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# Challenging the win-win proposition of community-based wildlife management in Tanzania

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## A case of Burunge WMA

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# DECLARATION

I hereby declare that this thesis is the result of my research, investigation and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for the award of any academic degree.

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## ABSTRACT

Community-based wildlife management promises to create a win-win situation in which the protection of wildlife resources and their habitat will benefit the communities living in and around areas of high wildlife density. Wildlife-based tourism is an important source of income in Tanzania and increasing conservation efforts is therefore a priority in the government's policy-making. Wildlife Management Areas (WMAs) are established on village lands and are claimed to provide tangible benefits to communities which incentivise protection of natural resources and wildlife habitat outside protected areas. This thesis challenges this win-win proposition by showing that some of the inherent trade-offs created by protectionist land use are not compensated by tangible benefits. The case studied in this thesis is Burunge WMA, one of the oldest and more successful WMAs in Tanzania.

A combination of survey data and in-depth household interviews is used to analyse the impact of Burunge WMA on different aspects of livelihoods. Findings suggest that restricted access to natural resources negatively impacts livelihoods and most likely results in relocation, not reduction, of resource use. Even though revenues generated through tourism activities are substantial, the distribution and use of those financial resources do not allow villagers to be compensated for costs created by restricted resource access and human-wildlife-conflict. Insights from qualitative field work indicate that there are other factors driving the positive economic development in villages, which is however hampered by increasingly scarce land resources. Albeit a win-win appeal, results from this study suggest that further attention needs to be directed towards the design and implementation of a community-based wildlife management which can provide a viable alternative to current land uses and the livelihood strategies built on those.

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Until lions have their own historians, tales of the hunt shall always glorify the hunter.

*African proverb*



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## ABBREVIATIONS

AEU	Adult equivalent unit
CBNRM	Community-based natural resource management
MNRT	Ministry of Natural Resources and Tourism
PIMA	Poverty and Ecosystem Impacts of Tanzania’s Wildlife Management Areas
TLU	Tropical livestock unit
TShs	Tanzanian Shilling
WMA	Wildlife Management Area

# 1. INTRODUCTION

This year the United Nations introduced its' agenda for the next fifteen years of global development, the Sustainable Development Goals (SDGs). Building on the Millennium Development Goals (2000 – 2015), which were mainly concerned with human development in developing countries, the SDGs now put a greater emphasis on the fact that human development is closely connected to climate and environment, and that global development concerns not only developing countries but indeed everyone in the global society. Goals addressing sustainable economic development, sustainable use of natural resources and environmental protection, shall now be pursued simultaneously with goals to end hunger, poverty and gender inequality.

Human well-being depends on ecosystem services, ranging from provisioning of clean air and water, timber, food or genetic resources, to cultural and recreational values attached to a certain landscape and ecosystem (Millennium Ecosystem Assessment 2005). To ensure continued provision of ecosystem services, trends of increasing anthropogenic pressure on land, water, natural resources and biodiversity, are countered by efforts of expanding conservation areas 'safe' of human influence. This incongruity of human activity and nature creates a trade-off: Conservation areas present opportunity costs in the form of foregone land use options (Adams *et al.* 2004, Hulme and Murphree 2001).

In the East African rangelands conservation efforts focus predominantly on protecting wildlife and its habitat. In Tanzania, where the case presented in this thesis is situated, conservation areas are steadily expanding. In 2012 one third of the land surface was already protected (World Bank 2015a), and there are no indications that this trend is slowing down (Brockington 2008). The pristine African wilderness and its wildlife is an image people attach high value to, feeding a flourishing safari and hunting tourism industry. In Tanzania, conservation is good business: The tourism sector contributes 1.9 billion USD per year (2013) in tourism revenues to the economy and has grown by more than 50% between 2010 and 2013 (World Bank 2015b, current USD). Yet both monetary and non-monetary benefits derived from these conservation efforts are not equally distributed, and often the benefits accruing to communities living with conservation are insufficient for them to see the benefits of these efforts.

The complex interactions between human development and biodiversity conservation are a topic of constant debate, both in academia and practice (Adams *et al.* 2004). High natural resource dependence of the poorest parts of the population characterise the vulnerability of human development to

environmental degradation. Conservation and development practitioners have recognised that addressing both poverty alleviation and environmental protection simultaneously has the appealing prospect of delivering a win-win solution (Roe *et al.* 2013).

High levels of poaching, increasing habitat loss, and a strong lobby of development agencies pushing for more involvement of local communities, led to a paradigm shift in conservation policy during the 1990's (Hulme and Murphree 2001). Community-based natural resource management (CBNRM) was introduced as an alternative to the historical top-down management of natural resources, sometimes called 'fortress conservation' (Brockington 2002), in which the local population is strictly excluded from the ecosystem and its management (Adams and Hulme 2001). In 1998 the Tanzanian government introduced Wildlife Management Areas (WMA). These community-managed conservation areas aim to combine the objectives of wildlife conservation, rural economic growth through tourism, and poverty reduction (URT 1998). By decentralizing governance and power to the local communities and enabling them to reap from their conservation efforts, incentives for environmental protection would be created, investments in sustainable natural resource use would be promoted, and thereby alternative livelihood strategies and rural economic growth would be supported. There appears to be much potential for a win-win solution.

Despite the win-win narrative, CBNRM in general has been criticized to serve conservation goals through employing the community, rather than creating livelihood opportunities that are based on sustainable natural resource management (Blaikie 2006). Scholars have pointed out that there is no clear evidence that the community-based approach actually holds what it promises (Hutton *et al.* 2005, Agrawal and Redford 2006).

Also the win-win claims of WMAs in Tanzania have been challenged by scholars who suggest that the Tanzanian state is still claiming power and revenues related to wildlife management, and that in reality there is little participation or benefits for the local communities (Goldman 2003, Igoe and Croucher 2007, Benjaminsen and Svarstad 2010, Benjaminsen *et al.* 2013, Bluwstein *et al.* in review).

Nearly ten years after the first WMAs were officially put into operation, one might ask: Has the win-win rhetoric materialised? Has the ecological and economic situation for these areas improved? Have wildlife populations recovered? Has environmental degradation reduced? Have communities benefited? How are these benefits distributed? Few studies provide an empirical assessment of both environmental and socioeconomic impacts of integrated development and conservation projects (Barrett *et al.* 2011, Ferraro & Pattanayak 2006), such as the WMAs in Tanzania. The need for a comprehensive evaluation of Tanzanian WMAs led to the interdisciplinary research project entitled

'Poverty and ecosystem service impacts of Tanzania's Wildlife Management Areas' (PIMA)<sup>1</sup>, which addresses the impacts of WMAs on the ecosystem, the natural resource governance, and on livelihoods.

This thesis contributes to the latter and focuses on the ways in which livelihoods were affected by the establishment of the Burunge WMA. Livelihood impacts play a critical role, since "community conservation will become possible where it recognises that conservation can be valued by the rural poor only insofar as it improves their standard of living." (Brockington 2002, p. 129). This thesis therefore aims to i) explore livelihood impacts by analysing changes in access to assets, ii) assess whether there is reason to believe that those changes are linked to the establishment of Burunge WMA, and iii) show how survey data can be complemented with data from in-depth interviews collected during a field study to produce more nuanced results in an impact evaluation.

The following section will provide the reader with background information about WMAs and the chosen study site. The methods section will introduce the reader to the PIMA survey data, the field study, and the methods chosen for the analysis. The results of this analysis are presented thereafter. The thesis ends with a discussion of results and their implications, as well as the identification of areas of caution for the impact evaluation, and concludes with suggestions for further research.

## 2. BACKGROUND

This section briefly introduces the background of WMAs in Tanzania and the study site Burunge WMA.

### 2.1. WMAS IN TANZANIA

Drastic declines in Tanzanian wildlife during the 1980s have led to increased conservation effort and an expansion of protected areas. In the 1998 Wildlife Policy WMAs were introduced as community-managed conservation areas aiming to combine the objectives of wildlife conservation outside protected areas, rural economic growth through tourism, and poverty reduction (URT 1998). The Tanzanian government promoted WMAs in areas of high conservation value, typically surrounding protected areas or in proximity to important wildlife migration corridors, and sent officials into the communities to 'educate' them about the importance of wildlife conservation. When convinced, villages would set aside a certain part of their communal land for conservation and draft a land use

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<sup>1</sup> PIMA is an international interdisciplinary collaboration between the University of Copenhagen, University College London, Imperial College London, TAWIRI, UNEP World Conservation Monitoring Centre, and the Tanzania Natural Resources Forum, and is funded within the Ecosystem Services for Poverty Alleviation (ESPA) research program by the Department for International Development (DFID), the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC).

and resource management plan (URT 1998). The participating villages form a community-based organization (CBO) that represents them and which, after a long and cumbersome 12-step procedure (Loveless 2014), is authorized to legally represent the WMA. The CBO is then allowed to sign contracts with investors or decide over allocation of funds<sup>2</sup>. This process is facilitated by experts from NGOs and donors who provide communities with technical assistance and funding. The CBO operates under the legal framework of the General Management Plan of Burunge WMA and the government's regulations for WMAs (URT 2012, URT 2009). Each village is represented by an elected spokesperson which sits on the board of trustees in the CBO.

As of 2012 there were 17 officially established WMAs in Tanzania, covering an area of 27,000 km<sup>2</sup> and affecting close to half a million people (WWF 2014). Another 21 WMAs are in the process of being established, and, if successful, the total area of all WMAs will accumulate to 7% of the total land surface of Tanzania (WWF 2014).

## 2.2. BURUNGE WMA

Burunge is one of the oldest WMAs, and was among the first four to be granted official WMA status by the Tanzanian government in 2006. Burunge WMA comprises ten member villages which are home to more than 30,000 people of the Mbugwe, Barbaig, Iraqw and Masai tribes (HDIC 2010). It comprises 280 km<sup>2</sup> of semi-arid lowlands in Babati district, Manyara region, strategically located between Tarangire National Park, Manyara Ranch and Lake Manyara National Park (WWF 2014).

Burunge WMA grew out of an existing village conservation area in Minjingu (PIMA 2015b). Villagers were encouraged to join the WMA as a potentially more lucrative way of continuing the conservation they were already doing. District officials from Babati came to the villages to hold meetings where villagers were educated about conservation and were promised revenues from wildlife-related tourism, compensation in case of crop raiding or livestock deaths due to wildlife, as well as continued access to all areas of grazing land (Igoe and Croucher 2007).

Thanks to the new tarmac road connecting Arusha and Dodoma, Burunge WMA is now just a three hour drive from Arusha, from where most tour companies depart. There are a number of investors from outside who have established tented lodges, campsites and areas for photography tourism. Currently there is one trophy hunting operator, one agreement with a safari operator, four lodges and one campsite (WWF 2014). However, not all the investors operating in the WMA villages pay the WMA

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<sup>2</sup> For reasons of simplicity, the CBO will be implicit as the executing body representing the WMA, when referring to "Burunge WMA" as an organisation.

(two of the four lodges (WWF 2014)) and some maintain individual agreements with the villages, even though that is no longer allowed under WMA rules (HDIC 2010).

The WMA's location gives it a strategic importance in conservation in the Tarangire-Manyara-Ecosystem, enabling wildlife migration between Tarangire National Park, Lake Manyara National Park, Manyara Ranch and Randileni WMA (e.g. Jones *et al.* 2009, WWF 2014). Burunge WMA is therefore a particularly interesting case to study: It has now been operating for almost a decade, has both a very high conservation importance and high tourism income potential, and is regarded as one of the most successful WMAs (AWF n.d.). This thesis aims to assess in which ways people's livelihoods have been impacted by Burunge WMA, and whether there are indications that it has contributed to increased economic well-being in the communities it accommodates.



Figure 1: Picture from the study site. Picture taken by author.

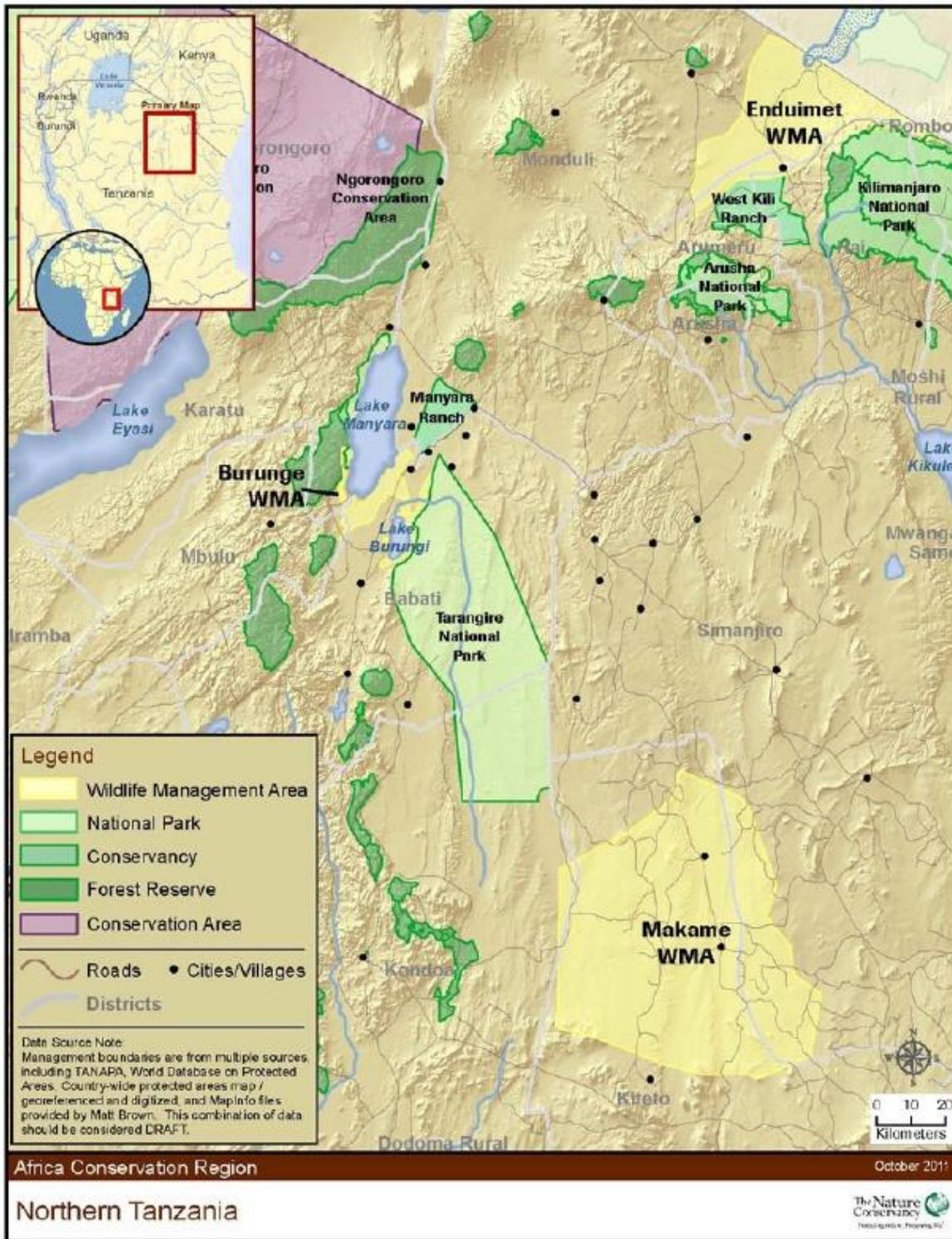


Figure 2: Map of location of Burunge WMA. Source: Sulle *et al.* (2011, p.5)

## 2.3. DEFINITIONS

This section will define a few concepts, which will be referred to throughout the thesis:

A *livelihood* can be understood as: “[...] the assets (natural, physical human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.” (Ellis 2000, p. 10)

The objective of a *livelihood strategy* generally is to create the means of survival (Ellis 2000). These strategies are complex and dynamic, comprising long-term visions, medium-term adaptation strategies as well as ad hoc coping mechanisms.

For the purpose of this analysis a *household* is defined as a co-resident social unit, usually related by kinship, that lives in the dwelling space on a daily basis and contributes to and lives on a joint household welfare (Ellis 2000). It is treated as a unitary decision making unit, thus ignoring intra-household relations and income distribution.

In this study, changes in *economic well-being* is measured based on wealth, not income (Carter and Barrett 2006). Economic well-being will be analysed by assessing changes in access to assets, which are regarded as the foundation for the types of livelihoods people in the studied area have (Ellis 2000).

*Assets* comprise natural capital such as land and water, physical capital such as buildings, roads and machinery, human capital meaning the skills, health and education of labour, financial capital and social capital (Ellis 2000).

The *costs of conservation* to the local population include the limited access to natural resources (pasture, firewood, water) and human-wildlife conflict. Their impact on livelihoods can be substantial (Hutton *et al.* 2005, Brockington 2002, Adams *et al.* 2004). Additionally, there are *opportunity costs* of conservation in the form of value of foregone land use options (e.g. cultivation) for the local population (Adams *et al.* 2004, Hulme and Murphree 2001).

*Human wildlife conflict* typically refers to crop raiding (elephants, zebras, and baboons), predators (lions, hyenas) attacking livestock, human casualties and injuries from wildlife encounters, wildlife transmitting diseases to domestic livestock, and trampling or destructing physical assets such as fences and sheds.

## 3. METHODS

This section presents the choice of methods and introduces the reader to the analysis undertaken in this thesis.

### 3.1. APPROACH

This thesis is a case study of the impact that Burunge WMA has had on livelihoods of the population living in Burunge WMA villages. The focus is on one WMA only because it allows an in-depth analysis of impact, and the identification and discussion of important contextual factors. To this end a combination of survey data and qualitative data collected during a field study will be used.

Measurable impact is an important tool for informing decision makers about policy effectiveness. Yet, the complexity of policies with a social impact can perhaps not be fully captured in quantitative terms. The mixed-method approach allows a deeper analysis beyond testing hypotheses, where new lines of argumentation can emerge, different angles can be used to explain a phenomenon, and therefore the plausibility of empirical results can be either assured or questioned (Neuman 2011). Because of the objective of this research, understanding the WMA from the villager's point of view is crucial. By conducting in-depth qualitative interviews with households, the researcher is introduced to their thoughts and perceptions (Bryman 2012, Ch. 20). That contrasts a purely quantitative approach, where the researcher forms hypotheses based on her view of the issue at hand, and then seeks to test for statistical significance (ibid).

Moreover, it is hard to establish sequences of events with survey data only, which can make it difficult to establish causal relationships (Neuman 2011). This is where the qualitative data can make an important contribution to verifying the plausibility of a relationship found in the statistical analysis, in reality. Empirical analysis often faces the problem of omitted variable bias. There might be another factor influencing a relationship which is unobservable because it was not included in the data collected, perhaps because at the point in time of the survey design it was not hypothesised that this factor could play a role. Some factors also remain unobserved simply because they are hard to measure in quantitative terms (e.g. personal motivation). However those unobserved factors, which might be the true drivers of a relationship between two variables, might be identified with the help of qualitative research. A mixed methods approach therefore allows the researcher to draw a more coloured and rich conclusion about the research question at hand.

This thesis uses data from the 'PIMA Homestead Head Livelihoods Survey' collected in 2014 - 2015 (PIMA 2015a). The survey data consists of information on livelihoods and well-being, access to and

use of natural resources, and the household's relationship with the WMA. The 401 households in the sample are distributed in four treatment villages in Burunge WMA and four matched control villages (see Table 1). Here the 'treatment' is the establishment of the WMA. The control villages are used as a comparison group in the analysis, and are therefore villages where no WMA has been established. This data will be referred to throughout the thesis as 'survey data' (N=401). The terms 'WMA villages' and 'treatment villages' will be used interchangeably and refer to villages indexed T1 – T4 in Table 1, while the term 'control villages' refers to villages indexed C1 – C4.

Figure 17: Map of sample villages. in Annex I and a short description of each village in Annex II provides the reader with a more detailed introduction to the study site and some contextual information.

<i>Index</i>	<i>WMA village</i> <sup>3</sup>	<i>Index</i>	<i>Matched control village</i>	<i>Field study</i>
T1	Minjingu-Kakoi, Minjingu-Olasity	C1	Gidemar	Yes
T2	Magara-Magara, Magara-Manyara, Magara-Maweni	C2	Kisangaji	Yes
T3	Sangaiwe	C3	Magugu	No
T4	Mwada-Mwada, Ngolei	C4	Namalulu	No

**Table 1: Sample villages overview. PIMA's sample of four treatment villages in Burunge WMA (T1-T4) and four matched control villages (C1-C4). Source: own presentation.**

Apart from that, qualitative data from the survey and additional data compiled by the enumerators conducting the survey, for instance for the village descriptions in Annex II, is used. In addition, I spent six weeks in the study area in June and July 2015, during which I interviewed 41 households in two WMA villages (T1 Kakoi/Olasiti and T2 Magara/Manyara/Maweni) and two control villages (C1 Gidemar and C2 Kisangaji) about their economic development, their perception of the village's economic development, environmental changes, and their perception of the benefits their village enjoys by being part of the WMA. This data will be referred to throughout the thesis as 'field study data' (N=41).

The results will be brought together in a mixed-methods assessment of the socio-economic impact of Burunge WMA. The next section introduces the concept of an impact evaluation based on the notion of

<sup>3</sup> Some of the villages in Burunge WMA have split since the WMA establishment. Kakoi and Olasiti used to belong to the village Minjingu, but are now villages of their own. Kakoi/Olasiti are therefore considered one WMA village in the sample. Similarly, Magara village split into three, but Magara, Manyara and Maweni are still considered one village in the sample.

comparing a treatment group to a control group in order to establish a causal relation between the treatment and the outcome of interest.

### 3.2. IMPACT EVALUATION

Impact evaluation is a tool used to assess the effectiveness of policy measures. Its appeal lies in the possibility to establish a causal relationship between treatment and outcome through use of experimental or quasi-experimental data that allows the construction of a counterfactual (Khandker *et al.* 2010). Figure 3 below illustrates the idea. The grey (white, black) dot is the post-treatment outcome (here: income) for the treatment (control, counterfactual) group. We are interested in the difference in outcomes between the treatment ( $Y_4$ , participants) and the counterfactual ( $Y_2$ ), i.e. the hypothetical case of two worlds in which everything is the exact same except that one world has received treatment and the other has not. In reality, the counterfactual cannot be observed (there is only one world), and therefore we compare the outcome variable before and after the establishment of the program for the treatment and control group. In practice this is done by calculating the difference-in-difference<sup>4</sup>:

$$(i) \quad (Y_4 - Y_0) - (Y_3 - Y_1)$$

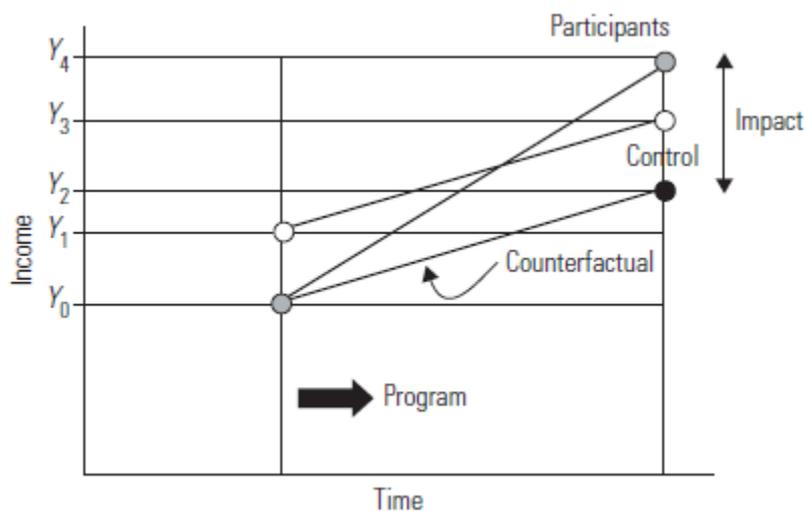


Figure 3: Evaluation using difference-in-difference. Source: Fig. 2.2. in Khandker *et al.* (2010, p. 23)

<sup>4</sup> Also called double difference.

It is important to ensure that the two groups (treatment and control) are not systematically different, because we assume that without the treatment both groups would have had the same outcome<sup>5</sup> (Khandker *et al.* 2010). The unobserved variables are assumed to not be correlated with treatment and to be constant over time, which allows us to write

$$(i) \quad (Y_3 - Y_2) = (Y_1 - Y_0)$$

If we insert this into the difference-in-difference equation (i), we arrive at our desired equation:

$$(ii) \quad (Y_4 - Y_2)$$

If the assumption of time invariance is wrong, e.g. because WMA villages are more (less) likely to increase wealth than control villages independent of the WMA, then the difference-in-difference will overestimate (underestimate) the treatment effect, as seen in Figure 4 below.

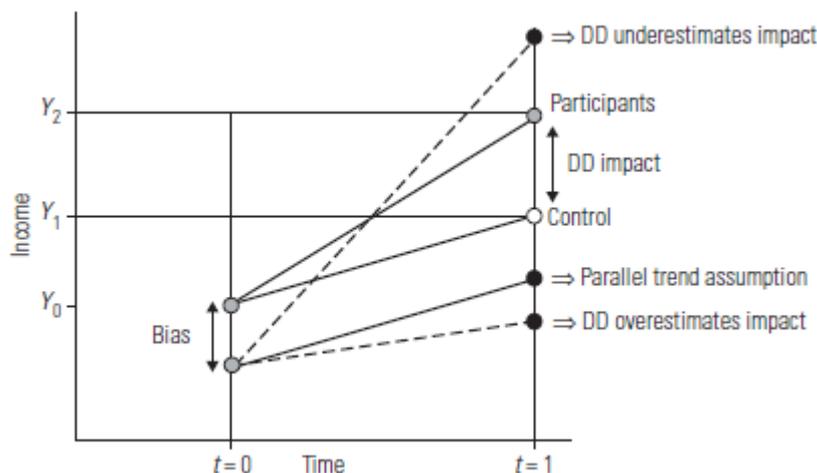


Figure 4: Biased difference-in-difference. Potential biases if unobserved heterogeneity is time-varying. Source: Fig 5.2. in Khandker *et al.* (2010, p. 77)

### 3.3. PIMA SURVEY

Data collected by PIMA for the purpose of the evaluation includes household-level livelihoods surveys from villages inside and outside the WMA. The purpose of surveying non-WMA villages is to construct a counterfactual: We want to find out what the well-being of WMA households would be, had the WMA not been established in that area. We can approximate that scenario by identifying villages that have not received the treatment, i.e. are outside the WMA area, but are otherwise very similar to the village

<sup>5</sup> Also called parallel trends assumption.

inside the WMA. In PIMA this was done by matching villages based on geographical factors. In the following a brief description of the survey design, sampling and matching, and the wealth ranking that was done by PIMA, is presented.

### *PIMA SURVEY DESIGN AND SAMPLING*

The PIMA sample for Burunge WMA consists of data from four WMA villages that are matched to control villages, and in each of those eight villages 40 households are selected by stratified random sampling. The sampling was conducted in 2014 based on village registers. In the absence of a baseline survey, recall data is used in the survey to establish the 'before' WMA establishment of 2007<sup>6</sup> which is then compared to the 'after' of 2014. Households that were not yet formed in 2007, that have immigrated after 2007 and that are female-headed now but were not before 2007, were excluded (PIMA 2014). As a next step, the participatory wealth ranking (described in the following section) was conducted, and very poor households were identified as one stratum. Another stratum was households where at least one household member had a leader position<sup>7</sup>. Then, ten households and five back-up households<sup>8</sup> from both the leader stratum and the very poor stratum were randomly selected (ibid). From the remaining villagers that do not pertain to either stratum, twenty households and ten back-up households were randomly selected (ibid).

The rationale for using these strata is the hypothesis that very poor households are more likely to be affected negatively by restrictions to natural resources through the WMA, and that leader households are more likely to benefit from WMA income. Therefore these households are of particular interest to the study and were oversampled.

WMA villages were statistically matched to control villages in the same region using nearest neighbour matching with replacement<sup>9</sup>. This approach matches two villages that have the closest pairwise match for a number of covariates (Keane 2015a). The variables included in the matching process attempt to find matches that are similar geographically:

- distance to major towns, to nearest road,

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<sup>6</sup> Burunge WMA was officially established in 2006. Nevertheless the year 2007 was chosen as a reference point in time for recall because a large volcanic eruption in Northern Tanzania made this a memorable year in both treatment and control villages.

<sup>7</sup> Positions in the WMA, of which there are around 6-10 in each WMA village, but also political village leaders (max. one per village) or subvillage leaders (one per subvillage).

<sup>8</sup> These were used if one of the 10 households was not able (or willing) to take part in the survey.

<sup>9</sup> With replacement means that one control village can be matched to more than one treatment village.

- annual precipitation, elevation, slope, population density
- % of village area covered by most common land cover types
- distance to wildlife corridors and edge of national park or game reserve
- % overlaps with elephant and lion population distribution

Based on these variables, matched pairs should have similar access to markets, face similar climatic and biophysical conditions, and be exposed to wildlife to a similar extent. This is important, because the treatment is not randomly assigned. Villages with high wildlife density and proximity to existing conservation areas are specifically targeted, and selection into the treatment (becoming a WMA village) is assumed to be based on those variables only. If other unobserved factors play a role in selection (e.g. tribal composition of the village population) the impact evaluation results will suffer from selection bias.

#### *WEALTH RANKING*

Part of the PIMA survey was a participatory wealth ranking of all households in the villages to be surveyed, based on which the stratified random sampling of survey households was conducted. Wealth is defined from the communities' perspective, using a participatory 'stages of progress' approach (Krishna 2005), in which four different wealth ranks are defined in small focus group discussions. The focus groups were typically men who were considered knowledgeable of village affairs and the households residing in the village, mostly elders and leaders (e.g. subvillage chairmen). The focus group is first asked to define their understanding of different levels of economic well-being. Typically, the definitions result in being asset-based, including dimensions such as housing, land and heads of cattle. However, they also comprise outcome-based criteria, such as the ability to feed one's family. Participatory wealth ranking was conducted in every village and used the distinct definitions of the four wealth ranks (1= very poor, 2=poor, 3=normal, 4=rich) to categorise each household in the village according to their situation then (2014) and in 2007.

On the one hand, by using a participatory wealth ranking approach, within-village wealth distribution is likely to be better captured than in conventional approaches<sup>10</sup> (Van Campenhout 2006). On the other hand, across-village comparison becomes more difficult, because the wealth ranking is based on subjective definitions of wealth, which might vary between villages (Van Campenhout 2006).

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<sup>10</sup> Often large-scale surveys using standardised income or consumption-based measures.

### 3.4. FIELD STUDY

I chose to travel to Tanzania and visit the study area myself in June 2015<sup>11</sup>. Proximity to the data and the subjects of analysis, in this case the households, is important in grounded research (Miles *et al.* 2014). It gave me the possibility to understand the local context of the case I was studying, beyond numbers and graphs.

The intention of the field work was, among other things, to uncover underlying and non-obvious drivers of the causal relationships that are being assessed. These might be difficult to capture in survey data, because they could not have been known to the researcher at the time of survey design (Neuman 2011). Ultimately, the results obtained from the survey are limited by the questions that were asked. Therefore, semi-structured interviews were chosen as the primary method for the field work. This approach offers the possibility to explore issues from the point of view of the interviewee. By framing the questions in an open manner the answers were selected and prioritised by the interviewees themselves. This approach also allows the researcher to explore new lines of explanation that were not visible from the data analysis but deserved further investigation (Neuman 2011). In addition, contextual information, including social, cultural and political factors, help better understand the livelihoods that are the focus of this thesis.

#### *SELECTION OF STUDY SITE AND HOUSEHOLDS*

Out of the eight villages that are sampled in Burunge WMA by the PIMA survey, four were visited again during the field study: T1 Kakoi and T2 Magara in the WMA, as well as C1 Gidemar and C2 Kisangaji, which are the respective matched control villages.

The choice of the two WMA villages included one village where prior research indicates that the impact of the WMA might be high (Igoe and Croucher 2007), and one village where the impact was expected to not be as substantial. The respective control villages to these WMA villages were also visited, adhering to the concept of the impact evaluation.

The same households that were surveyed in PIMA were visited again. The PIMA data provided a wealth rank in 2007 and 2014 for each of the households that were surveyed, and based on that the households were divided into three strata: households that have not changed wealth rank between 2007 and 2014, households that have changed by one wealth rank (e.g. from 'poor' to 'normal'), and households that have changed by two wealth ranks (e.g. from 'poor' to 'rich'). Households that had a

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<sup>11</sup> There is a time lag between the survey data collection (2014 – 2015) and my data collection (June 2015) of between a few weeks to a number of months, depending on the village.

change of two wealth ranks were selected, followed by households that have had a positive change, a negative change, and no change in wealth rank. Households from all wealth ranks were included, both very poor and rich households, as well as at least one female-headed household per village.

Practical considerations played a big role in household selection too. Often the household from the selection list that was nearest was chosen, rather than the next on the list. While the intention was to interview household heads, sometimes the interview was conducted with the wife if the household head was not available<sup>12</sup>.

In total 24 interviews in WMA villages and 20 interviews in control villages, of which 41 were PIMA households, were conducted. In addition village leaders and one knowledgeable elder who had worked for Tarangire National Park for many years were interviewed. An overview of the interviews conducted is found in Annex V. Interviews quoted in the thesis refer to village ID and household ID numbers assigned by PIMA, for instance '5\_HH123' quotes an interview with household number 123 in village number 5.

### *INTERVIEWS*

All interviews were conducted through an interpreter, who was my research assistant. He had detailed knowledge about Burunge WMA and contextual information about the villages we visited, because he had spent considerable amounts of time in each of them as a PIMA enumerator. He therefore was able to provide me with important information about the way the PIMA survey data was collected. His prior knowledge about the research topic, however, might have also made him inclined to pre-judge the answers that were given, and sometimes ask for more details if he felt the respondent was not sufficiently answering the question I had asked. The translations provided were not word by word, but rather his own interpretation, and sometimes a summary of what the respondent had said.

The 'quotes' from the interviews are therefore to be understood as analogous, not literal, transcript of what was said. This can be a limitation, as there might have been some information that was lost in the process of translation. For instance, I was not able to detect and interpret wording, intonation or language styles which might have helped me better 'read' the respondent.

Prior to each interview, my research assistant would present both himself and me to the respondent, explain the purpose of the visit and the objectives of the research. I would make sure to ask for consent on conducting and taping the interview. The respondent would also be informed that all information

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<sup>12</sup> Households heads were also the respondents of the survey data by PIMA that is used in this thesis.

given would be confidential in the sense that the documentation of data would only be referring to the number the household was given, but not to names.

I followed an interview guide, which I had prepared beforehand, and which can be found in Annex VI. Two pilot interviews were helpful in refining and refocusing the interview guide, for instance by improving framing and order of the questions. The interview started broadly with an open-ended question about the main challenges to economic development in the village, and the main challenges the respondents themselves faced in terms of their household's economic activities. Then I asked the respondent to recall the situation of the village and his<sup>13</sup> household in 2007, and to identify the main changes that have happened. Often, several issues came up which led to a longer discussion and several follow-up questions.

The respondent was then introduced to the wealth ranking stages and asked to name factors that he used to define a household of a certain wealth rank, e.g. 'very poor' (following Krishna 2005). The purpose of this exercise was to make sure to understand the respondent's perception of different levels of economic well-being, because the following questions built on these perceptions. It also served to get the respondent into the mind-set of thinking in terms of wealth categories and wealth trajectories. I then asked the respondent to assign a wealth category to his own household, reflecting his perception of the household's economic situation today, and then to do the same for the household's economic situation as it was in 2007. The response was verified with what had been stated earlier as the main changes in the household's economic development since 2007.

Based on whether the household has had a positive, negative or stagnant wealth trajectory, more detailed questions were asked. These were aimed at identifying factors that drive progression out of poverty and barriers that hinder this progression, as well as typical assets accumulated or lost along that trajectory (Krishna 2005, pp. 58-59). The respondent's future livelihood strategies were also enquired by asking about important investments the he was planning to undertake.

If by that time issues of access to natural resources and, in WMA villages, the WMA, had not come up during the interview, I would ask specifically about them. The respondent's understanding of what the WMA and its' purpose is, as well as the advantages and disadvantages that he associated with it, were of particular interest to me.

When all the information I needed had been obtained, I asked the respondent whether he had any question directed to me. Often respondents wanted to better understand the purpose of the research,

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<sup>13</sup> The majority of respondents were male, therefore the male gender will be used to generalise across respondents.

verify that I really was a student (and not a disguised NGO worker, for instance), and demanded to know what the benefit of this research would be to them.

Indeed, I often debated, with myself and my research assistant, how I could justify asking respondents for their valuable time and opinions without being able to give much back<sup>14</sup>. I usually explained that my intention was to write about what I have seen and learnt, thereby contributing to providing evidence of the impact of this WMA, in order to support further critical discussion of community-based wildlife conservation policies.

### *REFLECTIONS AND LIMITATIONS*

The data collected during the field work, and the results obtained from the analysis, are my personal interpretation of what I have seen and heard. They are framed by my perceptions, values, and feelings. They are also influenced by how the respondent perceived me, and by the situational context of the interview. For instance, some did not seem to truly believe that I was just a student who was writing about this case, but saw me as a person with monetary resources, or at least access to these through a NGO or donor organization. On one occasion, in a village where there had recently been someone who had been caught and incarcerated for poaching offenses, I was even suspected to be linked to the police. Others might have suspected that I actually was working on the side of tourism investors. Thanks to my research assistant much of the initial scepticism could be taken out of the way quickly, but some might have remained and coloured the responses I received.

The interview settings were very diverse: often in the respondent's backyard or their field, but sometimes also in a shop, eatery or a public space. Answers given in a private setting might have been different to those given in the semi-public setting.

During the field study, I only saw a snapshot of the particular situation on that day when I visited the village. Responses were for instance much affected by the fact that there had been very late and very little rainfall in 2015, varying in severity between villages. The timing of the visit - in the beginning of the dry season, after a very bad wet season, around harvest time, and a few months before national elections - might have influenced the results. For instance, when I asked about the change in their economic well-being and their own perception of their wealth trajectory between 2007 and 2015, there might have been a 'present-bias' because the cash inflow after harvest might have been lower than expected.

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<sup>14</sup> A minimal compensation was given to each respondent in the form of sugar and tea, which is considered appropriate to bring as a guest visiting a homestead.

I interviewed mainly local households in the villages I was studying, and two members of the village government. I therefore judge the risk of an ‘elite-bias’ in the field study data to be low (Miles *et al.* 2014). However, since I was working only together with my research assistant during those six weeks, and had little opportunity to discuss observations with ‘outsiders’, results from the field study might rather run the risk of being co-opted by the “agreed-on or taken-for-granted version of local events” (Miles *et al.* 2014, p. 296). Much contextual and socio-cultural interpretation was provided to me by my research assistant, which might have projected his perceptions on to mine.

I was only able to spend a few days in each village and a short while with each respondent, which limited my ability to build up trust, and to become an observant participant in the village life.

The impressions that I took home with me, and the information shared with me in the interviews, are thus influenced by a variety of factors connected to how I was perceived, how I perceived the respondents and the snapshot of village life I saw, as well as the timing and duration of the visit.

### 3.5. QUALITATIVE DATA ANALYSIS

These two data sources, one being the survey data and the other being semi-structured interviews with the same households, are linked in the analysis to provide a more substantive answer to the research question (Miles *et al.* 2014, p. 45). This integrative approach allows to verify the plausibility of the qualitative information gathered during the field work by displaying trends and testing hypothesis using the survey data, or vice versa.

Data collection and analysis were conducted simultaneously during the field work, following an iterative approach to data analysis (Bryman 2012, Ch. 20). While survey data can only be analysed after it has been collected (Neuman 2011, p. 509), I was able to already analyse parts of the data when in the field, and thus constantly adapt to the respondent, the situation, and the story that was emerging. Elaborate notes, voice recordings and pictures were used as means of documentation. I tried to find patterns, similarities and differences between different cluster, e.g. between different villages and sub-villages, in the data collected (Miles *et al.* 2014, Ch. 11). This process of conceptualising helped to refine the research question, and adapt my interviews towards those refined research questions.

Upon completion of the field work, a second iteration of data condensation would begin (Miles *et al.* 2014, Ch. 11). The data was organised such that I would get an overview over all interviews and then could identify the major themes that were talked about in each interview. Often recurring themes were for instance ‘drought’ or ‘lack of grazing land’.

To systematically analyse the data collected in the interviews, I established a framework that helped link my interview questions to respective parts of the survey questionnaire and to the overall research questions. The open-ended questions from the PIMA survey questionnaire were coded in order to display the most recurring themes. Here issues like 'poor public services' or 'corrupt leaders' would often emerge (PIMA 2015a). This enabled me to compare responses across villages and gather important contextual information about the villages. Also it enabled me to check whether the results obtained from the household interviews were somewhat in line with the results from the PIMA survey. This information was then substantiated with summary statistics and hypothesis tests in the data, and together build the foundation for the results I present in the analysis in section 4.

These results are presented using the livelihoods framework by Ellis (2000), which is described in the following section.

LIVELIHOODS FRAMEWORK

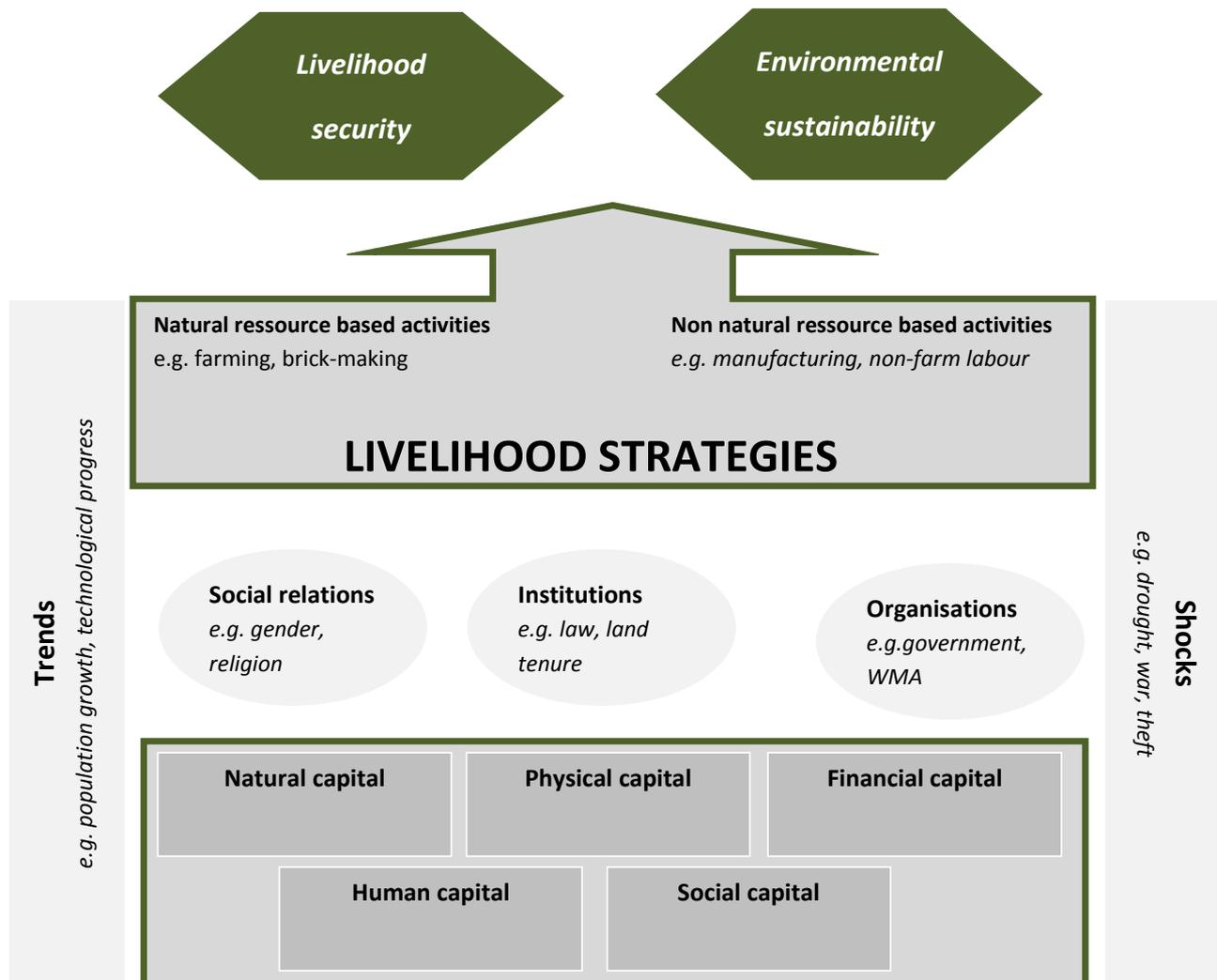


Figure 5: Author’s own illustration of the livelihoods framework by Ellis (2000, p. 30)

This framework, developed by Ellis (2000), departs from that the basis of a livelihood is built upon the assets that are accessible to a household, including natural, physical, human, financial and social capital. This access is modified by the social and institutional context. Social relations refer to factors such as gender, age, ethnicity, or religion. Institutions refer to rules of behaviour, such as laws, land tenure or informal and formal rules that govern a rural market (Ellis 2000). Organisations refer to, for instance, government agencies, NGOs, associations or private companies. Trends and shocks introduce a dynamic component to the model, influencing the way social relations, institutions and organisations mediate people’s access to assets. Important trends that directly impact rural livelihoods include

population growth, migration, technological progress, relative prices, national economic development and international trade (ibid). Shocks can be divided into covariate and idiosyncratic shocks. The former include natural disasters such as droughts and floods, pests and diseases, but can also be political in nature, such as a civil war. The latter are shocks to the single household, including loss of access to land, loss of assets (e.g. theft), and personal shocks such as health problems and death. In the absence of insurance or social security systems, these shocks can have a dramatic and lasting impact on a household's economic status.

All these factors determine the livelihood strategies people develop. Livelihood strategies can have several dimensions and comprise long-term visions, medium-term adaptation strategies as well as ad-hoc coping mechanisms. The objective of a livelihood strategy, generally, is to create the means of survival (Ellis 2000). Livelihood strategies include economic activities based on natural resources, such as income from collecting environmental goods (e.g. firewood), weaving and brick-making, cultivation of food and non-food products, and livestock keeping. They can also include non-natural resource based activities, such as income from petty businesses like shops, repair services, and manufacturing, as well as remittances.

Outcomes of livelihood strategies are here described as livelihood security and environmental sustainability (Ellis 2000). Livelihood security comprises a certain level of well-being achieved through income level and stability, and risk mitigation. Enabling a resilient ecosystem through environmental sustainability ensures secured provisioning of ecosystem services such as fertile soils, clean water, pasture, forest and biodiversity.

The following analysis applies this framework to Burunge WMA and aims to assess how changes in access to assets could have been modified by the WMA and how those changes impact the livelihoods of people living in Burunge WMA.

## 4. ANALYSIS

The analysis draws on the PIMA survey data, qualitative data compiled by the PIMA team, field observations and data collected from household interviews. The survey data results are displayed in descriptive statistics, difference-in-difference calculations, and treatment-control-group comparisons. Field study data will help explain some of the observations from the data and point out factors that are not observable. The analysis begins with descriptive statistics, followed by an analysis of changes in access to assets using the framework described in the previous section. It ends with a summary of results.

### 4.1. SOCIOECONOMIC DATA

The data used for this analysis is compiled of survey data collected in 401 households in four treatment villages of Burunge WMA, as well as four control villages.

Index	Village	Sampled households PIMA (PIMA 2015a)	Interviews field study	Population (HDIC 2010)
T1	Kakoi/Olasiti	41	15	6724
T2	Magara/Manyara/Maweni	40	9	6901
T3	Mwada/Ngolei	40	-	6502
T4	Sangaiwe	40	-	2180
	<b>TOTAL</b>	<b>161</b>	<b>24</b>	-
C1	Gidemar	80	9	-
C2	Kisangaji	40	11	-
C3	Namalulu	80	-	-
C4	Magugu	40	-	-
	<b>TOTAL</b>	<b>240</b>	<b>20</b>	-
		<b>401</b>	<b>44</b>	

**Table 2: Overview of households sampled in the PIMA survey and during field study. Source: own presentation.**

Taking means of the socioeconomic variables in the data reveals that the ‘average household’ head is male, in his forties, migrated to the village 27 years ago, has five years of schooling, is married, is head of eight household members of which one is his wife, was poor in 2007 and is still poor in 2014 (but still has slightly improved economically), owns 30 acres of land of which he cultivates 10, owns 34 heads of cattle and 25 other livestock (goats/sheep/pig/donkey).

This ‘average household’ can give a general impression of the socioeconomic setting: Households are led by a male, except in cases of divorce or death of the husband. Polygamous relations are common only in some parts of the population. Literacy levels are very low, and many have only completed primary school (see also the Table 3). Poverty is widespread. Most people depend on agriculture for their livelihood, but operate a petty trade on the side and also keep livestock (the very poor have

chicken, the poor typically keep goats and the wealthier own cattle). The most important staple crops are maize and rice; important cash crops are sesame, beans, cassava, sunflower, millet and sorghum, and horticulture products (e.g. tomatoes).

Index	Village	WR 2007	Years schooling	AEU 2007	Locally born
T1	Kakoi/Olasiti	2.41	3.95	7.41	44%
C1	Gidemar	2.36	3.91	6.14	34%
	diff	0.05	0.04	1.27*	0.1
T2	Magara	1.92	5.78	3.82	30%
C2	Kisangaji	2.05	6.13	4.65	36%
	diff	-0.12	-0.35	-0.82	-0.06
T3	Mwada	2.28	5.82	4.73	60%
C3	Namalulu	2.13	3.36	8.6	46%
	diff	0.15	2.46***	-3.86**	0.14
T4	Sangaiwe	2.42	5.75	4.05	47%
C4	Magugu	2.33	7.8	4.07	25%
	diff	0.1	-2.05***	-0.01	0.22**

**Table 3: Pair wise comparison of means before treatment (2007) between WMA village and matched control village for i) average wealth rank in 2007, ii) average years of schooling of household heads, iii) average AEU<sup>15</sup> in 2007, iv) percentage of households that were born in the village surveyed. The difference is tested and statistical significance is indicated if found (\*\*\*=0.01, \*\*=0.05, \*=0.1). Source: own calculations based on PIMA (2015a).**

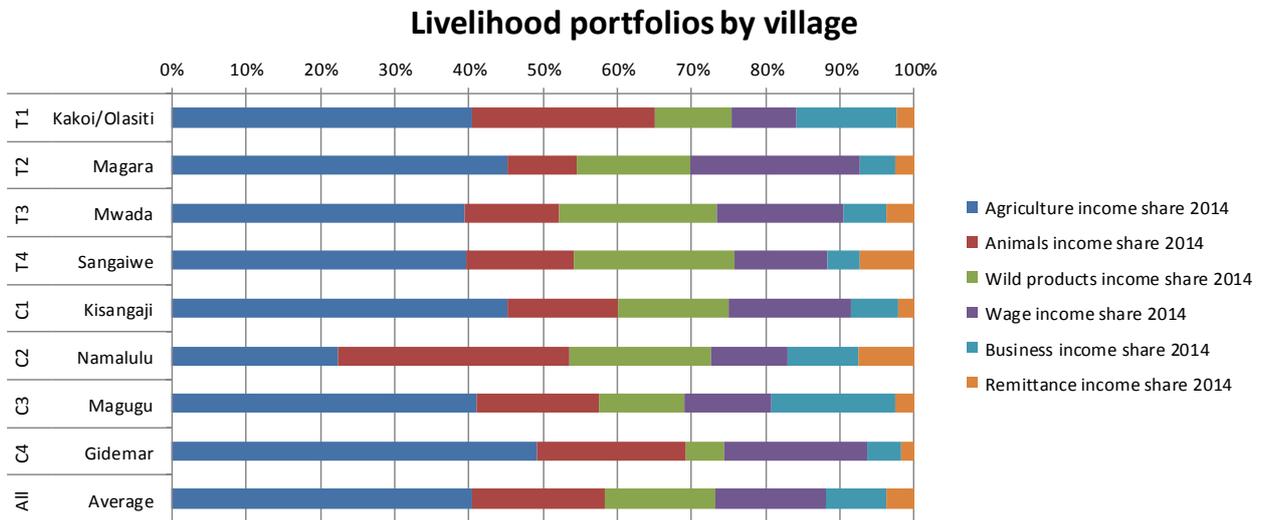
Table 3 compares means of key socio-economic indicators of wealth, education, household size and origin, between the matched treatment and control villages. Magara (T2) is the poorest of all villages, and households are on average smaller than in the remaining villages. Households are largest in Namalulu (C3) and Kakoi (T1). Education levels are especially low in Namalulu (C3), Kakoi (T1), and Gidemar (C1). In most villages more than half of the respondents were not born in the villages. Migration has been especially high in Magugu (C4), Magara (T2), Kisangaji (C2) and Gidemar (C1). Between the matched pairs there are no significant differences in the wealth ranking, but some differences in education levels and household size. In the impact evaluation we assume that these are constant over time, and therefore differenced out in the difference-in-difference calculation.

## 4.2. LIVELIHOOD PORTFOLIO

Households in the area have very diverse income sources comprised of farm income (e.g. from sales of crop or livestock), off-farm income (e.g. agricultural wage labour, in-kind income from arrangements such as share-cropping, sales of environmental goods or products made from natural resources), and non-farm income (e.g. income from small businesses, income from renting out land or physical capital, and remittances). The graph shows self-assessed income shares by respondents of the PIMA survey.

<sup>15</sup> The adult equivalent unit (AEU) normalises the caloric requirements of household members to those of a grown up, such that we end up with a comparable measure of household size. Details of conversion can be found in the Annex IV.

Except for Namalulu, where most income is derived from livestock keeping, agriculture accounts for on average 40-50% of income in all villages. The remaining income is earned from a diverse range of income sources, including products derived from animal husbandry, collected environmental goods ('wild products'), wage from casual labouring, small business income and remittances.



**Figure 6: Livelihood portfolio.** Self-reported share of total income derived from each of the six activities. The respondents were asked to divide up a total of 25 stones (100%) between the six activities, to indicate their relative importance in the income portfolio. Source: own presentation based on PIMA (2015a).

Departing from these livelihood portfolios, and based on the existing literature as well as field observations, a number of assets that are important to these livelihood portfolios, and where access is likely to have changed, were identified. These are categorised according to Frank Ellis’ categorisation of natural, physical, human, financial and social capital, which was introduced earlier (Ellis 2000). For each of those assets the next sections will discuss (i) how access has changed, (ii) how institutions, organisations and social relations modified that access, (iii) what role trends and shocks played, and (iv) what this change in access means for livelihood strategies. Particular focus will be laid on discussing the possible impact that the WMA has had on modifying the access to capital.

### 4.3. CHANGES IN WEALTH

#### a. Survey data

The wealth trajectories for all wealth ranked households<sup>16</sup> (N=3,350) in Burunge WMA (in villages T1 – T4) indicate that although there is a strong correlation (0.83) between the wealth rank in 2007 and today, there also have been considerable changes between ranks. All villages have on average experienced a positive change in wealth from 2007 to 2014 (diff=0.2, Pr(|T| > |t|) = 0.00). Table 4 illustrates that these changes in wealth can be observed primarily among the very poor and poor.

		2007			
		Very poor	Poor	Normal	Rich
2014	Wealth rank				
	Very poor	73%	2%	0%	0%
	Poor	24%	79%	2%	1%
	Normal	3%	19%	89%	6%
Rich	0%	1%	9%	94%	

**Table 4: Wealth trajectories.** Shows the wealth trajectories of all Burunge WMA households (T1-T4) that were ranked in the PIMA wealth ranking. The first (second, third, fourth) column shows the wealth rank in 2014 of households that were ‘very poor’ (‘poor’, ‘normal’, ‘rich’) in 2007. The diagonal shows the percentage of households that have not changed wealth rank. Source: own presentation based on PIMA (2015a).

The first column shows that 73% (n=596) of the households that were ‘very poor’ in 2007 still are in 2014, while 24% (n=193) moved to being ‘poor’, and 3% (n=26) to being ‘normal’ in 2014. The diagonal (from top left to bottom right) shows the percentage of households that have not changed wealth rank between 2007 and 2014, which increases with higher initial wealth rank. 27% of households that were ‘very poor’ and 20% of households that were ‘poor’ in 2007 have been able to progress. In contrast, only 7% of those that were ‘rich’ in 2007 are no longer ‘rich’ in 2014. What this table indicates is that in the four Burunge WMA villages a considerable amount of poor households have become less poor, and not many of those who were better off have fallen back into poverty. This table does not, however, show whether these changes are attributable to the WMA establishment.

To this end, Table 5 compares the Burunge WMA villages to control villages and shows how the wealth trajectories differ between those two groups. The last column shows the difference-in-difference of wealth ranks in 2007 and 2014 in treatment compared to control villages.

<sup>16</sup> As described in section 3.3, the stratified random sampling was based on a prior participatory wealth ranking of all households in the villages chosen for survey. Therefore, changes in wealth can be analysed for all wealth ranked households, not just for the sample of surveyed households.

Ind.	Village	n	Mean wealth rank 2014	Mean wealth rank 2007	Difference-in-difference
T1	Kakoi	666	2.62	2.47	0.08***
C1	Gidemar	410	2.24	2.17	
T2	Magara	1293	2.12	1.92	0.00
C2	Kisangaji	409	2.27	2.07	
T3	Mwada	971	2.13	1.94	-0.20***
C3	Namalulu	441	2.08	1.69	
T4	Sangaiwe	419	2.56	2.5	-0.42***
C4	Magugu	322	2.5	2.02	
<i>Aggregated difference</i>			<b>0.20***</b>		<b>-0.11***</b>

**Table 5: Wealth ranking difference-in-difference.** Results of a difference-in-difference test disaggregated by village, using all wealth ranked households (> survey sample). A negative difference-in-difference indicates that the change in wealth has been smaller in treatment villages than in control villages. N indicates the number of observations in each village. \*\*\* indicates 0.01 significance level of the t-test. Source: own calculations based on PIMA (2015a).

Aggregating across all villages, there is a significant difference between the wealth rank change in treatment and control villages, which means that on average the control villages have experienced a larger positive change in wealth than the treatment villages. Using a model approach which accounts for individual and village-level heterogeneity, Keane (2015b) finds an even stronger effect showing that control villages were more likely to have moved to a higher wealth category than Burunge WMA villages (difference-in-difference= -0.39\*\*).

However, when comparing those wealth changes for treatment-control-pairs, the rightmost column shows that the difference-in-difference is highly variable across matched village pairs. One out of four pairs indicates a positive treatment effect of the WMA (T1C1), two out of four indicate a negative treatment effect (T3C3, T4C4) and one indicates no effect at all (T2C2). These results also hold true when using a model-based approach (Keane 2015b).

2007	Very poor	Poor	Normal	Rich
n	1290	2338	989	314
$\Delta T$	0.3	0.18	0.06	-0.07
$\Delta C$	0.48	0.3	-0.009	-0.18
$\Delta(T-C)$	-0.18***	-0.12***	0.07**	0.11**

**Table 6: Wealth trajectory difference-in-difference.** The table shows the difference-in-difference by comparison of means between the change in wealth in treatment and control households, using all wealth ranked households (> survey sample) and disaggregated by the wealth rank in 2007. n indicates the number of observations. \*\*\* (\*\*) indicates 0.01 (0.05) significance level of the t-test<sup>17</sup>. Source: own calculations based on PIMA (2015a).

The treatment did not affect all wealth ranks equally. The 'poor' and 'very poor' in control villages have experienced a larger (positive) change in wealth than those in WMA villages. However, this change is negative in the case of the 'rich', meaning that more 'rich' households in control villages have had a

<sup>17</sup> Two-sample t-tests on equality of means were conducted using STATA13. Hypothesis tests with a significance level of larger than 0.1 were considered insignificant.

negative wealth trajectory up to 2014 and indicating an increased wealth inequality in WMA villages. These results put into perspective the positive indications of the wealth trajectories of only WMA households in Table 6, because the positive development among the poorer parts of the population is still smaller than in control villages.

#### b. Field study

During the field study, respondents were asked to identify the factors that have enabled them to progress out of poverty (those that became richer) or that hindered them from progressing economically (those that became poorer).

The most important driver of positive wealth trajectories was sales of (cash) crops. Many said that they had earned a lot of money in a good harvest which they reinvested productively. Often this was driven by the decision to switch to cultivating and selling cash crops (e.g. rice, sunflower, watermelon, legumes, sesame) instead of only subsistence crops (e.g. maize).

The second most important driver was income diversification. Many respondents have small businesses on the side, from the women selling produce by the roadside to small shop owners and middle men who bring (cash) crops to the nearest market place. Often mentioned reasons for diversification were risk mitigation (e.g. because of increasingly unreliable climatic conditions causing harvest failure) and higher income prospects (especially for the middle men) or long term investments in immovable assets (e.g. some had built 'business houses' that they rented out). The eleven treatment and seven control households that have had a positive wealth trajectory showed no obvious differences in the drivers that they mentioned, and there was no indication that the WMA played a role in driving these positive wealth trajectories.

This survey data analysis showed that although the overall development in wealth is positive, there are significant differences between WMA and control villages, and across wealth ranks. It is also shown that it is worth looking at the single villages, since the aggregated results seem to be driven by stronger changes in selected villages. The field study data indicates that there might be factors other than the WMA driving the significant difference in wealth.

To this end, the next sections will look in detail at the changes in access to the assets to analyse the ways in which Burunge WMA has impacted livelihoods in the local communities.

#### 4.4. CHANGE IN ACCESS TO NATURAL CAPITAL

As the livelihood portfolio showed, respondents generally rely on agriculture and/or livestock keeping, or a trade related to these, as a main source of income. Next to human capital (labour, know-

how), natural capital in the form of (fertile) land is a major input in agricultural production functions where access to modern inputs (fertiliser, pesticides, irrigation, tractor,...) is limited. This section will first look at changes in access to land, especially land for cultivation, and then access to grazing land, which is typically a common good shared among all villagers. Subsequently, change in access to different types of environmental goods will be presented.

## LAND OWNERSHIP

### a. Results

There are large differences in land ownership between the villages in this sample. Table 7 shows total land ownership and cultivated land in acres, and total and cultivated land relative to household size in 2007 and 2014. In T1 Kakoi/Olasiti land owners on average possess more than 25 acres in 2014 (column ii) and cultivate around 70% of it, which is quite extensive comparing to a Tanzanian average of around 6 acres (Deininger 2015<sup>18</sup>). In T2 Magara, for instance, people on average own only around 4 acres, and they cultivate most of it. Even larger landowners can be found in control villages, notably C3 Namalulu and C1 Gidemar. Total land ownership has increased between 2007 and 2014 in all villages but T4 Sangaiwe.

Total land owned differs between treatment and control groups and WMA inhabitants own significantly less land than control village inhabitants in both 2007 (column i) and 2014 (column ii). Comparing both before (2007) and after (2014) and treatment and control, the results show a significant difference-in-difference, indicating that Burunge WMA inhabitants own 7.73 acres less land than control village inhabitants now compared to 2007 (column i and ii). Thus, these results indicate a negative impact of the WMA on total land ownership.

Village land is divided up into different land uses by the village land use plan, allowing agricultural production only in certain areas. In most villages there is no longer vacant land for cultivation available, limiting the possibility of expanding cultivation (column iii and column iv).

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<sup>18</sup> Deininger (2015) uses data from a nationally representative sample collected for the Tanzania National Panel Survey (TNPS) among more than 3,000 households in 2008-2009.

Ind.	Village	i	ii	iii	iv	v	vi	vii	viii
		Total land owned (acres) 2007	Total land owned (acres) 2014	Cultivated land <sup>19</sup> (acres) 2007	Cultivated land <sup>19</sup> (acres) 2014	Total land/AEU 2007	Total land/AEU 2014	Cultivated land/AEU 2007	Cultivated land/AEU 2014
T1	Kakoi/Olasiti	23.37	26.64	17.05	19.14	2.67	2.55	2.05	1.85
C1	Gidemar	39.27	40.47	8.62	9.63	5.19	4.28	1.34	1.35
	<i>diff</i>	15.9	13.83	-8.43**	-9.5**	2.5	1.73	-0.71*	-0.5
T2	Magara	3.91	4.15	3.1	3.28	1.13	0.99	0.96	0.77
C2	Kisangaji	11.41	12.16	6.06	7.01	2.63	2.61	1.35	1.33
	<i>diff</i>	7.61**	8.01***	2.96*	3.73**	1.5**	1.62**	0.4	0.57
T3	Mwada	10.97	11.15	9.22	8.64	2.28	2.04	1.74	1.52
C3	Namalulu	54.5	77.95	16.34	17.29	4.59	5.37	2.15	1.54
	<i>diff</i>	43.53*	66.8**	7.11	8.66**	2.31*	3.33**	0.41	0.02
T4	Sangaiwe	10.66	10.06	5.14	6.15	2.88	2.26	1.52	1.33
C4	Magugu	7.22	8.3	5.75	8.02	2.01	2.07	1.35	1.74
	<i>diff</i>	-3.43	-1.75	0.61	1.87	-0.86	-0.19	0.18	0.4
T	All treatment	12.3	13.08	8.68	9.36	2.24	1.96	1.64	1.37
C	All control	34.36	42.88	10.31	11.5	4.04	4	1.53	1.48
Δ	Diff	22.06*	29.79**	1.62	2.14	1.8	2.04**	0.12	0.11
Δ	Diff in Diff	7.73 *		0.51		0.24		-0.012	

**Table 7: Land ownership. Average descriptive statistics and t-test results of the pairwise differences between treatment and control villages. Bottom rows show aggregated results and the last row shows the results of the difference-in-difference in comparison of means. \*\*\* (\*\*/\*) indicates 0.01 (0.05/0.1) significance level of the t-test. Source: own calculations based on PIMA (2015a).**

As Table 7 shows, household size varies largely<sup>20</sup>. Columns (v-viii) show the mean difference between 2007 and 2014 in land ownership per adult equivalent unit (AEU) in each household<sup>21</sup>. In general land ownership now is much more balanced across villages when looked at in relative terms. This is even more true for average cultivated land relative to household size (column vii and viii). All villages have either the same or less land per AEU for cultivation in 2014 compared to 2007, except in C4 Magugu.

These results indicate that there is a significant treatment effect of the WMA on absolute land ownership, however not when put into perspective to household size. There are no significant treatment effects visible for cultivated land on the aggregated level. Significant differences can be seen within village pairs T2C2 and T3C3, however these differences have been there even before the WMA establishment.

<sup>19</sup> Cultivated land can also be rented land.

<sup>20</sup> These differences can be driven by cultural differences (polygamy is practiced only by certain groups), but also by economic differences, since for some the number of wives and children (especially sons) is an indicator of wealth (5\_HH408, 5\_HH300, 30\_HH41).

<sup>21</sup> The AEU normalises the caloric requirements of household members to those of a grown up, such that we end up with a comparable measure of household size. Details of conversion can be found in Annex IV.

## b. Outliers

Land ownership in Namalulu (C3) stands out. On average 78 acres are owned, 17 are cultivated, and about 20 acres more land in total are owned in 2014 than in 2007. Indeed, satellite images show that the village land is vast and even the area designated as farmland in the village land use plan is only partly cultivated (Google Earth 2015). The images and the data suggest that land scarcity is not as big a problem in Namalulu (C4) as it is in the other villages, which might be driving the significant difference between control and treatment villages in column (i) and (ii).

## c. Trends

The trend of a growing population increases pressure on land in Burunge WMA and surroundings. Population in Burunge WMA has increased by around 50% between 2002 and 2012, from around 20,000 (WWF 2014) to more than 30,000 (Sulle *et al.* 2011). If productive land is taken out of use, this already existing land pressure would then be exacerbated by the WMA.

## d. Insights from the field and role of WMA

There are several possible explanations for the (sometimes large) differences between the area owned and the area cultivated. Land is an important asset, especially if the owner has a title to it. Buying or renting land and building a 'business house' (to be rented out) were the two top scorers when respondents were asked about their investment priorities. Few even bought land in Babati or Arusha, as investment, and because the title can be used as collateral for a loan (5\_HH433). Thus, the increase in total land ownership does not necessarily indicate that land acquisitions happened in the village itself. Cultivation is limited by the fertility of that land and access to other inputs such as labour, seeds, oxen/tractor, or irrigation. In addition, those whose main livelihood is built on livestock keeping might prefer to cultivate for subsistence only (McCabe *et al.* 2010).

Magara (T2) stands out being the only village that has on average less than one acre per AEU, and many respondents complained that land was a big constraint to their economic development. The village faces problems with encroachment of several protected areas, including the WMA. People farming inside the WMA area say they were given the land by leaders, that they have been farming there before the WMA was established and are unwilling to lose their land. These are not only villagers from Magara, but include people from other places such as Mwada, or Babati, who want to take advantage of the fertile land (rice, a valuable cash crop, can be grown there). One member of the village government in Magara (T2) said that they are now working closely with the District Office in Babati, who have access to police forces, and hope to evict the farmers who are cultivating there after

they have harvested their crops. The situation is however complicated by the fact that some of those farmers are district officials themselves, and therefore well-connected in Babati.

Access to land is particularly challenging where conflicting rules and legal systems make land tenure unclear (Sulle and Nelson 2009). The WMA relies on land use and resource management plans made by the village office. However, land categorised as ‘vacant’ or ‘unoccupied’ is often not unused (Sulle and Nelson 2009). Existing land scarcity, driven by the trend of population growth (migration) and increasing numbers of large scale land investments, might be exacerbated by the WMA if access to areas occupied by farmers, or used by villagers based on customary use rights, is denied.

The results have shown that there are significant differences in land ownership between treatment and control villages, likely driven by the large areas of land acquired in Namalulu in the period 2007-2014, which however are put into perspective when looking at total and cultivated land relative to AEU. The results have also shown that there seems to be no significant impact of the WMA on access to land for cultivation purposes. That is because most of the land that today is part of the WMA was village conservation area (where cultivation is prohibited) before. Conflicts arise when tenure is unclear and increasing land pressure forces people to invade conservation areas in search for land for cultivation.

## **ACCESS TO GRAZING LAND**

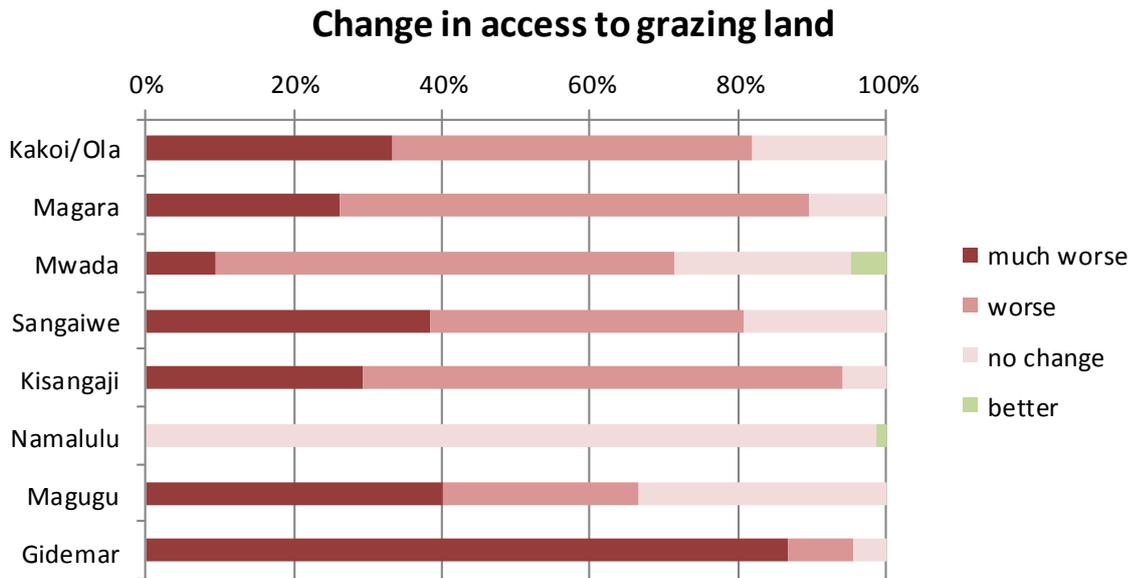
Livestock keeping is an important part of the livelihoods of the people living in Burunge WMA. Many villagers belong to traditionally pastoralist tribes, such as the Maasai, Arusha and Barbaig<sup>22</sup>. The communal land rights system traditionally provides for village grazing lands where villagers can come and jointly graze their cattle.

### **a. Survey data**

The survey data shows that grazing land access is a problem: 60% of the respondents in all villages (n=257) feel that access has become worse or much worse. There is a significant difference between WMA and control villages, where on average respondents in WMA villages experienced a (more) negative change in access to grazing land ( $\alpha= 0.0047$ ). 17% of respondents in WMA villages (n=161) thought that it was because of the WMA that access to grazing land has worsened.

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<sup>22</sup> Tribe affiliation is self-stated by the respondents in the PIMA survey.



**Figure 7: Access to grazing land. Shows respondents perception of how access to grazing land has changed in percentage of responses.**

In Kakoi (T1) the WMA area includes former dry season grazing land to which access is now restricted. No dry season grazing land is left for the many herders in the village, and more than half of the Kakoi/Olasiti (T1) respondents agreed that the WMA was the cause for their reduced access to grazing land. The survey data also shows that when asking about whether people graze on WMA land and if they grazed as many heads of cattle as they wished, most of those who answered “yes” were from Kakoi/Olasiti (76%). Out of those most said that they graze on WMA land all year round, while 30% said they only graze on WMA land in specific seasons. This contradiction (grazing is prohibited throughout the year) might reflect their protest, but it might also mean that they adapt by taking their livestock to other areas in the WMA where grazing is permitted.

#### b. Trends

The trends of a growing population and a reduction of the area available (e.g. because of large scale land acquisitions by foreign investors or the expansion of protected areas) increase land pressure. Therefore areas that used to be communal grazing land today often end up being used for other purposes. One example is Gidemar (C1), where in 2012 village leaders decided to divide up the village grazing land and sell parcels to farmers, because this was more lucrative to them.

### c. Field study

Since Kakoi (T1) is left with basically no remaining dry season grazing land, some villagers see themselves forced to illegally graze their cattle inside the WMA area. If found by rangers, livestock and herders are kept in detention until someone comes and pays them free. There have been incidents of violent confrontation, where rangers were beating up young boys (typically responsible for cattle grazing) and the detained livestock (5\_Interview1). Because of these incidents the present Kakoi village government is trying to find a diplomatic solution by negotiating a formal agreement with the investor who is running the hunting block, to allow dry season grazing in one part of the hunting block (5\_Interview2). Some, however, were detained by police and now have to appear before court for charges of trespassing (ibid).

Pastoralists are traditionally nomadic. Moving cattle to other places in search of fresh pasture and water is the most common coping strategy among the Maasai pastoralists when pastures are dried out or overgrazed (Goldman and Riosmena 2013). Some move to nearby villages, where common grazing land is still accessible, such as some herders from Ngolei (T3) who came to Manyara (T2) because the grazing land in Ngolei had been captured by the WMA (6\_HH1007). Others move within the region, to places where they have family or kin. Some also organise big herds to be moved further South, especially around Morogoro, where parts of the family would establish a temporary home (30\_HH41). This strategy is threatened by increasing land fragmentation due to privatisation of land for crop farming, sales to large-scale investors, as well as expansion of conservation areas (Goldman and Riosmena 2013). While a fundamental part of tradition and livelihood for some tribes, this movement can also be seen as economic displacement (30\_HH41, Holmes and Brockington 2013). Economic displacement caused by restrictions in access to essential common goods, in this case grazing land, can cause rupture in social relations, both in the community where they came from and in the community in which they arrive, because of competition over the remaining scarce resources (Holmes and Brockington 2013).

Another coping strategy in Kakoi (T1) was to reserve some of their own land for grazing (5\_HH654). Others try to feed their cattle on farm residues instead of pasture (27\_HH327). The examples suggest that those that are wealthier might be more resilient to changes in access, because they have access to private grazing land, a large crop production, or a good social network.



**Figure 8: Cattle grazing near Lake Manyara. In this area of the WMA grazing is permitted. Picture taken by author.**

## ENVIRONMENTAL GOODS

As Figure 6 in section 4.2 shows, environmental goods collection plays an important role in the livelihoods portfolio. Environmental income can be derived from both sales of the goods and households consumption. In the following we will look at how access to these goods has changed, and how that has impacted the income people derived from the collection of these goods.

### a. Trends

Access to firewood, construction materials and charcoal has worsened almost everywhere. Increasing land pressure, driven by population growth, large scale land acquisitions and expansion of protected areas, is forcing people to clear additional land. In Magara (T2) the village forest reserve, where people could go and collect firewood, has been more and more encroached by farmers who cut down the trees in order to cultivate that land (illegally); similar trends were reported in Kisangaji (C2).

Firewood (42% of environmental income in 2014) and construction materials (17% of environmental income in 2014) such as wooden poles and grasses for making thatched roofs and ropes, are the most important environmental goods, because they are needed on a day-to-day basis. Firewood is the most widely used energy for cooking, and still many houses are made of poles and thatched roofs, though more and more can afford brick houses and iron sheet roofs.

b. Survey data

### Change in environmental income share 2007 - 2014 by treatment and control group

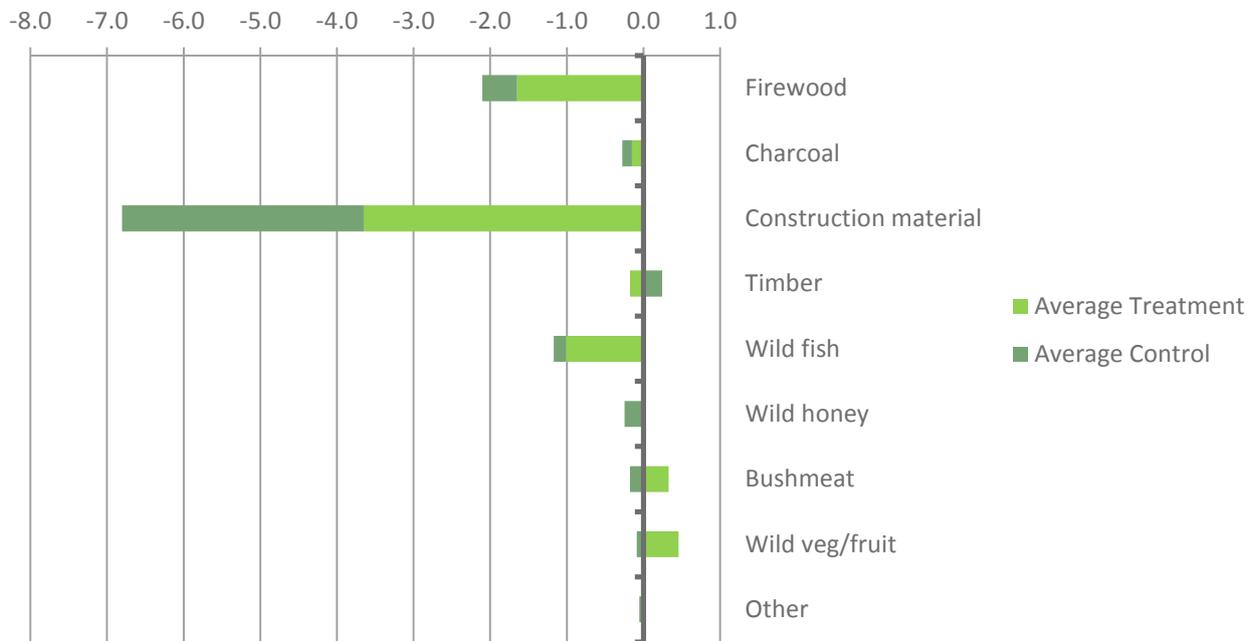


Figure 9: Environmental income. Change in shares between 2014 and 2007 (percentage points) of different environmental goods relative to total environmental income. Source: own presentation based on PIMA (2015a).

Note: The respondents were asked to distribute a total of 50 stones (=100%) among the different categories, in order to reflect relative importance. The focus is on actual collection and use, not on access (i.e. potential collection). The respondents would then place the stones again to show the portfolio as it was in 2007. To the left of the y-axis (0.0) changes are on average negative, while on the right they are on average positive.

The data shows that the largest changes in relative environmental income shares have taken place for construction material and firewood. The share of construction material to total environmental income, for instance, has reduced by more than 3 percentage points in both treatment and control villages. Most changes are negative, indicating that the total environmental income in 2007 was larger than the total environmental income in 2014. Comparing treatment and control villages, access to firewood (\*\*\*), construction material (\*\*), timber (\*), wild fish (\*), and bushmeat (\*) has reduced significantly more in WMA villages than in control villages<sup>23</sup>.

<sup>23</sup> Significance level of t-test of mean change in income shares for each category between treatment and control group: \*\*\*=0.01, \*\*=0.05, \*=0.1

### **Firewood and construction material**

In Magara the change has been largest: On average respondents' firewood income reduced by 20% of the total environmental income. This can be related to earlier mentioned clearance and encroachment of the village forest area, which earlier was villagers' source of firewood.

Many respondents from Kakoi (T1) and Mwada (T3) (around 50% and 30% respectively) felt that the WMA was restricting access to firewood and construction materials. 14 % name the WMA as cause for their reduced income from firewood, and, similarly, 18% relate their reduced income from selling construction materials to the WMA. Most respondents who thought the WMA was the cause for their reduced environmental income were from Kakoi/Olasiti (T1).

### **Timber and charcoal**

Timber does not play a large role in the environmental income of the respondents. Charcoal making is forbidden in all villages (even before the WMA) and violators are prosecuted (MNRT 2003). Therefore this type of income is hard to capture in survey data, since few are willing to talk about it openly. Only very few people reported environmental income from charcoal burning, and among those cases the share of income has reduced since 2007.

### **Water**

Access to water is a challenge in almost all villages, also control villages, and there are no clear indications that the WMA has directly affected access. A drier climate and increased run-off due to deforestation of catchment areas, as well as large plantations diverting water for irrigation purposes, were factors contributing to lower water levels in rivers. In villages without direct access to river water, wells, tanks and manmade lakes were used for water provision, requiring investments through village contributions, from the (district) government or donors. In several villages water projects were said to have been planned and paid for, but funds are claimed to have been diverted for personal enrichment, preventing implementation of the projects (Pima 2015b).

#### **c. Field study**

Villagers who want to collect firewood and construction materials inside an area that belongs to the WMA, need to obtain a licence. This licence has to be applied and paid for, and picked up at the WMA office in Mwada (which is a day's journey from some of the villages). It is personal, meaning that each family member needs such a licence if he or she wants to go collect environmental goods in the WMA. If caught in the WMA without a licence, high fines apply. Resources that were previously available for free now need to be paid for if collected inside the WMA.

Despite this obvious restriction, not in all villages people attributed changes in environmental income from collected goods to the WMA. Most that felt a restriction by the WMA were in Kakoi (T1), where access is completely prohibited in the area pertaining to the WMA (5\_HH236).

Restricted access to the essential resources translate into longer distances to the next collection area and therefore more time spent collecting environmental goods, especially for women and children. That means less time for other productive activities, which affects for instance farm labour supply. Wealthier households might be able to purchase firewood and other goods if distances for collection become too long, which means that their available income for other goods reduces. When environmental goods were used commercially, e.g. for production of goods that could be sold on the market, restrictions in access can have a significant impact on a household's income (5\_HH236).

At the same time, improved access to essential resources can make an important difference in everyday lives. Wells constructed in one part of Magara (T2) have reduced the amount of time spent fetching water and provided access to cleaner groundwater. This improvement contributed largely to their positive perception of the WMA and its role in contributing to village development, since a share of the project was funded by WMA revenues (6\_HH518).

The results indicate that there have been significant changes in access to environmental goods, most importantly firewood and construction material, and that these changes have been worse in WMA villages than in control villages. The statistical evidence thus points to a negative effect of the WMA on access to important environmental goods as firewood and construction material. This evidence is supported by the respondents only in some WMA villages, who attribute change in access to the WMA, but not in all.

#### 4.5. CHANGE IN ACCESS TO PHYSICAL CAPITAL

This section will analyse how the access to physical, specifically cultivated crops and livestock holdings, has changed. Emphasis will be put on shocks that can affect these two assets. Other physical assets such as buildings, roads, machines, although important for livelihoods, will not be discussed in this section.

##### **LIVESTOCK**

Today, only few rely solely on livestock keeping. Many have become agro-pastoralists, but livestock still plays an important role, especially in traditionally pastoral communities such as the Maasai or the Barbaig.

The average herd size is 33 (sd=168) for the entire sample (treatment and control) and the maximum herd size is recorded at 2000. Livestock is an important asset and an indicator of wealth and status. While poor people tend to know exactly how many goats, sheep and perhaps oxen they have, and would not mind telling, asking a rich livestock herder how many heads of cattle he owns is a more sensitive issue<sup>24</sup>. The distribution of herd size might have a long tail which we might not be able to see in the data because wealthier herders prefer not to speak about the precise extent of their wealth. Still, the changes in the total amount of livestock held, which is measured in tropical livestock units (TLU)<sup>25</sup>, can be an important indication of changes in livelihoods.

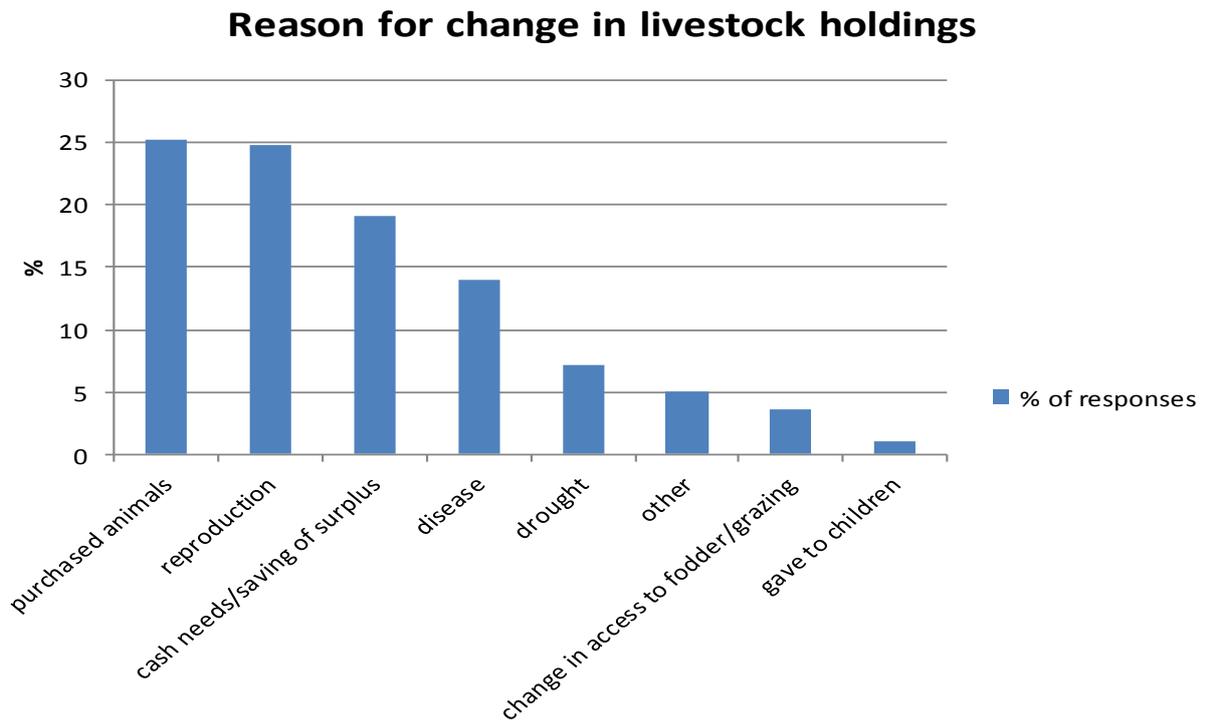
		(i)	(ii)	(iii)
		Mean TLU (2014)	Mean TLU (2007)	Difference
<b>T1</b>	Kakoi/Olasiti	56	66	-11
<b>T2</b>	Magara	7	4	3
<b>T3</b>	Mwada	16	9	6
<b>T4</b>	Sangaiwe	16	17	-1
<b>C1</b>	Kisangaji	19	12	7
<b>C2</b>	Namalulu	92	104	-12
<b>C3</b>	Magugu	7	9	-1
<b>C4</b>	Gidemar	62	54	8

**Table 8: Livestock. Mean livestock holdings measured in TLU in 2014 and 2007. Column (iii) is the difference between (i) and (ii). Source: own presentation based on PIMA (2015a).**

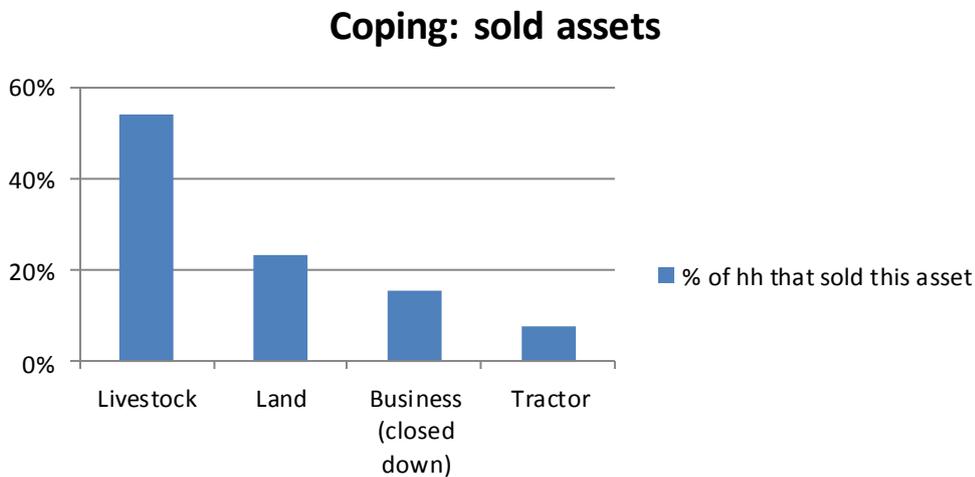
Table 8 shows that in Namalulu (C4) and Kakoi/Olasiti (T1) villages, there has been a strong negative trend in livestock ownership. Drought, disease and cash savings were mentioned as the most important reasons for a reduction in livestock holdings, while reproduction and purchasing of new animals were the main reasons behind increases in livestock holdings. The area was affected by severe droughts in 2009 and 2010, which led to a strong reduction in livestock (Goldman and Riosmena 2013). Drought affects livestock holdings in multiple ways: It dries out water sources and pastures, and it leads to failed harvests that force people to draw on their savings to buy food. Livestock is often used as a liquid financial asset that can be sold in times when immediate cash is needed (Dercon 1998).

<sup>24</sup> In polygamous societies wealthy people tend to have many wives and children, and it is common to give parts of the herds to the sons, which the father would then no longer consider his own. Asking a wealthy livestock herder for the number of cows he owns is like asking about someone's income in my society, as explained to me by my research assistant.

<sup>25</sup> One TLU is equivalent to one mature cow of 250 kg in the US or sub-Saharan Africa (Moreira Claro *et al.* 2010). See Annex II for details of the conversion.



**Figure 10: Change in livestock holdings.** Respondents that reported a change in livestock holdings (n=278) were asked for the reason for this change. The graph shows the percentage of respondents mentioning a certain reason. Source: own presentation based on PIMA (2015a).



**Figure 11: Asset sales of households interviewed during field study that have experienced a negative wealth trajectory (n=13) between 2007 and 2015.** Source: own presentation; field study data.

Unexpected cash needs are mentioned as most important reason for selling livestock in the PIMA survey (Figure 10). Similarly, it was the most common asset to be sold in response to a shock (Figure 11). At the same time buying livestock was, next to buying land, the most often mentioned asset accumulated on a positive wealth trajectory (n=18).

Even though access to grazing land has worsened in most villages, with no dry season grazing land left in some villages, change in access to fodder or grazing was named only by few in T3 Mwada (3), C4 Namalulu (1), C3 Magugu (3) and C1 Gidemar (3). While we cannot establish a causal relation, it seems that there are no indications that changes in access to grazing land immediately influences herd size.

There is little reason to infer that these changes in livestock holdings are related to the WMA, and indeed only two respondents did think so. The t-test also strongly supports that there is no significant difference in livestock holdings between WMA and control villages.

### **CROP CULTIVATION**

Most people in the sample are farmers, who derive 40-50% of their income from crop cultivation (see livelihoods portfolio section 4.2).

#### **a. Field study**

One of the major drivers of wealth accumulation was to switch from mainly consumptive crops to cash crops. Often improved access to markets, for instance because of improvements in roads which invited middle men to come to the village to buy crops, played an important role in furthering cash crop cultivation. But also social learning from migrants who brought new agricultural inputs, ideas and know-how with them contributed to a change in mind set from subsistence cultivation to market-oriented cultivation<sup>26</sup>. Many of those who have successfully progressed out of poverty have reinvested revenues from a successful harvest cash in renting additional land, hiring oxen, or buying improved seeds or fertilizer, and thereby slowly grown their agricultural production. Those that have been very successful now own a tractor and hire farm labour.

Nevertheless, there are also a lot of risks involved in crop cultivation, and many of those that have not been able to follow the same successful trajectory were thrown back by shocks. Farmers are ultimately dependent on the weather. Changes in climate have led to reduced and more irregular rainfalls, as well as higher frequency and intensity of extreme weather like drought and flood. Indeed drought or lack of rainfall was mentioned by almost everyone as a major challenge to their economic livelihoods. Magara (T2) and Kisangaji (C2), located at the foot of a mountain, also experience regular floods.

Another shock that can strongly affect agricultural production is pests or crop diseases. In Magara for instance, the 'yellow disease' is a large problem that is destroying many farmers' maize harvest. Since maize is a staple, loss of maize harvest has direct impacts on food security.

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<sup>26</sup> I was told that before people were 'lazy' and only cultivated for their own consumption. But ever since they realized that they could sell crops and earn income they became motivated and worked very hard.

A third shock, in some areas, is crop raiding by wildlife.

## SHOCKS TO PHYSICAL CAPITAL

Among the households that had become poorer, loss of physical assets, such as crops and livestock, were mentioned as second most important shock, after shocks related to health of a family member. This next section will therefore explore these shocks in further detail.

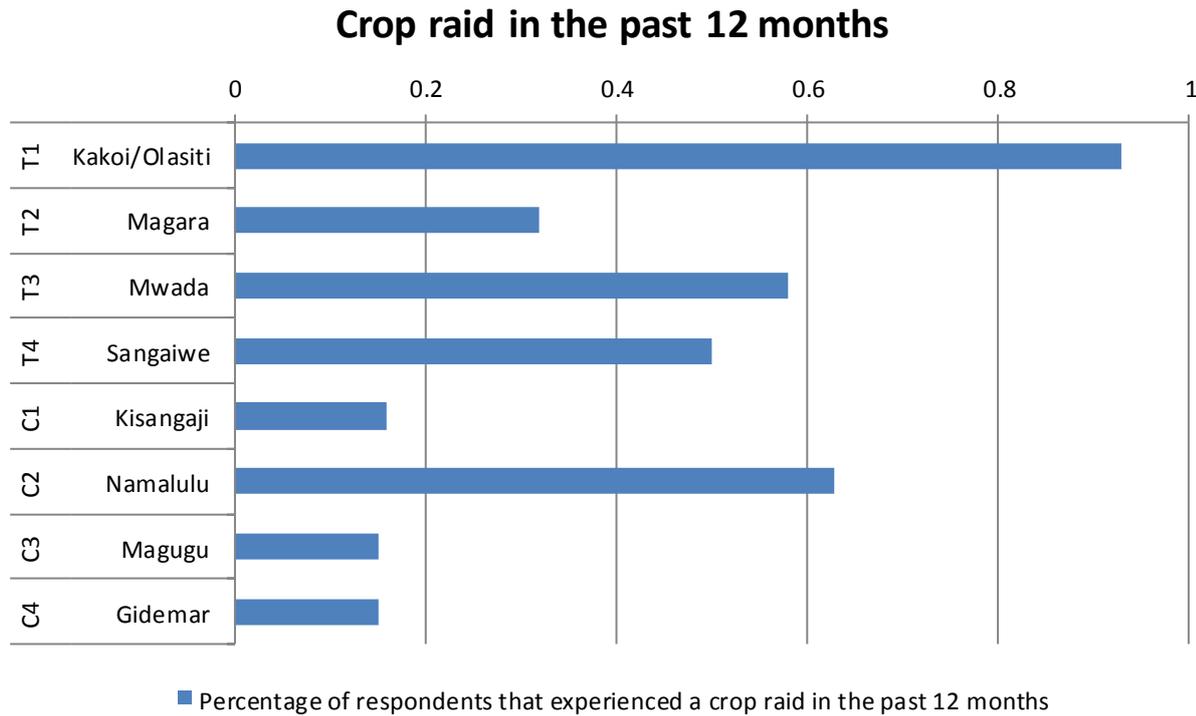
### a. Crop raiding

Elephants and zebras roam across cropland and devour entire fields of maize, beans or watermelon. There are large differences in the magnitude of crop damage inflicted on the villages in this sample. Significantly more in WMA villages than in control villages answered that they have experienced crop damage due to wildlife in the past 12 months, and that they had lost more than half of the harvest in that incident. Kakoi/Olasiti (T1) suffer by far the most, but also in Namalulu (C4), Mwada (T3) and Sangaiwe (T4) more than 40% had experienced crop damage by wildlife in the past 12 months.

	(i)	(ii)	(iii)	(iv)
	Crop raid in the last 12 months	Lost more than half of the harvest (in last 12 months)	Lost more than half of the harvest ever	Change in crop raid (1=much worse, 5=much better)
<b>Difference</b>	0.25***	0.13**	0.09**	-0.49***

**Table 9: Crop raid.** Shows the difference between treatment and control group answers to (i) whether the household has experienced crop damage by wildlife in the past 12 months, (ii) whether in that incident they lost more than half of the harvest, (iii) whether they have ever lost more than half of the harvest to crop damage by wildlife, and (iv) if they feel that crop damage by wildlife is worse or better today.

Note: Variables (i) to (iii) are binary; the difference can thus be interpreted as percentage. Question (iv) is a ranked order from 1 'much worse' to 5 'much better'. A positive sign indicates that more households in the treatment villages affirmed the question. Source: own calculations based on PIMA (2015a).



**Figure 12: Last crop raid. Percentage of respondents that answered "yes" when asked if they have experienced a crop raid by wildlife in the past 12 months. Source: own presentation based on PIMA (2015a).**

58% of all respondents who did lose more than half of the total harvest value in the past 12 months were from Kakoi/Olasiti (T1) villages. None of the respondents of the in-depth household interviews in Kisangaji (C2) or Magara/Manyara/Maweni (T2) reported wildlife damage, although the PIMA survey suggests that there are some incidents.

But not only WMA villages are affected: In Gidemar (C1) there is wildlife damage along the border with Tarangire National Park. Wealthier farmers can afford to hire labour to camp in fields in order to scare away elephants and other wild animals at night (30\_HH16).

Whether the comparably low levels of crop damage reported in the PIMA survey in Gidemar can be interpreted as a success of this adaptation strategy (if implemented by several wealthy farmers) is not clear. During the visit to the village in June 2015, the villagers had lost almost their entire harvest to drought. Because the drought had dried out most of the crops, it might be that wildlife was not attracted, and therefore wildlife damage was not considered a major problem by most respondents. Perhaps, crop damage might have been mentioned more often as a challenge if the timing of the interviews had been different.

Respondents were also asked whether they feel that the wildlife crop raids have become better or worse when comparing the situation in 2007 to the situation today. A t-test shows that on average the

response was significantly ‘worse’ in WMA than in control villages. Most of the respondents in Burunge WMA who perceived that crop damage by wildlife has become much worse compared to 2007 are from Kakoi/Olasiti.

a. Livestock predation

In areas with high wildlife density, livestock may become the victim of predators such as lions and hyena. Figure 13 compares average TLU lost to predators in the household’s last incident of livestock predation. Both aggregated and disaggregated by village pairs, there is no significant difference between treatment and control villages visible in the data. Livestock predation is a major problem in T1 Kakoi/Olasiti, where wildlife density is especially high.

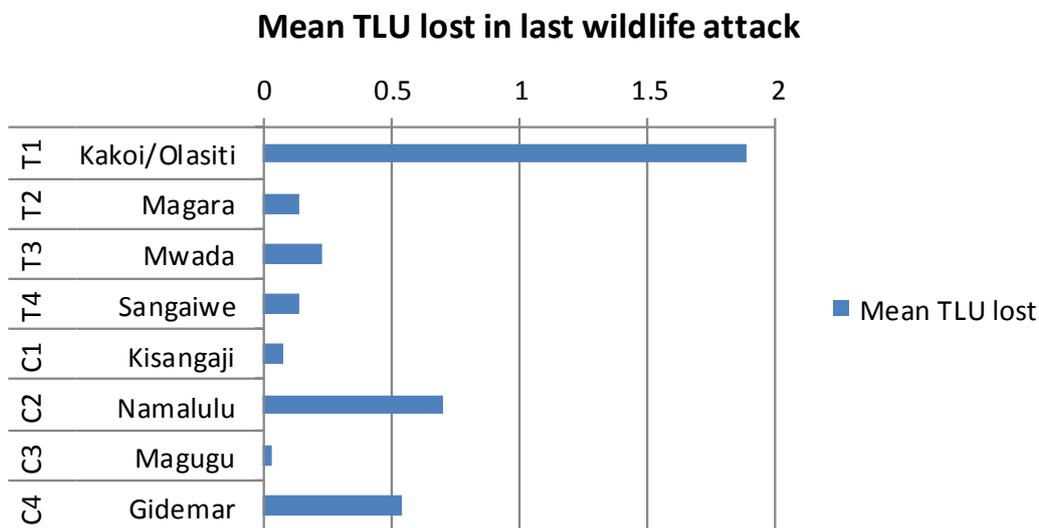


Figure 13: Livestock lost in last attack by predators, measured in TLU, by village. Source: own presentation based on PIMA (2015a).

In Kakoi/Olasiti (T1) livestock predation was an important topic which, next to crop raids, almost always was mentioned by the respondents of the in-depth interviews in the first question asked about the challenges the village was facing economically. In the first six months of the year 2015 there had already been three incidents involving more than 10 lions, of which the majority were subsequently killed by the Maasai warriors (5\_HH5012). Villagers are scared of dangerous animals like lions and hyena coming into their homes, but at the same time have no other choice but to go outside and try and scare them away with noise and flashlights (5\_HH326).

## HUMAN-WILDLIFE-CONFLICT

Successful conservation efforts will lead to increasing wildlife populations, and therefore more human-wildlife-conflict. Close to every respondent in Kakoi/Olasiti (T1) mentioned that the main challenge in the village is wildlife damage, whether to crops, livestock and humans. On not few occasions, human wildlife encounters ended deadly – on both sides (5\_HH512). The WMA adds another protected area to the surroundings of T1 Kakoi/Olasiti, where there is already Tarangire National Park, Lake Manyara National Park and Manyara Ranch. Figure 19 in Annex I shows why Kakoi/Olasiti (T1) suffer so much more from human-wildlife-conflict than the other WMA villages. The wildlife corridor between Tarangire National Park and Manyara Ranch conservation area is only 4 km long and 2.5 km wide but was passed by an estimated 1000 elephants and 2500 zebras between 2010 and 2012 (Kikoti n.d.).

Thus the geographic location in the wildlife corridor is most likely what is causing the extent of human-wildlife-conflict in T1 Kakoi/Olasiti compared to the other WMA villages. But control villages face similar challenges, such as C1 Gidemar to the west and C3 Namalulu to the east of Tarangire National Park where wild animals roam into village lands.

Namalulu (T4), Gidemar (C1) and Kakoi (T1) were the villages where ‘disease’ was mentioned most often. Livestock diseases are often transmitted by wildlife, in particular wildebeest, which regularly migrate through the area (Mwalyosi 1991). Between 2010 and 2012 an estimated 3500 wildebeests passed through the area in which Kakoi/Olasiti (T1) are located (Kikoti n.d.). Therefore, high wildlife occurrence in these two villages might also explain why many villagers have lost livestock to disease (see Figure 10).

Wildlife damage can be a threat to livelihoods. (5\_HH236) for instance, harvested only 2 bags instead of 30 bags on her 2 acres this year (2015), because elephants and zebra damaged the crops. Last year she lost all of the harvest. The dimensions of this problem become even clearer when putting numbers on the crop losses. Kakoi/Olasiti stands out with a mean value of crop loss of 1.4 million TShs in the last 12 months (657 USD<sup>27</sup>), compared to the crop loss values mentioned in the other villages which ranged between 22.400 TShs (10 USD) and 251.000 TShs (117 USD) in the last 12 months (these values were estimated by the PIMA enumerators based on numbers reported by the respondents on the area damaged, the volume of crops lost and the market price of that crop).

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<sup>27</sup> Current exchange rate 23.11.2015 from [oanda.com/currency/converter](http://oanda.com/currency/converter)

Tarangire National Park and Lake Manyara National Park are protected areas since more than 40 years, and Manyara Ranch since more than 10 years. One would therefore expect that the problem of wildlife damage in Kakoi/Olasiti (T1), given the geographical location between these protected areas, is not a new one. In Kakoi/Olasiti (T1) respondents confirmed that livestock predation is not a new phenomenon and has been a problem for a long time. Most respondents also said that crop raids has long been a problem, and that it was due to the geographical situation of the village, close to Tarangire National Park and the migration corridor to Manyara Ranch (5\_HH615).

*Q: "Is this [wildlife raiding farms] a new problem?"*

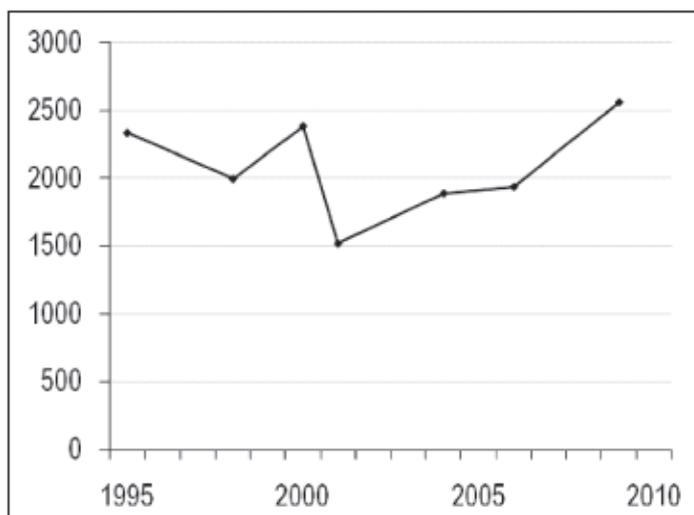
*R (5\_HH300): "No, it has always has been problem."*

*Q: "Has damage from wildlife always been a problem in this area?"*

*R (5\_HH616): "Yes, always.[...] I have been living here for 30 years now."*

Few indicated that there has been change in wildlife damages recently: 5\_HH512 said it was the 5<sup>th</sup> year since he has experienced crop damage from wildlife. 5\_HH433 says that since five years the crop raiding by wildlife has increased a lot, and that today also zebra and wild boar come to the villages, in addition to elephants which came also before. Typically they come just before harvesting, and therefore the crop damage is especially high in the good years. Some respondents indicated that wildlife increasingly have lost fear of humans (5\_HH274, 5\_HH616), and that they have become 'like humans' because they seem attracted to watermelons and maize (5\_HH70).

Increasing wildlife populations - a success for conservation - together with expanding human settlement and cultivation (Hariohay 2013), are likely explanations for the growing problem of human-wildlife-conflict. Aerial elephant counts indicate that the elephant population in the Tarangire-Manyara ecosystem is experiencing rapid growth:



**Figure 14: Elephant population.** “Trends in elephant abundance in the Tarangire-Manyara ecosystem from aerial total counts, 1995-2009 (TAWIRI)”, Source: TAWIRI Tanzania Elephant Management Plan 2010 – 2015, 2010, p. 12.

Most of the respondents facing the risk of crop raids by wildlife coped mainly by guarding their fields at night and selling livestock in order to buy the food they lost in the raid. Only very few mentioned that they had taken some measures to adapt. Sesame, a cash crop, is not very popular among elephants. Some had therefore changed to planting sesame instead of watermelon. Still, staples like maize and beans are important for food security, and will be continued to be cultivated, even at the risk of losing the harvest to crop raids. The poorer who cultivate mainly maize for subsistence, did not know what they could do in order to mitigate the risks of crop raiding. To protect wildlife from predators, fences can be constructed around the area where livestock is kept. However, truly effective protection is costly, and therefore only an option for few. In addition, for those who have little from the outset, a shock by wildlife damage can be a lot more catastrophic than for those who have a larger stock of assets. The latter are better positioned to mitigate, cope with and adapt to the risk. For the poorest, however, a crop raid can mean food insecurity for an entire season.

The results showed that agriculture and livestock keeping, the main livelihoods, are vulnerable to shocks. People living close to protected areas and wildlife migration corridors experience frequent damage by wildlife. There is a significant difference showing that treatment villages suffer more from crop raids than control villages today, but there is no significant difference in livestock predation. The shocks caused by human-wildlife-conflict are unlikely to be directly related to the WMA, but are rather related to trends in wildlife population and geographical indicators such as proximity to wildlife corridors.

## 4.6. CHANGE IN ACCESS TO HUMAN CAPITAL

### **EDUCATION AND KNOW-HOW**

Many of the respondents were very aware of the importance of education, and went to great lengths to send their children to school. The costs of sending children to school are quite high, and can be a challenge especially for poor households or households with many children. Although public primary education is 'free', parents have to pay for books, utensils, and uniforms. They often even are the ones who pay for renovation or improvement of school facilities. Many complain about poor service, and those who can afford it send their children to private schools. Secondary schools do charge school fees, and they are often further away, thus transport costs have to be added. As children get older, opportunity costs grow too (because they could help with farm activities or in small businesses). Therefore parents often struggle with sending their children on to secondary school.

Since the revenues that the villages receive from the WMA are often used for public development projects (see section 4.7), parents in WMA villages have a higher chance of being relieved from the burden of paying for new classrooms or laboratory equipment. Some village offices use WMA revenue to support very poor parents by paying for their kids' school fees. In Kakoi, the village office gives out interest free fixed term loans that can be used to pay for tuition fees.

### **HEALTH**

Poor health can be a major barrier to the economic development of households. The main reason for becoming poorer was, according to the households interviewed during the field study, shocks. Illness of a family member was the reason in most cases, because accessing medical services is difficult and expensive. Health-related expenses are often very high and create a sudden and unexpected need for cash. This immediate cash need can have detrimental medium and long run effects on the household's economic situation. In addition, many respondents in the surveyed villages complain about poor public health services. For some villages, the next village dispensary is far away, and might not be reachable in the wet season when roads get flooded and become unsurpassable.

Similar as with access to education, the village office can decide to spend the WMA money on improving health services (e.g. paying for improved facilities at the village dispensary). WMA villages might also be able to attract donor funding or NGOs easier than other rural villages. In these cases access to human capital in WMA villages will be improved, compared to control villages.

#### 4.7. CHANGE IN ACCESS TO FINANCIAL CAPITAL

The financial basis of the WMA are the revenues generated by tourism activities in the WMA, for instance by leasing a certain area to an investor or collecting a fee that tourists pay per night when staying at a lodge inside the WMA. The idea is that by sharing those revenues with the communities living in the WMA, those will be able to benefit from the conservation-related tourism and improve their livelihoods based on non-consumptive income. The next section will discuss direct monetary benefits from the WMA.

##### **DIRECT MONETARY BENEFITS**

Direct income from the WMA only accrues to villagers that gain employment as rangers or that participate in the WMA council or village natural resources council. Burunge WMA employs 18 rangers, which since 2010 are paid a monthly salary of 70,000 TSHs (USD 31.60<sup>28</sup>, HDIC 2010), amounting to an average yearly income of 835,625 TSHs (USD 377.68, n=8). Council members (n=19) reported between 10,000 TSHs and 2,400,000 TSHs income in the past 12 months (USD 4.51 – USD 1,085)<sup>29</sup>. In addition, a cash-for-work program funded by USAID was implemented in Burunge WMA between 2010 and 2013, where villagers were employed as rangers, staff at entry gates, in visitor centres and for road work and other infrastructure inside the WMA (WWF 2014).

Few of the respondents were involved in tourism-related activities (n=9, see category (iii)-(v) in Table 10), and most were from Kakoi/Olasiti (T1). The road to the main entrance to Tarangire National Park leads through Olasiti and is specked with gift shops and small businesses. Some women have established a small market outside the entrance gate, where they collectively sell handmade crafts and souvenirs to tourists. Magara (T2) is trying to maintain a local tourism project in which they charge tourists 5000 TSHs (USD 2.26) to see a nearby waterfall (6\_HH518). However, tourists passing through the village are few, so they are not able to generate significant income (6\_HH518). Even in Mwada (T3) and Sangaiwe (T4), where there are tented lodges, none of the respondents reported any income from tourism.

It is likely that tourism-related income in Kakoi/Olasiti (T1) is generated thanks to the location of the road and entrance to Tarangire National Park rather than Burunge WMA. None of the WMA investors in tourism activities are local (HDIC 2010). The results show that it seems to be difficult for the villagers to generate income from tourism-related activities. Those that do gain employment are likely to be the better-off, because they are more likely to be well-connected and educated.

<sup>28</sup> Current exchange rate 23.11.2015 from [oanda.com/currency/converter](http://oanda.com/currency/converter)

<sup>29</sup> Payments are based on the amount of time put into the council work, e.g. how often meetings are attended.

Direct income earned through AA/WMA in past 12 months	T1 Kakoi/ Olasiti	T2 Magara	T3 Mwada	T4 Sangaiwe	n
<b>i. Patrolling WMA/village land</b>					
Yes	1	2	3	2	8
Average net direct income earned in past 12 months (TShs)	1,626,250				
<b>ii. WMA or VNRC council</b>					
Yes	4	7	5	3	19
Average net direct income earned in past 12 months (TShs)	405,263				
<b>iii. Servicing tourists/hunters/researchers</b>					
Yes	3	0	0	0	3
Average net direct income earned in past 12 months (TShs)	1,161,667				
<b>iv. Selling crafts/souvenirs</b>					
Yes	4	0	0	0	4
Average net direct income earned in past 12 months (TShs)	150,500				
<b>v. Making/maintaining communal tourism infrastructure</b>					
Yes	1	1	0	0	2
Average net direct income earned in past 12 months (TShs)	30,000				

**Table 10: Direct income from WMA and tourism-related activities. The number of respondents in each village that earn income from the respective category is shown, followed by the average annual income earned through that activity. 1 TShs = 0.00045 USD. Source: own presentation based on PIMA (2015a).**

#### INDIRECT MONETARY BENEFITS – WMA REVENUE SHARING

Photographic tourism creates revenues to the WMA through a variety of fees charged to the tourists and a negotiable concession fee to the investor. Yet, the most profitable form of tourism is trophy hunting. Since 2013 the WMA can apply for quotas from the MNRT Wildlife Division and negotiate directly with hunting investors; however they still need the approval by the MNRT Wildlife Division before entering into agreements (WWF 2014). Prior to 2013 the MNRT Wildlife Division alone was able to negotiate with investors and give out quotas, and would then share 25% of total revenues derived from hunting activities with the WMA. In this process, the WMA would have no information about the terms negotiated with the investors and the resulting overall revenue (Benjaminsen and Svarstad 2010). As a result, payments of hunting revenue shares to the WMA were often intransparent and irregular (WWF 2014).

The revenues collected from non-consumptive tourism activities (e.g. photo safaris) that are taking place in the WMA under a contract between the WMA and an investor do not fully accrue to the WMA. The revenues are divided up between the central government (20%), the district government (15%) and the WMA (65%). On top of that, every investor has to pay a fee of 25,000 USD to the Director of Wildlife (MNRT Wildlife Division) when they initiate their tourism activity, thus circumventing the

WMA (WWF 2014). The WMA is entitled to only a fraction of the overall revenues generated on WMA land.

Distribution of revenues		Wildlife Division	WMA	District gvmt	Approximate value
Hunting	Block fee*	25%	75%	0%	USD 60,000 per season
	Game fee**	40%	45%	15%	Max. USD 25,000
	Conservation fee	55%	45%	0%	
	Observer fee	55%	45%	0%	
	Permit fee*	85%	15%	0%	
Non-consumptive	Initial payment	100%	0%	0%	USD 25,000
	Gross revenue***	20%	65%	15%	

\*WMA can negotiate higher fees, of which they keep 100% of the premium they negotiate. Since the new rules were introduced in 2013 only one WMA has managed to negotiate a premium above the minimum fee with an investor.

\*\*The most expensive game fees are for elephant trophies, fees can rise to US\$25,000 for bow-and-arrow hunting.

\*\*\*collected by MNRT Wildlife Division, then distributed. Fees incl. concession fees, bed fees, wildlife activity fees, vehicle entry fees, etc., and are negotiable between the investor and the WMA.

**Table 11: Overview of revenue sharing formula in WMAs. Source: compiled by author based on WWF (2014)**

Year	Revenue from tented lodges in TShs <sup>30</sup>	Revenue from hunting quota in TShs <sup>31</sup>
2006/2007	34 mn	~ 5 mn
2007/2008	60.7 mn	~ 20 mn
2008/2009	51.2 mn	~ 13 mn
2009/2010	159.7 mn	-
2010/2011	200 mn*	-

**Table 12: Revenues in Burunge WMA. Source: compiled by author based on Sulle (2010) and WWF (2014)**

Revenues earned from the two tented lodges in the WMA have increased from 34 million TShs (USD 15,367) in 2006/2007 to 200 million TShs (USD 90,396) in 2010/2011, after the per night fee has been increased from 5 USD per person to 15 USD per person (HDIC 2010). Hunting plays only a minor role in the budget (2.5% of total revenues in 2012, WWF 2014). Total revenues in Burunge WMA have increased from about 40,000 USD in 2007 to more than 300,000 USD in 2012 (WWF 2014, p.43).

The revenues the WMA receives are then divided up: 50% is allocated to WMA administrative and conservation-related expenses (e.g. paying staff salaries) and 50% is divided equally between the nine member villages (Sulle *et al.* 2011). WMA revenue shares received by each Burunge village amounted to 24,180 USD per village in 2014/2015, and as Figure 15 shows have increased since the WMA establishment in 2006.

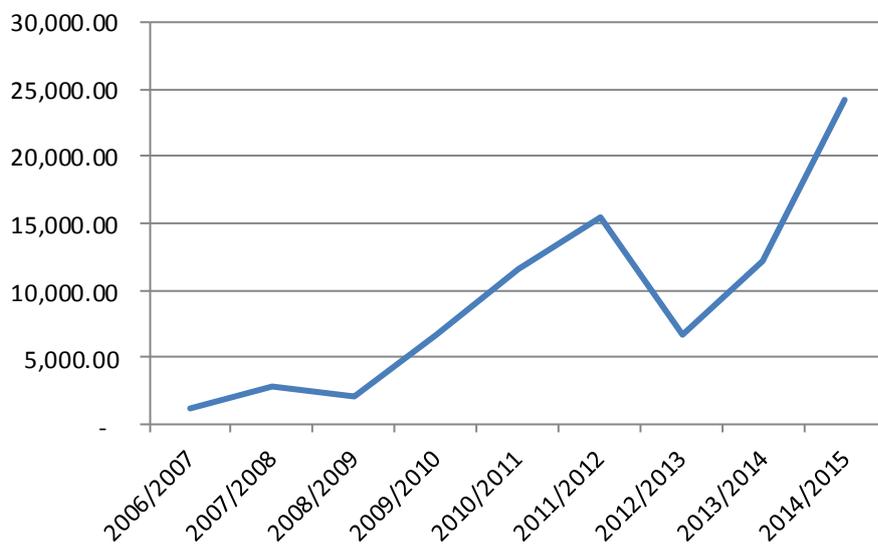
Since the new Wildlife Utilization Regulations (2008) were put into operation, tourism revenues generated by the WMA are collected by the MNRT Wildlife Division, which then distributes a share to

<sup>30</sup> HDIC 2010: CBO reports

<sup>31</sup> HDIC 2010: District Council Natural Resource Department reports

the WMA. Before the WMA collected revenues directly (Benjaminsen and Svarstad 2010). This however comes with increasing complaints of unduly and untimely payments on the part of the Wildlife Division. A former member of the village council explained that it was now very difficult for the village government to make plans for investments, since they could not be sure when the WMA revenues would arrive and how much it would be (5\_HH433). Burunge WMA collected revenues until 2012, after which the MNRT took over the responsibility - the effects of which are clearly visible in Figure 15 (personal communication, Bluwstein 2015).

**Burunge WMA revenues shared with each member village (USD)**



**Figure 15: WMA revenues.** Shows the revenues in USD that each of the member villages has received since the establishment in 2006. Source: Juhibu (2014)

Once the money has arrived in the village office, villagers have to decide what to do with the money. Typically it is used for investments in infrastructure and public services, and to pay school fees for children of the very poor. There are also reports that village leaders and local elites in Burunge WMA have taken advantage of the intransparent processes of revenue sharing and enriched themselves (Igoe and Croucher 2007). One member of a village government complained that they spent large amounts of unpaid time with the administration of WMA-related issues in the village but receive no compensation for their time. This, the respondent said with a smile, would create incentives for them to compensate themselves from the money they receive from the WMA.

The results showed how access to financial capital, in the form of direct and indirect monetary benefits, can be enhanced through WMA revenues. Villages living close to protected areas such as National Parks but are not part of a WMA do not receive revenue shares from tourism revenues.

Nevertheless, only very few gain employment through the WMA or tourism enterprises linked to it, so the only benefits accruing to the general population are when poor public services are improved in the villages.

#### 4.8. CHANGE IN ACCESS TO SOCIAL CAPITAL

Social capital is a bit more abstract in concept than the previously discussed assets. It refers to what people can draw from their social networks, and how relationships are organised. Putnam (1993) defines social capital as "features of social organisation, such as trust, norms and networks that can improve efficiency of society by facilitating coordinated actions". This section will give a few examples encountered in the field of distressed social relations that are linked to restricted access to assets.

In Kakoi (T1) it seemed that the joint objection of the hunting block and the WMA was bringing people together. Village patrols have been established to scare away wildlife that comes into the village at night. Maasai warriors went out into the hunting block with large numbers of cattle and weapons, to take a stand against the rangers who were beating up young boys for illegal grazing. Because farmers and herders are affected alike by the restrictions in access to the area, rather than causing divisions, the challenges, it seemed, have united villagers in their joint resistance.

A different picture emerged in Kisangaji (C2) and Magara (T2), where tensions are increasing because of lack of grazing land. Because cattle owners cannot find enough pasture to feed their herds, incidents where cows are found feeding in someone's farms cause a distressed relationship between villagers:

*(27\_HH327): "[...] But now there has been fight with some Mangati<sup>32</sup> last year December, they burnt down a Mangati boma<sup>33</sup>. [...] Because the Mangati fed livestock in peoples farm so they protested."*

*R(27\_HH448): "[...]But the Mangati people for instance, they can fight, they will use force. So no one can stop them."*

*(6\_HH986): "The main problem that farmers face is that livestock keepers are being aggressive towards farmers. Farmers cultivate their land and come harvesting time, livestock keepers let their cows into the farms to feed. If the farmer complains and tells the livestock keeper to remove his livestock from the farm, they can beat up the farmer. Livestock keepers see themselves as being superior to farmers, because livestock is more valuable than crops. [...] Most of them are migrants, from Tanga and Ngolei. And they are proud people, they have a lot of money. They know that if there is a problem, they can just pay a bribe in court to get free again. So they will have to move somewhere else.[...] They*

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<sup>32</sup> A traditionally pastoralist tribe, also called the Barbaig.

<sup>33</sup> A home of a family.

*came since 2008. In Ngolei the WMA does not allow them to graze anymore, that's why they come here."*

The last quote from Magara (T2) shows increasing tensions arising because of livestock herders from a WMA village (T3) moving their herds (within the WMA) in search of pasture. The incidents seem to create a divide between those that traditionally build their livelihoods on livestock keeping and those that traditionally build their livelihoods on agriculture, such that when talking about these issues there was a lot of "us" and "them".

In Gidemar (C1), where the entire village grazing land was divided up and sold as farming plots by the village leaders, there were also tensions. Livestock keepers, a minority of around 200 households, have held several meetings in which they planned for (violent) resistance against the leaders (30\_HH41). The wealthier livestock keepers have moved parts of their herds to other places in southern Tanzania where grazing land is still available (30\_HH41). Although traditionally nomadic, many have started becoming sedentary, investing in modern houses, subsistence cultivation and education, which means that only parts of the family move with the cattle, while the other part stays (30\_HH41). Social relations can be disrupted by these forms of displacement due to economic hardship, because they can break up ties in families and closely knit communities (Holmes and Brockington 2013).

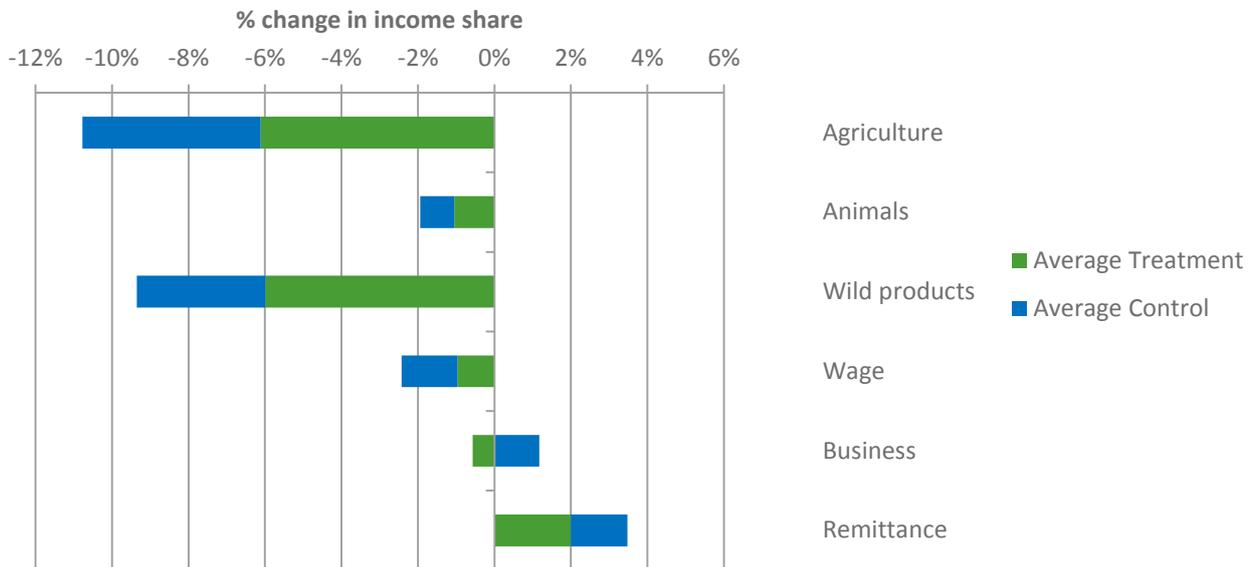
Existing divisions and inequalities in communities can be exacerbated if certain groups of the population are affected most by restrictions in access (e.g. the poorest, herders, women) but benefits are captured by another group (e.g. the well-connected, the wealthy) (Holmes and Brockington 2013). Moreover there is an imbalance of power between government-backed institutions and authorities (e.g. MNRT Wildlife Division, Tarangire National Park administration), influential and well-funded conservation NGOs (who support particularly the establishment phase of the WMA), and the villagers living inside the WMA, who have low levels of education, resources and power (Goldman 2003, Holmes and Brockington 2013).

These considerations shows the importance in understanding that the WMA not only has direct impacts, by restricting access to resources or providing monetary benefits, but also indirect impacts on the social relations in the communities.

The next section will show how livelihood strategies might have changed in response to the changes in access to assets.

## 4.9. CHANGES IN LIVELIHOOD STRATEGIES

## Change in income shares



**Figure 16: Livelihood changes.** Change in income share between 2014 and 2007 for each income source category (percentage points of total 2014 income), by treatment and control group. To the left of the y-axis (0.0) the change is on average negative, to the right the change is on average positive. Source: own presentation based on PIMA (2015a).

Changes in access to assets lead to changes in livelihood strategies (Ellis 2000). The graph shows changes in income shares between 2007 and 2014 (in percentage points) which have mostly been negative (to the left of the y-axis), indicating that the total income in 2014 was smaller than in 2007. On average households today have a smaller income share from agriculture, compared to 2007, as they are increasingly diversifying their income with business income and employment. Remittances have increased (to the right of the y-axis) in both treatment and control villages, whereas business income has increased only in control villages (mainly in C4 Magugu). Wild products (environmental goods) have a smaller income share in the livelihood portfolio today than in 2007, which might reflect a reduced dependence on wild products or, more likely, the increasing depletion and inaccessibility of those resources. In WMA villages income from wild products has reduced significantly more than in control villages (diff=0.77\*\*), supporting the findings in section 4.4. The change in income share for the other five categories do not show significant differences between treatment and control group households. Yet it shows that on average respondents distributed more stones across the six categories in their 2007 income portfolio than in their 2014 income portfolio, indicating that in 2014 they were worse off than in 2007. This contradicts the finding from the wealth ranking (where on average households were seen to be better off in 2014 than in 2007), indicating that there might be factors that lead to increased wealth but are not reflected in the income portfolio which focuses on the

relative contribution of each of the categories compared to each other (e.g. if the costs of production have reduced, or assets have increased in value).

#### 4.10. SUMMARY OF RESULTS

Indicator	Statistically significant difference-in-difference?	Statistically significant difference control vs. treatment?	Evidence from field study
<b>Wealth</b>	Yes		Positive economic development due to increasing cultivation of cash crops and successful income diversification, significantly more positive in control villages.
<b>Access to (cultivation) land</b>	No		Increasing land scarcity influenced by a variety of factors, but not WMA because often the land was village reserved land before.
<b>Access to grazing land</b>		Yes	Grazing allowed in most areas of the WMA, but has large impact where it is restricted.
<b>Access to environmental goods</b>		Yes	Previously freely accessible, collection is possible only with a licence that needs to be obtained at the WMA office in Mwada.
<b>Livestock holdings</b>	No		Important financial asset, changes most likely not related to the WMA or restrictions in grazing land access.
<b>Livestock predation</b>		No	Only in certain parts of WMA. Increasing wildlife numbers lead to high levels of damage, but relation to WMA is unclear. Main explanation: location of village in relation to migration corridors. Lack of adaptation/defence possibilities. Important cause of frustration.
<b>Crop damage</b>		Yes	
<b>Human Capital</b>	Indirect benefits possible when village decides to use WMA money to improve public services (schools, dispensary, water access)		
<b>Financial capital</b>	Direct monetary benefits can be significant but accrue to only few. Indirect benefits help improve poor public services in WMA villages.		
<b>Social capital</b>	WMA can potentially affect social relations and networks positively or negatively, evidence is however anecdotal.		

**Table 13: Summary of results presented in the analysis section. Source: own presentation.**

The wealth trajectories of households in all sampled villages have on average been positive, but control villages have on average experienced a larger positive change in wealth than the WMA villages.

Access to agricultural land is a problem in almost all villages, and there is no treatment effect visible. The data suggests that access to grazing land has become worse everywhere, but more so in WMA villages than in control villages. This difference is largely driven by one WMA village (T1) in which former village grazing land is now part of a hunting block where access is entirely prohibited.

Restrictions in access to environmental goods have the largest impact for the collection of firewood, the main energy source, and construction materials. Collection is allowed in most areas of the WMA, but a licence is required, which is costly to obtain. While access to these goods is increasingly a problem in most villages (caused by resource depletion), there is a significant difference between WMA and control village change in access and income derived from the collection of these products. The results indicate that access to natural capital has been impacted by the WMA to a certain extent, however not all WMA villages are equally affected.

Livestock is an important financial asset used as savings instrument. There is no significant difference between WMA and control villages in changes in livestock holdings, and the main reasons for loss of livestock were drought, disease and cash needs. Crop cultivation forms the basis of the livelihood for the majority of households, and successful cultivation of cash crops can help lift households out of poverty.

Shocks to physical capital include wildlife-induced damage, especially (i) diseases transmitted by wildlife to livestock, (ii) crop raids, (iii) livestock predation. The results indicate that WMA villages are worse affected by crop raiding, but not by livestock predation. The differences between villages can be explained by the geographic location of the villages in relation to protected areas, wildlife populations and migration corridors. It is unlikely that the WMA is the important driver of the difference between treatment and control villages.

Direct financial benefits accrue to a few who gain employment through the WMA, for instance as rangers. The general population benefits only indirectly, through tourism revenues that are shared among all WMA villages equally, and which many villages decide to use for public development projects such as improving health or education facilities. Revenues at the WMA level have been increasing, but the rules of sharing are such that comparably little arrives in the villages. In addition, intransparency and potential for elite capture and personal enrichment jeopardise the community's benefits from WMA revenues. Power imbalances, potential for elite capture and conflict potential over scarce resources can have an effect on social relations and community structures.

## 5. DISCUSSION

### AREAS OF CAUTION

Based on what was not observable in the survey data, what are areas of caution for the establishment of a causal relationship between Burunge WMA and livelihood impacts?

#### a. Outcome variables influenced by a similar treatment (Tarangire National Park)

In some villages another conservation area is causing changes in access to assets: Tarangire National Park. Conflicts over the exact location of the boundary between village land and the park are commonplace, including in the sample villages Kakoi (T1), Sangaiwe (T4) and Gidemar (C1). Similar problems take place along the eastern park boundary (Sachedina and Nelson 2010).

In Gidemar Tarangire National Park is encroaching onto village land, including settlement and farm land, ordering the eviction of at least 600 villagers (from Gidemar and neighbouring villages) (30\_Interview1). The appropriated area also included a conservation project run by four villages including Gidemar, which was generating revenues through a camping and photographic tourism investor. The encroachment began with a new road replacing the old road as demarcation of the boundary (30\_Interview1), followed by a gradual and violent process of appropriation (30\_Interview2, 30\_HH16). Many of the victims are now among the poorest of the poor, having lost one of their major assets: farmland. They live of the charity of their kin; one victim had to send his children to live with others, because he was no longer able to take care of them (30\_HH16). Even though land compensation was promised by the District Office, to calm down the angered villagers who were planning violent resistance, the victims are still waiting, since more than six years (30\_Interview1). This shock of expropriation has led to changes in Gidemar villagers' wealth, access to (cultivation) land and grazing area.

Tarangire National Park also contributes to village development projects as part of their Community Conservation Services which aims to improve local support of conservation (Sachedina and Nelson 2010). This is typically done by providing in-kind benefits such as building classrooms or giving villagers access to a water tank (e.g. in Kakoi (T1)). If these changes happened in the period examined in the impact evaluation, and can therefore not be assumed to be constant over time, they can confound the results of an impact evaluation.

### b. Treatment affecting access to assets in control village

Conflicts over boundaries are also common between villages. This is for instance the case for the boundary separating Maweni village (T2) from Kisangaji (C2). As 'Figure 17: Map of sample villages.' in Annex I shows, the WMA area in Maweni is bordering Kisangaji. Although this area is disputed, it was allocated to the WMA by Maweni. The process in which village land is allocated to the WMA is complicated, and often ignores customary land tenure (Goldman 2003). Once the land is assigned to the WMA, this is difficult to reverse (Bluwstein *et al.* in review). Kisangaji villagers are farming in that area, and claim that the land belongs to Kisangaji and that they therefore are rightfully farming there. The WMA on the other hand considers the agricultural cultivation as a breach of the WMA rules (27\_362). Because Kisangaji is a control village, this boundary conflict can be seen as a spill-over effect of the treatment, as it affects Kisangaji villagers' access to land, and might have important consequences if the WMA rules are enforced and the farmers are evicted.

### c. Pre-treatment differences between treatment villages that could affect outcome

Qualitative data entries during the PIMA survey collection suggest that several households in Kakoi/Olasiti (T1) have been evicted and/or expropriated of land in 1996 during the preparatory stages that led up to the establishment of Burunge WMA. This might point to important negative impacts of the WMA even before its official establishment. These incidents might have also shaped villagers perception of the WMA and its purpose and influenced their willingness to participate in it and accept its establishment. They might also colour the responses given in the survey, and therefore the outcomes observed.

### d. Unobservable factors affecting outcome which might not be constant over time

Unobservable factors influencing outcomes are assumed to be constant, such that they can be differenced out in the difference-in-difference calculation. This might not be true for all factors. When asked about the success factors driving their positive wealth trajectory, the majority of respondents mentioned crop sales as main reason. Factors influencing agriculture might not be time constant, and might affect outcome differently across villages. One of the most mentioned challenges was drought, which affects both crop cultivation and livestock keeping. Droughts can have a very large, sometimes long-lasting, impact on livelihoods; and they might hit some villages more than others. Positive 'shocks' that might influence outcome variables in some villages but not in other include infrastructure improvements, especially roads. Better roads often translate into better access to markets, which was an often mentioned driver of village economic development. Other positive shocks to crop production

were access to seeds, fertilizer, pesticides and agricultural credit. Agricultural extension officers or NGOs coming to a village were often the reasons for the improved access. Both positive and negative factors can be a problem for the impact evaluation if they affect outcome in only a certain village, and if they affect the village during the treatment period.

#### e. Relocation of resource use

A denial in access to environmental goods collection can result in a reduction in the income share of environmental goods. In the case of essential goods such as firewood and construction material, however, it rather leads to a relocation of the depletion of those resources (deforestation) outside the WMA (Kaswamila 2012). Increasing scarcity of cultivatable land further drives deforestation and clearance of formerly reserved land for environmental goods collection, as can be observed in Magara (T2). This is an important impact in itself, since protecting areas from resource extraction in one place, only leads to a relocation of resource extraction - often accompanied by higher costs for the users - but not necessarily in a reduction in resource extraction.

The example in the analysis showed that herders from Mwada (T2) have moved to Magara (T2), i.e. within the WMA, in search of pasture, because in their village the WMA has restricted access to common grazing grounds. This impacts the communities in which they arrive, since they compete for the resource of grazing land with local villagers. These relocations of resource use should be monitored, since, if they affect control villages, they might thereby confound results.

### IMPORTANCE OF THE COSTS OF LIVING WITH WILDLIFE

Human-wildlife-conflict is a known problem. Communities living with wildlife all face similar problems of crop damage, livestock predation and damage of other physical assets. In Burunge WMA an estimated 25% of all crop yields are lost annually to crop raids (MNRT 2003). Similar levels have been found elsewhere, for instance near Serengeti National Park (Mwakatobe *et al.* 2014). Every third PIMA surveyed household in T1 Kakoi/Olasiti has lost more than 50% of their harvest at least once. Livestock loss numbers ranged from 15 cows and goats per year in Magara (T2) to 70 cows and 350 goats/sheep in Minjingu (incl. T1 Kakoi); also the problem of wildlife transmitting diseases to livestock prevails (MNRT 2003).

As the analysis showed, a causal relationship between the WMA and these costs are unlikely. Nevertheless, these costs play an important role for the perception of the WMA and the extent to which communities are able to benefit from it. Shocks of wildlife damage affect the poorest worst. Crop raids can have severe consequences because maize, the most often targeted crop, is the major staple in the area.

Farmers face severe limits on their options to respond or adapt to these regular crop raids, and mostly choose guarding the fields at night and scaring away the elephants with flashlights and loud noise. More risky and costly methods such as fencing, shooting and poisoning are used less frequently, but according to Mwakatobe *et al.* (2014) elephants rarely are scared by anything else than the sound of a gunshot. However, the villagers have been warned not to kill or injure any wild animals, but instead report their loss and file for compensation (5\_HH159).

In addition, wildlife is seen as property of the state, or the National Park (Goldman 2003), and therefore villagers believe that it is the responsibility of the rangers to make sure wildlife does not conflict with humans.

*“Tarangire administration is not playing the role of keeping animals from going into villages. It is their responsibility to keep animals in their area just as livestock keepers have to take care of their cows.” (5\_HH274)*

The rangers hired by the WMA sometimes come to help villagers facing attacks by wildlife. But respondents feel that this assistance is insufficient, because the rangers do not have enough resources to effectively protect all villages (5\_HH274). With only one car response times are correspondingly long because the villages are spread out over a large area. By the time the rangers get to a farm where wildlife has been reported, the damage has most likely already occurred, sometimes with deadly consequences (5\_HH236).

Many of the respondents in Kakoi and Olasiti therefore expressed that they feel helpless and vulnerable, since they have almost no means to protect themselves from wildlife and receive very little assistance. There is widespread frustration about the fact that villagers are exposed to serious danger by predators, but are not allowed to defend themselves, e.g. by killing lions that come into the village. Reported losses are rarely compensated. It is therefore not surprising that villagers have little sympathy for the government's policies. After telling me that in the past year three villagers have been killed in encounters with elephants, and a fourth was seriously injured, one respondent asks me, clearly enraged:

*“How come that today the life of a human being is less valuable than that of an elephant? When the person died last year from the elephant attack, the [Tarangire National Park] and WMA people came and took pictures of the dead person. But they only shooed the elephant away, they didn't hurt or kill it. But when the villagers kill an elephant [in self-defence] they come with security guards and police with guns and those who killed the*

*elephant are in serious trouble. Then they are forced to pay big fines, at the least. Tell me, does this mean that the life of an elephant is worth more than human life?" (5\_HH236)*

The costs inflicted by wildlife damage seemed to be what determines whether the overall impact of the WMA is perceived as beneficial (e.g. in T2 Magara) or not (e.g. in T1 Kakoi) among the local people.

<b>Costs</b>	
Crop raids; mean (USD/year)	700 USD
Livestock predation; mean (USD/last incident)	214 USD
<b>Benefits</b>	
Revenue/village/year	24,180 USD
Inhabitants	3,691
<b>Per capita benefit</b>	<b>6.55 USD</b>

**Table 14: Costs and benefits using the example of Kakoi village. Source: own calculation based on Juhibu (2014), URT (2012), and PIMA (2015a).**

The revenue shares to the villages are not negligible, about 25,000 USD, but their impact varies by how the funds are invested and how they relate to the costs of wildlife damage. In Kakoi (T1), the mean loss value for crop raids was estimated at 700 USD/year (sd= 610 USD, n=36, 2014) and the mean loss value for livestock predation is estimated at 21434 USD in the last incident of livestock predation (n=32). WMA revenue shares of 24.180 USD per village in 2014/2015 (Juhibu 2014), divided by 3,691 inhabitants in Kakoi (URT 2012), illustrate that per capita gains are 6.55 USD/year. The costs borne by Kakoi residents are thus significantly higher than the benefits. In addition, these benefits are not paid in cash to households, but invested in public services.

While WMA revenues are distributed equally across villages, the costs of conservation are not. First, the amount of land villages gave to the WMA and the importance of that land for the villagers varies (MNRT 2003). Second, the amount and frequency of wildlife passing through that land and the villages, also varies, determining on the one hand the potential for tourism activities and on the other the costs inflicted upon villages by wildlife damage. Third, some villages are still able to access the land they gave to the WMA, for instance for grazing, while others are not. Thus, the fact that all villages receive the same share causes resentment among those villages that have to deal with high costs.

These costs then need to be added to the opportunity costs of foregone land use. Although it is difficult to produce estimates of these opportunity costs, there is little doubt that the costs by far exceed the potential benefits, and that those benefits rarely accrue to those who bear the costs (Emerton 2001).

<sup>34</sup> Estimated using livestock price from Hariohay (2013). Details of the calculation can be found in Annex II

Even though they might not be caused by the WMA directly, local support for conservation projects will only be found where these costs inflicted on the population are reduced or compensated by significant benefits that reach the general village population. If not, the consequence might not only be a threat to local livelihoods, but might also lead to measures of retaliation threatening the conservation intervention (see for instance Goldman *et al.* 2013, Mariki *et al.* 2015).

## WHAT IS THE COUNTERFACTUAL?

The counterfactual is the outcome (e.g. wealth, access to natural resources) that would be observed in WMA villages today, had the WMA not been established. Can we assume, for instance, that had the WMA not been established there, the villages would still live in the same situation as in 2007? Would the village reserved land still be protected or would it be encroached and farmed by now, because the village government had no means to protect it? Would there still be a hunting block in Kakoi (T1), restricting access to important grazing land? In a quasi-experimental impact evaluation the counterfactual is constructed using statistical methods to identify the appropriate comparison group. It is then assumed that outcomes in treatment and control villages would have, in the absence of the WMA, moved along the same trend.

The trends that we see in the control villages are encroachment of village reserved areas because of an increasing scarcity of land for cultivation due to (i) population growth by migration, (ii) the lease of large areas of village land to foreign investors by the central government, (iii) expansion of protected areas. The development in Gidemar (C1) suggests that the alternative might be forceful expansion of protected areas and eviction without compensation; or conversion of grazing land to cultivation land because the opportunity costs were deemed too high by the village government. Kisangaji (C2) experienced the loss of reserved grazing land due to a pressing need for cultivation land and high levels of migration, exacerbated by the loss of a large area of cultivatable land to a large scale investor. Village governments are unable to protect the village reserved areas, since they often employ only a hand full of rangers that stand no chance against groups of sometimes more than 100 illegal settlers (5\_HH518).

Costs related to human-wildlife-conflict are likely to be the same. Benefits from tourism business might be smaller or zero, since villages would then not receive benefit shares, but they might also be substantially higher. Villages that experience a high wildlife density on their lands are not dependent on a WMA membership to be able to benefit from tourism revenues related to wildlife conservation. In fact some of the villages, such as T1 Kakoi/Olasiti (then part of Minjingu village) or Vilima Vitatu (a Burunge village not part of the PIMA sample), had contracts with safari operators before the WMA.

Those revenues went directly to the village, and they did not have to pay shares to either the government or other villages. Now, the same tour operators pay the WMA through the Wildlife Division, and only a fragment of the total revenues arrives in the village where the company actually operates. For instance, Vilima Vitatu (Burunge WMA) received 17-20 million TShs/year from an investor before the WMA (2007-2009) and then received only 3,5 million TShs and 7 million TShs respectively in the following years (HDIC 2010).

Whether or not a positive or negative impact will be seen as a result of the impact evaluation depends on the constructed counterfactual. This is important to keep in mind when interpreting the results of an impact evaluation.

### WHAT KIND OF A POLICY IS THE WMA?

The win-win-narrative presented in the introduction makes a compelling case for combining poverty alleviation and environmental conservation as policy objectives. But there are fine nuances in the way this narrative is understood. Adams *et al.* (2004) present four different value positions: 1) poverty and conservation are separate objectives, 2) poverty alleviation is a critical constraint on conservation, 3) conservation shall not compromise poverty, and 4) poverty alleviation measures are dependent on resource conservation. The following section will discuss some of the evidence of the value position taken by the promoters of WMAs<sup>35</sup>.

The Tanzania Wildlife Management Authority Act (MNRT 2013) states as objective to

“enhance the conservation of wildlife and its habitats outside wildlife protected areas by establishing Wildlife Management Areas for the purposes of effecting community based conservation” (MNRT 2013, § 4c).

This objective indicates that the WMAs support conservation objectives by expanding habitat for wildlife outside of protected areas (e.g. National Parks) and establishing WMAs on village lands surrounding protected areas. Community-based conservation is then only the means to achieve this objective, which recognizes that communities must be involved if conservation outside protected areas is to be successful (Goldman 2003). Yet the prime objective is conservation which “shall not compromise poverty” (value position 3, Adams *et al.* 2004). Evidence showing that communities have no choice but to join the WMA, supports this hypothesis:

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<sup>35</sup> The Tanzanian government, especially the Wildlife Division of MNRT, but also district-level government authorities, conservation NGOs and donors that have supported the implementation of the WMAs (e.g. WWF, AWF, USAID) (Igoe and Croucher 2007, Sachedina 2008, Benjaminsen et al 2013).

Q: "Overall, do you think it's an advantage or disadvantage to be part of the WMA?"

R(5\_HH433): "It's a disadvantage."

Q: "Why did the village decide to become a member then, if it's a disadvantage?"

R(5\_HH433): "It was decree from president that every village should be part of WMA. They came and said it is a pilot but then it was the real WMA and they [the village government] can't get out again."

Above quote, by a respondent who used to be a board member in the WMA and a member in the village assembly, shows that villages do not have the choice to not be part of the WMA, once they have been identified as a village with land of high conservation value. The objective to make that land part of the WMA was pursued with education about the importance of conservation, convincing leaders and villagers with compelling arguments of high prospective tourism revenues and continued access and use of natural resources, and, if necessary, using authority ("decree of the president") (Igoe and Croucher 2007). Particular frustration is caused by the fact that many promises made in the beginning (e.g. continued access to the area) were not kept. Some claimed that officials purposefully lured them into the deal, by promising a lot of things they would not keep, since once signed up, there is no opt-out option (Igoe and Croucher 2007). Minjingu village refuses to be part of the WMA, because villagers did not trust the WMA concept, and felt that they would not benefit from it (Igoe and Croucher 2007). But they never were accepted as a non-member village and as a result, the WMA land that pertains to Minjingu is still claimed and occupied by the WMA, while the village refuses to receive no revenue shares of benefits of any kind (5\_HH433; Bluwstein *et al.* in review).

About a third of the WMA expenses finance patrolling (Juhibu 2014) by rangers who are primarily employed to control poaching and enforce WMA rules. This can be seen as an extension of the fortress conservation approach, in which conservation is enforced with guns and guards (Goldman 2003). Under Wildlife Management Authority Act (MNRT 2013) any offense towards wildlife (hurting or killing) can be punished with a fine of at least 500,000 TSHs and two years imprisonment; compensations for wildlife damage are only possible if arranged for personally by the MNRT Minister (MNRT 2013). According to these rules rangers have to document each case of wildlife being hurt or killed. Helping villagers to prevent wildlife damage, is, at most, a secondary objective. The fact that WMA funds are not allocated to mitigating human-wildlife-conflict, despite the problem being well-known and a concern to many villagers, but for anti-poaching activities, suggests the dominance of the conservation objective (Bluwstein *et al.* in review, Goldman 2003) (value position 1, Adams *et al.* 2004). It also suggests that, even after being in operation for several years, communities have little say in the allocation, use and benefit-reaping of the wildlife resources they are managing (Bluwstein *et al.* in review).

Nevertheless, the Tanzania Wildlife Management Authority Act (MNRT 2013) states the aim to

“integrate wildlife conservation with rural development through the transfer of the management responsibility of Wildlife Management Areas to local communities and ensure that the local communities obtain substantial tangible benefits from wildlife conservation” (MNRT 2013, § 4e),

suggesting that tangible benefits and managerial participation are “critical constraint[s]” on conservation (value position 2, Adams *et al.* 2004). There are two objectives combined in above statement, the first being “transfer of management responsibility” to local communities (MNRT 2013, § 4e). WMAs protect resources of very high value, which presents both an opportunity and a challenge. On the other hand, high value resources are rarely given away uncontested, and thus certain groups can exploit inequalities in prosperity and power to reap those benefits, and retain control over resources (Nelson and Agrawal 2008). Indeed, there seems to be only minimal interest in devolution of power away from the centrally governed Wildlife Division. Hunting concessions, for instance, are a big revenue source to the state, and the fact that they are given out without open call also leaves room for corruption on a large-scale (Benjaminsen and Svarstad 2010, Nelson and Agrawal 2008). Examples of state capture of successful village-level tourism enterprises that delivered tangible benefits to the communities, further suggest that tourism business as a revenue source and direct benefits accruing to communities are contested by the state, rather than being fostered (Sachedina 2008, Nelson 2004, 2007).

The second objective in above statement is “to ensure that the local communities obtain substantial tangible benefits from wildlife conservation” (MNRT 2013, § 4e). The high value of the resources in question implies a high potential for substantial revenue generation is high, and therefore tangible monetary benefits accruing to local people are potentially large. However, while WMAs are expected to generate revenues by attracting international tourism investors, they have little incentive to do so (Kangalawe and Noe 2012). Community-level financial benefits are small, amounting only to a few US dollars annually per capita. Direct financial benefits, through employment, are more substantial but only few benefit from those. That is although Burunge WMA is doing relatively well in attracting tourism investments and generating revenue (WWF 2014). The problems are therefore of structural nature, as reasoned above, and manifested in a revenue collection and sharing system which favours central government actors over local communities. The current policy design allows WMAs to be used as “tools for rent seeking by state officials” (Benjaminsen *et al.* 2013, p. 18) and is difficult to monitor or control because of the inherent intransparency.

These studies suggest that, at most, WMAs represent a conservation initiative which “shall not compromise poverty” (value position 3, Adams *et al.* 2004). Some suggest, that this might have been the case when the idea was first introduced, but has over the years shifted towards a purely conservationist objective, separate from a poverty alleviation objective (value position 1, Adams *et al.* 2004) (e.g. Benjaminsen *et al.* 2013).

## 6. CONCLUSION

The results in this thesis indicate that local livelihoods have been impacted by the establishment of Burunge WMA – negatively, through restrictions in access to common resources, and positively, through village-level revenue flows from the WMA’s tourism income. The counterfactual outcomes suggest that the WMA might prevent other land uses or forms of resource governance that could result in worse impacts. Increasing scarcity of land and natural resources translate into growing opportunity costs of conservation. These need to be compensated by substantial revenues from sustainable use of wildlife resources that are protected by the conservation area, if communities are to benefit from conservation. Anecdotal evidence from the field study suggests that in some cases social tensions may arise over scarce resources, economic displacement may take place and social inequalities may be exacerbated. These may be caused by a variety of factors which might include the WMA, yet further study of these issues is needed. Costs inflicted on villagers by wildlife can threaten food security and draw down on productive physical assets, but no serious attempt of risk mitigation is undertaken by the WMA. Direct benefits from the WMA accrue to only few, and rarely to those who bear the highest cost. Community benefits pass through a complicated system of benefit sharing which favours central authorities over communities, lacks transparency and downward accountability. Whether these are perceived to be a benefit or not by villagers depends on the wildlife-related costs faced by villagers, as these are unlikely to be covered by the benefits.

The win-win-win narrative of conservation (i) increasing wildlife tourism investments which bring (ii) substantial benefits to rural communities by offering alternative livelihoods in sustainable use of wildlife resources, thereby (iii) creating greater incentives for communities to conserve wildlife habitat, and thus protecting biodiversity and reducing degradation of important ecosystems, creates a “worldview [in which] there are no losers, only stakeholders” (Igoe and Croucher 2007, p. 552). The narrative is questionable, yet, further consolidation of evidence is necessary before definitive causal relations can be established. Insights from the field suggest that migration and pastoralist mobility, village-level developments and shocks, as well as impacts on social relations and structures within communities, are topics of further research which could greatly enhance the insights gained from an

impact assessment. In addition, aspects of intra-community and intra-household distribution of costs and benefits could give indications of impacts affecting certain parts of the community more than others, potentially exacerbating existing inequalities. Analyses of impacts need to pay particular attention to non-monetary aspects of well-being, which include social, cultural and political dimensions of conflicts of land, access and rights to resources.

Rural livelihood's dependence on natural resources suggest that by protecting natural resources through conservation, and ensuring the continued flow of ecosystem services, rural communities' well-being will be enhanced. Yet the design and implementation of the conservation intervention determines whether natural resources are protected to the benefit of the people depending on them, or at their cost.

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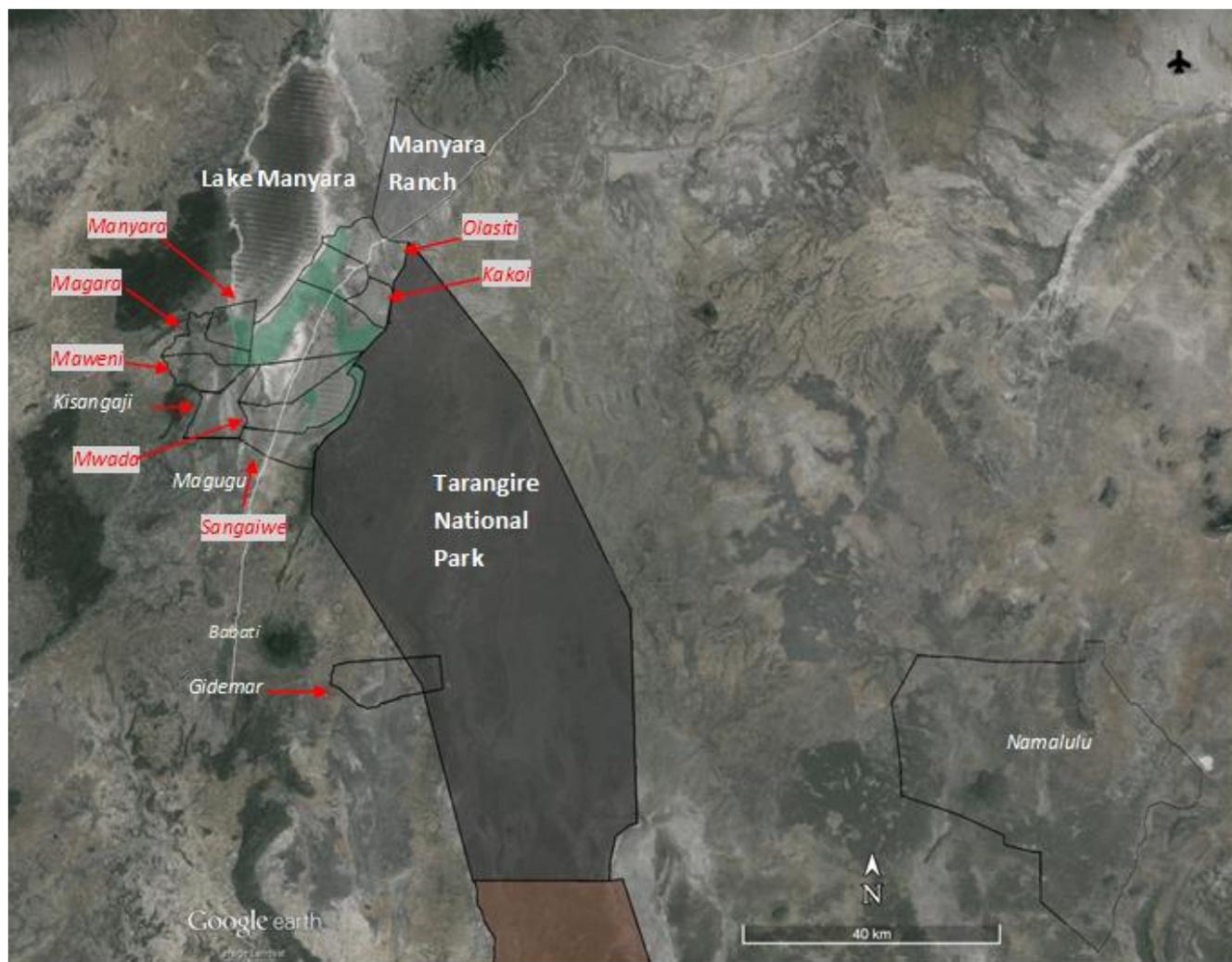
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## ANNEX

## I. MAPS



**Figure 17: Map of sample villages. Treatment villages are labelled in red, control villages are labelled in white. The green area indicates the Burunge WMA area. Village borders are estimates, based on georeferenced village maps, fieldwork, GIS shapefiles from NBS, WWF, TANAPA. Source: Bluwstein (2015).**



**Figure 18: Gidemar village map.** Estimated Gidemar village boundary and Tarangire National Park (grey). Dots are the surveyed PIMA households. Based on village map in village office manually georeferenced with Google Earth. The overlap is the disputed area in which households have been evicted and expropriated. Source: Bluwstein (2015).

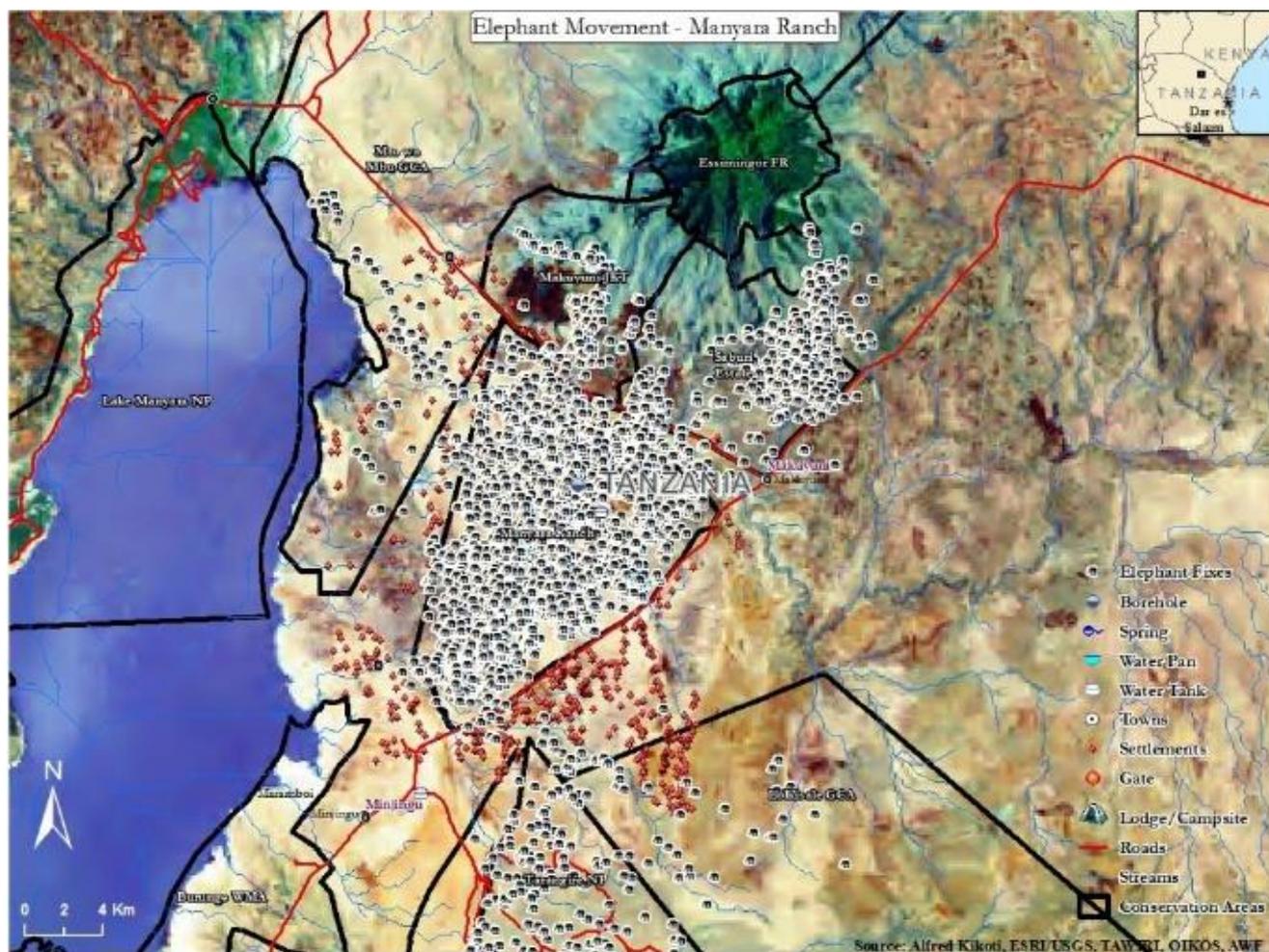


Figure 19: Elephant density in the Kwakuchinja wildlife corridor. The corridor is located between the protected areas Tarangire National Park and Manyara Ranch. Black-white dots show where elephants were found (GPS-tracked), red dots show settlements and the black line shows the borders of the conservation areas. Source: Kikoti (n.d., p. 10)

## II. VILLAGE DESCRIPTIONS

The village descriptions are meant to briefly introduce each of the studied villages and explain some local contextual factors. ‘Figure 17: Map of sample villages.’ in Annex I shows the location of the studied villages.

### T1: KAKOI/OLASITI (WMA/FIELD STUDY SITE)

Kakoi and Olasiti villages used to be sub-villages of Minjingu village, but split and became independent villages in 2010. They are located in an important wildlife corridor, connecting several important conservation areas. With Tarangire National Park to the east, Manyara Ranch to the North and Lake Manyara National Park to the west, they are surrounded by protected areas. The Arusha-Dodoma tarmac road passes through the village of Olasiti, and many tourists in safari jeeps pass the village every day on their way to the main entrance of Tarangire National Park not far from Kakoi village.

Most farmers cultivate maize, sesame, water melons, pulses and legumes. Apart from farming, livestock keeping is an important part of the livelihoods. There are also some small business owners in both villages, running local shops or eateries. The main challenge in the village is wildlife damage, whether to crops, livestock or humans. Access to clean water for humans and livestock is a big problem, along with drought that destroys crops and dries up the few water sources there are. Another challenge is lack of grazing land. When the villages split in 2010, all reserved grazing area remained with Minjingu when Kakoi and Olasiti became independent (Bluwstein *et al.* in review). In addition, the area formerly used for dry season grazing by livestock herders is no longer accessible after the area, pertaining to a hunting block, has been leased by the WMA to an investor who uses the area all year round<sup>36</sup> (Bluwstein *et al.* in review).

The general attitude among villagers towards wildlife protection and environmental conservation is critical, since they are facing reduced access to essential resources (land, grazing land, firewood, water) as well as repeated shocks (wildlife attacks and crop raids).

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<sup>36</sup> In some hunting blocks grazing is permitted outside hunting season, when hunting operators do not use the area.

### T 2: MAGARA/MANYARA/MAWENI (WMA/FIELD STUDY SITE)

Magara, Manyara and Maweni villages are located in the west of the WMA, with Lake Manyara to the North and separated from Tarangire National Park by Sangaiwe, Mwada and Vilima Vitatu villages. The villages are located at the foot of a mountain, which provides them with fresh water but increasingly, due to increased deforestation in the catchment area, also leads to floods in years of good rainfall. Manyara is the village closest to Lake Burunge, further south lays Magara, followed by Maweni, which also border Kisangaji, the control village. The main economic activities are agriculture and livestock keeping. Recent road works have improved access for farmers to the Magugu market which has encouraged cash crop production, especially of rice.

Villagers live on small plots of land in closely knit neighbourhoods and have their farms elsewhere. Land scarcity is particularly dire in the area, also because a large chunk of the village land has been leased to an agricultural investor by the district government without consent of the village government (6\_HH518). The village has problems with illegal encroachment of the village forest reserve and the WMA land, for which it faces charges by the WMA and is required to pay fines. Between 2009 and 2011 13 million Tanzanian Shillings (TShs) (6,000 USD) of allocated benefit shares were withheld by the WMA (Sulle *et al.* 2011). The village lacks the power and resources to enforce law and protect its protected areas.

### T 3: MWADA/NGOLEI (WMA)

Mwada and Ngolei villages are located to the west of Tarangire National Park and the south of Lake Manyara National Park, encompassing Lake Burunge. The main tarmac road connecting Arusha and Dodoma leads through Mwada, where the WMA office is located. The main economic activity is farming, and the most important cash crops are cotton and millet. Livestock keeping is another important livelihood, and some people additionally engage in small businesses and fishery. The main challenges are lack of clean water and food insecurity, due to drought and crop damage by wildlife, as well as scarcity of land for cultivation and grazing, due to increases in population (migration). Crop damage by wildlife is mostly experienced by farmers who have land close to the WMA. A few respondents to the PIMA survey were critical of the WMA because they suspected that their village leaders were misusing the WMA money.

#### T 4: SANGAIWE (WMA)

Sangaiwe is located between Tarangire NATIONAL PARK and the Arusha-Dodoma tarmac road. The main economic activities are crop cultivation, especially cotton, sunflower and sesame. Sangaiwe has an area for grazing, though as human and livestock population increase, both grazing and farming land is becoming scarcer. Therefore some graze inside the WMA illegally and risk being fined when caught. Another main challenge is access to clean water, and drought. Crop damage is not as large of a problem as in other parts of the WMA. There is a conflict with Tarangire National Park over the park's boundary. Sangaiwe has one tented lodge in the WMA area, run by an operator who has a good relationship to Sangaiwe villagers since he employed some villagers and participates in important village events.

#### C1: GIDEMAR (CONTROL/FIELD STUDY SITE)

Gidemar is divided in three sub-villages of which one borders Tarangire National Park. The main economic activity is agriculture, and there is a group of around 200 homesteads of rich herders with large numbers of cattle, most of them of the Mangati tribe (30\_HH41). Important crops are sunflower, beans and maize. The main challenges are food insecurity, due to drought, lack of farmland, and in some cases wildlife damage. Some households close to the Tarangire National Park also face problems with predators attacking their livestock. Other challenges are water scarcity and insufficient access to health services and markets for crops and livestock, mainly due to a very narrow and poor road which becomes unsurpassable in the wet season.

Additionally, village leaders are blamed to be corrupt, allocating land to the highest bidder (30\_HH41). Some of those land buyers come from as far as Arusha to establish large farms of more than 100 acres. There is very little land allocated for the poor. In 2012 all grazing land has been made farm land by decree of the village leaders, ignoring the needs of villagers that are herders and dependent on the village grazing land. An ongoing border conflict between Gidemar and Tarangire National Park has caused many evictions and is a big concern for villagers in Gidemar. 'Figure 18: Gidemar village map. in Annex I shows the overlapping area which is claimed as village land by Gidemar but now annexed into Tarangire National Park.

### C 2: KISANGAJI (CONTROL/FIELD STUDY SITE)

Kisangaji village is located next to Maweni village, which is in the WMA village sample, and connected to Magugu and the tarmac road by a long and rough road that becomes unsurpassable in the wet season. The climate is favourable in Kisangaji, and many farmers plant rice and legumes which are valuable cash crops that can be sold at the market in Magugu. There now is no grazing land left in Kisangaji village, and neither is there any vacant land for cultivation. That means that in order to expand agricultural production, villagers have to either rent land or buy from other landowners, which is expensive. Access to firewood, the most important energy source, has dramatically worsened because of land being cleared for cultivation. There is no more vacant land where natural resources could be collected, so for collection of firewood the villagers need to get permission from a landowner to collect firewood on his land.

Lack of rainfall is also a problem in Kisangaji, both for cultivation and for water supply. Drinking water supply, and irrigation water in the dry season, is scarce. Some respondents blamed the village leaders for poor leadership because of the poor public services (health and education services, water supply, and the poor road condition).

### C 3: NAMALULU (CONTROL)

Namalulu is located further away from Burunge WMA than the other three control villages, in Simanjiro district. It is a large village with seven subvillages and large wealth differences. Some large land owners own up to 1000 acres and have cattle herds of 1000 cattle and more. Similar to Gidemar, also in Namalulu village leaders are reported to receive large bribes for giving away village land to rich farmers from outside, who turn it into farmland. Poor people are allocated only very little land, and often work as casual labourers on the rich people's farms. Since the rich people pay high prices for land, some poor people also sell their land to them. Most people belong to the Maasai tribe and are agro-pastoralists, only few run small businesses. The main crops cultivated are maize, beans and sunflower.

Persistent drought and environmental degradation due to deforestation in the catchment area has dried up natural springs, so that water supply in the village is a huge problem for both humans and livestock. The only water source is a borehole drilled near the natural springs and which is privately owned and sells the water at a high price. Furthermore poor village

leadership and poor public services, especially infrastructure, primary education and health services are posing major challenges to villagers.

#### C 4: MAGUGU (CONTROL)

Magugu is located by the Arusha-Dodoma tarmac road and is not far from the district capital Babati. Its' market place attracts many farmers from surrounding villages who come to process their crops, especially rice, and sell it at a higher price to traders from larger cities who come to buy at the Magugu market.

The main challenges are land scarcity and resulting conflicts among villagers and with the village councils about boundaries. Many lack capital for buying agricultural inputs or renting land, and water for irrigation is also a constraint. Also, as in almost all villages, lack of rainfall is a major problem for crop cultivation and results in food insecurity especially for poor people without livestock or access to improved inputs.

### III. LIVESTOCK UNITS CONVERSION

The livestock units reported in the PIMA survey questionnaire were converted into Tropical Livestock Units (TLU). One TLU is equivalent to one mature cow of 250 kg in the US or sub-Saharan Africa (ILRI 2011). The following conversion factors were used:

Livestock class	Weight (kg)	TLU
Bulls (> 3yrs)	320	1,2
Cow	250	1,0
Calf	25,5	0,405
Goat	25	0,2
Kids	10	0,08
Sheep	25	0,2
Lamb	10	0,08
Donkey	175	0,8
Pig	50	0,3
Piglet	20	0,12

**Table 15: Conversion factors to Tropical Livestock Units. Source: Njuki *et al.*(2011)**

Valuation of livestock losses to predators in the PIMA survey were undertaken using implicit livestock prices in Hariohay (2013).

Animal type	cattle	goats	donkey	sheep	other	TOTAL	Nb of hh	Ave. loss/hh
Hariohay (2013) Nb lost	50	192	17	158	19	436		
Total value lost	9375	6000	1275	3950	71.25	20671.25	195	106.01
<b>Value/animal</b>	<b>187.5</b>	<b>31.25</b>	<b>75</b>	<b>25</b>	<b>3.75</b>			
PIMA Kakoi/Olasiti nb lost	10.4	150	3	0	0	163.4		
Total value lost	1950	4687.5	225			6862.5	32	214.45

**Table 16: Livestock unit valuation.** Based on the number of livestock units lost and total value of that loss in Hariohay (2013), the implicit value per animal was calculated and applied to the number of livestock units lost reported in PIMA. All values are in US dollars.

#### IV. ADULT EQUIVALENT UNITS CONVERSION

Adult-equivalent units for each household were calculated based on the caloric requirements differences by age and gender and a reference value of 2,550 kcal for adults.

	AEU
Children (0-3)	0.44
Children (4-10)	0.75
Men (11-24)	1.11
Men (25-50)	1.14
Men (50+)	0.9
Women (11-24)	0.86
Women (25-50)	0.86
Women(50+)	0.75

**Table 17: AEU conversion factors.** Source: Moreira Claro *et al.* (2010)

#### V. INTERVIEW OVERVIEW

Date	Index	Village	Village ID	HHid	HH head ?	WR (1-y, 0-n)	Categories	Categories	Categories	WMA impact?
10-06-2015	T1	Kakoi	5	159	1	1	Wildlife damage	Drought	Lack of grazing land	1
10-06-2015	T1	Kakoi	5	70	1	1	Drought	Lack of grazing land	Wildlife damage	1
24-06-2015	T1	Kakoi	5	Interview1	-	0	Land conflict - WMA investor			1
10-06-2015	T1	Kakoi	5	25	1	1	Wildlife damage	Lack of grazing land		1
24-06-2015	T1	Kakoi	5	236	1	1	Wildlife damage	Lack of access to NR		1
24-06-2015	T1	Kakoi	5	274	1	1	Wildlife damage	Water		1
20-06-2015	T1	Olasiti	5	433	1	1	Wildlife damage	Drought	Access to NR	1

20-06-2015	T1	Olasiti	5	514	1	1	Drought	Pests	Access to NR	0
20-06-2015	T1	Olasiti	5	512	1	1	Wildlife damage	Drought		0
22-06-2015	T1	Olasiti	5	616	1	1	Wildlife damage			0
22-06-2015	T1	Olasiti	5	654	1	1	Wildlife damage	Access to NR	Lack of grazing land	1
23-06-2015	T1	Olasiti	5	300	1	1	Livestock disease	Drought	Wildlife damage	0
23-06-2015	T1	Olasiti	5	370	1	1	Drought	Livestock disease	Access to NR	0
23-06-2015	T1	Olasiti	5	408	1	1	Drought	Lack of grazing land	Access to NR	0
25-06-2015	T1	Kakoi	5	Interv iew2	-	0	Land conflict - WMA investor	-	Lack of grazing land	1
09-06-2015	T2	Manyara	6	1007	1	1	Farmer - pastoralist conflicts	Access to NR	Drought	1
09-06-2015	T2	Manyara	6	681	1	1	Lack of agric. Inputs	Drought		1
<del>09-06-2015</del>	T3	<del>Manyara</del>	6	<del>528</del>	0	0	-	-	-	-
05-06-2015	T2	Magara	6	220	0	1	Pests	Lack of agric. Inputs		1
05-06-2015	T2	Magara	6	420	0	1	Drought			0
05-06-2015	T2	Magara	6	439	1	1	Infrastructure (road + elec)	Lack of agric. Inputs		1
05-06-2015	T2	Magara	6	518	1	1	Drought	Pests	Land conflicts	1
06-06-2015	T2	Maweni	6	1208	1	1	Pests	Floods		1
06-06-2015	T2	Maweni	6	1373	0	1	Drought	Access to NR		0
29-06-2015	C2	Kisangaji	27	234	1	1	Market	Livestock disease		.
29-06-2015	C2	Kisangaji	27	314	1	1	Farmer - pastoralist conflicts	Irrigation		.
29-06-2015	C2	Kisangaji	27	327	1	1	Lack of grazing land			.
<del>30-06-2015</del>	C3	<del>Kisangaji</del>	<del>27</del>	<del>XX</del>		1				-
30-06-2015	C2	Kisangaji	27	362	1	1	Drought	Lack of agric. Inputs	Land conflicts	1
30-06-2015	C2	Kisangaji	27	401	1	1	Drought/Floods			.
30-06-2015	C2	Kisangaji	27	413	1	1	Infrastructure (road)			.
30-06-2015	C2	Kisangaji	27	448	1	1	Drought	Lack of grazing land	Farmer- pastoralist conflict	.
01-07-2015	C2	Kisangaji	27	76	1	1	Infrastructure (road)	Market	Access to NR	.
29-06-2015	C2	Kisangaji	27	115	1	1	Drought	Access to NR		.

2015											
01-07-2015	C2	Kisangaji	27	122	1	0	Drought		Agric. Inputs	Access to NR	.
18-06-2015	C1	Gidemar	30	16	1	0	TNP conflict				.
16-06-2015	C1	Gidemar	30	25	1	0	TNP conflict				.
17-06-2015	C1	Gidemar	30	143	1	1	Drought				.
18-06-2015	C1	Gidemar	30	38	1	1	Drought		Pests	Lack of agric. Inputs	.
16-06-2015	C1	Gidemar	30	74	1	0	Lack of agric. Inputs		Drought		.
16-06-2015	C1	Gidemar	30	89	1	1	Lack of grazing land		Market		.
16-06-2015	C1	Gidemar	30	Interv iew1	-	0	TNP conflict				.
17-06-2015	C1	Gidemar	30	41	1	0	TNP conflict			Lack of grazing land	.
17-06-2015	C1	Gidemar	30	Interv iew2	-	0	TNP conflict				.

## VI. INTERVIEW GUIDE

	HHid
	Date
	Village_id
	Village
	Subvillage
	Respondent (1- hh head, 2 - wife)
	WR2014
	WR2007
1	What are the main (everyday) challenges are for people living in this village (in terms of their economic activities)?
2	In your household specifically, what are the main (everyday) challenges?
3	Recall 2007?
4	What are the main changes in your households livelihood between now and 2007?
5	What have been the main changes in terms of the village's economic situation between 2007 and now?
6	Wealth ranking exercise: I would like to understand your perception of the different levels of wealth in this village. I will ask you to define four ranks of wealth (very poor – rich), and to explain what, in your opinion makes a household poor or rich.
6.1.	Very poor 2015
6.2.	Very poor 2007
7.1.	Poor 2015
7.2.	Poor 2007
8.1.	Normal 2015
8.2.	Normal 2007
9.1.	Rich 2015
9.2.	Rich 2007
10.1.	If you think about your household in comparison to the other households in the village, how would you classify yourself (very poor/poor/normal/rich)?
10.2.	In 2007?
11.1.1.	[IF 10. = wealthier] Why do you think your household has become wealthier? What factors contributed most to causing the improved economic situation?
11.1.2.	Which (major) assets did you accumulate along the way?
11.1.3.	Why do you think you have been more successful than other households?
11.2.1.	[IF 10. = poorer] Why do you think your household has become poorer? What factors contributed most to causing the worsening economic situation?
11.2.2.	Which (major) assets did you lose along the way?

- 
- 11.3.1.** [IF 10. = no change] Why do you think your household has been successful in not becoming poorer
- 
- 11.3.2.** Why do you think your household has not been successful in getting wealthier?
- 
- 11.3.3.** What are the most important factors that prevented you from becoming a wealthier household?
- 
- 11.3.4.** What did other households, which did get wealthier, do different?
- 
- 12** **[All]** If you would have some extra cash this year, what would be the first investment(s) you would make? Why?
- 
- 13** Have you noticed any changes in your environment over the past 10 years?
- 
- 14** Do you know about the WMA (Juhibu)? [WMA only]
- 
- 15** Do you feel your (economic) situation has changed in any way because of the establishment of the WMA (Juhibu)? How/Why? [WMA only]
- 
- 16** Do you feel that the WMA (Juhibu) has contributed significantly to village development? Why/Why not? [WMA only]
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- 17** Do you know what the idea/concept/purpose of having a WMA is?