (Roe, 2008). REDD+ designers have endeavored to incorporate lessons on failures and successes from past approaches (Sunderlin & Atmadja, 2009). Issues of multi-sectoral approaches to deforestation, addressing governance challenges, formalizing tenure, understanding the role of both underlying and proximate drivers of deforestation and generating adequate funding have all received considerable attention. Still, the big question remains; could REDD+ be the policy that finally links conservation and development, generating the much needed outcomes of reduced deforestation and improved social welfare?

This paper sets out to contribute to this debate by investigating two research questions. First: What are the impacts of REDD+ on social welfare? Second: What are the impacts of REDD+ on forest carbon storage? To answer the first research question, we measure quantitative changes in livelihoods and assess the feelings and experiences of people qualitatively. On the second research question, we measure changes in the forest cover and in the amounts of carbon stored in the forest (carbon stock). In addition, we undertake a qualitative evaluation of people's perceptions about the status of the forest. Finally, we use theory-based evaluations to examine the underlying causal processes through which the observed livelihood and forest outcomes occur. The research was carried out in two REDD+ pilot sites located in the districts of Kilosa and Kondoa in Tanzania.

2. Causal mechanisms for environmental and social outcomes of REDD+

A growing number of authors are calling for theory-based impact evaluations as a means to understand the processes through which interventions produce or fail to produce impacts (Margoluis et al., 2009; Puri & Dhody, 2016; Westhorp, 2014; White, 2009; Woodhouse et al., 2015). Put differently, theory-based evaluations aim at answering why and how interventions cause impacts and identify breaks in the causal chain. Unfortunately, theories explaining social and environmental outcomes from forest protection are still in their infancy (Jagger et al., 2010). Nevertheless, we propose below the casual chain that links the REDD+ intervention to outcomes in livelihoods and forest status (Figure 1). The causal processes identified are based on project documents, observations from fieldwork and recent articles on mechanisms identified in other areas (e.g., Ferraro & Hanauer, 2014; 2015).

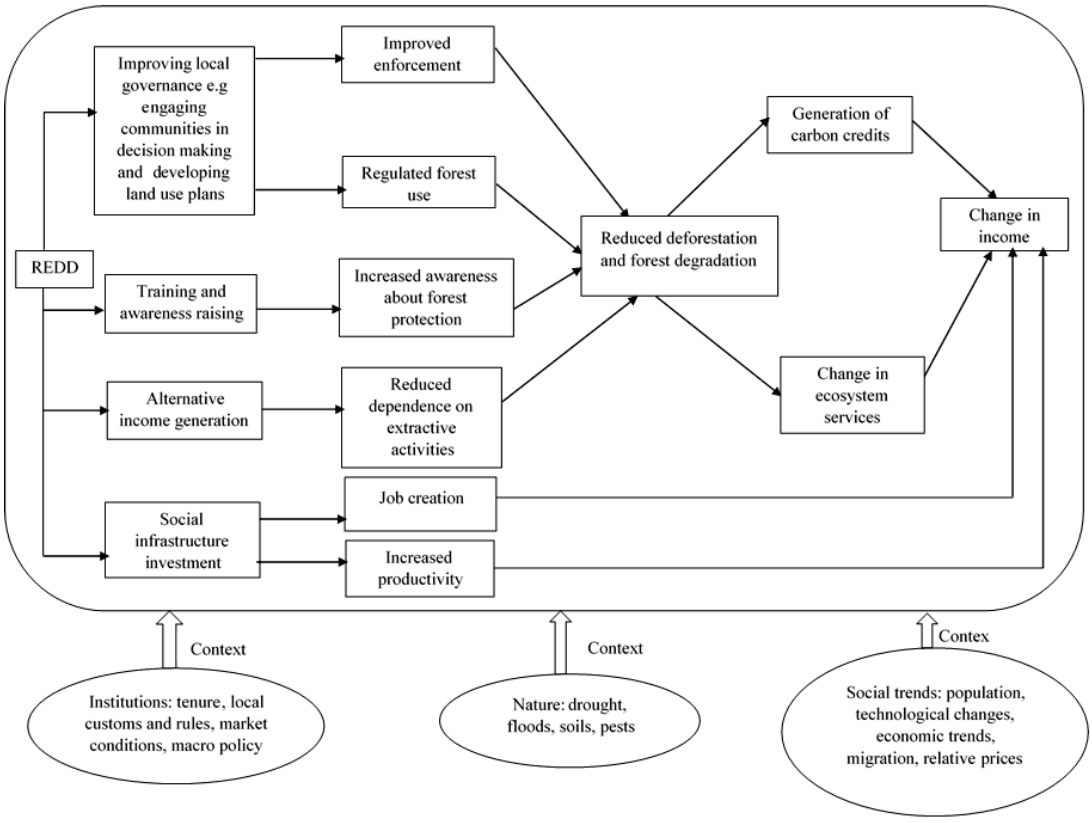

Figure 1: Causal processes linking REDD+ to livelihood and forest outcomes

2.1 Causal mechanisms for outcomes in forest status

The overall mechanism through which REDD+ could affect deforestation is by influencing decisions on how people use forests. This relates to what forest users perceive as the relative costs and benefits of engaging in REDD+. REDD+ may influence human decisions on forest use by improving the governance structures – e.g., developing land use plans with corresponding bylaws, which regulate how people utilize forestlands. By strengthening enforcement, REDD+ results in an increase in the perceived cost from penalties and could reduce deforestation. Enforcement could be improved through influencing local governance and forest management and engaging communities in decision-making by increasing its legitimacy and possibly internalize the goals of

forest protection. Practices like shifting cultivation, grazing, timber extraction, clearing for agriculture, charcoal making and timber extraction may be outlawed for certain areas in the forest. Another process by which REDD+ influences decisions is through enhancement of environmental knowledge. Here, capacity building and training may change perceptions about the benefits and costs of protection and the norms surrounding protection. Finally, REDD+ could drive outcomes by influencing the way people generate income. By providing less-extractive or non-extractive income activities like tourism, intensive agriculture, handcrafts, sustainable charcoal and cooking stoves, REDD+ reduces dependence on forests, which may lower deforestation and forest degradation.

2.2 Causal mechanisms for outcomes in livelihoods

REDD+ influences livelihoods through three main mechanisms: restrictions on forest use, offering compensation and enhancing ecosystem services. Starting with restrictions, these could cause negative social outcomes through lost income from foregone land/forest uses, fines and penalties for illegal activities, crop destruction by an increasing number of wild animals and increase in land/forest conflicts. To counter the effects of these costs on livelihoods, REDD+ attempts to compensate by cash payments in return for emission reductions or improvements in forest cover. Alternatively, REDD+ could enhance provision of social services and facilitate alternative income generation. REDD+ projects could for instance invest in social infrastructure like education, health, water and sanitation, transport and communication. Such social investments could boost livelihoods by providing jobs or increasing productivity. The final mechanism through which REDD+ influences livelihoods is by bolstering ecosystem services. By restricting forest use, REDD+ may enhance or sustain ecosystem services that are vital for livelihoods of rural people such as rainfall and pollinators.

The casual processes detailed above will not work in the same way under all circumstances. This is why it is crucial in theory-based evaluation to understand the context in which REDD+ operates. Context refers to the political, biophysical, social and economic setting in which an intervention is implemented and will affect not only how an intervention works, but also for whom it works, and how people respond to it (Westhorp, 2014).

3. Research strategy

REDD+ projects operate in complex environments, where it is often difficult to ascertain whether observed changes are decisively from the intervention or from other forces. REDD+ impacts could be masked by factors including weather changes, regulations, socioeconomic policies, ecological, political and market conditions. Due to this complexity, analysts increasingly advocate for using a combination of methods in impact evaluation (Bamberger, 2012; Woodhouse et al., 2015). The study thus adopts a mixed method approach combining both quantitative and qualitative research techniques – i.e., household surveys, GIS analysis, focus group discussions and resource person interviews. Regarding the quantitative part, we use the Before-After/Control-Intervention (BACI) research design to isolate the effect of REDD+ on the observed outcomes. Quantitative methods, are however, ill-suited for unravelling the processes through which observed REDD+ impacts come about and how the context in which REDD+ is implemented influences the changes. The qualitative component unpacks these underlying causal mechanisms thereby enriching our understanding of the processes and widening our basis for making conclusions.

3.1 The Before-After/Control-Intervention research design

The study uses the BACI research design to evaluate changes in livelihoods and forest status following the implementation of REDD+. In the BACI design, data are collected from treatment and control units before (baseline) and after a project is implemented. BACI then compares the differences between treatment and control units, before and after the intervention to detect if there is an impact from the project – in this case REDD+ (Bos et al., 2017; Jagger et al., 2010; Smith, 2013).

To estimate REDD+ impacts consistently, BACI requires that initial characteristics of treatment and control units are comparable/balanced. This is achievable only in randomized selection processes, in which all units have an equal chance of being part of the REDD+ intervention (Jagger et al., 2010; Ravallion, 2007). The effectiveness of BACI is therefore compromised when treatment – the REDD+ program in this case – is not randomized. Non-random placement may arise when for example REDD+ pilot sites are targeted at locations with lower potential for socio-economic development such as remote areas or areas with low agricultural productivity (e.g., poor soils or difficult terrain). The observed relationship between REDD+ and

socio-economic outcomes may then reflect the effect of the remoteness or agricultural potential rather than the true causal effect of the policy. In other words, if there is a correlation between outcomes and the variables that determine both outcomes and participation in REDD+ (confounders), estimates of REDD+ impacts may be biased. To eliminate this bias, all confounders must be captured in the data and controlled for. However, in practice, it is highly unlikely that all confounders are known and can be measured by the analyst (Ravallion, 2007). This results in a selection bias, which in this paper is controlled for using matching methods and regression estimators as elaborated in section 3.5.

3.2 Selection of study areas

This study is part of a comparative study across REDD+ pilots in Brazil, DRC, Ghana, Tanzania and Uganda. Baseline studies were done in all these pilot areas, but only in the case of the pilots in Tanzania was it possible to do complete BACI analyses due to termination of projects, delays or incompleteness in implementation in the other countries. In the case of Tanzania, there were altogether nine REDD+ pilots launched by the government of Tanzania with support from the Norwegian Ministry of Foreign Affairs. We chose Kilosa and Kondoa because they had large patches of forest composed mainly of miombo woodlands, the most dominant type of forest in Tanzania. Also, Kilosa and Kondoa had high rates of deforestation and their proponents planned to establish a complete REDD+ process including payments. There were also logistical considerations such as ease of access.

Originally, three pilot villages were selected in each of the two study areas. However, one of the villages in Kilosa was later dropped from the analysis because REDD+ implementation was stopped, as the village became part of the Kilosa township. Ultimately, analysis was done on a total of five pilot villages. We had four control villages, two in each study area.[1] Control villages were selected to match the characteristics of REDD+ villages. As such, controls were from the same geographical areas as REDD+ communities. While this was important because it ensured that controls and intervention sites had similar socio-economic and ecological conditions, the downside was the risk that REDD+ activities in intervention sites could influence activities of controls. To deal with this problem, we asked people in control villages (during the 'after' round

[1] We chose more pilot than control villages as we recognized the possibility that not all villages invited to participate in REDD+ would complete the process.

of data collection) about their knowledge of REDD+ from the neighboring communities to ascertain if there was contamination from intervention villages. We found that in most cases they were either completely unaware or knew very little about the program. They also mentioned that they did not think that REDD+ influenced their communities. Given people's limited knowledge of REDD+ in control areas and the physical distances involved, we concluded that there was no contamination from intervention villages.

3.3 Sampling

Within the villages, households were selected randomly from an inclusive sampling frame such as the village register. In the baseline (before study), a total of 237 surveys were done in Kondoa and 240 in Kilosa, while in the after study we managed to reach 158 in Kondoa and 151 in Kilosa. Attrition was mainly due to death of the household head or migration from the area. Note that in the 'after' round, the surveys followed the same household as in the 'before' round thereby producing a two-year panel data set.

For focus group discussions we chose 'regular' villagers separated in groups of men or women comprising 5-10 people. We also undertook resource persons' interviews usually with community leaders, district or regional agricultural and forestry staff as well the NGO staff. These were selected purposefully for their knowledge of key issues such as forest use, livelihoods and the REDD+ project.

3.4 Collection and analysis of data

The two major rounds of data collection ('before and after') are described in the sections below. It is important to add, however, that our understanding of pilot activities is supplemented with information from two consecutive projects (2010 – 2013 and 2014 – 2016), studying the processes, transaction costs and impacts of implementing REDD+ in six REDD+ pilots including the study areas (Vatn et al., 2016). This gives us deeper knowledge of REDD+ implementation, allowing us to unpack the mechanisms that might explain the outcomes of the intervention.

3.4.1 Collection of livelihood data

Livelihood data for the 'before' round were collected in 2010 just before REDD+ was implemented while 'after' data were collected between November and December 2015. In both rounds, we collected both qualitative and quantitative data.

Household questionnaires were the primary instrument used to collect quantitative data. The questionnaire nonetheless, also included a number of open-ended follow up questions after some of the quantitative questions to allow us explore the reasoning behind a particular numerical response. To allow comparability, the questionnaire retained the same structure in both rounds of data collection and across the two pilots and controls. Nevertheless, in the after round, it was edited to reduce length and to accommodate insights that we had gained in the before data collection round as well as through following the pilots during the whole implementation phase. The questionnaire was subdivided into sections, the first covering demographics, land ownership, physical assets, savings, social assets and vulnerability (shocks). This was followed by a section mapping livelihoods and related constraints where data was collected on agricultural and livestock production, forest resource use as well as income from other sources including business and transfers. The next section mapped out ownership, management and use rights to forestland and other forest resources. This section also sought people's views on management systems and the rules defined for use rights. Next was a section on perceptions, attitudes and norms about forest conservation and finally one about perceptions on compensation in return for forest conservation.

Qualitative data were collected using semi-structured interview guides in focus group discussions (FGDs) and with village chairpersons. The issues discussed were similar to those in the questionnaire. In the focus groups, participants discussed income, food security, technological changes, shocks and coping strategies, prices and price changes, gender division of labor and weather conditions. FGDs also sought to understand the institutional structure for collective decision-making, rules and practices on resource use. In the interviews with village chairpersons, we discussed about the general livelihood conditions, rules on resource use, market conditions, immigration patterns, population trends, forest status, land use patterns, weather and forest conditions.

3.4.2 Analysis of livelihood data

Consistent estimation of impacts proceeds by first identifying and controlling for potential sources of selection bias (Ferraro & Hanauer, 2014). This is based on an understanding of the selection process – i.e., processes through which some units (e.g., communities or households) – came to be part of the REDD+ program and others not. The selection processes of REDD+ pilot sites in Kilosa and Kondoa districts are discussed in detail in Appendix A.

3.4.2.1 Dealing with potential sources of selection bias

We employ two strategies to control for selection bias. The first was to ensure that controls selected for the study are as similar as possible to treatments in terms of factors that simultaneously affect outcomes and selection into REDD+ (see selection criteria in Appendix A). So, we matched treatment/pilot and control villages based on the characteristics of the pilots including the type of forest, the level and drivers of deforestation and forest degradation, proximity to markets and other infrastructure, land tenure and degree of forest dependency. Then, considering that the unobservable confounders were mostly either time-invariant or could be assumed to be roughly constant over the five-year study period, we use regression models that correct for time-invariant selection bias. Specifically, we chose the fixed effects (FE), random effects (RE) (Greene, 2003) and the Difference-in-difference (DID) estimation (Woodridge, 2002; 2009). Given the selection processes, we have no reason to believe that apart from deforestation rates, there are any other time-varying unobservables that influence both selection into REDD+ and outcomes. We thus control for deforestation rates in the regressions and assume – given the selection criteria – that other time varying factors are unimportant. Details on model specification follow below.

3.4.2.2 Model estimation

Our primary strategy to estimate REDD+ impacts is the fixed effects model, constructed as follows:

$$\ln Y_{it} = \beta_0 + \beta_1 \mathrm{Impact}_{it} + \beta_2\, \mathrm{Year}_t + \beta_3 \mathrm{Treatment}_i + \beta_4 X_{it} + \beta_5 Z_i + a_i + u_{it}$$

where, Y_{it} is total income or forest income for household i in year t. Total income includes both cash and subsistence income from all livelihood strategies pursued in the local area including

income from livestock, crops, fish, forests, off-farm businesses and remittances. Income is adjusted for inflation and log transformed to account for skewness in the income distribution. Impact_{it} indicates the time-varying treatment status of household i. It is measured by a dummy variable equal to 0 for all households in 2010 and 1 for households located in REDD+ villages in 2015. It captures the impact of REDD+ on household income. Year_t indicates fixed time effects to control for unobservables that differ across time but not households, such as policy or weather changes. It is a dummy equal to zero for the year 2010. Treatment_i is capturing whether the household is in a treatment or control village, hence, controlling for the effect of different conditions in the two groups of villages.

X_{it} is a vector of time-varying covariates of household income. They include household level variables such as age, gender and education of the household head, size of the household, farm size, income shocks and social capital (simple sum of the number of organizations the household head is a member of). Additional household variables are an index of the value of tropical livestock units (TLU), the amount of forest area deforested in the last 12 months and the distance from house to nearest forest, which measures access to forests. X_{it} also includes time-varying village level covariates such as the Gini coefficient as a measure of inequality.

Z_i are time-invariant covariates. At household level, asset ownership[2], is assumed to be roughly constant over the five-year study period and is computed by aggregating assets into an index developed using the Principal Component Analysis (PCA) technique (Moser & Felton, 2007). The assets include houses, televisions, radios, bicycles, motorbikes, cars as well agricultural implements like hoes, pangas, ploughs, and oxen. Village level variables include distance from the nearest main city as an indicator of market access and village fixed effects captured by village dummies to control for any remaining effects that might be explained by differences in location. a_i denotes time-invariant unobservables. It represents unobservable household and village characteristics – e.g., personal motivations, ability and skill as well as size of the village forest and forest governance. Finally, u_{it} are time-varying unobservables at household or village level.

[2] In order to reduce the length of the questionnaire, we decided not collect data on household assets in the second round. This was done on the assumption that assets may not change to any significant degree between 2010 and 2015.

Bias in the parameter that estimates impacts (β_1) arises if the composite unobservable ($a_i + u_{it}$) is correlated with being in a treatment village or not (Treatment_i). To reduce this bias, the FE model transforms the data and eliminates all time-invariant unobservables (Wooldridge 2009). So, we no longer have to assume independence between the treatment and the time-invariant component (a_i) of the composite unobservable.

To test whether our results are robust to alternative model specifications, we estimate impacts also using the Difference-in-Difference (DID) and Random effects (RE) models (Wooldridge, 2009). The key difference between the FE and RE is that the latter model assumes that the unobservables are uncorrelated with the explanatory variables while the FE assumes no such independence. Given the assumptions, the RE unlike the FE includes time invariant variables from the regression. RE thus overcomes a major weakness of the FE. The DID is a version of the FE and assumes that the selection bias (the unobserved difference in mean counterfactual outcomes between treated and untreated units) is time-invariant. It proceeds by calculating the difference between the before and after values of the mean outcomes of the treatment and control groups and then the difference between these two mean values is the impact estimate. The DID also keeps the time invariant variables.

3.4.3 Collection and analysis of carbon data

The core methodology for assessing the impacts of REDD+ on carbon emissions arising from deforestation and forest degradation, involved combining data on the amount of forestland converted to other land uses, with information on how much carbon remains trapped in the forests after the land use changes. In addition, we also undertook qualitative assessments of people's perceptions about the status of forests, which enabled a more in depth understanding of the causes of change in forest cover and carbon stocks. Figure 2 is a flowchart showing the methodology followed in estimating land use land cover changes (as specified by Mondal et al. 2013).

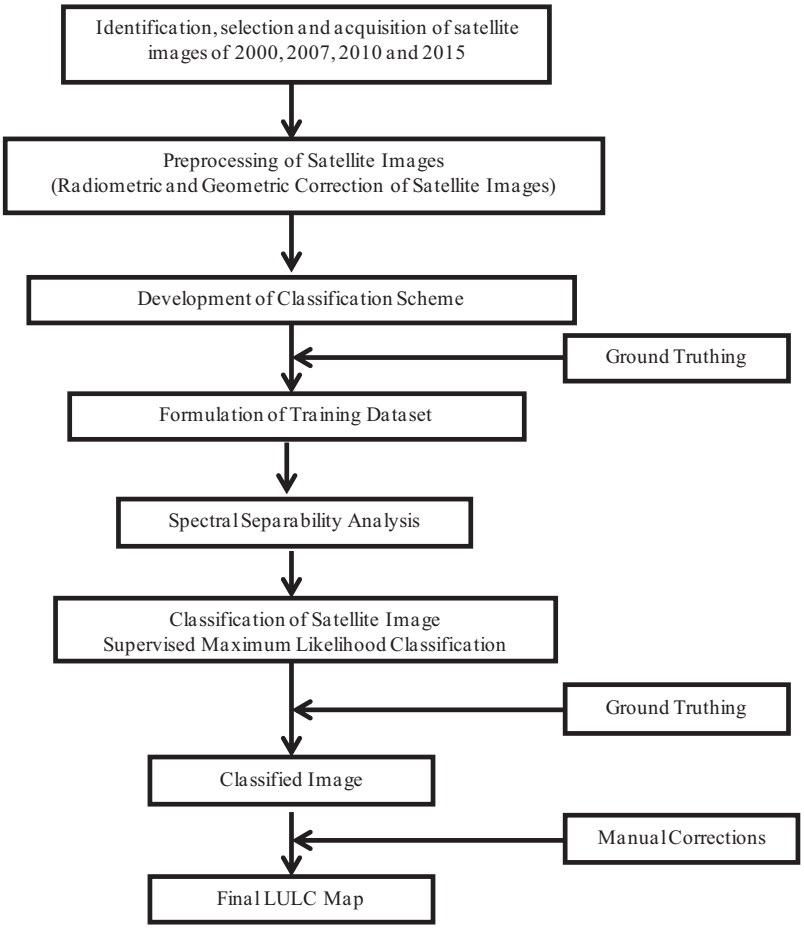

Figure 2. Methodology for Land Use Land Cover mapping
Source: Based on Mondal et al. (2013)

The amounts of forest cover gained/lost as a result of REDD+ initiatives were estimated using GIS data and Landsat imageries for the years 2000, 2007[3], 2010 and 2015 with field observations supplementing these data in 2015. Land cover changes were captured on the basis of Landsat 5 TM and Landsat 7 ETM. In Kilosa, the analyses cover all the 12 pilot villages and a selection of 9 control villages bordering the pilots, while in Kondoa all 18 pilot villages and 12

[3] The year deviates from the 5 year interval due to lack of data from 2005 and the problem of cloud cover in the 2006 images.

control villages were studied (see also section 4 below). Expanding the number of villages compared to the livelihood analyses was done to increase validity as much as possible. Following the BACI methodology, we then compared the differences in forest cover in treatment and control villages, before and after the intervention to try to isolate any impacts of REDD+ on deforestation trends. The analyses distinguished between five land cover classes: Closed woodlands (woodland with greater than 40% canopy closure) open woodlands (woodland with less than 40% canopy closure), bushland (open woody vegetation that is less than 5 meters high), grasslands (predominately grassland with less than 10% cover of woody vegetation) and cultivation areas (annual crops, settlements). Finally, there is also a category for cloud/shadow (residual clouds and their shadows not filled in).

We estimated biomass and carbon stocks by vegetation types[4] based on the national forest monitoring and assessment report of mainland Tanzania (MNRT, 2015). Carbon stock was computed as follows: Carbon (tonnes/ha) = Biomass (tonnes/ha)*0.47*Area covered by forest (ha).

4. Context of the study

This section details the context in which REDD+ operated in our study areas. It provides information about the project proponents, how REDD+ was implemented/project activities, the livelihoods of communities in the participating communities as well as the historical and present situation of deforestation and forest degradation.

4.1 Kilosa

The project proponents were the Tanzania Forest Conservation Group (TFCG) in partnership with the Tanzania Community Forest Conservation Network (MJUMITA), both national NGOs. (TFCG, 2009). Implementing REDD+ was based on establishing Participatory Forest Management (PFM), working only with forests on village land and excluding those villages bordering government reserves (MNRT-FBD, 2007). REDD+ operated in 12 pilot villages.

[4] Since the objective of this paper was to understand forest cover change, results are presented only for changes in woodlands.

The main livelihood activity was farming. Households also kept poultry and small animals like goats and pigs[5]. Generally, markets for products were abundant because most villages were close to Kilosa town. Prior to 2010, there were no restrictions on any forms of land use in village forests. Smallholder agriculture was the major driver of deforestation and forest degradation. Although some people still expanded their agricultural lands, by 2010, most people had permanent farms and new ones were mostly opened to cater for the rising population. Other drivers were fire, production of fuelwood, charcoal, timber, poles, and to a minor extent livestock grazing. Fuelwood was the main energy source for the local people.

With the advent of REDD+, project villages carried out land use planning. This involved establishing village borders and demarcating village land into various user zones including village forest reserves and areas where people could collect firewood, do agriculture, harvest timber, cut wood for charcoal etc. By-laws on the use of resources from the forest were also established. Rules included requirements for permits before harvesting timber, cutting wood for charcoal or clearing land for agriculture in use areas. Fines and penalties for non-compliance were put in place. Although it is required by Tanzanian law to have village natural resource committees (VNRCs), only a few villages had, and these were typically not operational. TFCG/MJUMITA strengthened VNRCs and forest patrol teams were elected. Residents were also trained about natural resource issues and legal frameworks surrounding natural resources in Tanzania.

TFCG/MJUMITA also facilitated the establishment of income generation activities such as improved agricultural practices, beekeeping, chicken rearing and use of improved stoves. So-called 'trial payments' were conducted in 2011 – 2012 with community and individual payments.

4.2 Kondoa

REDD+ in Kondoa was implemented by the African Wildlife Foundation (AWF) – an NGO established in 1961 with a focus on conserving wildlife in Africa. There were two forest reserves in the project area – Salanga is a central government reserve under the jurisdiction of the Tanzania Forest Service, while Isabe is a local government forest reserve managed by the district. The project was implemented in 18 villages. 13 villages bordered the government forests. Four had

[5] Cattle is mostly owned by the Maasai ethnic group. No Maasai operated in the villages selected for livelihood studies, though.

forests on community/village land, while one village had both own forests and bordered a government forest.

Drivers of deforestation included extraction of wood-based forest products, primarily fuelwood, charcoal and timber. Different from Kilosa, residents also kept large numbers of livestock especially cattle, goats, sheep and donkeys. In some cases, these animals grazed in the forest, which accelerated degradation through trampling of young seedlings and deforestation as trees were removed to construct cowsheds. Crop production was the most important source of income, making expansion of farms another important driver of deforestation. The area also had high incidences of drought, which entrenched reliance on forest resources. Forests were generally accessible since most of the villages were close to both forest reserves and village forests. The area also had good access to external markets for both agricultural and forest products.

As there was weak control and enforcement before REDD+ started, the practice in most of the villages was de-facto open access except in four of the villages where AWF started implementing PFM in 2007. As part of REDD+, a series of trainings were carried out to raise awareness about environmental issues. In addition, bylaws for forest use were adopted. In communities bordering government forests, this implied that timber, poles and charcoal harvesting as well as agricultural expansion were prohibited. Grazing in forests was not allowed except in the dry season when one may obtain a permit to do so. Generally, people were encouraged to practice zero grazing. Some non-timber forest products (NFTPs) like fuelwood, grass for feeding animals required one to obtain a permit while others like water, wild fruits and vegetables were free of charge. Typically, people could collect NTFPs two days per week. A joint committee of communities bordering government forests was set up to enforce the rules. Patrols were held 2-3 times a week by the VNRCs together with officers from Tanzania Forest Service. In villages with community forests, rules were less strict. In one of the villages for instance, separate areas were allocated for collecting NTFPs like fuelwood and agricultural expansion. NTFPs were free of charge. Grazing in the forest was acceptable with a permit. However, charcoal and timber production was prohibited.

There was one round of trial payments made for community projects. No individual payments were made. Income generation activities included sustainable agriculture, sustainable building materials, tree planting, sustainable cooking stoves and sustainable charcoal making.

Trainings were given to members of demonstration groups who self-selected into activities of their choice.

5. Results

We begin this section with a summary on how key livelihood outcomes (total and forest income) changed between 2010 and 2015, followed by econometric results showing impacts of REDD+ on total and forest income. Finally, we present results on the impact of REDD+ on carbon and forest status.

5.1 Descriptive statistics

Table 2 summarizes the differences in livelihood outcomes in treatment and control communities before and after REDD+. The table shows that after REDD+, mean total income reduced in pilots as well as in controls. However, in comparison, pilots fared better. Thus, while controls lost over half (52%) of their mean total income, pilots lost about 39%. In both study areas, our discussions in the focus groups and with village leaders revealed that the drought of 2014/2015 was the major cause of income changes. Note, however that Kilosa experienced only mild reduction in rainfall, while in Kondoa the drought was very severe. Accordingly, the loss in income in Kondoa was much larger than in Kilosa.

The drought notwithstanding, there was a belief in pilot villages that agricultural training by NGOs and provision of inputs was improving yields. Pilot communities likewise perceived an increase in rainfall between 2010 and 2014, which they believed, was a result of better forest protection from REDD+. Consequently, there was a common perception in the pilot villages that income was mostly increasing before the drought (from 2010 to 2014). In control villages on the other hand, the perception was that less rain and changing rainfall patterns were reducing incomes between 2010 and 2014. It is important to point out, however, that it was in Kilosa where people associated income gains directly with REDD+. While the benefits of REDD+ were alluded to also in Kondoa, the picture was more mixed as people also noted the challenges of land scarcity, recurrent droughts and low soil fertility. Nevertheless, to the extent that these 'positive' attitudes are true, this lends support to the quantitative results (Table 2) showing that even faced with the drought, pilots lost less income than controls.

Table 2. Summary statistics for the outcome variables in the overall sample in 2010 and 2015

	Full sample 2010 (N=295)			Full sample 2015 (N=295)		
Dependent variables	Pilots	Controls	Pilots vs. Controls	Pilots	Controls	Pilots vs. Controls
Total income	1079.8	1296.1	-216.3	658.7	619.7	39.0
	(89.0)	(132.8)	(154.7)	(52.2)	(73.9)	(88.7)
Forest income	125.8	135.8	-10.0	123.8	91.6	32.2
	(24.9)	(35.0)	(42.2)	(17.5)	(17.6)	(26.7)

Further situating these results into the wider economic context in the study areas, we find a broad consensus in both study areas in controls and pilots alike, that living conditions were getting better between 2010 and 2015[6]. Leaders often pointed to the fact that many people were building modern houses, and that more people own motor cycles and bicycles in 2015 when compared to 2010. In the FGDs, respondents generally felt that social infrastructure including education, health and road networks was improving. There was also a government social safety net program – the Tanzania Social Action Fund (TASAF) – that was offering cash transfers to the most vulnerable households. In terms of technology improvements, there have been significant improvements in the telecommunications. A number of mobile networks now operate in the villages, and many more households own at least one mobile phone. Respondents noted the importance of mobile phones in connecting them to external markets, allowing them to follow prices thereby reducing exploitation by intermediaries. Mobile phones were also being used to effect business and non-business money transfers. Controls and pilots in both study areas also saw an increase in the hiring of tractors and use of oxen for farming. Further, there seemed to be an upward trend also in the use of technologies like fertilizers, improved seed and pesticides. Obtaining such inputs was however easier in the pilot villages as AWF and TFCG supplied such inputs at subsidized prices, although this was limited to a few groups of demonstration farmers. In some controls, government provided subsidized inputs. People nonetheless complained that these

[6] [1] Based on these qualitative results, we do acknowledge the fact that contrary to our earlier assumption, household assets may have changed significantly over the 5-year period. Nonetheless, this is unlikely to affect our key findings because a) asset ownership is not a confounder affecting both participation in REDD+ and outcomes in livelihoods and deforestation, b) as we show, it is the state programs not REDD+ that is responsible for the changes, and c) although absolute levels of assets within households may have changed, it is reasonable to assume that the relative changes between households did not change greatly.

were sometimes late. Use of solar technology is another innovation that was important in the study areas. Since 2010, there has been a boom in the use of solar powered technologies allowing people to for example charge phones, light homes and watch television. This was true for both controls and pilots.

5.2 Econometric results

Results presented below are from fixed effects regressions using overall and sub-sample data from Kondoa and Kilosa. We also carried out distributional impact analyses to find out if REDD+ produces different impacts for different groups of people including men and women as well as high and low income households. Given that the dependent variable (income) is log transformed, the coefficients approximate the percentage change in income arising from a unit change in the independent variable. All specifications include the following controls: A dummy of whether the household is located in a REDD+ or control village, age, sex and level of education of the household head, household size, size of farmland owned by household, a dummy of whether or not the household faced a shock in the last 12 months, household asset ownership, an index of social capital, total livestock units, amount of forest cleared on average per year, distance from household's residence to the nearest forest, distance from the village center to the main external market, village level Gini coefficient and village fixed effects. Robust standard errors are estimated for all models to control for heteroskesdascity and for the clustering of model errors within households in the two periods. The regression results below (table 2 and 3) show only a small set of variables, full regression results can be found in appendix B.

5.2.1 Impact of REDD+ on total income

Results in Table 2 reveal that although the impact of REDD+ on total income seems positive in the full sample as well as in Kondoa, this increase is not statistically different from zero. In Kilosa, REDD+ depresses income, but this result is also highly insignificant. Further, regressions for assessing the distributional impacts of REDD+ revealed that REDD+ had no differential impacts based on gender or income (see Appendix C). This essentially implies that REDD+ has had no effect on total income, a result that holds true for the full sample as well as for Kondoa and Kilosa separately. We instead find that the most important variable accounting for the change in total income was the drought in the 2014/2015 agricultural season, captured by the coefficient on the

time effects dummy variable 'year'. The effect of 'year' on total income for the full sample was, hence, a 39% decrease between 2010 and 2015 in the whole sample. In Kondoa, the reduction caused by 'year' was estimated to be more than 100%, while in Kilosa the effect of 'year' on total income was an increase by 5%, while the increase was not statistically significant (Table 2).

Table 2. FE estimates of impact of REDD+ on total income

	Full sample		Kilosa		Kondoa	
Independent variables	Coefficient	SE	Coefficient	SE	Coefficient	SE
REDD+ impact	0.202	(0.227)	-0.029	(0.303)	0.341	(0.321)
Year (0=2010; 1=2015)	-0.392*	(0.206)	0.053	(0.231)	-1.127***	(0.376)
Observations	465		233		232	
Number of households	287		142		145	
Model R-squared	0.340		0.324		0.535	

*** p<0.01, ** p<0.05, * p<0.1

Information from focus groups and resource person interviews shed light on why REDD+ may have failed to cause a positive impact on total income. Discussions revealed that income-generating activities were limited to only a few households in demonstration groups and not adopted widely by the rest of the villagers. Additionally, market conditions were difficult. For example, demand for improved cooking stoves was low, while production costs for sustainable charcoal and bricks were high. Furthermore, trial payments in both areas were made only once and there was a common sentiment in both areas was that the level of payments was very low. TFCG and MJUMITA had the most developed plan to link the Kilosa project to the carbon market. This did not work out partly because of technical issues around verification, and partly because the carbon price was too low to cover the investment. This resulted in no flow of resources from outside the project.

5.2.2 Impact of REDD+ on forest income

As shown in Table 3, REDD+ significantly and substantially increased forest income in the Kilosa sub-sample. In Kondoa and the whole sample, we find a modest decrease and increase respectively in forest income, but these are statistically insignificant. Similar to the results on total income, the time variable was once again the most important in accounting for the change in forest income. Thus, between 2010 and 2015, forest income increased significantly by 94% in the full sample signaling that forests could have played a role as shock absorber during the drought of 2014/2015.

Table 3. FE estimates of impact of REDD+ on forest income

	Whole sample		Kilosa		Kondoa	
Independent variables	Coefficient	SE	Coefficient	SE	Coefficient	SE
REDD+ impact	0.013	(0.39)	1.230***	(0.45)	-0.038	(0.72)
Year (0=2010; 1=2015)	0.941**	(0.39)	0.659	(0.41)	0.093	(1.52)
Observations	394		218		176	
Number of households	261		136		125	
Model R-squared	0.309		0.6		0.262	

*** p<0.01, ** p<0.05, * p<0.1

Qualitative data suggests that there was a general reduction in availability of forest resources in the controls. This was the case even though access to forests was not restricted. In most control villages, there were no rules to manage resource use at all. In others, leaders tried to put in place rules, but motivation to follow rules as well rule-ownership by locals was low and enforcement insufficient. Thus, focus groups consistently submitted that forests were increasingly degraded and that non-timber forest products were increasingly scarce. In addition, distances from homes to forests were increasing as nearby trees had been cleared. Put together, these revelations may explain why REDD+ was able to produce a positive impact on forest income (at least in Kilosa). That is; by regulating resource use – for instance through permits and keeping 'out' non-residents – and improving enforcement, REDD+ increased availability of forest resources to people in pilots while unregulated use reduced availability in controls.

5.2.3 Robustness checks

The RE and DID regression results are presented in appendix D. These results are all in line with the key findings from the FE model indicating that REDD+ has had no impact on total income in any of three samples and that the drought explains the reduction in income in the full sample and in Kondoa. Also consistent with the main results, total income in Kilosa is not affected by either REDD+ or the drought. In the same way, both the RE and DID models confirm the result that REDD+ significantly increases forest income in Kilosa, but does not influence it in either in Kondoa or the full sample. The RE and DID models also show that, forest income increases significantly in 2015 in the whole sample and in Kilosa.

5.3 Impact of REDD+ on forest carbon storage

In Kilosa, forests (closed and open woodlands) cover 59,153 ha in pilot villages, representing 39% of the total area, while there are 29,740 ha of forests in control villages, about 38% of the area. The data show that, REDD+ improved carbon storage[7] in Kilosa, by reversing the trend of deforestation and forest degradation in pilot villages. Following a decline from around 1,607,100 tons in 2000 to 1,558,600 tons in 2007 and 1,307,100 tons in 2010, carbon stock recovered during the REDD+ implementation period, surpassing its original (2000) levels to 1,656,900 tons in 2015. In contrast, control villages saw a reduction of carbon stock from about 953,170 tons in 2000 to 826,000 tons in 2007, followed by a slight increase to 853,300 tons in 2010 and then a reduction to 823,400 tons in 2015 (Figure 3).

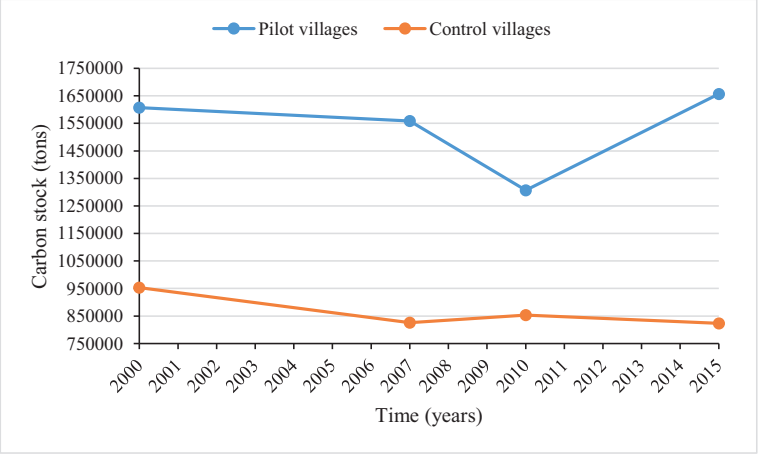

Figure 3. Carbon stock change in Kilosa pilot and control villages

Behind these data lies the observation that woodlands recovered during REDD+ implementation in pilot villages as opposed to the controls where forest coverage reduced. Accordingly, forest area in pilot villages increased by about 8,262 ha between 2010 and 2015, compared to a large loss in forest cover of 5,270 ha in the three years before REDD+ (2007-2010). A slight increment of 554 ha between 2000 and 2007 resulted from expansion of open woodlands,

[7] Cloud cover might compromise the quality of the satellite imagery, although this was not a major limitation in this case, as cloud cover was not more that 1% of the total land area in all years. The recovery of vegetation and drying out of leaves is another source of uncertainty for estimating forest cover. Carbon data estimates could also be uncertain because of using only one parameter to model the relationship between carbon stock and the area covered by forest. These uncertainties, however, do not seem to influence the overall conclusions.

while the reduction in carbon stock during this period, implies a decrease in the area covered by closed woodlands. Control villages lost about 200 ha of forests between 2010 and 2015, and 6200 ha between 2000 and 2007 although there had been a gain of 2880 ha in the period preceding REDD+ (2007-2010).

The above results are consistent with evaluations in focus group discussions and interviews with resource persons. Respondents in pilot villages noted that forests were recovering and they attributed the changes to REDD+. The positive impacts from REDD+ arose due to the strengthening of the VNRCs and patrol teams enabling them to perform regular forest patrols and to enforce bylaws. In control villages, the extent of forest management depended on leadership in the particular village. Thus in some villages, leaders instituted patrol teams and encouraged the work of VNRCs while in other villages there was no control in the use of forest resources at all. Thus in control villages, the general perception was that forest status was worsening although perceptions varied from village to village depending on the level of forest management. Where there was some form of forest management, enforcement and compliance to rules seemed more challenging than in pilot villages.

Turning to Kondoa, the total area covered by forests in pilot villages is 25,682 ha while in control villages, forests cover some 37,818 ha. This corresponds to 41 and 29% of the total area in pilot and control villages respectively. The findings show that also in Kondoa, REDD+ reduced carbon emissions from deforestation and forest degradation, as carbon stocks increased in pilot villages during REDD+ implementation (2010-2015) while stocks in control villages decreased during the same period (Figure 4). However, unlike Kilosa, pilot villages in Kondoa registered improvements in forest cover prior to REDD+, due to governance initiatives that were taking place during that period. Between 2007 and 2010, AWF was establishing PFM in some communities while the regulations within the government owned forest reserves in Kondoa probably explain the increases for the 2000/2007 period in both pilot and control villages.

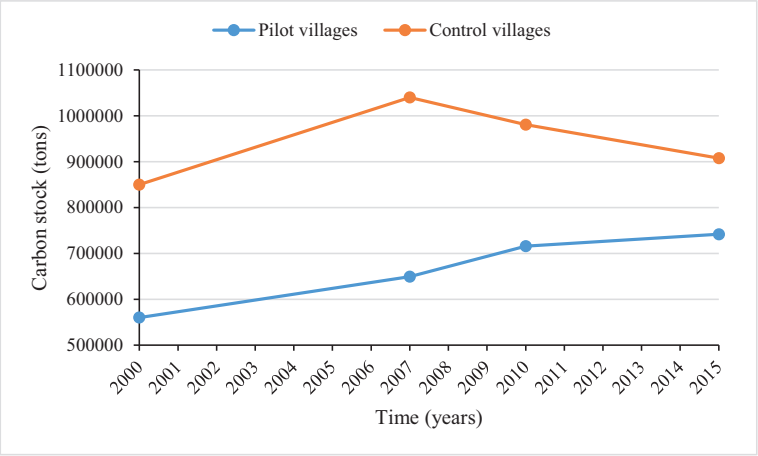

Figure 4. Carbon stock change in Kondoa pilot and control villages

Results on land use change also indicate a positive impact of REDD+ on forest cover in Kondoa, with pilot villages having an increase of 1,286 ha between 2010 and 2015 compared to a loss of 1,115 ha in controls. Similarly, attitudes about forest cover expressed in focus groups and in resource person interviews also point to a positive REDD+ effect. Accordingly, respondents in pilot villages perceived forest status to be improving while in controls forest conditions were worsening. Reasons for the positive changes in pilot villages are similar to those observed in Kilosa including the strengthening of local forest management and enforcement. In comparison, forest management and enforcement was weaker in control villages leading to negative changes in forest status.

6. Discussion

Discussing the above findings, we will here explore how REDD+ implementation unfolded along the causal pathway specifically reflecting on where there are breaks in the pathway leading to a failure to realize expected outcomes. As we have seen, REDD+ was implemented in a complex environment, where several factors other than the REDD+ program itself could have influenced the changes observed. We, therefore, widen our interpretation of the quantitative results from the BACI analyses by supplementing with qualitative assessments and situating the results within the wider context in which REDD+ operates.

In terms of total income, we find that REDD+ neither improves nor harms rural livelihoods. From theory, we expect positive impacts of REDD+ on income to be mediated through compensation and ecosystem services, and negative impacts through restrictions on forest use. REDD+ failed to cause positive impacts on total income because the causal pathway was broken at several critical nodes. First, there was insufficient investment in income generating activities. Second, payments for reduced deforestation were not sustained and were low. Third, there was a drought during the year of data collection, such that ecosystem benefits from the perceived increase in rainfall, reported by residents of pilot villages, could not be realized in our observations. Rather, improvements in living conditions as expressed qualitatively came from expansion of public investments by the Tanzanian government following improvements in access to education, health and nutrition and high growth in the Tanzanian economy – an average of 7% over the decade (2005-2015) (Emenuga et al., 2016; WorldBank, 2016). These macro-economic dynamics rather than REDD+ appear to be the main drivers of the social changes expressed by the people. Sunderlin et al., 2017 argue similarly.

On the other hand, REDD+ did not negatively affect livelihoods because restrictions were characterized by regulated access as opposed to a complete ban on the use of forest products. In fact, the evidence suggests that REDD+ contributed positively to forest income in Kilosa. Through improved enforcement, regulated use of forests and increased awareness about forest protection, REDD+ appears to have slowed down deforestation and degradation and increased availability of some forest products in Kilosa.

Overall, the literature still presents mixed results on the socio-economic impacts of payments for ecosystem services (PES) projects. Some studies, do not find any significant contribution of the projects to livelihoods (e.g Sunderlin et al., 2017 on REDD+), others are inconclusive about the effects (e.g Corbera et al., 2017 on REDD+), while some have found some positive impacts (e.g., Alix-Garcia et al., 2014; Clements & Milner-Gulland, 2015; Clements et al., 2013; Tacconi et al., 2013 on PES).

The difference in the impact of REDD+ on forest income in Kilosa (i.e positive impact) and Kondoa (i.e no impact), can be explained through the way tenure differently influences access to forest resources in the two pilots. In Kondoa, forests are mostly located on government land while in Kilosa, REDD+ was implemented in community forests. Accordingly, regulations were

stricter in Kondoa than in Kilosa. For instance, the law does not permit extraction of charcoal and timber in government owned forests and these restrictions became better enforced under REDD+. In contrast, the bylaws adopted in Kilosa allowed villagers to extract charcoal and timber after obtaining a permit. In addition, Kilosa pilots designated some forest parts as 'for-use' areas for collecting fuelwood, medicines and wild foods on any day of the week. A combination of land pressure and government ownership meant that most pilot villages in Kondoa could not have separate 'for-use' areas, instead designating one or two days of the week when people could collect these resources. These tenure differences imply that forest resources were more available to pilots in Kilosa[8] than in Kondoa. Moreover, considering that data were collected during a 'bad' agricultural season, the large and positive coefficient on REDD+ in Kilosa could indicate that people were turning to forests to cope with the shock, though restrictions made this more difficult in Kondoa.

Further, our studies on land use suggest that REDD+ increased the amount of forest carbon stored by improving forest cover in both sites, although the recovery was stronger in Kilosa. Overall, the causal mechanisms for outcomes in forest status operated as expected which explains the reduction in deforestation in the Kilosa pilot and a continued enhancement in Kondoa. Accordingly, REDD+ activities in both areas emphasized local governance and training. These translated into improved enforcement, regulated forest access and more appreciation of environmental protection leading to recovery in forest cover. Perhaps the only shortcoming along the causal pathway on forest status was that REDD+ did not foster reduced dependence on extractive activities, as efforts on alternative income generation were limited. Even then, the improvements in enforcement, regulation of forest access and better attitudes to environmental protection, meant that REDD+ was still able to deliver on its aim of reducing deforestation and degradation. This result finds support in Simonet et al. (2018), who similarly find that REDD+ reduces deforestation if programs combines a mixture of strategies including incentives, disincentives and enabling measures.

That REDD+ managed to improve forest cover, but posted limited success on income, reflects the strategy of the implementing NGOs in both study areas, which prioritized

[8] Morgan Brown one of the members of staff for TFCG had a different explanation for the positive effect of REDD+ on forest income in Kilosa. According to him, REDD+ was able to control agricultural expansion but degradation from charcoal making and timber was more difficult to control hence the increase in forest income.

strengthening institutions and forest governance while focusing less on income generation and compensation. It is noteworthy that in contexts where institutions and property rights are weak, the literature supports this strategy, advocating the prioritization of governance rather than quick compensation and payments (Clements et al., 2010; Tacconi et al., 2013). Institutions were weak in both study areas before REDD+, a scenario that is prevalent in many developing countries. In such cases, it is argued that prioritizing governance creates greater local incentive for participation, facilitates collective action and stronger institutional frameworks and enables smooth transfer of payments. However, as is clear from our results, the socio-economic results from such an approach may take longer to be achieved – see also Clements et al., (2010) for a similar reasoning. This implies that if REDD+ is to boost livelihoods, projects would require sufficiently long time periods to first streamline the necessary governance structures and then roll out payments. Yet, in the present case, projects ended after a few (4-5) years, and at the time, low prices on the international carbon markets meant that communities could turn to them for payments. Over time, one risks that REDD+ hurts livelihoods as there are no carbon payments, while communities are still formally bound by the strict regulations limiting their use of forest resources.

The role of context in influencing outcomes should, however, not be overlooked. We have for example shown that although causal processes worked similarly in both sites, tenure differences enabled REDD+ to contribute to forest income in Kilosa while precluding such an effect in Kondoa, where bylaws were more restrictive. Contextual factors may also help us understand why forest recovery was lower in Kondoa despite the fact that communities pursued similar activities to encourage forest regrowth. Considering that in terms of drought occurrence, soil fertility and land scarcity, Kondoa is more vulnerable, the need for alternatives to reduce dependence on forests is higher. However, as we have seen, alternatives were limited and regulations very strict in Kondoa, a situation that encourages illegal activities and compromises improvement in forest cover.

The above underlines the significance of understanding and addressing the local realities in which REDD+ is implemented. In this regard, the role of environmental conditions is worth discussing, ning that agriculture is a vital component of many developing country economies where REDD+ is to be implemented. In the present case, 99% of the sample indicated that agriculture was their main occupation, with the diversification strategies including livestock

production and small businesses like food vending and beer brewing, all being dependent on rainfall. So, irregular rainfall and water scarcity in Kondoa was one of the major problems that REDD+ needed to address (see also Bolin et al., 2012). Yet, the precipitation problem of semi-arid Kondoa was largely overlooked by the implementers of REDD+[9], despite the fact that environmental challenges in Kondoa have a very long and well-known history (Dejene et al., 1997; Östberg, 1986). Thus, implementers did not provide adequate alternatives to counter the negative effects of stringent rules on livelihoods. Also because of the REDD+ rules, forest extraction could not play its role as a shock absorber, a common coping strategy in forested landscapes of developing countries (Shackleton & Shackleton, 2004; Shackleton et al., 2011; Takasaki et al., 2004). Failure to account for local realities like the precarious environmental situation in Kondoa, comprises the long-term sustainability of REDD+. Indeed, recent work has found conflict and resentment towards REDD+ to be higher in Kondoa than in Kilosa (Nantongo, 2017; Vatn et al., 2017).

7. Conclusion

This study had two main objectives. The first was to examine whether REDD+ influenced livelihoods, while the second was to find out if REDD+ influenced forest cover and the associated carbon storage. The paper employs a mixed methods approach combining quantitative and qualitative techniques to investigate REDD+ impacts and follows a theory-based evaluation, to understand the underlying mechanisms driving the changes. To eliminate rival explanations and isolate impacts that can be attributed to REDD+, the study has used the Before-After/Control-Intervention research design.

Results support the idea that REDD+ can reduce carbon emissions from forest loss (see also Duchelle et al., 2018 and Simonet et al., 2018). We, however, find that its impact on welfare is either small or non-existent a result in line with Sunderlin et al., 2017. The quantitative analysis shows that REDD+ had no impact on total income in both REDD+ pilots and that the drought in the 2014/2015 agricultural season was the main explanation for the reduction in total incomes particularly in the already semi-arid Kondoa. We also find evidence from qualitative data to

[9]Note that AWF, the NGO in Kondoa approached communities to seek their opinion as they were developing their proposal for REDD+ (Author in review). We do not think however, that vulnerability of Kondoa to droughts was sufficiently addressed in the design for REDD+.

suggest that social infrastructure in terms of education, health, road networks and access to new technologies was improving during the study period. These changes were, however, driven by government policies rather than activities of REDD+. Hence, REDD+ failed to positively contribute to livelihoods in the five-year period, because of insufficient investment in income generating activities, low payments and the drought that compromised benefits from agriculture. On the other hand, REDD+ did not negatively affect livelihoods because REDD+ rules – especially in Kilosa – allowed regulated access to forest resources. In fact, through improved enforcement, regulated access and improved awareness about forest protection, REDD+ seems to have enhanced forest restoration and slowed down deforestation and forest degradation, implying that forest products were more available to people in REDD+ villages at the end of the pilot period. In Kilosa, where tenure (community ownership) allowed for more flexibility in the rules, increased availability of forest resources translated into a significant increase in forest income in 2015 as compared to 2010, which also became a vital shock absorber during the drought year. Nevertheless, Kondoa did not register this positive effect of REDD+ on forest income, most probably because the dominant tenure (public ownership) called for stricter regulations on access to forest resources. REDD+ also increased forest cover and carbon stocks in both pilots – although the effect is more pronounced in Kilosa than in Kondoa – due to better local governance, community engagement, land use planning and training, which led to improved enforcement, regulated forest access and more appreciation of environmental protection causing a recovery in forest cover.

The above results provide early evidence that if mechanisms that could cause changes operate as expected, REDD+ could indeed simultaneously contribute to improvements in both livelihoods and forest cover. Nevertheless, one should be careful when 'extrapolating' the results to other countries and regions. As we have shown, local contexts are important for how the causal mechanisms will operate. In this case, we have highlighted that even though REDD+ activities were similar in Kilosa and Kondoa, tenure and environmental differences led to different outcomes in the two REDD+ pilots.

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APPENDIX A

Pilot area selection

This is an overview of the process of how proponents selected REDD+ pilot villages. Information is from project documents, (Namirembe, Ebeling, Olander, & Doggart, 2010a, 2010b, 2010c, 2010d) and (Matilya, 2012), secondary sources (Charnley & Overton, 2006; Dyngeland & Ericksson, 2011) and interactions with project staff.

Selection process in the case of Kilosa

The selection process started at the beginning of 2010 with a prescreening exercise to select the district to focus on. As a starting point, TFCG selected 12 districts based on two prescreening criteria. The existence of eastern arc mountains and presence of TFCG and (or) MJUMITA in the area. The eastern arc mountain range was chosen primarily because of the high concentration of endemic species found in its forests, while focusing on areas with TFCG/MJUMITA presence was meant to leverage TFCG experience and partnerships built over time. Following the prescreening exercise, TFCG together with consultants developed and refined assessment criteria. The criteria were grouped into four in the following order of importance; technical feasibility, likelihood of successful project implementation, level of community organization and governance and potential for replicability and co-benefits. Based on these criteria and through consultations with NGOs, representatives from government agencies, the Norwegian embassy in Tanzania and the Institute of Resource Assessment, Kilosa and Kilolo districts were then selected out of the 12 prescreened districts. This was followed by field visits to develop more detailed profiles about the two selected districts. Finally a workshop involving national and district government stakeholders, NGOs, research and community organizations was held to rank the districts, where Kilosa emerged as most suited one for REDD+. TFCG/MJUMITA then proceeded to choose specific sites within the district where REDD+ was to be carried out, following similar criteria used to evaluate the districts. This selection was based on satellite imagery of forest blocks, field visits and consultations with village leaders, resulting in 13 out of the total 164 villages in Kilosa to be selected.

As the goal of the pilot was to trade carbon on international markets, critical factors for evaluation at all stages of the selection process related to the technical feasibility of the project, as indicated by carbon values. Therefore, through the above selection process, sites/villages were more likely

to be selected if they had the following characteristics. Large forest area, high historical deforestation rates, as a demonstration of a compelling baseline, high carbon densities with evergreen forests ranked higher than miombo woodlands, low risk from leakage with charcoal and logging seen as greater risks than subsistence agriculture or grazing, and low biophysical risks such as human induced fires. To demonstrate high likelihood for successful project implementation, sites also had to exhibit low opportunity costs, low pressure on forests – e.g low population density – presence of other implementing partners and to be in advanced stages of PFM, which signaled that the preliminary institutional basis was in place, so that sites were now ready to develop REDD+. In terms of the level of community organization, the primary indicator was that sites were actively involved in community based forest management (CBFM), which was also seen to reflect high potential for equitable benefit sharing. At the stage of selecting forest blocks/villages, this criterion led to the elimination of all sites under joint forest management (JFM) because of uncertainty about how communities were to share benefits with government. Under community organization and governance, sites also had to demonstrate good governance such as potential to handle illegal activities in forest and land management and strong political leadership. Finally, regarding co-benefits, pilot sites had to have high biodiversity – understood to fetch a higher value on voluntary markets and to contribute to national and international benefits - and medium to high poverty levels, which was seen as necessary if REDD+ was to contribute to livelihoods.

Selection process in Kondoa

AWF being an NGO with a focus on conserving wildlife, had a long history of working in Tarangire National Park. Because the Tarangire river was the main source of dry season water for the wildlife in Tarangire National Park, selection of the area grew out of concern that AWF had about the degradation of forests in the head waters of the Tarangire river. Therefore, selection of sites in Kondoa was based on only one criteria; the proximity of the sites to catchment areas for the Tarangire river. The process for selection started in 2006 – prior to the introduction REDD+ – with collaboration between the United States Forest service and AWF. The collaboration was meant to assess the potential for carrying out PFM and identifying activities that could be introduced in villages surroundings the catchment areas to relieve pressure on the forests. As a result, all villages which lie inside and outside surrounding government forest reserves of Salanka, Isabe and Kome forest reserves were identified as potential sites. Implementation began with four

villages in 2007 and later, when REDD+ was introduced in 2010, the project was scaled up to include all villages around Salanka and Isabe forest reserves.

Overall, the processes through which project proponents selected the REDD+ pilots suggest that pilot villages were designated mainly on the basis of ecological characteristics namely forest size, forest type, species concentration and diversity as well as geography i.e location, distance from cities, rivers, roads etc. Other selection criteria included socio-economy (type of livelihood activities pursued, population density, current and historical rates of deforestation, presence or absence/level of participation of development organizations) and institutional capacity (local political organization, forest management and governance, tenure). All these factors are potential sources of selection bias, as they are likely to influence also outcomes in terms of livelihoods and deforestation.

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APPENDIX B

Table B1. Impact of REDD+ on total income (FE)

	Full sample		Kilosa		Kondoa	
Independent variables	Coefficient	se	Coefficient	se	Coefficient	se
REDD+ impact	0.202	(0.227)	-0.029	(0.303)	0.341	(0.321)
Year (0=2010; 1=2015)	-0.392*	(0.206)	0.053	(0.231)	-1.127***	(0.376)
Treatment (0=Control; 1=Pilot)	-		-		-	
Age of household head, years	-0.024	(0.015)	-0.017	(0.021)	-0.027	(0.021)
Sex of household head (0=Female; 1 Male)	0.217	(0.272)	1.367**	(0.610)	0.325	(0.309)
Level of education of household head (1=No formal education; 2=Primary; 3=Secondary; 4=Higher education)	-0.172	(0.244)	-0.026	(0.362)	-0.270	(0.343)
Distance to main market, km	-		-		-	
Household size	0.027	(0.039)	0.054	(0.051)	0.020	(0.056)
Size of farmland, acres	0.029	(0.042)	0.293***	(0.089)	-0.014	(0.037)
Household experienced income shock in the last 12 months (0=No, 1=Yes)	-0.178	(0.161)	0.333*	(0.185)	-0.649**	(0.259)
Asset ownership, PCA scores	-		-		-	
Social capital index	0.089	(0.075)	0.049	(0.104)	0.069	(0.115)
Total livestock units (TLU)	0.208***	(0.062)	0.161	(0.210)	0.197***	(0.068)
Amount of forest cleared on average per year, ha	0.003	(0.142)	-0.076	(0.217)	-0.001	(0.211)
Distance from house to nearest forest, minutes walking	0.002	(0.001)	0.001	(0.002)	-0.000	(0.003)
Village level Gini coefficient	-3.318**	(1.284)	0.319	(2.390)	3.131	(3.781)
Village fixed effects	-		-		-	
Constant	8.895***	(0.933)	4.562***	(1.626)	7.002***	(2.000)
Observations	465		233		232	
Number of households	287		142		145	
R-squared	0.340		0.324		0.535	

Table B2. Impact of REDD+ on forest income (FE)

	Wholesample		Kilosa		Kondoa	
Independent variables	Coefficient	se	Coefficient	se	Coefficient	se
REDD+ impact	0.013	(0.39)	1.230***	(0.45)	-0.038	(0.72)
Year (0=2010; 1=2015)	0.941**	(0.39)	0.659	(0.41)	0.093	(1.52)
Treatment (0=Control; 1=Pilot)	-		-		-	
Age of household head, years	-0.015	(0.025)	0.005	(0.028)	-0.029	(0.05)
Sex of household head (0=Female; 1 Male)	0.045	(0.562)	0.849	(0.917)	0.544	(0.96)
Level of education of household head (1=No formal education; 2=Primary; 3=Secondary; 4=Higher education)	-0.131	(0.436)	-0.022	(0.42)	-0.524	(0.89)
Distance to main market, km	-		-		-	
Household size	-0.058	(0.068)	-0.063	(0.069)	-0.106	(0.16)
Size of farmland, acres	-0.139*	(0.073)	0.07	(0.137)	-0.224**	(0.11)
Household experienced income shock in the last 12 months (0=No, 1=Yes)	0.189	(0.241)	0.066	(0.222)	0.346	(0.62)
Asset ownership, PCA scores	-		-		-	
Social capital index	0.166	(0.113)	0.053	-0.151	0.294	(0.23)
Total livestock units (TLU)	-0.154	(0.175)	-0.271	-0.221	-0.161	(0.28)
Amount of forest cleared on average per year, ha	0.349	(0.216)	-0.353	-0.348	0.425***	(0.14)
Distance from house to nearest, forest, minutes walking	0.003*	(0.002)	0	-0.002	0.006	(0.01)
Village level Gini coefficient	-2.566	(2.088)	10.208***	-2.966	3.123	(10.5)
Village fixed effects	YES		YES		YES	
Constant	5.919***	(1.84)	-2.3	-2.236	4.976	(5.39)
Observations	394		218		176	
Number of households	261		136		125	
R-squared	0.309		0.6		0.262	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX C

Table C1. Impact of REDD+ on women

Log of total income	FE	se	RE	se
Year (0=2010; 1=2015)	-0.381*	(0.202)	-0.430***	(0.161)
Treatment (0=Control; 1=Pilot)			-0.015	(0.355)
Impact on women	0.144	(0.658)	0.053	(0.215)
Age of household head, years	-0.024	(0.015)	-0.008**	(0.003)
Gender of household head (0=Female; 1=Male)	0.116	(0.570)	0.249	(0.172)
Education level of head (1=No formal education, 2=Primary; 3=Secondary; 4=Higher education)	-0.179	(0.242)	0.146	(0.093)
Distance to main market, km			-0.004	(0.004)
Household size	0.028	(0.038)	-0.015	(0.025)
Size of farmland, acres	0.027	(0.040)	0.082***	(0.030)
Household experienced income shock in the past year (0=No; 1=Yes)	-0.180	(0.159)	-0.151	(0.092)
Asset ownership, PCA scores			0.072**	(0.030)
Social capital index	0.086	(0.077)	0.111***	(0.042)
Total livestock units (TLU)	0.206***	(0.063)	0.152***	(0.043)
Amount of forest cleared on average per year, ha	0.015	(0.014)	0.023**	(0.010)
Distance from house to nearest, forest, minutes walking	0.002	(0.001)	0.001*	(0.001)
Village level Gini coefficient	-3.313**	(1.287)	-3.408***	(1.051)
Constant	8.911***	(0.960)	8.101***	(0.658)
Observations	465		465	
R-squared	0.342			

Table C2. Impact of REDD+ for lower income households (lower half of the income distribution)

Log of total income	FE	se	RE	se
Year (0=2010; 1=2015)	-43.089	(56.477)	-131.096***	(41.613)
Treatment (0=Control; 1=Pilot)			87.199	(94.022)
REDD impact	-109.701	(83.107)	-32.848	(46.044)
Age of household head, years	-2.350	(3.265)	-1.017	(0.773)
Gender of household head (0=Female; 1=Male)	86.118	(71.962)	24.402	(24.354)
Education level of head (1=No formal education, 2=Primary; 3=Secondary; 4=Higher education)	71.348	(85.851)	-26.559	(29.006)
Distance to main market, km			0.195	(1.004)
Household size	-3.376	(20.231)	0.862	(4.315)
Size of farmland, acres	18.706	(40.030)	11.768**	(4.696)
Household experienced income shock in the past year (0=No; 1=Yes)	-51.221	(76.897)	-20.810	(27.700)
Asset ownership, PCA scores			3.708	(9.260)
Social capital index	20.890	(30.601)	23.834**	(11.484)
Total livestock units (TLU)	-14.657	(62.301)	-11.470	(11.728)
Amount of forest cleared on average per year, ha	292.141	(232.993)	-8.329	(6.487)
Distance from house to nearest, forest, minutes walking	-0.183	(0.639)	0.353	(0.222)
Village level Gini coefficient	-949.951*	(496.193)	-852.616***	(247.341)
Constant	714.268**	(279.514)	814.361***	(137.244)
Observations	219		219	
R-squared	0.724			

*** p<0.01, ** p<0.05, * p<0.1

Table C3. Impact of REDD+ for higher income households (upper half of the income distribution)

Log of total income	FE	se	RE	se
Year (0=2010; 1=2015)	-606.936*	(359.627)	-910.644***	(259.914)
Treatment (0=Control; 1=Pilot)			-296.529	(555.859)
REDD+ impact	22.584	(470.731)	371.470	(286.226)
Age of household head, years	0.485	(22.367)	-0.943	(4.379)
Gender of household head (0=Female; 1=Male)	290.843	(578.263)	255.657	(201.402)
Education level of head (1=No formal education, 2=Primary; 3=Secondary; 4=Higher education)	-1,091.434	(929.104)	183.485	(139.678)
Distance to main market, km			-6.691	(5.727)
Household size	-13.027	(83.466)	-64.176*	(34.358)
Size of farmland, acres	-40.673	(85.679)	52.498	(40.533)
Household experienced income shock in the last 12 months	-372.873	(399.688)	-183.424	(167.541)
Asset ownership, PCA scores			68.803*	(38.374)
Social capital index	309.671**	(136.653)	117.067*	(61.880)
Total livestock units (TLU)	300.045**	(137.639)	160.178***	(52.885)
Amount of forest cleared on average per year, ha	28.469	(74.789)	32.193***	(6.123)
Distance from house to nearest, forest, minutes walking	0.240	(2.621)	0.174	(1.180)
Village level Gini coefficient	283.753	(2,120.890)	658.401	(1,356.003)
Constant	3,096.703	(2,439.549)	1,505.120*	(804.978)
Observations	247		247	
R-squared	0.528			

*** p<0.01, ** p<0.05, * p<0.1
N:B All models control for village fixed effects

APPENDIX D:

This appendix presents results from the robustness checks. Variable descriptions are found at the end of the document

Table D1. RE model results on the impact of REDD+ on total income

	Whole sample		Kilosa		Kondoa	
VARIABLES	Coefficient	se	Coefficient	se	Coefficient	se
Time	-0.432***	(0.161)	-0.191	(0.169)	-0.990***	(0.328)
Pilot	0.329	(0.253)			0.176	(0.265)
REDD+	0.196	(0.185)	0.290	(0.254)	0.134	(0.280)
HH_age	-0.008**	(0.003)	-0.009**	(0.004)	-0.003	(0.006)
HH_sex	0.286***	(0.108)	0.606***	(0.151)	0.159	(0.151)
HH_edu	0.148	(0.094)	0.232*	(0.138)	0.163	(0.141)
Distance_mkt	-0.003	(0.003)	0.075***	(0.017)	-0.003	(0.004)
HHsize	-0.015	(0.025)	0.034	(0.028)	-0.035	(0.038)
tot_area	0.082***	(0.031)	0.257***	(0.052)	0.045*	(0.027)
a25majorinsho	-0.149	(0.092)	0.007	(0.123)	-0.311**	(0.130)
Wealth	0.073**	(0.030)	-0.019	(0.035)	0.087	(0.055)
socapital_index	0.110***	(0.042)	0.049	(0.050)	0.098	(0.068)
TLU	0.152***	(0.043)	0.097	(0.087)	0.166***	(0.048)
B18Forestclear_ha	0.014	(0.032)	0.121	(0.148)	0.015	(0.032)
B10Dist_forest	0.001*	(0.001)	0.001	(0.001)	0.000	(0.001)
Gini	-3.450***	(1.043)	0.366	(1.911)	1.292	(3.117)
Village fixed effects	YES		YES		YES	
Constant	8.058***	(0.623)			6.132***	(1.487)
Observations	465		233		232	
Number of households	287		142		145	

Table D2. DID model results on the impact of REDD+ on total income DID

	Whole sample		Kilosa		Kondoa	
VARIABLES	Coefficient	se	Coefficient	se	Coefficient	se
time	-0.435***	(0.161)	-0.238	(0.174)	-0.935***	(0.335)
pilot	-0.355	(0.248)			-0.029	(0.325)
REDD+	0.197	(0.185)	0.360	(0.261)	0.104	(0.289)
HH_age	-0.008**	(0.003)	-0.009**	(0.004)	-0.002	(0.005)
HH_sex	0.289***	(0.109)	0.600***	(0.152)	0.135	(0.153)
HH_edu	0.155	(0.094)	0.244*	(0.141)	0.202	(0.143)
Distance_mkt	-0.002	(0.003)	-0.013**	(0.005)	-0.003	(0.003)
HHsize	-0.021	(0.025)	0.029	(0.027)	-0.045	(0.039)
tot_area	0.084***	(0.031)	0.252***	(0.055)	0.051*	(0.028)
a25majorinsho	-0.145	(0.092)	-0.040	(0.125)	-0.250*	(0.132)
Wealth	0.076**	(0.030)	-0.011	(0.036)	0.087	(0.055)
socapital_index	0.110***	(0.041)	0.044	(0.050)	0.099	(0.067)
TLU	0.155***	(0.043)	0.107	(0.090)	0.173***	(0.048)
B18Forestclear_ha	0.021	(0.032)	0.142	(0.145)	0.027	(0.032)
B10Dist_forest	0.001*	(0.001)	0.001	(0.001)	0.000	(0.001)
Gini	-3.409***	(1.050)	0.613	(1.962)	0.820	(3.174)
Village fixed effects	YES		YES		YES	
Constant	8.006***	(0.630)	5.233***	(1.081)	6.181***	(1.522)
Observations	465		233		232	
R-squared	0.323		0.378		0.355	

Table D3. RE model results on the impact of REDD+ on forest income

	Whole sample		Kilosa		Kondoa	
VARIABLES	Coefficient	se	Coefficient	se	Coefficient	se
time	0.592**	(0.245)	0.594**	(0.278)	0.434	(0.580)
pilot	0.120	(0.366)			0.036	(0.415)
REDD+	0.139	(0.293)	0.873**	(0.377)	0.146	(0.449)
HH_age	-0.008**	(0.004)	-0.008	(0.005)	-0.004	(0.007)
HH_sex	0.188	(0.161)	0.573***	(0.199)	-0.092	(0.277)
HH_edu	0.100	(0.144)	0.165	(0.179)	0.218	(0.214)
Distance_mkt	0.010***	(0.004)	-0.001	(0.022)	0.011**	(0.005)
HHsize	0.027	(0.029)	-0.015	(0.030)	0.071	(0.053)
tot_area	0.003	(0.046)	0.028	(0.094)	0.007	(0.046)
a25majorinsho	0.219	(0.147)	0.102	(0.147)	0.447	(0.274)
Wealth	0.013	(0.041)	0.109*	(0.062)	-0.146**	(0.068)
socapital_index	0.037	(0.062)	-0.031	(0.077)	0.124	(0.108)
TLU	-0.031	(0.060)	-0.057	(0.118)	-0.013	(0.063)
B18Forestclear_ha	0.049	(0.087)	0.047	(0.267)	0.032	(0.071)
B10Dist_forest	-0.000	(0.001)	-0.001	(0.001)	-0.002	(0.003)
Gini	-2.909*	(1.627)	6.313**	(2.539)	-2.882	(5.163)
Village fixed effects	YES		YES		YES	
Constant	3.803***	(0.920)			3.088	(2.439)
Observations	394		218		176	
Number of households	261		136		125	

Table D4. DID model results on the impact of REDD+ on forest income

	Whole sample		Kilosa		Kondoa	
VARIABLES	Coefficient	se	Coefficient	se	Coefficient	se
time	0.582**	(0.245)	0.545*	(0.289)	0.434	(0.580)
pilot	0.116	(0.365)			0.520	(0.427)
REDD+	0.143	(0.293)	0.769*	(0.411)	0.146	(0.449)
HH_age	-0.008**	(0.004)	-0.009*	(0.005)	-0.004	(0.007)
HH_sex	0.184	(0.160)	0.468**	(0.198)	-0.092	(0.277)
HH_edu	0.103	(0.143)	0.160	(0.177)	0.218	(0.214)
Distance_mkt	0.010***	(0.004)	-0.012*	(0.007)	0.011**	(0.005)
HHsize	0.028	(0.028)	-0.005	(0.029)	0.071	(0.053)
tot_area	0.005	(0.045)	0.018	(0.095)	0.007	(0.046)
a25majorinsho	0.219	(0.148)	0.075	(0.156)	0.447	(0.274)
Wealth	0.012	(0.040)	0.115*	(0.059)	-0.146**	(0.068)
socapital_index	0.034	(0.061)	-0.051	(0.074)	0.124	(0.108)
TLU	-0.031	(0.060)	-0.041	(0.122)	-0.013	(0.063)
B18Forestclear_ha	0.046	(0.086)	0.157	(0.266)	0.032	(0.071)
B10Dist_forest	-0.000	(0.001)	-0.001	(0.001)	-0.002	(0.003)
Gini	-2.910*	(1.631)	4.946*	(2.759)	-2.882	(5.163)
Village fixed effects	YES		YES		YES	
Constant	3.787***	(0.916)	1.453	(1.394)	3.088	(2.439)
Observations	394		218		176	
R-squared	0.118		0.253		0.112	

Variable description

VARIABLE	Description
Time	Year (0=2010; 1=2015)
Pilot	Treatment (0=Control; 1=Pilot)
REDD+	REDD+ impact
HH_age	Age of household head, years
HH_sex	Sex of household head (0=Female; 1 Male)
HH_edu	Level of education of household head (1=No formal education; 2=Primary; 3=Secondary; 4=Higher education)
Distance_mkt	Distance to main market, km
HHsize	Household size
tot_area	Size of farmland, acres
a25majorinsho	Household experienced income shock in the last 12 months (0=No, 1=Yes)
Wealth	Asset ownership, PCA scores
socapital_index	Social capital index
TLU	Total livestock units (TLU)
B18Forestclear_ha	Distance from house to nearest forest, minutes walking
B10Dist_forest	Amount of forest cleared on average per year, ha
Gini	Village level Gini coefficient

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