



## ANALYSIS OF DRIVERS AND AGENTS OF DEFORESTATION AND FOREST DEGRADATION IN MASITO FORESTS, KIGOMA, TANZANIA

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### ABSTRACT

*A study to assess the direct and indirect drivers and agents of deforestation and forest degradation was carried out in Masito forests in Kigoma Region. Several methodologies were deployed including review of key literature, focused group discussions, household level interviews and review of “smart phones” database of disturbance incidences in the forests. Results revealed that despite forest protection measures taken by the government and other actors for purposes of REDD+ carbon trade, deforestation and forest degradation are problems that are being experienced in the study area. Evidence of deforestation and degradation were provided through change detection data, forest disturbance incidences and community perception on the drivers of deforestation and degradation. The main drivers of deforestation and degradation were characterized to fall into direct drivers and indirect drivers. The demand for land and forests resources was responsible for a number of direct drivers. Indirect drivers were perceived to entail underlying causes of deforestation and degradation forming a complex interaction of socio-economic, political, cultural and technological variables that cause deforestation and degradation. Characterization of the main agents of deforestation and degradation revealed that human actors in various capacities and functions have served as agents. The assessment of leakage risks revealed that the risk of shifting destructive activities to non-REDD+ project villages was mitigated. In order to address the drivers and sustaining the REDD+, the study recommends the need to address forest tenure; provision of alternatives to the agents of deforestation and degradation, extension support to non-REDD+ villages for capacity building in forest protection; and ensuring that the process of REDD+ piloting is finalized to the level that communities finally sell carbon to get tangible benefits.*

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## Contribution/ Originality

This unique study has demonstrated that the application of different triangulated methodologies including android devices database, remote sensing and socio-economic surveys provides a holistic analysis of the drivers and agents of deforestation, degradation and forest disturbance instances hence enabling forest managers to improve forest management strategies for carbon trade.

## 1. INTRODUCTION

Tanzania has about 48 million ha of forest cover which is approximately 55% of her forest and woodland cover (Malimbwi, 2014). Deforestation and forest degradation are some of the challenges facing the forest sector in Tanzania (Kessy, 1998; Malimbwi, 2014). In April, 2008 the Government of the United Republic of Tanzania in collaboration with the Norwegian Government signed an agreement to support piloting of REDD+ activities in the country (URT, 2008; Kimaro, 2012). The Jane Goodall Institute is among eight NGOs that took part in piloting REDD+ activities in Western Tanzania, the work which was done in collaboration with central and local government, academic institutions and the private sector (URT, 2008). Since its inception in 2010 the Jane Goodall Institute (JGI) REDD+ Project had been carrying out constant interventions aimed to address the drivers of deforestation in the Masito Ugalla Ecosystem Pilot area located on the eastern shores of Lake Tanganyika in western Tanzania (Fig. 1) aimed at improving both forest conditions and peoples' livelihoods (Yanda, 2010). The project covers 91,000 hectares and is an important watershed catchment for Lake Tanganyika. The project interventions were based on the understanding that community's over dependence on the forest resources was one of the major factors that contributed to deforestation. Prior to the REDD+ Piloting Project, the JGI has had interventions in the area which have been extended to the current project.



Figure-1. Location Map JGI-REDD+ Project

(Source: JGI (2014) with authors' modification)

These include: the establishment of alternative environmentally friendly livelihood options for community members, training and capacity building at village level to improve awareness of community members on the importance of forests particularly on the possibilities of benefiting from the forest through REDD+ payments, preparation and implementation of forest management and fire management plans and by-laws, establishment of demonstration plots to increase farmers' knowledge and skills on sustainable agricultural practices including agroforestry, and the establishment of an inter-village forest management organization involving 7 villages in the name of JUWAMMA which has managed to improve social cohesion at the community level (JGI, 2007a;2007b; JGI, 2008a; Yanda, 2010). The objective of this paper is to analyse the direct and indirect drivers and agents of deforestation and forest degradation and leakage risks in villages found within Masito Ugalla Ecosystem.

## **2. METHODOLOGY**

For triangulation purposes, the assessment deployed four techniques for information collection. Triangulation essentially involves assessing a research problem from more than one perspective and therefore deploying a variety of methods in data collection. The purpose is to increase data validity and reliability as emphasized by different scholars (Miller and Wilson, 1983; Punch, 2000). The methods deployed in this study included reviewing of key documents, Focus Group Discussions, household questionnaire survey and review of smartphone disturbance incidence database as described in section 2.1- 2.4.

### **2.1. Review of Key Documents**

Both technical reports from research and consultancy assignments conducted in the area, performance reports by project implementation team and other relevant publications were reviewed. The aim of the review was to establish the state of knowledge in relation to deforestation and forest degradation trends in the area.

### **2.2. Focused Group Discussions with Key Informants**

Focused group discussion with identified key informants in the study area was conducted using a pre-designed checklist and information was compared across different groups. Key informants for each village included at least one project staff, four field level extension officers, twenty five village council representatives, at least five representatives from village environmental committees and five Fire Monitors (FM) making a total of 40 representatives. Proportionally, this sample size was more than 10% for each village. At the district level 100% of technical staffs were involved as key informants.

### **2.3. Household Questionnaire Survey**

Household questionnaire survey was conducted in both project and non-project ("leakage") villages. The distance between the project and non-project villages ranged between 20 and 30 km implying that the possibility of leakage existed. The questionnaire aimed to solicit perceptions of household heads or their representatives on the awareness of the existing drivers of deforestation

and degradation in the project area, the extent and seriousness of the challenges, possible solutions and the contribution of the JGI REDD+ project in addressing the drivers of deforestation and degradation. The questionnaire was also designed to solicit information on possible leakages in terms of shifting destructive activities to non-project (leakages) village and increase in price of various forest products.

In each village a sample of 30 household heads was drawn to respond the interviews which were conducted by trained assistants from within the district. A total of 210 households were involved in the interviews out of which 150 household (20 of which were female headed) were from project village, while 60 households (5 of which were female headed) were from leakage villages.

#### **2.4. Review of Smartphone Incidences Database**

The use of smartphones and other android devises in monitoring forest disturbances has recently emerged as one of the useful technniques in recording forest monitoring (GCP, 2012; Forests Monitor, 2013; World Bank, 2013). The technique was used to record disturbance incidences encountered in the forests during the patrols. The smart phones record the location, the disturbance incidences, whether the incidence is recent or otherwise and other parameters that can enable researchers and project implementers to design intervention aimed to minimize forest disturbance (Pintea, 2012; World Bank, 2013). The reviewed data included also the mapping of the disturbance incidences recorded for the past six months within the project area. The collected/captured information was used in providing evidences of existing deforestation and forest degradation in the study area.

### **3. RESULTS AND DISCUSSION**

#### **3.1. Evidence of Deforestation and Degradation from Change Detection Data**

Available literature within the project indicate that forest change detection was conducted using 2001, 2007 and 2011 Landsat TM and ETM satellite imagery, ground-truth data derived from field surveys, oblique aerial photos and very high resolution satellite imagery collected from 2001-2012 (Kimaro, 2012). The findings indicate that deforestation and forest degradation is a problem that requires attention in the project area. It is caused by a number of drivers including infrastructural development, forest fires, expansion of settlements and encroachment farming into the forests (Figure 2). Road construction is the major infrastructural development that has caused deforestation. On the other hand expansion of settlements and encroachment farming has been associated with the existence of refugee's settlements on the Mpanda side of the Ecosystem. Fire occurances are frequent especially during the dry season as confirmed by community representatives during the data collection period.

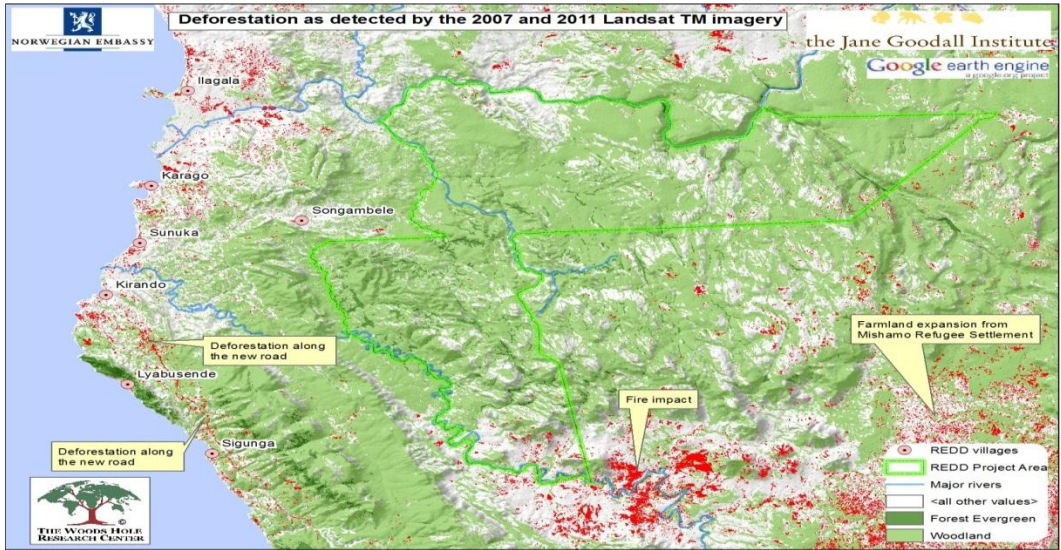


Figure-2. Deforestation and degradation in the project area as detected by 2007-11 Imagery

(Source: Kimaro (2012))

### 3.2. Evidence of Deforestation and Degradation from Smartphones Database

Figure 3 provides evidences from smartphones database. According to the results in figure 3, illegal pitsawing incidences were the highest encounters. Pitsawing was confirmed by encounters of pitsawing frames locally known as *pundas*, fresh cut trees and abandoned pitsawing sites. This was followed by incidences of encountered wildlife hunting camps. Others in order of severity included newly opened farms, fire affected areas, livestock herds, abandoned settlements, and bullet husks confirming poaching, poachers found in the forests and constructed brick making kilns. These results confirm the sources of forest destruction and deforestation in Tanzania as pointed out in the national forest policy (URT, 1998) and the national REDD strategy (URT, 2010).

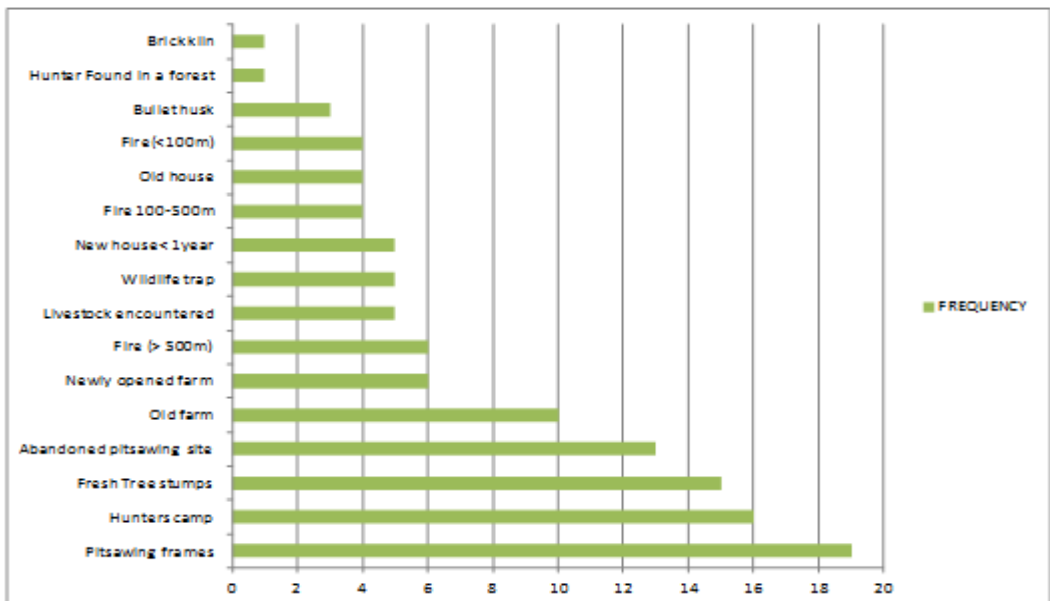


Figure-3. Frequencies of encountered disturbances

### 3.3. Community Perceptions on the Extent of Deforestation

Results in figure 4 indicate that the majority of the respondents (about 91%) were not involved in any forest related income generation activity mainly because of the agreed upon by laws on forest protection and established land use plans. It is expected that the rest (9%) of the respondents with forest related activities would had more knowledge on forest destructive activities. As such, the mere fact that most respondents had nothing to do with forest activities implied that the opinions expressed represent what the majority of the community members would perceive to be the seriousness of various drivers of deforestation. Responses on the magnitude of seriousness (that is perceived to be a threat or not) of various drivers of deforestation and forest degradation are summarised in Table 1.

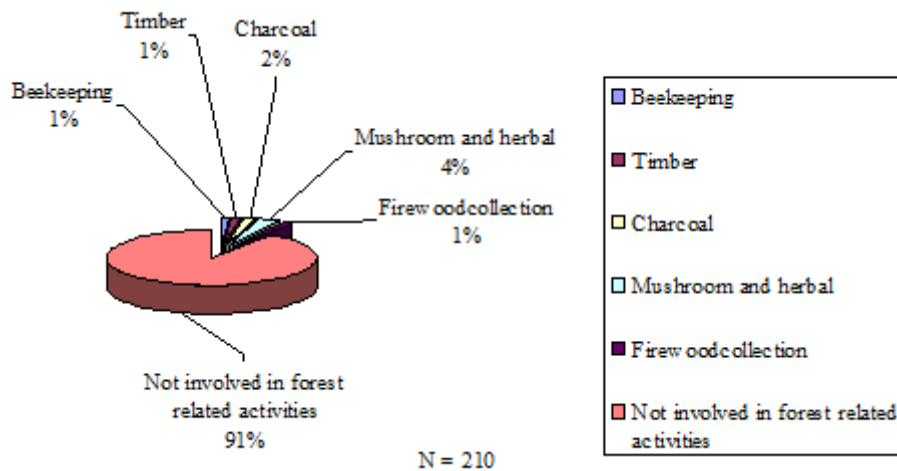


Figure-4. Respondents involvement in forest related activities

Table-1. Responses on seriousness of various drivers of deforestation in the project area

Causes	Households' perception on status of causes of deforestation							
	REDD+ sites (N = 150)				Non-REDD+ sites (N = 60)			
	Very serious (%)	Serious (%)	Not serious (%)	No opinion (%)	Very serious (%)	Serious (%)	Not serious (%)	No opinion (%)
Agriculture	19	31	24	26	25	20	23	32
Cutting poles for construction	4	17	15	64	7	12	8	73
Bush fire	67	8	13	12	72	10	13	5
Ineffective village leadership	21	27	9	43	22	15	17	47
People living close to forest	7	21	5	66	10	20	10	60
Improper livestock keeping	33	21	17	29	23	33	18	25
Influx of immigrants	13	9	21	58	13	22	15	50
Illegal harvesting of forest products	65	8	14	13	57	7	23	13
Poaching of wildlife	23	3	3	72	22	5	12	62
Charcoal making	39	30	29	3	63	18	13	5

Results in Table 1 show that in both REDD+ project and leakage villages high percentage of community representatives perceived a number of drivers as either being very serious or less serious. This was true for expansion of agriculture, forest fires, livestock keeping, charcoal making, ineffective village leadership, illegal harvesting of forest products, poaching and influx of

immigrants. Yet, substantial proportions of representatives had no opinion and could not comment on the seriousness of the disturbances. The main reason given by those who did not have opinion was that it has been long time since they entered the forests because access rules have been restricted and measures are taken against tracepassers into the forests.

### 3.4. Characterization of Drivers of Deforestation

The type of drivers identified during the study falls under two categories, viz: the direct/proximate and indirect. The direct drivers of deforestation and forest degradation are human activities and actions that directly impact forest cover and result in loss of carbon stocks. Available literature suggest that (Arnold, 2000; FAO, 2007) agriculture is estimated to be the proximate driver for around 80% of deforestation worldwide. Commercial agriculture is the most important driver of deforestation in Latin America (around 2/3 of total deforested area). In Africa and (sub) tropical Asia it accounts for around 1/3 of deforestation and is of similar importance to subsistence agriculture. Mining, infrastructure and urban expansion are important but less prominent. The situation in the study area is analysed in the forthcoming sub-sections.

#### 3.4.1. Direct Drivers

In the study area the direct drivers identified were illegal expansion of agricultural activities and/or settlements to the forest, grazing in the forest and improper livestock keeping, charcoal making, uncontrolled forest fires and pitsawing and pole cutting activities. Others include infrastructure development, hunting of wildlife, firewood collection and boat/canoe making. Illegal expansions of agriculture activities to the forests have proved to be one of the drivers of deforestation and forest degradation in the area. This largely takes a form of encroachment farming by small scale subsistence farmers in search of more fertile land. Large scale land grabbing is reported in the project area (JGI, 2008b) in establishment of bio-fuel farms but not inside protected areas.

**Table-2.** Respondents' perceptions on agriculture as a driver

Causes	REDD+ site (N=150)	Non-REDD+ sites (N=60)
	%	%
Agriculture expansion	73	68
<i>How agriculture cause deforestation</i>		
➤ Majority of rural inhabitants are farmers (clear forest for farming)	25	23
➤ Shifting cultivation practices	31	28
<i>Opinion on measures to be taken</i>		
➤ Proper farming practices be encouraged	26	23
➤ Land use plans which should define clearly forest boundaries from other land uses	6	3

According to results in Table 2 about 73% of respondents in REDD+ project villages and about 68% from non-REDD+ villages confirmed that agricultural expansion is a problem. The major reasons provided were that farmers clear forests to expand their farmland while others do

practice shifting cultivation. To address the problem, respondents were of the opinion that intensification of agriculture should be emphasized as well as establishment and adherence to proper land use plans.

Some communities' members do establish illegal settlements inside forest in the project site. These can either be temporary or sometimes relatively permanent settlements. Those who establish such settlement are often engaged in other destructive activities including for example agricultural activities, charcoal making, pitsawing, illegal grazing in the forest and hunting of wild animals causing deforestation and forest degradation.

Respondents opinion was sought during the survey and revealed that only about 32% of respondents in REDD+ project villages and about 38% of respondents in the leakage villages admitted presence of illegal settlements in the forest. The low response could possibly be argued to be a reflection of the fact that forest patrols are more intensive now compared to the past. The patrols together with law enforcement through village level institutions seem to contribute in addressing the problem of illegal settlements. However, evidence provided in section 4 of this report suggests that the problem is still there.

Illegal grazing in the forest is mostly practiced by immigrants' livestock keepers from outside the region. These include livestock keepers coming from Mwanza and Shinyanga regions in search of grazing land. Others include livestock keepers from nearby countries of Burundi and Rwanda. Large herds of cattle are often encountered in the forests.

During the study period a herd of more than 2000 cattle was encountered in forests within the study area (Songambe village). During the survey majority of respondents (66% from REDD+ project and 60% from non-REDD+ project villages) confirmed the presence of illegal grazing in the study area. Respondents reported that sometimes livestock keepers set forests on fire to clear the vegetation and give way to fresh re-growth with better forage for livestock. More than 50% of respondents from both project and leakage villages were of the opinion that the problem can be solved through agreed upon land use plans and protecting the forests against illegal immigrants.

The demands for charcoal both for domestic and commercial purposes pose a threat to the forests in the area. Charcoal makers illegally trespass into the forests and cut down trees and make charcoal. This activity contributes substantially to deforestation and forest degradation. Respondents during the survey confirmed that charcoal making is a serious agent of deforestation and forest degradation in the area.

According to Table 3, about 59% of respondents from the REDD+ villages and 65% from leakage villages confirmed this. The lower percentage in the REDD+ villages reflect project initiatives that have been introduced in the area to address the problem of charcoal making. To alleviate the problem it has been proposed by respondents that there is need to empower charcoal makers with alternative income sources, increase education on improved charcoal production techniques and provision of alternative source of energy.

Devastating forest fires do affect both the Masito forest and village forests including general land forests every year.



**Table-3.** Respondents' perceptions on charcoal making as a driver

Causes	REDD+ sites (N = 150)	Non-REDD+ sites (N=60)
	%	%
Charcoal making	59	65
Why is Charcoal making causing deforestation		
➤ Most illegal immigrants are involved in charcoal making	59	65
➤ High demand of charcoal	3	3
Opinion on measures to be taken		
➤ Empower charcoal makers with alternative income sources	18	18
➤ Educate charcoal makers on improved charcoal production	9	15
➤ Alternative source of energy	7	8

Fires are more frequently during the dry season on average villages in the project area experiences at least five fire incidences every dry season, causes of forest fires range from hunters, honey collectors and farmers in the process of land clearance for agricultural activities. The survey results revealed that more than 80% of respondents from both REDD+ project villages and non-REDD+ project villages confirmed that fire incidences are one of the major causes of deforestation and degradation (Table 4). It has been suggested by respondents that awareness raising and law enforcement should be intensified in the area to curb the problem of forest fires.

Devastating forest fires do affect both the Masito forest and village forests including general land forests every year. Fires are more frequently during the dry season on average villages in the project area experiences at least five fire incidences every dry season, causes of forest fires range from hunters, honey collectors and farmers in the process of land clearance for agricultural activities. The survey results revealed that more than 80% of respondents from both REDD+ project villages and non-REDD+ project villages confirmed that fire incidences are one of the major causes of deforestation and degradation (Table 4).

**Table-4.** Perception of respondents on fires as a driver of deforestation

Causes	REDD+ sites (N = 150)	Non-REDD+ sites (N=60)
	%	%
Forest fires	84	88
How forest fires cause deforestation		
➤ Burn trees and regenerants	84	88
Opinion on measures to be taken		
➤ Education on the effect of fire on forests	49	58
➤ Train and establish fire crew to stop fire	23	27
➤ Effective law enforcement	41	37

It has been suggested by respondents that awareness raising and law enforcement should be intensified in the area to curb the problem of forest fires.

Illegal pit sawing is often encountered in the forests. Evidence of pit sawing is normally encountered in term of confiscated lumber, abandoned pit sawing sites, existing pit sawing frames (*punda*). The main product from pit sawing activities is normally lumber for various uses. Forest disturbance also results from illegal cutting for trees for purposes of serving as poles for house construction. It was the perception of the respondents that these two activities contribute to forest

destruction (Table 5). However, only a small percentage of respondents confirmed this to be a problem. The reason given for this low response was that law enforcement by village level institutions has been effective in reducing the number poles cutters.

**Table-5.** Perception of respondents on cutting of poles as a driver

Causes	REDD+ sites (N = 150)	Non-REDD+ sites (N=60)
	%	%
Cutting poles for construction	25	23
How cutting poles cause deforestation		
➤ Poles are important construction material	25	23
Opinion on measures to be taken		
➤ Low cost alternative construction material	3	3

In the project area some infrastructural development activities contribute to deforestation and forest degradation. One such case is road construction activities. Evidence from change detection data have shown that area where such developments were taking place was affected by deforestation.

Illegal hunting of wildlife contributes to deforestation and forest degradation, hunters either cut trees to prepare animal traps or establish temporary settlement in the forests in search for wild animals. In worst case fire is used for hunting. It was the perception of the respondents during the survey that illegal hunting of wild animals contributed to forest destruction as confirmed in Table 6. However, the percentage of respondents who confirmed hunting of wildlife to be a problem was relatively low but yet higher in the leakage villages compared to the project villages. The reason given for this was more effective law enforcement by village level institution.

**Table-6.** Perception of respondents on the problem of wildlife hunting

Causes	REDD+ sites (N = 150)	Non-REDD+ sites (N=60)
	%	%
Poaching of wildlife	27	38
How poaching of wildlife cause deforestation		
➤ Use of fire to trap wildlife	30	37
Opinion on measures to be taken		
➤ Effective law enforcement	32	28
➤ More education on conservation issues	12	13

Firewood is one of the main sources of energy in the areas surrounding the project. Firewood collection sometimes involve cutting down of fresh trees for the purpose of drying to serve as firewood. As the drivers of deforestation firewood collection in the project area goes beyond the use of firewood for domestic purpose to commercial use in large quantities. This is particularly true where firewood is used for drying fish, salt making, brick making and tobacco curing.

The project area operates along the shores of the Lake Tanganyika where boats and canoes are used for navigation in the lake. The activity of boat and canoe making often involves cutting down of big trees in order to get logs of reasonable sizes for the activity. This contributes as a driver of deforestation and forest degradation.

### **3.4.2. Indirect Drivers**

Underlying the indirect drivers are complex interactions of social, economic, political, cultural and technological processes that affect the proximate drivers to cause deforestation or forest degradation. They act at multiple scales: international (markets, commodity prices), national (population growth, domestic markets, national policies, governance) and local circumstances (subsistence, poverty). Our findings confirm that economic growth based on the export of primary commodities and an increasing demand for timber and agricultural products in a globalizing economy are critical indirect drivers. In REDD+ readiness plans, many countries identify weak forest sector governance and institutions, lack of cross-sectoral coordination, and illegal activity (related to weak enforcement) as critical underlying drivers. Population growth, poverty and insecure tenure are also cited. International and market forces, particularly commodity markets are also key underlying drivers.

### **3.4.3. Population Increase**

Increasing population pushes the demand for land and forest resources upwards. The push eventually leads to forests destruction. In the project area population increase results from two main sources namely, natural growing and immigration. Where the former is a natural phenomenon the later results from decreasing forests resources from elsewhere. Immigrants to the project area come from both inside the Tanzania and neighboring countries. The conspicuous activities that are associated with migration of people to the project area are livestock keeping and agricultural expansion.

### **3.4.4. Inadequate Law Enforcement**

Control of forest and wildlife resources in Tanzania is largely vested under the Ministry of Natural Resource and Tourism which has a network of Natural Resource Management law enforcement throughout the country. Foresters and wildlife officers at Regional, Districts and Sub-districts levels are supposed to enforce laws that control forests and wildlife resources within their jurisdiction. Unfortunately their effectiveness as law enforcers is challenged by inadequate staffing levels, shortage of working facilities and extensive forest resources which cannot be adequately controlled by poorly equipped law enforcers. This has resulted to noticeable disturbances in the forests in terms of deforestation and forest degradation.

### **3.4.5. Weak Governance**

At village level participatory natural resources management was introduced in Tanzania to address the challenges of institutional vacuum in forest management which was a result of poor law enforcement. Through participatory forest management village level institutions including village councils and environmental committees do take part in controlling forests resources within their areas in collaboration with government officers. When government at village level is weak or corrupt control of forests resources becomes ineffective resulting to deforestation and forest degradation.

### 3.4.6. Lack of Awareness and Mobilization

When communities are aware of the potential benefits from conservation and negative consequences of forests destruction their actions towards forest controls change. When awareness is combined with mobilization at local level involving for example formation of local level institutions for forest controls communities demonstrates better control over surrounding forest resources. In these villages where the level of awareness and mobilization was relatively higher, forests destruction was less. This was true when the REDD+ project villages and non-REDD+ project villages were compared.

### 3.4.7. Lack of Sustainable Alternatives

The demands for wood, wood products and energy sources put substantial pressure on forest resources resulting to deforestation and forests degradation. The destruction is constantly aggravated by the facts that government and conservation initiatives have not adequately identified and made available sustainable alternative to communities. This is particularly true for alternative supplies of forests products and services as well as income generating activities. In villages where attempt to provide alternatives have been tried the pressure on forests resources has relatively decreased.

## 3.5. Agents of Deforestation and Degradation

The differences between “agents” and “drivers” of deforestation and degradation are that, the agent refers to the key actors who are deforesting. Agents refers to the understanding of the “who” actually deforest the land as such agents of deforestation refer to those individuals, corporations, government agencies or development projects that clear the forests (FAO, 2007). Table 7 below presents agents of deforestation and forest degradations and its associated roles.

**Table-7.** Agents of deforestation and forest degradation and their roles

Agents	Their roles in causing deforestation & degradation
Firewood collectors	<ul style="list-style-type: none"> <li>• Cut down trees for firewood</li> <li>• Sometimes cause fire especially smokers</li> </ul>
Charcoal makers	<ul style="list-style-type: none"> <li>• Cut down trees for charcoal production</li> <li>• Cause forest fires</li> <li>• Create roads in the forests</li> <li>• Sometimes establish settlements</li> </ul>
Infrastructural developers	<ul style="list-style-type: none"> <li>• Clear forests to pave way for development projects e.g. roads and construction works</li> <li>• Open roads in the forests</li> <li>• Sometimes establishes temporary settlements</li> </ul>
Salt industries owners	<ul style="list-style-type: none"> <li>• Increase the demand for firewood</li> <li>• Use firewood for salt extraction</li> </ul>
Gypsum miners	<ul style="list-style-type: none"> <li>• Clear forests for mining purposes</li> <li>• Create settlements</li> <li>• Use firewood</li> </ul>
Boat makers	<ul style="list-style-type: none"> <li>• Cut trees for boat making</li> </ul>
Tobacco farmers	<ul style="list-style-type: none"> <li>• Cut trees for firewood to cure tobacco</li> </ul>
Immigrants	<ul style="list-style-type: none"> <li>• Increase the demand for land and forest resources</li> <li>• Create settlement in the forests.</li> </ul>

### 3.6. Assessment of Leakage Risks

The assessment of leakage risks as recommended by Shoch *et al.* (2011) revealed that the risk of shifting destructive activities to non-project or leakage village was mitigated. This has been through introduction of alternative income generation activities. Secondly there is evidence of horizontal learning from the REDD+ project villages to non-REDD+ project villages. Awareness on the potential benefits that can result from REDD+ if village level institution collaborate in forest protection has spread to the non-REDD+ villages. The non-REDD+ villages have gradually embarked on process such as institutional strengthening at village level, formation of environmental committees and patrol team. The project has supported the gradual processes through education, awareness raising and trainings. As a result the capacity of the non-REDD+ villages to control forest recourses against intruders has increased with the hope of benefitting from REDD+ in the future.

## 4. CONCLUSIONS AND RECOMMENDATIONS

Evidence of deforestation and degradation were provided through change detection data forest disturbance incidences and community perception on the drivers of deforestation and degradation. The demand for land and forests resources were responsible for a number of direct drivers including agricultural expansions, illegal settlements in the forests, grazing and improper livestock keeping, charcoal making, forest fires, pit sawing for lumber and poles cutting activities, infrastructural development, hunting of wildlife, firewood collections, tree cutting for boat and canoe making. Indirect drivers were perceived to entail underlying causes of deforestation and degradation forming a complex interaction of socio-economic, political, cultural and technological variables that cause deforestation and degradation among the indirect drivers identified includes population increase resulting from natural growth and immigrants, inadequate law enforcement, weak governance, lack of awareness and mobilization and lack of sustainable alternatives.

Characterization of the main agents of deforestation and degradation revealed that human actors in various capacities and functions have saved as agents. The main agents identified included small scale farmers, loggers and pit sawing, livestock herds, firewood collectors, charcoal makers, infrastructural developers, salt industries owners, gypsum miners, tobacco farmers and immigrants. The assessment of leakage risks revealed that the risk of shifting destructive activities to non-REDD+ project villages was mitigated. This was done by supporting communities to identify alternative livelihood options and builds the capacity of non-REDD+ project villages to control forest resources.

The JGI-REDD+ project is addressing the various drivers of deforestation through supports in-terms of providing trainings and capacity building, institutional strengthening at village level, formation of CBO for REDD+ piloting purpose, facilitating undertakings of land use plan, making of by-laws and establishment of demonstration farms.

The study recommends the following;

First, the process of REDD+ piloting should be finalized to the level that communities can finally sell carbon. This involves a number of processes including preparation of relevant document and taking all the necessary stapes to finalize the initiatives. If this is not positively

finalized the danger of increased forest destruction through loss of moral at the community level is evident

Second, identified threats at community level should be addressed. These include issues of forest tenure in relation to handing over the ownership of the respective general land forest to the CBO (JUWAMMA) for REDD+ piloting purpose. Unless villages and CBO have a forest designated for REDD+ and carbon trade, the whole piloting initiative will be a failure not only to the project but the district, region and the nation. Some training on fund raising skills needs to be provided to the CBO

Third, Initiatives initiated by the project to provide alternatives to the agents of deforestation and degradation should be sustained and expanded

Fourth, support should be extended to non-REDD+ project villages to assist in building the capacities of the villages towards improved forest protection and be encourage/sensitized to embarking on REDD+ as well

## 5. ACKNOWLEDGMENTS

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