

Title: The spatial distribution of benefits resulting from REDD+ and FSC implementation in Southeastern Tanzania

Authors: Meghan Cornwall, Katie O'Gara, Brian Schaap, Louis Vayo II, Karen Azeez

Abstract:

Forest loss and land use changes associated with agricultural expansion, urban development and bioenergy production are key concerns for many governments and forest-dependent communities around the world. Several strategies exist to address forest loss, including market-based mechanisms that promote good forest governance such as the Reducing Emissions from Deforestation and forest Degradation program that includes enhancements in biodiversity and livelihoods (REDD+) and the Forest Stewardship Council (FSC) certification. Many positive outcomes result from forest governance programs like REDD+ and FSC, including payments, increased stakeholder participation, and dissemination of knowledge among forest dependent communities. However, the distribution of and satisfaction with these outcomes is highly contextualized and variable at the community level. The objective of this paper is to analyze and understand the ways in which REDD+ and FSC program design and implementation impact the distribution of, and satisfaction with, program benefits at the community level. Specifically, this paper analyzes three study sites in Southeastern Tanzania implementing these programs. Our study finds that forest conservation programs have the opportunity to either exacerbate or ameliorate underlying disparity caused by spatial asymmetry in rural communities in Southeastern Tanzania. Different benefit-sharing and implementation mechanisms are shown to exhibit varying levels of success in overcoming baseline inequalities, and appear to be more important in determining community level benefits, participation, and knowledge sharing than inherent programmatic differences between REDD+ and FSC.

1. Introduction:

Forest loss and land use changes associated with agricultural expansion, urban development and bioenergy production are key concerns for many governments and forest-dependent communities around the world (IPCC 2008). Several strategies exist to address forest loss including market-based mechanisms and regulation (Long 2010). In order to increase stakeholder participation in these mechanisms and ultimately reduce global deforestation, good governance must be a central component of program implementation (Andersson and Agrawal 2011, Bhattarai and Hammig 2004). The Reducing Emissions from Deforestation and forest Degradation program that includes enhancements in biodiversity and livelihoods (REDD+) and the Forest Stewardship Council (FSC) certification are examples of participatory, market-based forest governance mechanisms that stress good governance in forest conservation.

Forest governance programs like REDD+ and FSC provide tangible and intangible benefits to implementing communities, including revenues in the form of cash payments, increased stakeholder participation, and the transfer of knowledge to forest dependent communities (Scriven 2012, Pinto and McDermott 2013). The objective of this paper is to analyze and understand the ways in which REDD+ and FSC program design and implementation impact the distribution of and satisfaction with program benefits at the community level.

Specifically, this paper analyzes three study sites in Southeastern Tanzania implementing different combinations of REDD+ and FSC. These programs were chosen for analysis because program revenues constitute a significant portion of each site's total community income and neither program has predetermined how benefits are distributed within a community. Furthermore, Tanzania provides a unique geographic context in which to explore these issues; the spatial arrangement of rural villages has been heavily influenced by the historical process of villagisation, a program which aimed to cluster disparate rural populations into formalized villages in order to improve rural production and economic self-reliance (Briggs 1979). As a result, the contemporary Tanzanian village structure is prone to geospatial inequalities in power, wealth and education, which can influence the distribution of benefits from REDD+ and FSC within a community.

Overall, we argue that forest conservation programs have the opportunity to either exacerbate or ameliorate underlying disparity caused by spatial asymmetry in rural communities. Different benefit-sharing and program implementation mechanisms exhibit varying levels of success in overcoming baseline socioeconomic asymmetries, and appear to be more important in determining community level benefit, participation, and knowledge perceptions than the type of forest conservation program chosen (i.e. REDD+ or FSC).

This paper explores the ways in which REDD+ and FSC program design and implementation impact the distribution of and satisfaction with benefits at the community and individual levels in Southeastern Tanzania. In order to do so, we first detail a brief history of REDD+ and FSC and contextualize the two programs in Tanzania. For further context, our study sites and methodology utilized for data collection and analysis are explored. Next, the results of the study are split into two sections. The first section focuses on the distribution of direct payments from REDD+ and FSC, the impacts of which are heavily influenced by spatial dynamics within each community. The second section outlines the effectiveness of and participants' satisfaction with their knowledge and participation in decision-making regarding REDD+ and FSC. These results are explored spatially and demographically, highlighting key differences in the effectiveness and equitability of implementation techniques. Finally, both sections are examined for similar characteristics and recommendations are made for implementing organizations to overcome spatial asymmetry at the community level.

1.1 REDD+ vs. FSC: History and Benefits for Participating Communities in Tanzania

REDD+ and FSC are market-based forest governance strategies intended to provide tangible and intangible benefits to participating communities. The United Nations (UN) created the REDD+ protocol in 2009 as a policy instrument to mitigate carbon emissions through payments to communities and landowners in exchange for forest conservation ultimately resulting in increased carbon sequestration and improved community livelihoods and biodiversity (Mustalahti et al. 2012). REDD+ Readiness preparations began in 2008 in anticipation of international REDD+ funding (Burgess et al. 2010), and Tanzania underwent a REDD+ pilot phase from 2009 to 2013 to build institutional capacity for the future expansion of REDD+ and evaluate potential policy options moving forward. During this time, non-governmental organizations were given broad design and implementation license to establish each pilot project (Tanzania Natural Resource Forum 2012).

FSC was established after the 1992 UN Earth Summit; as a non-profit organization that promotes responsible forest management through a forest certification program (FSC 2013). There are

various types of FSC certificates available to communities as well as the public and private sector (FSC 2014). FSC certificates, like most certifications, are costly for small-scale forest managers like rural communities in Tanzania (Pinto and McDermott 2013). To address this issue, FSC recently created a group certification to expand the program's applicability to small-scale forests and increase access of FSC certification to smallholders (FSC 2014). The group certification enables multiple communities or landowners to pool resources and apply for a single certificate for all of the forests under their management (ibid). In 2009, the first FSC certificate of this type in Africa was granted to the Mpingo Conservation and Development Initiative (MCDI) (MCDI 2012). MCDI works with communities in the Kilwa District of Southeastern Tanzania, where valuable African blackwood, also known as mpingo, is harvested and sold primarily for wind instrument production (FSC 2012). While the majority of FSC certificates have traditionally been awarded in industrialized countries (Pinto and McDermott 2013, Rametsteiner and Simula 2003), FSC has expanded into less-industrialized countries through their group certificate, creating new opportunities for analysis of its implementation and impacts at this scale (FSC 2014, Pinto and McDermott 2013).

REDD+ and FSC utilize different approaches to achieve forest conservation and success is largely determined by their respective implementing organizations. The primary goal of both programs is to reduce forest loss through forest conservation or sustainable forest management (Brown et al. 2011, Pinto and McDermott 2013). However, secondary outcomes such as equitable benefit-sharing and increased stakeholder participation are also aspects of each program (Scriven 2012, Pinto and McDermott 2013).

This paper focuses on three REDD+ and FSC program benefits: direct payments, participation in program related decision-making, and the transfer of forest governance knowledge to participating communities (Gebara 2013, Peskett et al. 2008, Börner et al. 2010, Pinto and McDermott 2013). In the case of REDD+ and FSC, payments can be managed in many ways as neither program predetermines how revenue streams must be distributed within communities (Makala 2013, Meshack 2013). In Tanzania, participating villages in conjunction with implementing organizations, have chosen various mechanisms to distribute revenues from REDD+ and FSC, including individual cash payments and/or earmarking revenues for community development projects (referred to from now on as community projects) (Tanzania Natural Resource Forum 2012; Makala 2013). Each payment mechanism, or combination of mechanisms, can compensate for opportunity costs associated with program participation and serve different groups within a community, thereby producing varying effects on the distribution of tangible benefits (Börner et al. 2010, Peskett et al. 2008).

Participation in decision-making spaces and increased knowledge about program content are important intangible benefits for participating communities (Mahanty and McDermott 2013, Gebara 2013, Thornber 2003). REDD+ and FSC strive to achieve equitable participation and decision-making in their programs, and a basic understanding of program design, content, and implementation at the individual and community levels is required to accomplish this (Gebara 2013). UN safeguards for REDD+ aim to ensure a net positive impact on communities, including the "full and effective participation of relevant stakeholders" (Scriven 2012). Additionally, the FSC group certification was introduced to make the program more inclusive and participatory. There are several methods for measuring level of understanding and participation including individual measures of satisfaction, which are important because they provide insight into each person's desire and ability to engage with REDD+ or FSC.

Beyond the central goal of REDD+ and FSC, equitable benefit sharing and program participation are desired outcomes of each program. The distribution of and satisfaction with these benefits depend highly on the context and manner in which they are implemented.

1.2 Spatial Dynamics and Program Implementation in Tanzania

As mentioned previously, the villagisation process in Tanzania has produced unique spatial arrangements within rural villages that ultimately impact REDD+ and FSC program implementation. Following the country's independence from British colonial rule in 1961, President Julius Nyerere adopted a socialist ideology that determined Tanzania's political, social and economic development over the ensuing decades (Ibhawoh and Dibua 2003). Given the highly dispersed geographical arrangement of the country's rural population, Nyerere implemented a program of villagisation to group distant rural populations into formalized villages, requiring the involuntary resettlement and relocation of rural farmers into more centralized locations. Villagisation was meant to enable communal agricultural production, and to ease the burden on the central government in its efforts to provide social services to rural communities (Hyden 1975).

However, because many rural Tanzanians resisted relocation, newly formed village boundaries often included distant hubs, called 'subvillages', with smaller populations that had little contact with or connection to the larger population center of their village (Briggs 1979). As a result, the Tanzanian village structure is prone to geospatial inequalities in power, wealth and education due to the concentration of social services and village-level decision-making structures in the village center, which are difficult for distant subvillage populations to access. As various studies have shown, proximity to social services such as roads, schools, wells, or health clinics determines the level at which an individual can benefit from these services, and can lead to inequity within a community (Castro-Leal et al. 2000, Handa 2002, Sultana 2006, Rahman and Smith 2000). The three study sites included in this paper were subjected to villagisation in the early 1970s and exhibit characteristics of spatially driven disparity.

In this context, Tanzania, in recent years, implemented a progressive and innovative system of decentralized Participatory Forest Management (PFM), which provides increased autonomy to forest-dependent communities to sustainably manage and receive livelihood benefits from their forests (Mustalahati et al. 2012). Both REDD+ and FSC in Tanzania have the potential to enhance PFM and impact the above-mentioned socioeconomic imbalances through the targeted distribution of benefits in participating communities. While the national level policy context in which REDD+ and FSC were established in Tanzania is important, community level dynamics play a more nuanced and critical role in shaping benefit distributions at the local scale. Our study sites are described below in order to provide additional detail about the implementing communities chosen for our analysis.

2. Study Site

Three villages located in the Lindi Region of Southeastern Tanzania were chosen for this study: Muungano, Nainokwe, and Kikole (Table 1, Figure 1, Figure 2, Figure 3). Miombo woodlands, comprised of a diverse distribution of grasses, sedges, shrubs, palms, and dispersed trees (Malmer, 2007; Campbell, 1996), dominate the forest ecosystem of the region and provide

valuable forest products essential for the livelihoods of the majority of rural communities (MCDI, 2012). Most villagers in this region rely on subsistence farming and use shifting agricultural methods (Makala 2013, Meshack 2013).

Table 1. Village demographics.

Village Name	District Name	Population size	Number of subvillages	NGO Involvement	Program	Forested area under program (hectares)
Muongano	Lindi	2,300	7	Working with TFCG since 2010	REDD+	6,434
Nainokwe	Kilwa	447	2	Working with MCDI since 2010	FSC	8,502
Kikole	Kilwa	1,200	3	Working with MCDI since 2006	FSC	454

For its REDD+ pilot project in Muungano, the Tanzania Forest Conservation Group (TFCG) distributed an initial trial payment to the village totaling approximately \$32,200 USD. TFCG encouraged the community to choose how the funds would be disbursed and villagers decided through a majority vote to reserve 80% for individual cash payments and 20% for community projects. Each person received a cash payment of approximately \$10 USD. The remaining funds were used to build a village office and provide furniture for the local school. TFCG also focused on addressing the drivers of deforestation through the promotion of alternative livelihood training in the village, such as beekeeping, chicken keeping, and conservation agriculture.

Villagers in Nainokwe and Kikole adopted a different method of benefit sharing for their FSC project implemented by MCDI, in which revenues were entirely spent on forest management and community projects rather than individual cash payments. Villagers further decided to distribute the revenue from FSC timber sales accordingly: the village government handles 50%, the Village Natural Resource Council (VNRC) handles 45%, and 5% is paid as a tax to the district government.

Nainokwe received a total of approximately \$21,800 USD from its two initial sales of FSC certified timber. The village government utilized its 50% revenue allocation to construct houses for the Village Executive Officer (VEO) and the village midwife, build a village office, supply health insurance for the elderly, and provide occasional school meals for children. Importantly, each of the buildings constructed are located in the village center, as is the school where lunches were served. The VNRC dedicated its 45% share of the revenues toward the funding of forest patrols, the purchase of forest monitoring and management equipment, and meeting allowances for VNRC members.

Kikole has sold FSC certified timber twice since 2009, receiving a total of \$4,375 USD. The village government used its portion of revenues to purchase and install a motorized water tap and to construct a nurse's house, both in the village center. The VNRC dedicated its allotment to fund forest management activities, forest patrols, meeting allowances, and office supplies for VNRC members, as well as health insurance for their families.

3. Methods

Data was collected from May through July 2013 using the International Forestry Resources and Institutions (IFRI) methodology. IFRI is a global research network that examines how governance arrangements affect forests and the people who depend on them through a suite of qualitative and quantitative surveys (IFRI 2014). In each study site, focus groups and household surveys were conducted to understand perceptions of participation and satisfaction with forest governance, REDD+, and FSC. The main stakeholder groups interviewed include (Table 2):

- Forest Governance Officials: District Forest Officers, village government officials, Village Natural Resources Committee (VNRC) members, and management from the two implementing NGOs: TFCG and MCDI.
- Village-Level Forest User Groups: Formal and informal village groups that use forests, including timber harvesters, beekeepers, food-gatherers, and charcoal producers.
- Households: A random sample of households stratified by subvillage was selected for interviews.

All interviews were conducted in Swahili by a native speaker using paper surveys that were subsequently recorded electronically.

Table 2. Number of focus groups and interviews completed in each village.

Village Name	Governance Interviews	User Group Interviews	Household Interviews
Muongano	4	3	35
Nainokwe	3	2	30
Kikole	3	3	30

3.1 Data Analysis

Qualitative data collected during the household surveys was coded for statistical comparison and all data were analyzed for trends in responses across various socioeconomic indicators using comparison-of-means tests and linear regression.

In order to analyze wealth distributions within and between the three villages, a wealth index was created from a list of assets and food security measures assessed in the household surveys. Variables include ownership of land, livestock, bicycles/motorcycles, mobile phones, and other important household assets, which were weighted according to relative value gleaned from the household surveys. Income was not included in this index because a majority of respondents could not accurately recall their yearly earnings, which are highly variable. The lowest quartile of respondents was labeled “poor,” the middle two quartiles were considered “average,” and the highest quartile was coded as “wealthy.” A sensitivity analysis was conducted adjusting all the values of the index by factors of two and three, and found that over 99% and 90% of households respectively remained in their socioeconomic classification.

In addition to the wealth index, an access index was created in order to analyze the spatial organization of subvillages within each village. Social services including schools, wells, village government offices, and markets are concentrated in the village center. The index is therefore a composite of two factors which impact a participant's ability to travel to the village center and access these services and amenities: travel time to the village center and the presence of seasonal travel barriers such as ephemeral rivers or flood zones. The values in the index are ordinal, ranging from one to four, with low numbers representing easy access to the village center and high numbers representing difficult access (Table 3). Each subvillage was assigned to an access zone based on the following criteria:

Zone 1: Contains the village center and subvillages within a 5-20 minute walk, without any seasonal barriers.

Zone 2: Contains subvillages that are within a 20-45 minute walk from the village center, without any seasonal barriers.

Zone 3: Contains subvillages that are within a 1-2 hour walk from the village center with no seasonal travel constraints, or subvillages that are within a 20-45 minute walk from village center with seasonal barriers.

Zone 4: Contains subvillages that are a 2+-hour walk from the village center with seasonal travel barriers.

Table 3. Assignment of each subvillage to access zones.

Village Name	Subvillage Name	Accessibility	Subvillage Population
Muungano	Ujamaa	1	116
	Umoja	1	360
	Mnazi Moja	1	465
	Naruwi	2	180
	Uleka	2	425
	Likonde	3	140
	Kipunga	3	870
Nainokwe	Nainokwe	1	390
	Kichonda	4	130
Kikole	Kikole	1	1100
	Nanyati	3	350
	Mbunga	4	200
1=most accessible, 4=least accessible			

The geographic arrangements of each village are visualized in maps drawn by community members and later digitized in ArcGIS 10.2, identifying the location of services, subvillages, forests, and rivers (Figure 1, Figure 2, Figure 3).

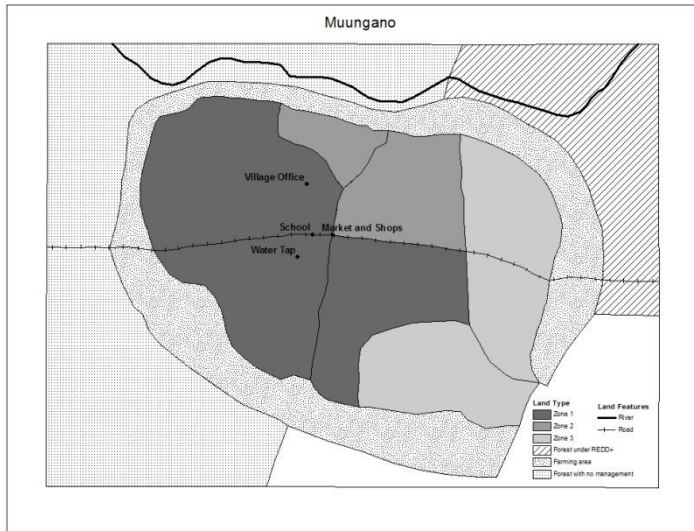


Figure 1. Map of Muungano village including access zones, conserved forest location, and critical social services.

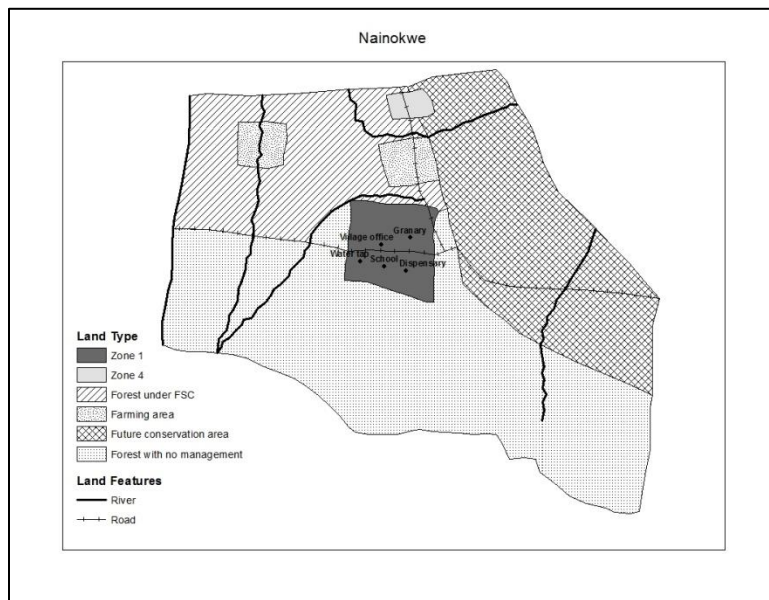


Figure 2. Map of Nainokwe village including access zones, conserved forest location, and critical social services.

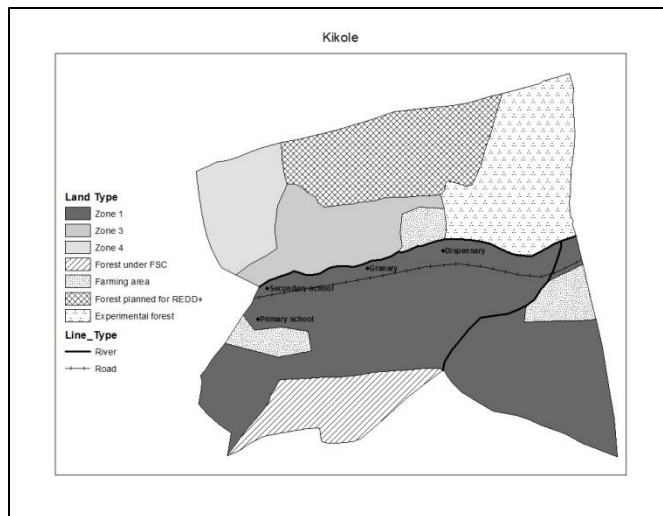


Figure 3. Map of Kikole village including access zones, conserved forest location, and critical social services.

Analysis of the data and indices across different indicators revealed a number of interesting patterns, which are explored below.

4. Spatial Analysis of Benefit Distribution

4.1 Spatial asymmetries within the modern Tanzanian village

A clear understanding of the baseline socioeconomic and demographic characteristics of a community is necessary in order to be able to evaluate the equitability of benefit distribution in forest governance programs such as REDD+ and FSC (Peskett et al. 2008). Given the reality that nearly all communities will have at least some level of disparity in wealth, education, and political power among their members (Agrawal and Gibson 1999, Spiteri and Nepal 2005), understanding the contours of these pre-existing trends allows for a more accurate evaluation of the impacts of conservation programs (Andersson and Agrawal 2011, Meshack et al. 2005, Peskett et al. 2008). Following Ribot and Peluso (2003), we draw upon the notion of ‘access,’ or “the ability to derive benefits from things,” as a theoretical framework for understanding the way in which the spatial distribution of program participants and centralized social services within a village creates an underlying and pre-existing asymmetry, which ultimately mediates the benefit distribution mechanisms of forest conservation programs. The access index is useful in quantifying differences that were clearly evident among residents of different subvillages concerning their ability to access social services at the village center. In addition, the index enables an analysis of the impacts of spatial distribution on program outcomes and benefit sharing arrangements.

We repeatedly noticed the important role that village level spatial arrangements play in contributing to baseline asymmetries and access within communities through our household surveys. Residents of the most distant subvillages are consistently disadvantaged by their physical separation from activities and services concentrated in the village center and

respondents repeatedly voiced their frustration with this difficulty. For instance, many residents living in Muungano's farthest subvillages complained of trouble accessing clean water since the village's cleanest water tap was located so far away. Children living in Nainokwe's most distant subvillage, Kichonda, faced great difficulties in traveling to the school located a few hours' walk away from their homes; children of Kikole's two most distant subvillages were unable to attend school during the rainy season. These anecdotes illuminate the reality of disparity in access to basic services within these villages and demonstrate the context of asymmetry and inequity into which the REDD+ and FSC programs are intervening.

4.2 Equitability of Payment Mechanisms: Balancing Costs and Benefits

Numerous studies have highlighted the importance of spatiality in shaping community dynamics and mediating the impacts of benefit distribution for program participants (Castro-Leal et al. 2000, Handa 2002, Sultana 2006, Rahman and Smith 2000). A primary component of forest governance initiatives such as REDD+ and FSC is the provision of direct monetary or in-kind benefits to program participants. Assessing the ways in which this benefit provision interacts with or impacts existing power dynamics in target communities is necessary to understand the equitability of the programs' benefit distribution arrangements. Furthermore, participation in REDD+ and FSC exact varying opportunity costs for different groups of participants and equitable benefit distribution would theoretically entail a balancing of these costs with program benefits for all participants (Börner et al. 2010, Sommerville et al. 2010, Peskett et al. 2008, Brown et al. 2011).

From our discussions with community members in the three study sites, it is clear that individuals relying more directly upon the forests placed under protection through REDD+ or FSC bear higher opportunity costs than individuals with less reliance on these areas. Furthermore, dependence on forests is more common for participants in distant subvillages, which are generally located closer to the conserved forest areas. Residents of Muungano's most distant subvillages complained of losing their right to farm in the forest, which they did before the implementation of REDD+. Respondents from Kichonda, Nainokwe's most distant subvillage, reported that FSC prohibited them from practicing subsistence hunting in the new FSC conservation area. In general, these anecdotes illustrate the higher than average opportunity costs associated with program participation for villagers living in Zones 3 and 4, where we would therefore expect to see proportionally larger benefit distributions in order for the benefits to be considered equitable.

4.2.1 Benefit Distribution Approaches

REDD+ and FSC are primarily strategies to provide financial rewards to communities in return for the sustainable management of forest resources. Both programs allow for a wide degree of freedom for implementing agencies and communities to determine the ways in which these monetary benefits will be distributed. The two NGOs implementing REDD+ and FSC in the case study villages adopted distinct benefit sharing arrangements, which had differing levels of success in overcoming the preexisting spatial disparities that have thus far been described.

The principal difference between the benefit distribution approaches adopted by the three communities is the degree to which the benefits were distributed individually or communally, through individual cash payments versus community projects. This affects how successful each approach is in overcoming the unique challenges and opportunity costs facing residents of distant

subvillages. We now turn to an analysis of the impacts of each of these benefit distribution approaches, seeking to uncover their relative advantages and disadvantages in promoting equitable benefit sharing, as well as effective development assistance.

4.2.2 Equity Outcomes of Individual Versus Community Payments

Forest management programs such as REDD+ and FSC, through the strategic distribution of cash payments and community projects, have the potential to ameliorate, exacerbate, or simply perpetuate the pre-existing spatial disparities that characterize participating Tanzanian communities. The three case study villages involved in this study allow for a comparison of NGO strategies regarding program design and implementation, which appear to have been important in determining the extent to which existing spatial inequalities among village residents were meaningfully addressed.

Our findings suggest that the approach in both Nainokwe and Kikole of using all FSC revenues to fund community development projects resulted in the exacerbation of existing spatial asymmetries that marginalize residents living in distant subvillages. The majority of the community projects implemented disproportionately benefitted either village leaders—such as the VEO or VNRC members—or residents living in subvillages close to the village center. Improving health services through the construction of houses for the nurse and midwife, expanding water provision through the purchase of a motorized water tap, and enhancing school support services through the expansion of the school meal program are all interventions that have greater proportional benefits for residents living near to the village center due to their location. These residents already had a comparative advantage in accessing centrally located social services, and the community projects resulting from FSC revenues only expanded this disparity between near and distant residents. In addition, as previously noted, residents with low access to the village center tend to face higher opportunity costs as a result of program participation. Therefore, their proportion of costs to benefits is even higher, represents a significant exacerbation of spatial disparities, and is therefore highly inequitable.

In contrast, the approach adopted by residents of Muungano to distribute benefits primarily through individual cash payments appears to have been more successful in avoiding the centralizing tendencies of community development projects. In the context of existing spatial asymmetries in access to social services and program related opportunity costs, individual cash payments are an effective mechanism to bypass the authority of the village government, minimizing the potential for elite capture of benefits and for the selection of community projects which disproportionately benefit centrally located residents. However, while individual cash payments avoid the exacerbation of spatial asymmetries, they rarely overcome them due to their size. By failing to meaningfully address spatial inequities, the equal distribution of cash payments to all village residents simply perpetuate them.

While our case study findings show that individual payments appear to be somewhat more successful than community projects in distributing benefits from REDD+ and FSC equitably, community projects do have some distinct advantages over individual cash payments that cannot be ignored. Many development challenges facing rural communities—such as inadequate or unhealthy drinking water, substandard medical and educational facilities, or a lack of important agricultural equipment or inputs—represent collective action problems in which cooperative community effort is needed in order to provide public goods. Community projects are in many

cases uniquely equipped to overcome these challenges in a way that individual cash payments alone cannot.

4.2.3 Approaches for Enhancing Equity

Our findings suggest that community projects have the potential to exacerbate underlying disparities and individual cash payments simply continue them. Yet, in order to ensure that community projects enhance equity within a community, specific measures can be taken to overcome spatial inequalities. One such method is to require that a certain percentage of community revenues be used for projects specific to each subvillage, with the proportions determined either by relative population or by differences in opportunity costs. This approach could be beneficial for the implementing organization as well as the community because payment for ecosystem services (PES) payments based on opportunity costs can increase effectiveness in forest conservation (Newton et al. 2012) and it could also be considered more equitable. Implementing community projects in this way would enable collective action to solve larger problems, while also ensuring that benefits do not accrue with political elites or residents living close to the village center.

Some aspects of the REDD+ pilot project in Muungano provide positive examples of how program design and implementation can overcome pre-existing spatial asymmetries. TFCG concentrated a large portion of its education and outreach activities in Muungano's two most distant subvillages. Its decision to locate conservation agriculture training and demonstration plots in these subvillages, which are more closely located to and dependent upon the forest, provides a useful example of a program implementation strategy that directly addresses the higher opportunity costs faced by these residents. Additionally, by providing bicycles to select residents of these distant subvillages, access constraints were likely partially overcome. Furthermore, with its next round of anticipated REDD+ payments, Muungano plans to build a primary school in the median zone of the village in order to address the challenges children from surrounding subvillages face in travelling to school in the village center. These are precisely the types of distributed community projects that effectively overcome the disadvantages facing distant program participants, and maximize the equitability of benefit distribution.

Thus, while centralized community projects appear to *exacerbate* pre-existing spatial asymmetries, and individual cash payments appear to *perpetuate* them, dispersed community projects—implemented with an eye toward addressing spatial asymmetries—have the potential to *ameliorate* these disparities and increase individual satisfaction with the programs. However, payments are only one element of forest conservation programs, and attention should be paid to secondary outcomes.

5. Spatial Analysis of Participant Perceptions and Satisfaction

Although payment mechanisms are a core component of forest conservation programs like REDD+ and FSC, other outcomes also have the potential to positively impact participating communities, and are similarly impacted by village spatial arrangements, including:

- 1) Knowledge and understanding of program content and implementation activities;
- 2) Participation in decision-making

Given the disparate, spatially driven variation of benefits from these programs, it is necessary to understand how physical location affects knowledge of and participation in REDD+ and FSC across demographics. The previous section of this paper illustrates that objective assessments are useful in informing program design, but participant perceptions are another equally important consideration in evaluating the degree to which these programs overcome spatial disparities. Therefore, knowledge and participation are explored below both objectively, and through measures of satisfaction with these outcomes. Both objective and subjective measures of program knowledge and participation are stratified geographically.

We observed a negative relationship between access to the village center and the two outcomes mentioned above both objectively and subjectively (Table 6 and Table 7). Residents living in distant subvillages with limited access to the village center appeared less knowledgeable about the goals of REDD+ and FSC, less involved in village governance activities, and less satisfied with the programs overall.

5.1 Measures of Effectiveness and Satisfaction of Knowledge Sharing and Decision Making Processes

The following variables were selected to measure the effectiveness of and satisfaction with knowledge-sharing and decision-making processes of REDD+ and FSC at the community level (Table 4):

1. Participation in rulemaking
2. Clarity of forest rules
3. Village General Assembly attendance
4. Awareness of revenue information
5. Basic understanding of program

Each variable was tested for correlation with measures of wealth, education, age, gender, and access to the village center (Table 4 and Table 5). Results indicate that for many of the variables of interest, education was the most salient factor in predicting differences between respondents. However, given that each additional year of education reported by a respondent is associated with a 3.4%¹ increase in the probability that the respondent will live within access zone one ($p < 0.05$), this finding indicates that education and access are tightly linked, as respondents with greater access to the village center are significantly more educated than respondents with low access.

¹We used a linear probability model to regress access on wealth and education, where access was defined as a binary variable: “zone one=0” and “zones two to four=1.” We combined zones two to four to improve statistical power

Table 4. Description of key variables.

Variable Name	Description
<i>Dependent Variables</i>	
Participation in Rulemaking (Create Rules)	Ordinal measure of participation in the formation of rules on forest use and management, values from 0-3, Never=0; Often=4
Clarity of Forest Rules (Clarity Rules)	Binary measure of clarity of rules in the conservation area of the forest, Unclear=0; Clear=1
Meeting Attendance (Meet)	Ordinal measure of village meeting attendance, values from 0-4 Never Attend=0; Always Attend=4
Revenue Information (Inform)	Binary measure of whether adequate information on VNRC revenues are provided to respondents, N=0; Y=1
<i>Independent Variables</i>	
Distance (Dist)	Ordinal measure of distance/access to village center, values from 1-4 Closest=1; Farthest=4
Wealth	Indexed measure of weighted averages of assets and food security, asset values assigned from data collected in the field; values from -0.35-24.4
Education (Educ)	Number of years that respondent has attended school
Age	Number of years old of respondent
Gender (Gend)	Gender of respondent, M=0; F=1

Table 5. Mean values of key variables by village.

Village Name	n	Dependent Variables				Independent Variables				
		Create Rules	Clarity Rules	Meet	Inform	Dist	Wealth	Educ	Age	Gend
Muongano	23	0.217	0.957	1.43	0.087	2.13	4.97	3.48	36.96	0.17
Nainokwe	25	1.36	0.92	2.32	0.6	1.72	5.19	6.08	45.4	0.36
Kikole	20	0.35	0.55	2.05	0.5	1.95	8.24	5.6	45.1	0.25

Table 6. Ordinary least square regression results for participation by village

Independent Variables	Dependent Variables					
	Participation in Rulemaking			Meeting Attendance		
	Muongano	Nainokwe	Kikole	Muongano	Nainokwe	Kikole
Distance	0.313 (0.279)	-0.446** (0.224)	0.019 (0.159)	-0.022 (0.371)	-0.075 (0.118)	0.035 (0.30)
Wealth	-0.003 (0.029)	0.020 (0.092)	-0.053 (0.022)	-0.011 (0.077)	0.26** (0.127)	0.015 (0.051)
Education	0.106 (0.08)	-0.064 (0.082)	0.080* (0.047)	0.161* (0.095)	-0.042 (0.073)	0.31*** (0.065)
Age	0.004 (0.016)	-0.012 (0.015)	0.015** (0.007)	0.035 (0.031)	0.012 (0.012)	0.003 (0.016)
Gender	-0.026 (0.271)	-1.30** (0.636)	1.17** (0.60)	-0.628 (1.168)	-0.275 (0.703)	-0.617 (0.98)
Intercept	-0.936 (0.70)	3.42*** (1.18)	-0.665 (0.594)	-0.208 (1.52)	0.913 (1.31)	0.158 (1.18)
R ²	0.2271	0.2285	0.4189	0.2814	0.2668	0.3791
Prob > F-stat	0.7781	0.288	0.1858	.0032**	0.0945*	0.00***
n	23	25	20	23	25	20

(p<0.10*; p<0.05**; p<0.01***)

Table 7. Ordinary least square regression results of knowledge by village

Independent Variables	Dependent Variables					
	Clarity of Rules			Info on VNRC Revenue		
	Muongano	Nainokwe	Kikole	Muongano	Nainokwe	Kikole
Distance	0.016 (0.036)	-0.017 (0.055)	-0.12 (0.101)	0.133 (0.091)	-0.065 (0.09)	-0.16 (0.112)
Wealth	-0.024 (0.012)	0.003 (0.023)	0.008 (0.016)	0.029 (0.017)	0.037 (0.0347)	0.026* (0.016)
Education	0.0256* (0.0145)	0.008 (0.035)	0.066** (0.032)	0.042 (0.026)	0.056** (0.026)	0.058*** (0.021)
Age	0.001 (0.002)	0.003 (0.006)	-0.005 (0.006)	-0.0017 (0.005)	0.004 (0.007)	0.01* (0.0052)
Gender	-0.183 (0.12)	0.117 (0.098)	-0.233 (0.246)	-0.135 (0.142)	0.225 (0.226)	-0.041 (0.22)
Intercept	0.951*** (0.12)	0.714 (0.324)	0.618 (0.516)	-0.4 (0.25)	-0.074 (0.54)	-0.15 (0.47)
R ²	0.1017	0.2225	0.2594	0.03912	0.2416	0.3583
Prob > F-stat	0.9004	0.2784	0.0544*	0.5501	0.0245**	0.0002***
n	23	25	20	23	25	20

(p<0.10*; p<0.05**; p<0.01***)

5.2 Community Level Knowledge Sharing

The sharing of knowledge about forest conservation and management as a component of REDD+ and FSC is intrinsically beneficial in the three study sites, as many villagers rely on their forests for subsistence. With an understanding of basic forest management practices and the elementary details of program implementation, community members can increase their individual ability to participate in decision-making and forest governance activities.

5.2.1 Mechanisms for Community Level Knowledge Sharing

Knowledge is disseminated in the villages studied through many sources, including village-level meetings and word-of-mouth. In each village there are four Village General Assembly (VGA) meetings each year where the Village Council, the main governing body for the village, reports on all administrative matters. The Village Council and VNRC provide updates on REDD+ and FSC program status, report revenues, discuss rule changes, and present ideas for expenditures. Meetings can be long and hard to follow because of the breadth of issues covered. One participant in Muungano noted that sometimes he has to leave the meetings early to attend to his farm and misses out on discussions regarding REDD+ and the forest.

Through our interviews with TFCG and MCDI officials, we learned that forest knowledge is also spread in the community through capacity-building programs. In Muungano, TFCG provides trainings on conservation agriculture, beekeeping and chicken keeping to select villagers, which are focused in the subvillages with higher REDD+ opportunity costs. The NGO encourages participants to teach their neighbors, friends and families about conservation agriculture to spread information throughout the village. TFCG and MCDI also build capacity through the VNRC in each village, teaching members about forest management, GPS tracking and forest monitoring. In Nainokwe and Kikole, MCDI also conducts trainings on fire breaking and forest patrolling for all villagers, and screens educational films about forest management and conservation in the main subvillage, a popular event. These opportunities to learn and engage with forest management material are open to all villagers, but those with the least access to the village center struggle to attend the trainings or may not even learn about the opportunities, decreasing their understanding and ability to participate in forest governance activities.

5.2.2 Effectiveness of Knowledge Sharing Within the Community

Several indicators are related to effective knowledge sharing within communities participating in REDD+ and FSC, including basic knowledge of the program and its revenues and rules. Household survey respondents were asked if they had heard about REDD+ and FSC in their village and if they could explain what the program entailed. Of the total respondents in Muungano, 81% had heard about REDD+, while 70% in Nainokwe and 80% in Kikole had heard about FSC. Marginalized groups including women, the elderly, and people who had difficulty accessing the main subvillage were less likely to know about REDD+ and FSC. For example, in a focus group interview with men in Nainokwe, the oldest participant, who was over 80 years old, had no understanding of FSC and had never heard of the program, despite living in the village center. He cited being too old to understand these matters. Furthermore, respondents in Kikole's least accessible subvillage reported that they rarely traveled to the village center for

informational meetings because it was too far away. These trends were observed in all three villages. Therefore, while knowledge of the programs seems to be widespread, variations exist among different demographic groups and geographic location.

In addition to knowledge of a program's existence, an understanding of benefit sharing is also important for evaluating REDD+ and FSC implementation strategies. One of the core outcomes of these programs is for villages to capture revenue from carbon sequestration or timber sales, and a widespread understanding of these sources of income can speak to the inclusivity of the programs. A majority of respondents (86% across all three villages) were aware of some aspects of the revenues generated by REDD+ and FSC. Despite this overall high level of understanding, important differences emerged among respondents in Nainokwe and Kikole based on spatial location. Knowledge of FSC revenue expenditures is negatively correlated with access to the village center, although this trend is not statistically significant (Table 7). This trend was not observed in Muungano, where all respondents had knowledge of the REDD+ individual cash payment, regardless of subvillage location. This is likely because every Muungano resident received an individual cash payment, whereas in Nainokwe and Kikole revenues were used for community projects located in the village center.

Finally, knowledge of REDD+ and FSC rules and regulations are important in achieving program success and community buy-in. The rules are generally clear to villagers; however, some trends show that perceptions of the clarity of rules are affected by education, holding constant other variables (Table 7). As one becomes more educated, it may be easier to understand fully the rules and how they pertain to the forest program. As previously described, education levels are negatively correlated with access to the main subvillage, a factor that perpetuates and compounds the marginalization of distant residents.

5.2.3 Satisfaction with Outcomes of Knowledge Sharing

Objective measures of knowledge sharing glean valuable information about the effectiveness of program implementation. In contrast, subjective measures provide insight into participants' satisfaction with implementation, an important indicator for program buy-in.

When household survey respondents were asked if they felt they had sufficient information about revenues and expenditures managed by the VNRC, only 36.7% of respondents in Kikole, 56.7% of respondents in Nainokwe, and 11.4% of respondents in Muungano felt that they were well informed. These numbers indicate that an insufficient amount of information is disseminated about revenues and expenditures pertaining to forest activities, especially in Muungano. Regression results indicate that education is the most important factor determining satisfaction with information on FSC revenues, holding other variables constant ($p < 0.01$) (Table 7), and Muungano shows a similar positive trend for REDD+ revenues. Since education is negatively correlated with distance, these two variables both play a role in understanding satisfaction with REDD+ and FSC revenues and expenditures. Therefore, more educated respondents, who tend to live nearer to the village center, are more satisfied with their level of knowledge and information about REDD+ and FSC.

In summary, analysis of knowledge sharing reveal that spatial asymmetries have an impact on this intangible benefit of REDD+ and FSC within each community. This is similar to our result

that spatial dynamics affect tangible cash and in-kind payments. Therefore, as residents become more isolated from the village center, they are less likely to benefit from program outcomes.

5.3 Decisions Made at the Community Level

Knowledge and understanding of REDD+ and FSC are important in determining the extent to which an individual can participate in forest governance in their community. However, decision-making structures themselves are a significant determinant for the effectiveness of and satisfaction with decision-making abilities for participants. Everything from meeting locations to how options are presented to community members influences the outcomes of decisions made.

5.3.1 Community Level Decision Making Structures

The only public venue for decision-making available to all villagers is the VGA, where attendees vote on issues of program participation, revenue distribution, contractual agreements, and the location and size of conserved areas. However, the Village Council and VNRC create initial proposals for program implementation before the VGA.

REDD+ and FSC decision-making processes fit with preexisting governance structures in each village. Under Participatory Forest Management (PFM) in Tanzania, the Village Council is the highest authority and decision-making body in a village, while the VNRC acts as its implementer for natural resource management (Nzunda et al. 2011, Zahabu et al. 2009). Decisions concerning the management and program design of REDD+ and FSC are vetted through these bodies before reaching the VGA. Village Council meetings, open exclusively to Council members, are one arena for decision-making where members liaise with NGOs and formulate proposals for community projects and benefit-sharing mechanisms. These are then presented for approval at the VGA. The VNRC also creates proposals through closed meetings, in which members suggest program expenditures for VNRC forest activities and community projects.

It is important to note that both the Village Council and VNRC have significant influence over the ultimate outcomes of the VGA and their proposals for REDD+ and FSC implementation are often accepted without amendments.

5.3.1 Effectiveness of Decision Making Structures

Decision-making in REDD+ and FSC programs in Southeastern Tanzania is deliberately designed to be as inclusive as possible. Community participation in the design and implementation of REDD+ and FSC is important for program buy-in, and feeling excluded can lead participants to have low levels of satisfaction, either with the program as a whole or with their role in the program. Most community members participate in program management and decision making by attending VGA meetings.

Access was often acknowledged as a barrier to meeting attendance during household interviews. One woman in Kikole living in Zone Three did not feel comfortable going to village meetings because she did not know anyone, it was far away, and she did not feel welcomed. This response speaks to the perceptions of both geographic and social marginalization often expressed by residents of distant subvillages. Furthermore, members in Zone Two of Kikole mentioned that the meetings are hard to attend because they have to ford a river to reach the town center.

Additionally, respondents in the most distant subvillage of Nainokwe mentioned that the long distance to the village center keeps them from attending meetings.

This dynamic is further supported and complicated through analysis of access and participation in rule making regarding the forest, which is most often facilitated through voting and approving rules at the VGA. In Nainokwe, access to the village center is negatively correlated with participation in rule making (Table 6). In addition to the village center being inaccessible, a Nainokwe VNRC member from the farthest subvillage reported resigning from his position because he felt that his opinion was disregarded and he could not participate actively in the meetings. Marginalized members of the subvillage feel disempowered and refuse to participate in part because of the perception that the Village Council and the VNRC disproportionately serve elite community members. This attitude was especially prevalent in Muungano, where people who lived farther away from the main subvillage felt that individual dissent would not change the opinions of village leaders. Many of these distant residents avoided active participation in the rule making process, choosing instead only to agree with what was proposed.

Without participating in village proceedings and the management of forest conservation programs, residents of distant subvillages cannot vote or voice their collective opinions about REDD+ and FSC implementation, and therefore have less influence in program management.

5.3.2 Satisfaction with Outcomes of Decision-making

As stated above, objective measures are critical for understanding the effectiveness of decision-making spaces. However, subjective measures indicate satisfaction with the ultimate outcomes of these spaces. One such indicator is participants' satisfaction with expenditures resulting from REDD+ and FSC, as they are decided on at the VGA. Therefore, widespread dissatisfaction with expenditures would indicate that the VGA, as a decision making space, is unsatisfactory for participants.

Analysis of the villages participating in FSC—Nainokwe and Kikole—revealed a trend between access and satisfaction with program revenue and expenditures. Respondents with less access to the village center were generally less satisfied, most likely because community projects were implemented solely in the village center. When analyzing Nainokwe and Kikole separately, it is clear that dissatisfaction is stronger in Nainokwe as access decreases. For example, 50% of respondents from the farthest subvillage in Nainokwe felt that the Village Government was neglecting to distribute expenditures in their subvillage. Many of the residents wanted schools, water taps, and clinics built in their subvillage which lacked even these most basic social services.

This spatial trend was similar but more complex in Muungano. When asked if the individual cash payment received by each village resident was fair, 58% of respondents living closest to the village center, 22% of respondents living in the median zone, and 64% of respondents living farthest away responded positively. This interesting pattern may be due to three characteristics of program implementation and demographics in Muungano. First, respondents living farthest away from the village center are on average the most poor in the village and their response may indicate that the cash payment received was proportionately larger for them. Second, community projects such as the purchase of school furniture and construction of village offices were

established within the zone closest to the center. Finally, conservation agriculture was established in the farthest zone as a component of REDD+. This resulted in participants in the closest and farthest zones benefiting more from REDD+ than those living in the median zone who received neither training in conservation agriculture nor community projects in their subvillages.

Overall, satisfaction with REDD+ and FSC revenues and expenditures was again most strongly influenced by access to the village center. Aspects of program implementation by each NGO further complicated this relationship, and at times partially overcame the potential marginalization of distant subvillage residents. Thus, although access is a key component contributing to satisfaction at the community level, program design and implementation can be adjusted to compensate for these dynamics.

6. Conclusion

In conclusion, REDD+ and FSC design and implementation can exacerbate, ameliorate, or perpetuate preexisting spatially driven inequity in Southeastern Tanzania. An important opportunity to address spatial disparity is presented in the thoughtful design of benefit-sharing mechanisms and inclusion techniques. We recommend that NGOs have a strong understanding of community-level dynamics prior to program implementation, and construct benefit-sharing mechanisms thoughtfully by addressing this context. We also suggest that benefit-sharing is most effective when a combination of individual payments and geographically dispersed community projects are established to address spatial inequity and compensate for the opportunity costs associated with the participation of REDD+ and FSC, many of which are higher for community members living in distant subvillages. Implementing these techniques will not only improve objective, quantifiable measures of disparity, including income and the capture of in-kind benefits, but can also increase levels of participation and individual satisfaction with a program, and therefore buy-in and compliance. Application of these lessons to other REDD+ and FSC programs in developing countries across the globe could contribute to the achievement of more equitable and inclusive outcomes for REDD+ and FSC participants.

References:

- "About UN-REDD." *UN-REDD Programme*, 2014 Web. 12 Apr. 2014. <<http://www.un-redd.org/AboutUN-REDDProgramme/tabid/102613/Default.aspx>>.
- "About us." *FSC Forest Stewardship Council*, 2013. Web. 1 Apr. 2013. <<https://ic.fsc.org/about-us.1.htm>>.
- "About us." *International Forestry Resources and Institutions (IFRI)*, 2014. Web. 15 Apr. 2014. <<http://www.ifriresearch.net/about-us/>>
- Agrawal, Arun, and Clark C. Gibson. "Enchantment and disenchantment: the role of community in natural resource conservation." *World development* 27.4 (1999): 629-649.
- Andersson, Krister, and Arun Agrawal. "Inequalities, institutions, and forest commons." *Global environmental change* 21.3 (2011): 866-875.

- Bhattarai, Madhusudan, and Michael Hammig. "Governance, economic policy, and the environmental Kuznets curve for natural tropical forests." *Environment and Development Economics* 9.3 (2004): 367-382.
- Börner, Jan, et al. "Direct conservation payments in the Brazilian Amazon: Scope and equity implications." *Ecological Economics* 69.6 (2010): 1272-1282.
- Briggs, John. "Villagisation and the 1974-6 Economic Crisis in Tanzania." *Journal of Modern African Studies* 17.4 (1979): 695-702.
- Brown, H. Carolyn P., Smit, Barry, Sonwa, Denis J., Somorin, Olufunso A., and Nkem, Johnson. "Institutional perceptions of opportunities and challenges of REDD+ in the Congo Basin." *Journal of Environment and Development* 20.4 (2011): 381-404.
- Burgess, Neil D., et al. "Getting ready for REDD+ in Tanzania: a case study of progress and challenges." *Oryx* 44.03 (2010): 339-351.
- Castro-Leal, Florencia, et al. "Public social spending in Africa: do the poor benefit?." *The World Bank Research Observer* 14.1 (1999): 49-72.
- Deloitte. *Mid-term review report of nine NGO REDD+ pilot projects in Tanzania: higher-level overview of NGO REDD+ portfolio.* Deloitte: New York, 2012.
- Gebara, Maria F. "Importance of local participation in achieving equity in benefit-sharing mechanisms for REDD+: a case study from the Juma Sustainable Development Reserve." *International Journal of the Commons* 7.2 (2013): 473-497.
- "Group Certification." *FSC Forest Stewardship Council*. 2014. Web. 12 Apr. 2014.
<<https://us.fsc.org/group-certification.199.htm>>.
- Handa, Sudhanshu. "Raising primary school enrolment in developing countries: The relative importance of supply and demand." *Journal of Development Economics* 69.1 (2002): 103-128.
- Hyden, Goran. "Ujamaa, Villagisation and Rural Development in Tanzania." *Development Policy Review* 8.1 (1975): 53-72.
- Ibhawoh, Bonny, and J. I. Dibua. "Deconstructing Ujamaa: The legacy of Julius Nyerere in the Quest for social and economic development in Africa." *African Journal of Political Science* 8.1 (2003): 59-83.
- IPCC and Pachauri, Rajendra K. "Climate change 2007. Synthesis report. Contribution of Working Groups I, II and III to the fourth assessment report." (2008).
- Long, Andrew. "Global Climate Governance to Enhance Biodiversity & Well-Being: Integrating Non-State Networks and Public International Law in Tropical Forests." (2010).
- Mahanty, Sango and McDermott, Constance L. "How does 'Free, Prior and Informed Consent' (FPIC) impact social equity? Lessons from mining and forestry and their implications for REDD+." *Land Use Policy* 35 (2013): 406-416.
- Makala, Jasper. Personal Interview. 08 Jun 2013.
- Meshack, Charles K., Ahdikari, Bhim, Doggart, Nike, and Lovett, Jon C. "Transaction costs of community-based forest management: empirical evidence from Tanzania." *African Journal of Ecology* 44 (2006): 468-477.

- Meshack, Charles. Personal Interview. 02 Jun 2013.
- Mpingo Conservation and Development Initiative (MCDI). "Mid-term review report." (2012).
- Mpingo Conservation and Development Initiative (MCDI). "Mid-term review report." MCDI: Kilwa Masoko, 2012.
- Mustalahti, Irmeli, Bolin, Anna, Boyd, Emily, and Paavola, Jouni. "Can REDD+ reconcile local priorities and needs with global mitigation benefits? Lessons from Angai Forest, Tanzania." *Ecology and Society* 17.1 (2012): 114-125.
- Nzunda, E., E. Luoga, and T. Mahuve. "Community-Based Forest Management in Tanzania. Strengths Weaknesses, Opportunities and Threats." *The 13th Biennial Conference of the International Association for the Study of Commons (IASC), Hyderabad, India*. 2011.
- Peskett, Leo, Schreckenber, Kate, and Brown, Jessica. "Institutional approaches for carbon financing in the forest sector: learning lessons for REDD+ from forest carbon projects in Uganda." *Environmental Science and Policy* 14 (2011): 216-229.
- Pinto, Luís F.G. and McDermott, Constance. "Equity and forest certification – A case study in Brazil." *Forest Policy and Economics* 30 (2013): 23-29.
- Rahman, Shams-ur, and David K. Smith. "Use of location-allocation models in health service development planning in developing nations." *European Journal of Operational Research* 123.3 (2000): 437-452.
- Rametsteiner, Ewald, and Markku Simula. "Forest certification—an instrument to promote sustainable forest management?." *Journal of environmental management* 67.1 (2003): 87-98.
- Ribot, Jesse C., and Nancy Lee Peluso. "A Theory of Access." *Rural sociology* 68.2 (2003): 153-181.
- Savaresi, Annalisa. "The Human Rights Dimension of REDD." *Review of European Community & International Environmental Law* 21.2 (2012): 102-113.
- Scriven, Joel. "Developing REDD+ policies and measures from the bottom-up for the buffer zones of Amazonian protected areas." *Environment, Development and Sustainability* 14 (2012): 745-765.
- Sommerville, Matthew, et al. "The role of fairness and benefit distribution in community-based Payment for Environmental Services interventions: A case study from Menabe, Madagascar." *Ecological Economics* 69.6 (2010): 1262-1271.
- Sultana, Farhana. "Gendered waters, poisoned wells: political ecology of the arsenic crisis in Bangladesh." *Fluid bonds: Views on gender and water* (2006): 362-86.
- Tanzania Natural Resources Forum. "Working together for learning and action: Shared experiences of the Tanzania REDD+ pilot projects." Tanzania Natural Resource Forum: Arusha, Tanzania, 2012.
- Tanzania Natural Resources Forum. "REDD realities: learning from REDD pilot projects to make REDD work." Tanzania Natural Resource Forum: Arusha, Tanzania, 2011.

Thornber, Kirsti. "Certification: A discussion of equity issues." *Social and Political Dimensions of Forest Certification*. 1. Errol Meidinger, Chris Elliott and Gerhard Oesten. Remagen-Oberwinter, Germany: Forstbuch, 2003. 63-82.

Wily, L. Alden. "Forest law in eastern and southern Africa: moving towards a community-based forest future?." *UNASYLVA-FAO*- (2000): 19-26.

Zahabu, Eliakimu, et al. "Forestland tenure systems in Tanzania: an overview of policy changes in relation to forest management." *INA fagrapport 14* (2009): 6-24.