



Developing a framework to define cost-effective conservation strategies in human-dominated landscapes

Noelia Zafra-Calvo^a, Volker Mauerhofer^a

^a United Nations University - Institute of Advanced Studies (UNU-IAS)
Corresponding author: Noelia Zafra-Calvo; zafra.calvo@ias.unu.edu

Abstract

We present a conceptual framework based on property rights regimes and negotiation situations about compensation payments to analyse the cost-effectiveness of strategies for off-reserve conservation actions in human-dominated landscapes. We explore the costs of implementation, monitoring and enforcement, and decision making of conservation actions based on the bundles of rights over natural resources of different stakeholders and the distribution of rights in negotiation situations relating to compensation. We demonstrate the theoretical utility of the framework by applying it on a sample of 275 papers from the academic literature dealing with property rights. We found that our framework is able to explain the negotiation situation and to define rights of compensation for existing situations about conservation and natural resource management worldwide. We also practically test it in two wildlife corridors in African countries: Mozambique and Tanzania. Our results for applying the conceptual framework to those countries suggest that the framework is also practical applicable. It was useful to identify bundles of property rights for different stakeholders and it helped to designate compensation right holders in negotiation situations. The new framework contributes to better delineate cost-effectiveness strategies for conservation in human-dominated areas in those African countries.

Keywords: property rights; negotiation situation; Africa; conservation strategies

1. Introduction

In order to achieve conservation goals, it is important to develop strategies for managing conservation at landscape scale (Margules and Pressey, 2000). Off-reserve conservation actions and approaches have been recognized worldwide to support existing protected area networks to achieve biodiversity conservation and sustainable natural resource management (Wilson, et al., 2007). It is necessary to explore the less costly ways to achieve a conservation goal, both within protected areas but also in wildlife corridors and areas outside reserves, as funding for conservation is limited.

Most of the off-reserve conservation actions take place in human-dominated areas where the cost-effectiveness of conservation actions is strongly related to property regimes over natural resources. It is necessary to recognize how different strategies for nature conservation perform under different property-rights regimes of natural resources and negotiation situation, to make decisions about which combinations are the most cost-effective. A natural resource property regime as described in Bromley (1991) is an explicit - or implicit - structure of rights and duties characterizing the relationship of individuals to one another but also the arrangements of those individuals establish with individuals and institutions outside of the group, with respect to that particular resource. He considers four main resources regimes: (a) state property regimes, (b) private property regimes, (c) common property regimes and (d) non-property regimes - open access. Different types of property regimes offer distinct incentives to manage and conserve natural resources and they also involve different costs to achieve conservation.

Wätzold and Schwerdtner (2005) cover the aspects of the cost-effectiveness of the conservation actions distinguishing between three categories of costs: (a) implementation, (b) monitoring and enforcement, and (c) decision making costs. The implementation costs refer to the costs of the conservation actions that have to be performed to attain the aim of conservation. Monitoring and enforcement costs refer to costs of supervision and punishment under law regulations. Decision-making costs include the costs of acquiring the information necessary to make appropriate decisions, and coordinating decision-making if different property right holders are involved. They include the resources spent on meetings, negotiation and resolving conflicts.

The identification of the holders of the rights over the natural resources and the rights to compensation in a negotiation situation on conservation is essential to analyse cost-effectiveness of conservation actions. Because it can help to envisage the likeliness of a compensation solution and the relative extent of the financial effort involved in comparison to the other negotiation situations described. Therefore, the aim of this research is to create as well as theoretically and practically test a more comprehensive framework for assessing the most cost-effective strategies for off-reserve conservation actions in human-dominated landscapes in connection with negotiation situations as well as related bundles of property rights.

We describe two conceptual approaches on property rights and negotiation situations which provide the intellectual basis for our new framework. Then we show how we combine these two approaches in order to create the new framework and we explain the advantages of the new framework including its application potential. The new framework is afterwards theoretically tested by applying it on a sample of 275 papers from the academic literature dealing with property rights in the sense of Schlager and Ostrom (1992). In the following, we practically test the framework in two case studies in African wildlife corridors: Quirimbas Niassa Wildlife Corridor – Mozambique -, and Selous Niassa Wildlife Protection Corridor - Tanzania. Finally we will provide our conclusions on the results of the theoretical and practical test of the new framework.

2. Property rights and negotiation situations: two conceptual approaches

Schlager and Ostrom (1992) present a more detailed approach to explain resource management in regimes usually categorized as common property, describing different situations where multiple stakeholders have diverse bundle of rights over a natural resource. By understanding how property regimes influence resource management and conservation, as well as disentangling the bundle of rights on property regimes, we can examine the characteristic of the natural resource management systems and the resource users and value in better detail the costs.

Schlager and Ostrom (1992) distinguish five different property rights operating at two decision-making levels: operational and collective-choice. The bundle of rights at operational level includes the permission to access in the sense of the right to enter a defined physical property and the permission to withdraw in the sense of the right to obtain the products of a resource. In the case of collective-choice level the bundle of rights includes the permission to manage - the right to regulate internal use patterns and transform the resource by making improvements -, to exclude - the right to determine who will have access rights, and how those rights may be used-, and to alienate - the right to sell or lease - a resource.

Furthermore, rights holders can be grouped into different categories based on the bundle of rights they hold. Authorised users have the rights of access and withdrawal but lack the authority to devise the rules of management or to enforce the exclusion of others. Claimants possess rights of management in addition to the rights of authorised users. Though they devise management rules, claimants have no authority in limiting the access and withdrawal rights of users. Proprietors authorise who may access a resource and how resources may be utilised. They do not, however, have full alienation rights. Owners retain the authority to exploit and transfer all other rights such as as sell or lease the right. These authors also emphasize that different bundles of property rights, whether *de facto* or *de jure*, influence incentives for individuals, the types of actions they take, and the outcomes they achieve.

Beside the property rights regime also the negotiation situation is crucial as it reflects the distribution of different interests over natural resources in connection with rights. Furthermore it determines the formal power distribution from the beginning that may influence the outcome of negotiations about payments for any

environment-related rights. Mauerhofer and Nyacuru (*in preparation*) based on Rothgang (1997) distinguish between five negotiation situations in conservation, depending on the distributions of rights and the overall legal structure considering that stakeholders do not have a intrinsic motivation to preserve biodiversity or natural resources.

In the first category, conservationists have property rights but they have to accept compensation - if it is offered - for non-conservationists to use natural resources. This situation happens for instance when a conservationist NGO buy land to declare a protected area but they have to accept later the establishment of an infrastructure on that land (such as an hydropower plant or a motorway) and a compensation potentially offered for it. The second situation occurs when non-conservationists have to accept compensation from conservationists - if offered - for restriction in the use of natural resources. For example, when a new protected area or environmental legislation affects a land or natural resource and holders of rights need to accept compensation if it is offered for restriction in the use of natural resources. Under the third situation, conservationists have the rights over natural resources and they can decide if they accept compensation - or not - to use natural resources. This is for example the case where Government decides to allocate hunting permits inside a reserve and receiving the adequate compensation - sometimes as a way to increase the revenues for develop conservation actions into the reserve. In the fourth situation non-conservationists are the ones who may accept compensation - or not. In that case restrictions on use are only possible upon acceptance of compensations. It is the case for example of a Reducing Emissions from Deforestation and Forest Degradation (REDD+) strategy. Holders of rights over the forest can accept compensation (payments) to avoid forest degradation or deforestation; or not. Finally, Mauerhofer and Nyacuru (*in preparation*) consider a fifth category where certain uses of the environment are not allowed and no compensation is necessary - rule of inalienability. The first and second case include in the negotiation situation the possibility to restrict partly or fully the rights over the use of natural resources and the compensation involved , while the third and the fourth case determine only the possibility of a voluntary exchange. Furthermore, each of these cases can base either on a formalized legal regime based on laws issued according to institutionalized procedures by the competent legislative body, or the cases can have their origin in informal (customary) law regimes. All the five cases can also reflect a combination of these two different legal regimes.

3. Towards a systematic framework to assess cost-effective conservation strategies

We present a framework that incorporates bundles of property rights as described by Schlager and Ostrom (1992) into negotiation situations as described by Mauerhofer and Nyacuru (*in preparation*) to distinguish sixteen different situations to better understand negotiation positions when a form of compensation can be negotiated with the holders of rights over natural resources (Table 1). The last combination - rule of inalienability - actually does not provide any space for negotiation and we do not consider it anymore in the new framework. Our framework describes in each case a negotiation situation where a wide range of stakeholders could be considered conservationists as well as non-conservationists depending on different interests over natural resources, and where the right to receive compensation is disentangled into the bundle of rights of each stakeholder over the resource. It provides a theoretical and conceptual basis to better analyze the costs and assess cost-effectiveness of the conservation actions.

The sole opportunity or the definite duty to accept a compensation for the partial or full restriction of a right can correspond in negotiations in different ways with the sole opportunity or duty to offer such a compensation. The whole negotiation situation is also influenced by which type of right is on stake at all. The explicit expression of these relationships often predetermines the costs of implementation, monitoring and enforcement, and decision-making regarding a conservation action.

In the following we show results of the theoretical application of the new framework on a sample of 275 papers from the academic literature dealing with property rights in the sense of Schlager and Ostrom (1992). The sample was gained by a survey in the Web of Knowledge and Scopus (7th Jan 2013 WoK and 10th Jan 2013 Scopus) where we extracted all papers that cite Schlager and Ostrom (1992) by that date. We show for each of the sixteen negotiation situations at least one concrete example which we found within our overall sample of 275 papers except for one of them (Table 1).

Negotiation situations, Mauerhofer and Nyacuru (<i>in preparation</i>)	Bundle of rights, Schlager and Ostrom (1992)	Examples for references in the literature
Conservationists has to accept compensation	Owner	Quinn, et al. (2010)
	Proprietor	Bottazzi and Dao (2013)
	Claimant	Nagendra and Gokhale (2008)
	Authorised user	Lescuyer, et al. (2012)
Non-conservationist has to accept compensation	Owner	Agarwala, et al. (2010)
	Proprietor	Ting, et al., (2011) and Barsimantov, et al., (2011)
	Claimant	Cinner, et al., (2012)
	Authorised user	Nagendra and Gokhale (2008)
Conservationists may accept compensation	Owner	Nielsen and Treue (2012)
	Proprietor	Abubakari (2012)
	Claimant	-
	Authorised user	Gomez-Marquez, Alejano and García-Bastante (2011)
Non-conservationists may accept compensation	Owner	Persha and Blomley (2009)
	Proprietor	Thanh and Sikor (2006)
	Claimant	Ahmed, et al. (2008)
	Authorised user	Mwangi (2007)

Table 1 - Systematic framework to assess cost-effective conservation strategies

In the following we describe more in detail how these cases found are fitting in our framework.

3.1. Conservationists have to accept compensation

Thus, we found that Quinn, et al. (2010) describe a situation where recreational groups in UK uplands have the right of access over natural resources, as a typical negotiation situation when conservationists – in this case conservation bodies - have ownership rights of the land but they have to accept compensation - if offered – for access or use to the natural resources. Recreational groups have access rights to land as authorized users - they are described as authorized entrants. The costs of the conservation actions in this situation differ to the costs if recreational groups have not access rights to the protected land. Implementation costs increase when conservation bodies need to establish fences, recreational infrastructures, and especially monitoring and enforcement costs rise when it is necessary to control potential damages of wildlife or ecosystems done by general public . Recreational groups can cause costs to conservationists; conservationists even as owner of the resource have to accept compensation.

In Pilon Lajas Biosphere Reserve and Indigenous Territory, Bolivia (Bottazzi and Dao, 2013) the State has the ownership rights of the territory but local communities are the proprietors of the land and natural resources. In that case local communities are conservationists that prefer to preserve the forest around the reserve but they have to accept compensation - if offered - for new migrant settlements that arise in the buffer zone of the reserve. These new settlements contribute to higher deforestation due to different management practices of the forest by those new communities. The cost for original communities of losing forest and habitats is high but they can not avoid the new settlements or new communities using the forest.

In Indian sacred forests (*kan*), local communities are considered claimants. They have to accept the State, as holder of ownership rights, to provide leasing of extraction rights to local contractors and they also have to accept - if offered - compensation (Nagendra and Gokhale, 2008).

Lescuyer et al. (2012) illustrate a situation where local communities as authorized users of the forest have to accept compensation of logging companies. The costs of enforcement and decision-making change in those

cases where arrangements need to be made with multiple stakeholders. The logging concession is mainly an agreement between the State, who has the ownership rights of the forest, and a private operator. Local communities as authorized users, or even claimants under customary laws, have to accept the compensation offered by the logging operator.

3.2. Non-conservationists have to accept compensation

Another negotiation situation occurs on the opposite case, when non-conservationists hold the rights over natural resources but have to accept compensation for the execution of conservation activities by other stakeholders. Agarwala et al. (2010) show a situation when farmers have to accept compensation for the damage that wolves produce in their livestock in Wisconsin, USA. They are private owners of the land and livestock but the legal framework provides conservationists rights to implementation of conservation measures and the farmers have to accept these measures.

In the Baishuijiang National Natural Reserve in China, local communities are proprietors of the forest but they have to accept compensation that is offered for forest resource protection because they are within a legally protected area (Ting et al., 2011). Local communities living within the Maya Biosphere Reserve in Guatemala are also the proprietors of the land and natural resources and they depend on forest for their livelihoods, but they have to conserve the forest and accept compensation if offered by the State for the establishment of the Biosphere Reserve (Barsimantov, et al., 2011).

Fishermen of Madagascar have to accept compensation (if offered) for marine preservation, as they have management rights – they are claimants - in marine parks (Cinner, et al., 2012).

In Nepal local communities as authorized users have to accept compensation to reduce the withdrawal of the forest in buffer zones of protected areas (Nagendra and Gokhale, 2008).

In last situations described the stakeholders have to accept compensation, while in the following cases conservationists and non-conservationist may accept compensation by voluntary agreements. The costs of monitoring, enforcement and decision making to develop conservation activities where voluntary agreements are involved may vary in different ways comparing with the cases where no voluntary agreements are involved. On the other hand, the cost of decision making is important in those situations which imply a long negotiation process until reach a voluntary agreement. The extent of the negotiation process in these cases depends on the property regime and institutional structures of governance of who hold rights over the natural resource (Mburu, Birner and Zeller, 2003).

3.3. Conservationist may accept compensation

When the government of Tanzania, as holder of ownership rights over natural resources, agrees on a community forest based management with local communities in a protected area (Nielsen and Treue, 2012), it is voluntarily accepting loss of rights over forest resources to preserve endangered species. In this case it is required that local communities protect the forest against illegal hunting in community forest based management agreements in the country. This situation shows a case where the holder of property rights may accept compensation - or not - in the negotiation process.

In Ghana, local communities hold exclusion rights over wildlife as proprietors. They may accept compensation establishing an agreement with the government to create a protected area or with a conservation body to create a wildlife sanctuary (Abubakari, 2012). In this example, they reject agreements with external stakeholders but hippos, monkeys and crocodiles are protected without any compensation because they protect animals by cultural or spiritual reasons.

In Spain, pastoralist hold authorized user rights over traditional transhumance routes (Gomez-Marquez, Alejano and García-Bastante, 2011). These authors indicate that, when a private mining operator is licensed to open an exploitation where routes pass through, pastoralists may accept compensation for relocation of

water resources, routes, etc... As a result when pastoralists do not accept compensation the private operator would not be allowed to extend the mining exploitation.

No example could be found in the literature to fulfil the situation where claimants have rights over the natural resources and where they may accept compensation. Cases where local communities hold claimant rights over a forest that they plan to preserve, for example, and they actually can decide if accept compensation from a logging company to exploit that forest, would fit into that situation.

3.4. Non-conservationist may accept compensation

Persha and Blomley (2009) illustrate a situation where non-conservationists – a forestry cooperative -, are the owner of a forest in Tanzania. The cooperative may decide if it accepts compensation, for example from a REDD+ program, to conserve the forest.

Thanh and Sikor (2006) also describe local communities in Vietnam as proprietors of a forest who can decide whether to transform it in agricultural land or instead to accept compensation in order to avoid deforestation. It is also important for the analysis of the cost-effectiveness of a conservation strategy to know the costs as well as the willingness to accept compensation or pay to conserve a natural resource.

Ahmed, et al. (2008) find that local communities in the Hakaluki Haor wetland in Bangladesh may have willingness to participate in wetland conservation activities. They hold the right to manage the natural resources of the wetland as claimants and they may accept conservation practices under monetary or non-monetary compensation.

Pastoralist in Kenya's Maasailand who are authorized users may accept aggregate their grazing land via a voluntary agreement with other pastoralists to improve the livestock production and sustainability of the traditional practices (Mwangi, 2007).

4. *Practical application of the framework – Greater Ruvuma Landscape*

All these literature examples in the previous subchapter confirm the theoretical applicability of the framework. Now we test applicability on two practical case studies related to two wildlife corridors in Mozambique and Tanzania.

4.1. Region and local communities

Both wildlife corridors are situated within the Greater Ruvuma Landscape, an extensive transfrontier area along the Ruvuma River that includes parts of four ecoregions: the Southern Inhambane-Zanzibar Coastal Forest, East African Mangroves, Eastern Africa Marine Ecoregion, and Eastern Miombo Woodlands and Savannahs (Olson and Dinerstein, 2002). The landscape extends on Southern Tanzania - Ruvuma, Mtwara, Lindi, Morogoro and Pwani Provinces - and Northern Mozambique - Niassa and Cabo Delgado Provinces.

There are three main protected areas in the landscape, namely the Quirimbas National Park¹ (QNP), Niassa Reserve² (NR) and Selous Game Reserve³ (SGR). Two wildlife protection corridors have been already established. One of them was created between Niassa Reserve and Selous Game Reserve, Selous Niassa Wildlife Protection Corridor (SNWPC). It has 6,000 km² and it is located in Ruvuma Province, Tanzania. And the second one lays between Quirimbas National Park and Niassa Reserve, the Quirimbas Niassa Corridor (QNC). It has around 7,000 km² and it is situated in Cabo Delgado Province, Mozambique. There is a plan to establish another wildlife corridor in the region linking the Niassa Reserve with the recently declared Lake

¹ It was created in 2002 and it extends over 7,500 km² in Cabo Delgado Province, Mozambique.

² It was created in 1954; it has an extension of about 23,000 km² plus 19,000 km² of hunting blocks concessions around the reserve and it is located in Niassa Province, Mozambique.

³ It was declared UNESCO site in 1982, 48,000 km²; it is located in the Ruvuma, Mtwara, Lindi, Morogoro and Pwani Provinces, Tanzania.

Niassa Reserve - NLNC, Niassa Province, Mozambique. The landscape provides essential conservation values. For example, the elephant population of the landscape is estimated to exceed 65,000 animals and constitutes one of the largest elephant populations in Africa (Olson and Dinerstein, 2002).

Communities living in the landscape are mainly subsistence or small-scale farmers who, to a varying degree complement with livestock keeping. Agricultural production consists mostly of crops such as maize, cassava, rice, beans and millet. They also produce cash crops such as groundnuts, sesame, cashew nut trees, cotton or tobacco. Communities use the forest mainly for timber extraction for household consumption or construction, charcoal production and hunting. However it is important to notice that they practice shifting cultivation; therefore the forest constitutes the reserve of future land for subsistence agriculture and other economic activities. Fishing is common in the Ruvuma and adjacent rivers as well as in the coastal areas. Those communities face the challenges of impending impacts of infrastructure development, big scale forest conversion to commercial agriculture, unsustainable charcoal production, unsustainable and illegal logging and hunting (World Wildlife Fund, 2011).

Local communities are been defined in multiples ways rather emphasizing the different concepts than create an idea of a community as defined spatial unit, homogeneous social structure and norm-sharing (Agrawal and Gibson, 1999). In our case a local community is considered a group of people spatial defined that share the same interest, customs and norms on the use of a natural resource. In our analysis the framework is applied to landscape level. Thus, local communities are considered as a homogeneous stakeholder rather like considering the differences between members within the local communities.

Our analysis regarding the property right regimes suggest that under the legal frameworks of both countries local communities hold or are given the right of access, withdrawal for subsistence purposes and management of the natural resources. However, alienation is an exclusive governmental right. The Government represents the State as the owner of land as well as of natural resources. Formally, the Government decides whether to sell, or to lease the exploitation of a natural resource by issuing licenses and concessions to a company or investor, or whether to preserve for biological conservation. The Government also can transfer exclusion rights to local communities for exploitation in the sense of community based management.

4.2. The regulatory background in Mozambique

In Mozambique, the Land Law of 1997 is the main source of regulatory procedures for land management. By law, the State holds ownership rights over land and natural resources. Although it recognizes the rights of local communities over land they have customarily occupied, as well as rights to delimit and register their land, manage and allocate land and resolve disputes within these areas. The law does not define customary laws but introduces the idea of communities as claimants of the land in the country. The absence of title is supposed not to affect the recognition of the rights acquired by individuals and local communities over the land. Communities can also acquire exclusion rights over the land via the Land Use Right Certificate (DUAT, *Direito de Uso e Aproveitamento da Terra*). DUATs can be acquired through inheritance and by peaceful occupation of the land for at least 10 years according to traditional norms and customs. The DUAT needs approval which can be requested from the Public Administration.

The Forest and Wildlife Act (1999) does not automatically allow the use of the resources for commercial purposes. Thus it is limiting access to local communities to these resources to subsistence purposes. Local communities or private individuals claiming to obtain a right to use the resources for commercial purpose, thus those who ask for receiving and holding management rights, are required to apply for a license to the Public Administration. In order to obtain that license, the applicants have to fulfil the technical requirements establish in the law. The license has a validity of one year renewable. The law also regulates that the State may delegate power to manage forest and wildlife resources to institutions in other sectors such as civil society, the private sector and local communities. Rules for the implementation of this legal provision have not been clearly established yet.

Whether to provide concessions of forest and wildlife exploitation to private investors is directly negotiated with the Provincial Government who awards management and exclusion rights to the operator for a validity of 50 years renewable. The law stipulates that concession approvals may only be given upon favourable outcomes from local communities' consultation processes. Sometimes conflicts between private companies and local communities arise as a result of overlays in rights when forest companies are being granted rights over community lands. Recent attempts to devise a national process towards community land delimitation are trying to set the general context for the establishment of direct partnerships between local communities and private companies, based on the commercial exploitation and use of community delimited land by private sector third parties.

Community Based Forest and Wildlife Management (CBFWM) in Mozambique is mostly granted to the communities where there is no interested private investor. This is the case of forest reserves, protected areas where the State is responsible for managing these. Participatory or co-management of forest reserves has been recognized as the appropriate strategy by the Government. The current situation is that those forest reserves do not provide adequate sources of income to local communities, thus most of them have been converting into agricultural land for subsistence and income generation or overexploited, thereby threatening the conservation objective of the reserves (Nhantumbo, Norfolk and Pereira, 2003; Virtanen, 2005; Kuge, 2005).

Formalising property rights that local communities hold under customary traditions, or transfers rights from the State to local communities, face significant challenges such as a) conflicts between resource claimants, b) possible failure of the State to appropriately define the tenure right or effectively defend it, c) problems with local authorities and governance institutions, d) superposition of new models over existing traditional institutions, and e) the lack of systems to support resource management (Larson, et al., 2008). It is widely documented that formalised property right systems may compete with and even eliminate, well-established and effective local systems, opening the door to opportunism and possible mismanagement of natural resources (Jacoby and Minten, 2005; Bromley, 2008; Meinzen-Dick and Mwangi, 2008; Nagendra and Gokhale, 2008; Sjaastad and Cousins, 2008; Deininger and Feder, 2009). On the other hand, Community Based Management (CBM) approaches entail that local communities hold or are given the right at least of management and/or exclusion of the resource. The approach is also based on the idea that the local communities will conserve natural resources if it is in their own economic interest to do so. Although these approaches have recorded some success, they have also faced a number of difficulties and challenges (Songorwa, 1999).

4.3. The regulatory background in Tanzania

The Tanzania Government has enacted several laws in order to regulate the management of the natural resources. These laws include the Land Act (1999) and the Village Land Act (1999), the Forest Act, (2002) and the Wildlife Conservation Act (2009). The State is the owner of the land and the natural resources in the country. However, the Land Act establishes three categories of land, namely general land, reserved land and village land. The Village Land Act provides that village land may be held under a customary right of occupancy by local communities. Most of the land in Tanzania is village land but the State retains the power to regulate the use of the land holding by communities under customary rights of occupancy. Communities are authorized users of the natural resources while the State retains rights of exclusion and management.

Tanzania has a long history in Community Based Natural Resource Management (CBRM), especially in forest resources. Tanzania National Forest Policies of 1995 and 1998 set up an institutional framework for forest management for Joint Forest Management (JFM) between communities and Government within forest reserves, and for Community-Based Forest Management (CBFM) in village land.

The law contains the opportunity for communities to receive management functions in public reserves within the framework of JFM in different kinds of agreements with the Government. Additionally, CBFM starts three categories of reserves in village land: (a) Village Land Forest Reserve (VLFR) managed by the entire community; (b) Community Forest Reserves (CFR) managed by a designated group within the community; and (c) Private Forests (PF) managed by designated persons. The Forest Act (2002) creates a scheme of

rights and responsibilities to use and manage resources on reserves, offering to the communities some rights of management and even exclusion.

Community-Based Wildlife Management (CBWM) is possible under a Wildlife Management Area (WMA). It requires participating villages to develop a Land Use Plan (LUP) with areas designated for specific uses: (a) wildlife management, conservation; (b) village forest; (c) agriculture and livestock grazing; (d) residential uses; (e) reforestation; (f) and/or any other area-category community wishes to designate.

The LUP use to cover a period of up to 15 years. The community constitutes a Community Based Organizations (CBO), officially registers it and submits an application for Authorised Association (AA) Status to the Government. When a CBO has been granted the status of AA it is granted user rights over the wildlife occurring within the WMA. The user rights can include a quota for bushmeat (for community consumption), trophy hunting, and non-consumptive tourism (Schuerholz and Baldus, 2007). Communities acquire also exclusion rights and they are guaranteed day-to day management rights and enforcement responsibilities in the area.

4.4. The practical application of the new framework

An analysis of the negotiation situations in connection with the distribution of property rights shows that all the four theoretical cases distinguished by Mauerhofer and Nyacuru (*in preparation*) could be also found by us.

The first situation is when conservationists have rights over natural resources but non-conservationists may cause costs to them and conservationists have to accept compensation - if offered. The case of a mining or logging company, or game reserve, which obtains a concession to operate into communities land fit the situation in our landscape. In the QNC most of the available land has been conceded to private forestry operators. There are also two concessions to game reserves for trophy hunting. Loss of the land is a huge cost for local communities as they had preserved that land for future agricultural subsistence and other economical activities. They have the right to receive 20% of the taxes collected from the exploitations as compensation for the costs of losing preserved community land. Even receiving compensation from the exploitations has a cost to local communities. Bureaucracy necessary to fulfil all requirements to receive compensation appears to be high in terms of monetary costs for travelling, technical support, taxes and fees as well as for opportunity costs related to the time spent for travelling, opening a bank account, writing a management plan and mapping.

The second situation is wherein conservationists do not have any right over the natural resources but they have the right to prevent the damage through non-conservationists. Non-conservationists hold rights over natural resources but they have to accept compensation. This arises when a protection corridor is declared by the Government in one area where communities have at least the right to withdrawal a resource. In this case they have to accept some restriction of use and management and the compensation offered. In our case in SNWPC local communities hold authorized user rights or in the best situation claimant rights under traditional customs over the forest. The corridor imposes new regulations about forest use and exploitation that they have to accept even in village land. Beekeeping projects are been developed to economically compensate local communities for the high costs of decrease forest use for charcoal and other resources of income from the forest. The costs for conservationists are also not trivial in terms of implementation of beekeeping activities, monitoring and enforcement of forest and substitutive activities, and decision making, such as information about economical alternatives, preferences; and negotiation costs. Another example is the implementation of Reducing Emissions from Deforestation and Forest Degradation (REDD+) programs. Envirotrade, is running the Envirotrade's Quirimbas Community Carbon Project inside the boundaries of the QNP - Macomia, Quissanga and Meluco districts. In Selous Niassa Wildlife Protection Corridor the consulting firm JV Gauff (JBG-Gauff Ingenieure) with Wildlife Conservation Society Tanzania (WCST) and the Tanzanian Government is implementing a carbon project. Usually local communities in non protected land may accept compensation from conservation bodies or private operators. Thus, they may receive payments to avoid deforestation and maintain the sustainable management of the forest (Payments for Ecosystem Services, PES), or not. In our case it is a compensation for the establishment of the corridor and local communities may no participate in the carbon projects to receive a monetary compensation for forest conservation but they have to accept the restrictions of use of the forest in any case.

The third situation is when conservationists as right holders may accept compensation. In SNWPC we found a Community Wildlife Management Program (CWMP) where the Government accepts to transfer proprietor rights over wildlife to local communities. In exchange, the Government receives the 'compensation' of wildlife being protected.

The fourth situation, wherein non-conservationists have rights over natural resources and restrictions are only possible upon acceptance of compensation, occurs for example when introducing conservation-oriented agricultural and agro forestry techniques. In this case communities hold the property rights and they may (or may not) accept compensation. In QNC compensation to local communities is often done by some scheme of voluntary management agreements, where some measures include technical assistance, supply of ecologically friendly inputs or new market opportunities such as fair-trade or organic products.

4.5. Cost of monitoring, enforcement and decision making

Costs of monitoring and enforcement are high for the organization mainly responsible for it, the Government. The Government has the right and responsibility in our landscape to monitor and enforce legislation as owner of the land, even in licensed land or land covered by concessions. Thus, measures of monitoring and enforcement are frequently insufficient or lack. In the case of voluntary agreements with local communities, cost of monitoring and enforcement are often integrated into the agreements. Contracts about wildlife management and carbon payments include monitoring and enforcement as some of the responsibilities of the new holders of proprietor rights over the forest, the local communities. Furthermore, the compliance of local communities with legislation appears usually low. Thus, monitoring is more frequently used than enforcement. When local population perceives a rule to be legitimate, they decide to comply. While Government regulations have a low compliance, local regulations under the scheme of traditional structures of governance and negotiation use to have a higher rate of compliance by the members (Hayes, 2007; Persha and Blomley, 2009). Rights of exclusion and management also provide a strong motivation for compliance with the regulations to local communities. The perception of loss of rights is on the base of most conflicts related with over exploitation of natural resources and poaching of wildlife (Gilligham and Lee, 1999, 2003; Shemweta and Kidegesho, 2000).

Decision making costs are related to gathering the necessary information to take adequate decisions, meetings, negotiations and resolving conflicts. Management agreements in our planning region appear to involve an important share of decision-making costs because (a) in most cases to obtain the right information to make decision is a complex task involving no necessary obvious variables and detailed knowledge of local situation; and (b) negotiation process incorporates various stakeholders as government, local communities or private actors with different interests, expectations and negotiation situations. Negotiation costs are an important issue for all stakeholders but especially for local communities in terms of opportunity costs (Meshack et al., 2006). The extend of time and resources spent in meetings and conflict resolving activities is high for local communities and it need to be compensated with incentives. Local communities in our region appear to have more incentives to participate in meetings and negotiations if they perceive that they have the right of exclusion and managing a resource.

5. Conclusion

Understanding the interactions among different bundles of rights over natural resources and their connexion with negotiation situations provide substantial knowledge for improve the cost-effectiveness of conservation actions. We have presented a systematic framework for assessing the cost-effectiveness of conservation by assessing who has the rights and duties related to compensation and by analysing the diverse costs related to property rights and negotiation situations in conservation actions.

To demonstrate the theoretical utility of our framework we revised the literature and we found examples to illustrate the situations described in the new framework. We also presented two practical case studies applications to assess the cost-effectiveness of conservation actions in human-dominated landscapes by apply the framework to two African wildlife corridors: Quirimbas Niassa Wildlife Corridor (Mozambique)- and

Selous Niassa Wildlife Protection Corridor (Tanzania). Our analysis revealed insufficient monitoring and enforcement and high cost of decision making in (a) gathering the information necessary to take decisions; and (b) negotiation processes incorporating multiple stakeholders.

The analysis has the potential to contribute to an improved framework for natural resource management and sustainable development in human-dominated areas in African countries. It is necessary to understand how different strategies for nature conservation perform under different property-rights regimes of natural resources and negotiation situation, to make decisions about which combinations are the most cost-effective to be applied under limited funding.

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