

Contribution of Community Conservation and Ecotourism Projects on Improving Livelihoods and Sustainable Biodiversity Conservation in and around Nyungwe National Park (NNP)

Ange Imanishimwe^{1,2,3*}, Theophile Niyonzima³ and Donat Nsabimana²

¹Biocoop Rwanda, A Social Enterprise Integrating Biodiversity Conservation and Community Development, Rwanda

²Department of Biology, College of Science and Technology, University of Rwanda, Rwanda

³Department of Geography, College of Science and Technology, University of Rwanda, Rwanda

Abstract

The Rwanda Development Board has established the Revenue Sharing Scheme to create a win-win approach in protected areas conservation and management. Through this scheme, RwF 1,133,195,986 have been invested in 152 Community Based Conservation Projects (CBCs) and Integrated Conservation and Development Projects (ICDPs). This paper provides inputs for improving the prospects of ICDPs by giving consideration to each of the five capitals namely natural, social, human, built, and financial. The language of ICDPs has been adopted by development agencies of all persuasions. There is now some urgency to identify the characteristics of the environment and the community in which success is most likely. This paper assesses the contribution of Revenue Sharing Scheme in strengthening CBCs and ICDPs around Nyungwe National Park. We looked at the efficiency and effectiveness of the mentioned projects. The study was guided by the following key objectives; to examine the social economic impact of tourism revenue sharing program towards the development on local communities, and analyse the challenges faced by local administration and beneficiaries in management of these revenue sharing. To archive the set objectives, a cross sectional research design was used, combined with qualitative and quantitative approach. We collected secondary data from RDB. The study adopted descriptive and statistical approaches in processing data and Special Program for Social Scientist (SPSS) computer program was employed in data analysis. The findings show that above 50% of community conservation projects that were funded through revenue sharing scheme are not any more there because there was no strategy for monitoring and impact evaluation. The findings also show that there is no significant contribution of revenue sharing to reducing the threats to biodiversity in Nyungwe National Park. RDB put a lot of efforts in law enforcement than in community conservation. As a recommendation, RDB needs to increase efforts in community conservation and review the revenue sharing scheme to make it more successful given that it will increase to 10% from the fiscal year 2018-2019.

Keywords: Integrated conservation and development projects; Human capital; Financial capital; Natural capital; Social capital

Introduction

The first use of the term “integrated conservation and development project” (ICDP) that we have been able to locate was in the Luangwa Valley Integrated Conservation and Development Project jointly undertaken by FAO and the Government of Zambia in the mid-1960s [1]. The ICDP has been widely applied to many different types of conservation initiatives and projects around the World with organizations whose primary mission is conservation and community development [2]. From this, the ICDPs were one of the solutions to human wildlife conflicts and it creates a win-win situation in protected areas by motivating people for biodiversity awareness and wildlife management. All that has resulted to the expanded definition of the ICDP described as “approaches to the management and conservation of natural resources in areas of significant biodiversity value that aim to reconcile the biodiversity conservation and socio-economic development interests of multiple stakeholders at local, regional, national, and international levels” [3].

The long history of the effectiveness and efficiency of ICDPs was concerned in meeting either conservation or development objectives [4,5]. And this has contributed in improved livelihoods with desire to reduce, minimize and reverse environmental degradation. There should be establishment of methodology to guide the implementation of ecodevelopment projects but the problem is that many countries don't have a follow up strategy to make sure that ICDPs are well implemented to find the solutions of the local communities at grassroots level hence

lead to the tremendous loss of biodiversity and human-wildlife conflicts otherwise it is associated with lasting improvements in the wealth and well-being of the communities [5,6].

The success and inefficiency of ICDPs was tested like Salafsky et al. [7] tested the hypothesis that, if a viable enterprise is linked to the biodiversity of a protected area and generates benefits for a community of stakeholders, they will act to counter the threats to the resource. These ICDPs can promote the financial stability of local communities to get the funds to invest in other projects like agriculture, get the food, and bring the other yields to the market. However, market integration and utilization had positive effects only on behavior and economics. Information on community homogeneity was rarely available, and no effects of this could be detected. For example, Wells et al. [8] identified a suite of factors that have been associated with failed ICDPs in the past, including over-

***Corresponding author:** Ange Imanishimwe, Biocoop Rwanda, A Social Enterprise Integrating Biodiversity Conservation and Community Development, Rwanda, Tel: +250788840755; E-mail: angeish07@gmail.com

Received July 02, 2018; **Accepted** July 23, 2018; **Published** July 30, 2018

Citation: Imanishimwe A, Niyonzima T, Nsabimana D (2018) Contribution of Community Conservation and Ecotourism Projects on Improving Livelihoods and Sustainable Biodiversity Conservation in and around Nyungwe National Park (NNP). J Tourism Hospit 7: 363. doi: [10.4172/2167-0269.1000363](https://doi.org/10.4172/2167-0269.1000363)

Copyright: © 2018 Imanishimwe A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

optimistic goals, weak assumptions, unconvincing local participation, targeting of the wrong threats, uncertain financial sustainability, low benefit generation, and the need by donors for rapid success readily identifiable as their own. For its success, it was suggested that ICDPs are more likely to succeed when there is a proper understanding of the root causes of environmental degradation and when relevant national and regional policies are understood. The adaptive management and appropriate incentives for conservation should be undertaken for effective engagement with stakeholders [6].

In most of the case, ICDPs fail for the reason that there is unconsidered reality for community health and development in its implementation. Adams et al. [4] suggest that this shortcoming arises from the lack of consideration for four realities of integrating conservation and development: (1) poverty and conservation are separate policy realms with little opportunity for integration, (2) conservation will be undermined unless poverty is alleviated, (3) there is a moral obligation for conservation not to compromise poverty reduction, and (4) poverty reduction itself depends on the conservation of living resources. Additionally, in their review of the science of sustainable development, again based on case studies, Sayer and Campbell [9] suggest that successful ICDPs require an understanding of existing environmental and social trajectories as well as action research and the use of both local and external knowledge and maintain that stable and fair tenure and governance arrangements and incentive payments are important and that natural resource scientists should be associated with management.

Conceptual Framework

Those Integrated conservation and development projects (ICDPs) are sponsored by environmental organizations and have taken in consideration the management of natural capital of the area. Those humanitarian organizations often focus on the health, education, and skills of the human population, or the human capital. This consideration of human capital in conservation and development projects creates a great impact on ICDPs efficiency if it is well managed and implemented. Government agencies have recently paid considerable attention to social capital especially on the issues of legality, governance, law, and policy. Which is one of the required capital to strengthen conservation and community development and this intervention of the government in ICDPs bring changes for the management and better implementation of the program and consider community perceptions on what they need for the program and their intervention. Development banks are concerned with infrastructure and job creation, which are forms of built capital. Finally, many foundations have recently made attempts to achieve conservation through payments for environmental services, which enhances local financial capital. When ICDPs aim to improve the capital assets of the area and its population, they invest in these five capital assets: natural, human, social, built, and financial (Figure 1) [10,11].

However, this investment it doesn't take into account local states and when people are living in extreme poverty, it is advised to invest in their health and education and in the productivity of their agriculture than in the protection of their forests. ICDPs have to be based upon an understanding of the states and trends of the capital assets of the concerned populations [12]. This provides the foundation of a conceptual framework for designing conservation and development interventions. The Rwanda Development Board can refer to this model to successfully implement ICDPs around the protected areas of Rwanda.

The Biophysical constraints on conservation and development is acknowledged on this integrated conservation and development projects (ICDPs). And this implies that the limit for resources use from protected biodiversity parts of the landscape and Soils, climate, and other biophysical factors place an absolute limit to compensate for loss of production. And due to the facts the tremendous extraction rates of non-timber forest products and other commodities that are potentially compatible with biodiversity conservation can rapidly exceed environmental limits. And this is not to mean that community development and conservation are impossible in landscapes operating near their physical capacity to support humans but there is a need of external investment to shift from natural resource extraction to knowledge-based industries and community-based ecotourism in particular is widely promoted as a key instrument of ICDPs [13,14].

In many integrated conservation and development projects (ICDPs), there is an assumption that the number of people in the landscape is relatively static. However, in resilience literature [15], population change is one of the slow variables that can drive the dynamics of a system once a threshold has been passed. In setting up alternative enterprises to redirect demand from biodiversity parts of the landscape, there is rarely any discussion about what happens when those enterprises can no longer support a growing population, as though population growth is beyond the scope of ICDPs. Another limiting demographic factor in ICDP trajectories is the availability of appropriate skills in biodiversity conservation and community development for some decision makers and some policymakers. Delays in the importation or development of skills is a fundamental constraint on ICDPs [16], whether they deal with natural resource management, governance, or business management.

And it was suggested that ICDPs have greater concern for the health of the environment than that of people, but the two are inextricably linked and need to be considered when hypotheses about ICDPs are tested. Although there is some concern that community development proposals have had to expand their focus to take the environment into account if they want to obtain funding [2] and that the community development organizations sometimes don't consider the social and financial benefits of wildlife conservation [17]. Around Nyungwe National Park, there is a high population and it is not easy for ICDPs to have a quick positive impact to the entire population. When there should be a proper planning, ICDPs can promote the creation of off farm income and so many jobs for the youth.

As with other forms of community development [2], many integrated conservation and development projects (ICDPs) try to

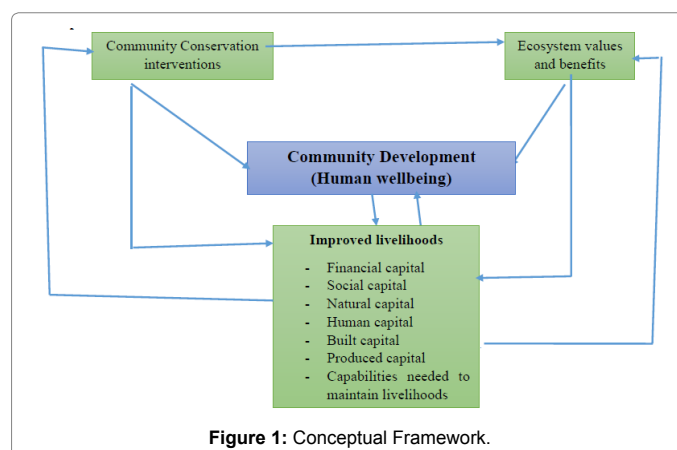


Figure 1: Conceptual Framework.

empower stakeholders by involving them in research and development at all stages so that they achieve ownership of the project objectives [9]. Frequently, this involves the empowerment of those with less power in the community, particularly women, who often have a vested interest in sustaining natural resources because they are usually the ones who collect and use them to maintain subsistence inputs to the household [18,19]. There is empirical evidence that the democratization of decision making can benefit natural resource quality; in the Indian Himalaya, natural resource quality was more likely to be maintained in those areas in which there was a reasonable probability that community leadership could change [19]. Despite from this also democratization can reduce corruption, which is increasingly seen as a threat to conservation [20] and thus the effectiveness of ICDPs. On the other hand, strong, stable leadership can also have benefits. In Cameroon, the relative success of the conservation program at Kilum/Ijim is the result of the absolute authority of the local traditional leader, the Fon [21], although such systems are rarely stable for long.

The case studies of integrated conservation and development projects (ICDPs) rarely consider the importance of built capital to program persistence, and there is an underlying assumption that the creation of infrastructure generally increases the level of threat to natural capital values. The development component of ICDPs is thus commonly considered to be the development of social, financial, and human capital without the uncomfortable recognition that built capital may be a precondition for some of the other types of development. This is in marked contrast to community development, in which the creation of housing or other facilities is a measure of success that reinforces social capital [22] and in some societies built capital can be a primary benefit derived from conservation projects [23]. And due to this there is a significant association between the development of built capital and subsequent increases in income [24]. In fact, built capital is sometimes the sole measure of success and, such is the durability of concrete, steel, and tar, that the construction of roads and solid buildings then shapes the society for which they were built [25]. When the built capital is encouraged, there is a creation of a lot of jobs that improve directly the community livelihoods [26].

One of the principal underlying assumptions of integrated conservation and development projects (ICDPs) is that there must be financial compensation for any loss of opportunity arising from biodiversity conservation. There is empirical evidence that biodiversity, as opposed to individual useful species and processes, is more valuable globally than locally [27]. As Kiss [28] maintains, those seeking biodiversity conservation in poor countries are usually external stakeholders competing with both local values and other external stakeholders who place greater value on the resources they can extract. Some societies are focusing on their unbroken traditions in religions and at the local level that effectively conserve biodiversity without financial compensation [29,30]. In such cases, supporting those who advocate the maintenance of local traditions may be more effective than providing payments.

In facts, there may be situations in which financial support may merely replace, and could undermine, local traditions of conservation and powerful economic forces and motivations usually do overwhelm both local philosophies that are consistent with conservation and those promulgated by proponents of ICDPs. Regardless of philosophy, people living with nature cannot afford to bear the costs incurred by foregoing the opportunities offered by alternative and mutually exclusive land uses [31]. The traditional societies, at least some members of the community are actively seeking to increase their status through

alternative exploitative land uses. The difficulty then is to provide sufficient ongoing funds to match alternatives, always being aware that any funding slippage may be irredeemable in terms of land-use change and biodiversity loss. The difficulty is that, beyond subsistence, poverty is relative, and the desire for status is never satisfied [32]. Thus, it could be argued that financial compensation for those with food, water, security, and shelter is less effective in the long term than the internalization of the belief that biodiversity has intrinsic value by those making critical decisions about land use.

Apart from this, there should be an idea of revenue sharing scheme as one of the programs adapted in situations community around conservation areas like Nyungwe National Park (NNP) which has faced various threats, mainly the use of snares and tree cutting. The level of community engagement is at a low appreciation and the effective use of revenue sharing is critical. A conducted research indicated that revenue sharing program in Rwanda had improved the quality of life of people living nearby Nyungwe national park, and particularly, there was improvement on the income levels of residents as a result of various projects established and supported through revenue sharing. However, it is not clear why these positive changes on the side of human wellbeing do not contribute to the conservation of NNP, because negative effects are likely to occur, when there is no significant effect of revenue sharing on local livelihoods [28].

A previous study of ecotourism in NNP indicated that the little active involvement of local communities in the park's conservation and protection is based on a lack of community empowerment through community conservation outreach and unfair tourism revenue sharing projects. That is why further research are needed to see why ecosystem services from Nyungwe help people but people don't contribute a lot to conserve Nyungwe for sustainable development.

Revenue sharing and community based conservation projects

The revenue sharing scheme has improved community conservation to some extent because there are tangible factors that some former poachers became park protectors and this was done on the financial support from RDB. There are some challenges that are in this scheme like bureaucracy and choosing the fundable projects and there is no direct correlation between its contribution and the decrease in illegal activities in the park. This research is clearly discussing the community participation in conservation and the issue and the recommendations to improve the impacts of revenue sharing and ICDPs to the communities around this tropical rainy forest. However, on the other hand, human capital weaknesses restrain the fraction of the community members who participate in the benefits of ecotourism to only those who are semi-skilled in planning, business management, financial management, marketing, and product research and development, while those who are not skilled in this domain are often placed in a poverty trap [33].

The main objective of this study was to assess the effectiveness of tourism revenue sharing programs and CBCs towards the socio-economic development of local communities around Nyungwe National Park. The specific objectives underlying this study were: (i) To examine the social impact of tourism revenue sharing programs and CBCs towards the development of local communities; (ii) To examine the economic impact of tourism revenue sharing program and CBCs towards the development of local communities; and (iii) to analyze the challenges faced by local administration and beneficiaries in management of revenue sharing. The study was set to answer the following research questions: Is there any social impact accruing from

tourism revenue sharing programs and CBCs towards the development of local communities? Is there any economic impact accruing from tourism revenue sharing programs and CBCs towards the development of Nyungwe local communities? What are the possible challenges that local administration and beneficiaries may be facing in management of revenue sharing and CBCs?

Methods

Study area

NNP is located to the south-western part of Rwanda and it is surrounded by two districts in the southern province (Nyamagabe and Nyaruguru) and three districts in the western province (Karongi, Nyamasheke, and Rusizi). This national park is a tropical montane rain forest and it is very rich in biological diversity with some unique species only found in the Albertine Rift [34] between a latitude of 2°15' and 2°55'South and longitude 29°00' and 29°30'East and at an altitude of between 1,600 m and 2,950 m and the highest point in Nyungwe is the top of the mountain Bigugu around Uwinka [35].

This forest is continuous to Kibira National Park in Burundi [36,37]. NNP is known at an international level because it is rich in fauna and flora [38]. The Research was conducted in and around Nyungwe National Park, in Kitabi Sector of Nyamagabe District, Kivu Sector of Nyaruguru District, Twumba Sector of Karongi District, Bweyeye Sector of Rusizi District, and in Bushekeri Sector of Nyamasheke District. These locations were chosen because there are many CBCs and ICDPs and we were interested to see their contribution in improving local communities' livelihoods. The Rwanda Development Board helped us to get data. Within each sector, cells and villages neighboring NNP were studied (Figure 2).

Data collection

From May 2017 to October, 2017, the data collection was conducted RDB offices in Nyungwe National Park. We collected data on all projects funded by Revenue Sharing Scheme where we were recording each project and the budget invested in it. We also asked the Community Conservation Wardens the status of that project and

we visited where those projects are or where they were to confirm the information we got from the office. Secondary data involved different reports at the park levels, especially those from community partnership and ranger based monitoring programs.

Data analysis

We put all data in our computer and for data analysis we used SPSS and presented our data with tables and histograms.

Results and Discussion

Revenue sharing (RS)

Revenue sharing distribution per district is given in below Table 1.

Categories of funded projects

Status of funded projects were shown in below Figure 3 and the procedure of project selection was shown in Figure 4.

Allocation to the beneficiaries

Allocation to the beneficiaries was shown in Figures 5 and 6.

Revenue sharing and funded community projects

The 5% of revenue sharing from tourism activities were used in developing communities around protected areas and to develop an idea of community based conservation as well to ensure biodiversity conservation and better management of protected areas. Human pressure on resources from protected areas especially Nyungwe

District	Amount	Projects
KARONGI	100,651,872	19
NYARUGURU	215,064,014	32
NYAMAGABE	230,040,865	29
RUSIZI	279,295,208	37
NYAMASHEKE	308,144,027	35
Total	1,133,195,986	152

Table 1: Revenue sharing per Sector from 2005 to 2017.

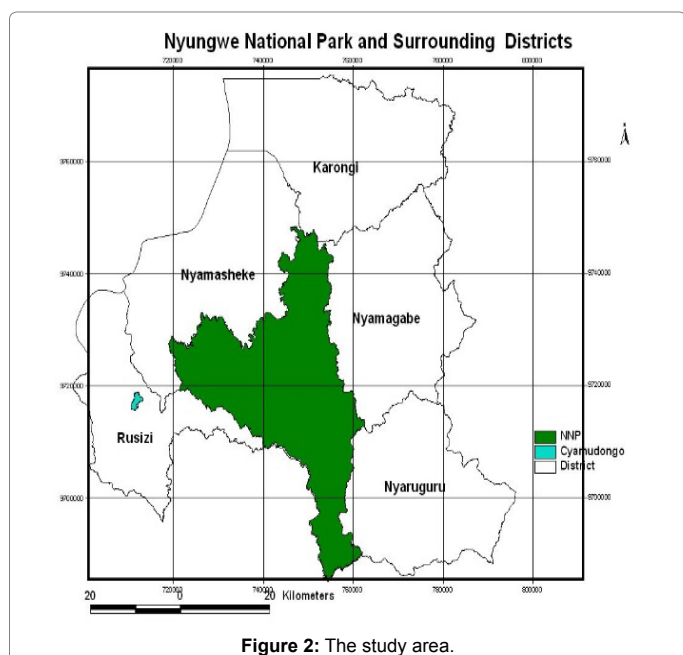


Figure 2: The study area.

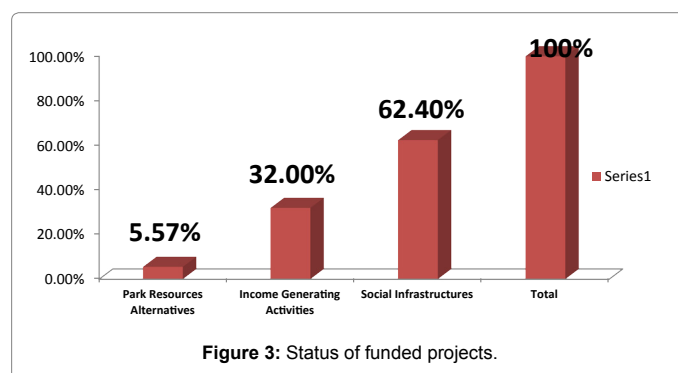


Figure 3: Status of funded projects.

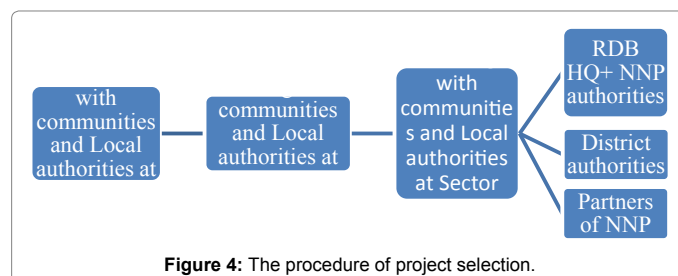
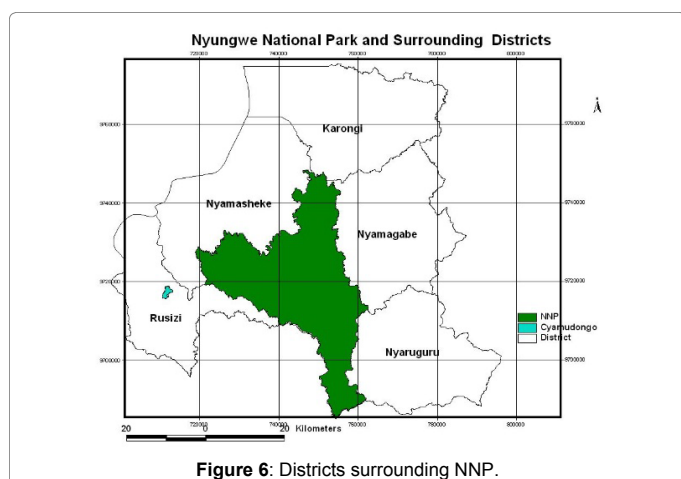
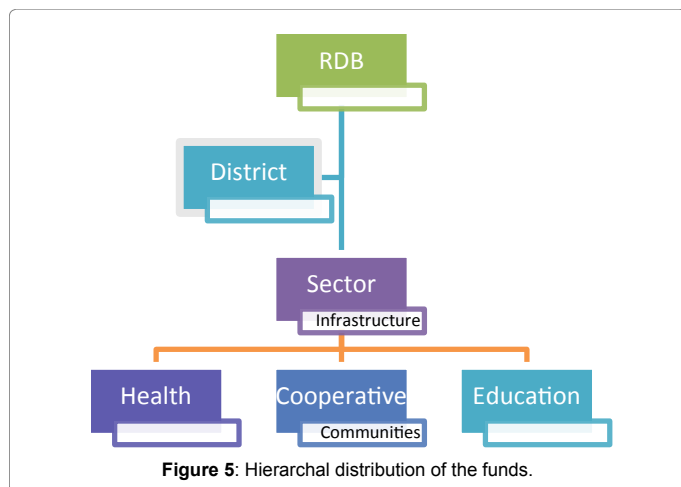


Figure 4: The procedure of project selection.



National Park were at high level due to the fact that it is a tropical rain forest with diverse species and other resources and this is the reason that human pressure was increasingly high. Then community based conservation was required for the management of the park to act together with local community around the park.

From this, the government has taken a possible measure of developing communities around the protected areas to raise the living standards of people to avoid people going back in the park for resources encroachment. Instead they should start working together with the management of protected areas for biodiversity conservation and environmental protection.

Through revenue sharing different project were financed and community cooperatives were supported where about 1,133,195,986Frw were invested in 152 different developmental projects of local communities from the year 2005 to 2017 as shown in above Table 1. From the ideas of revenues sharing, the amount from the above paragraph was invested in different projects where local community around NNP was supported through project development and financial support from revenue sharing. Development agencies and policymakers are increasingly advocating tourism revenue sharing as an effective way to increasing local development around protected areas. In Rwanda, through its outreach programme, the Tourism Revenue-Sharing (TRS) programs, Rwanda Development Board (RDB) usually remits 5 per cent of the park entry fees every year to fund

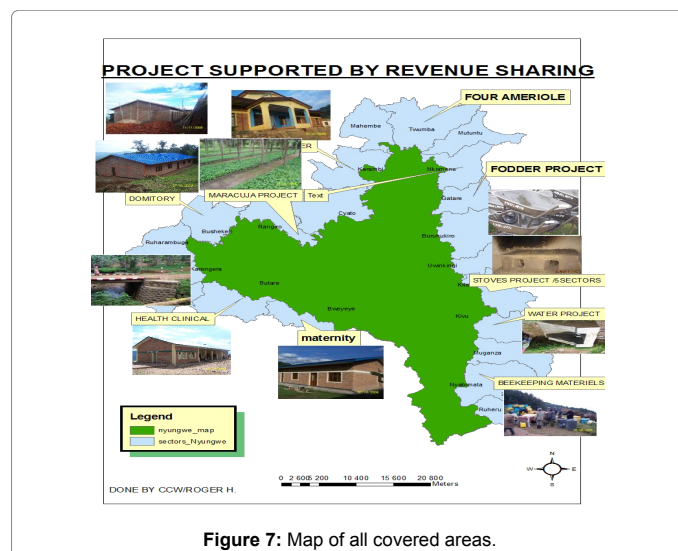
various community projects where given tourist attraction is found. With recommendations from researchers, from the next fiscal year, there will be a shift from 5 to 10% of revenue sharing. The RS intends to contribute to the improvement of community livelihoods and park conservation. The community, in return, should contribute to the park integrity. This win-win community-park based approach can lead to sustainable co-management and protection of National Parks.

The report from community conservation department in RDB shows that about 152 community projects were supported through revenue sharing from the year 2005 to 2017. Among these projects some are created for sustainable income like building schools in Nyamasheke district, health clinics in Rusizi district, water supply in Nyaruguru and local communities' projects like fodder project in Nyamagabe and Maracuja project in Nyamasheke. Not only that but also some cooperatives were supported like beekeeper's cooperative in Nyaruguru district (Figure 5).

In deciding which project is appropriate for the fund some criteria were followed like that the project should be beneficial to the large number of people, job creation to the large number of people and being a long term sustainable projects. And from these different projects that were selected in five districts surrounding Nyungwe National Park; 35 projects were selected in Nyamasheke district with a fund of 308,144,027frw, 37 projects with 279,295,208frw in Rusizi and others as shown in above Table 1. From the above results, it is found that revenue sharing is contributing in community development and this will ensure and strengthen community perceptions on biodiversity conservation as well as impacting positively the park management through community based conservation (Figure 7).

Community Based Organizations (CBOs) around Nyungwe National Park

There are the Community Based Organizations including Cooperatives and Social Enterprises around Nyungwe National Park. Some are active but a large percentage of them are not active or idle. When they want to fund the local communities sometimes they give funds to these Organizations but their management teams don't have skills to manage the funds and there is a bureaucracy in funds transfer from RDB, district, sector, and final to the CBO. Because of that routing, corruption occurs at local level and affects the projects that could be done through revenue sharing scheme.



Challenges in the implementation

There are a number of challenges that the revenue sharing program has met including the ineffectiveness of RS steering committee and M&E Committees; lack of good project proposal design; lack of common understanding on RS objectives/principles Project selection; Cooperative management issues; lack of systematic records of NGOs' support/funds under RS scheme; lack of sustainability of projects; lack of awareness strategy; Poor accountability Lack of common understanding on procurement modalities; and high density population around NNP.

Threats to Nyungwe National Park

The management and sustainable use of Protected Areas Management Policy in Rwanda is of great interest to many stakeholders. Human-wildlife conflicts constitute one of the most serious threats to the continued survival of Rwanda's National Parks. Participation and partnerships are becoming increasingly important for wildlife management, and is an important pillar of Rwanda's overall development strategy. The wildlife conservation and Nyungwe National Park (NNP) management goals set out are closely harmonized with other national development goals as set out in Vision 2020 and the Economic Development and Poverty Reduction Strategy I and II (EDPRS I&II). The increased number of tourists visiting NNP indicated by the results of this study should in turn contribute to the poverty alleviation and hence reduce illegal activities, as ecotourism is appreciated to improve the livelihoods of the local communities through revenue sharing, hence enhance biodiversity conservation (Jessica and Calfucura 2012).

The big challenges to the National Park are the illegal activities conducted there; the big challenges to the local communities are low mindset and food insecurity. In our research we analyzed the data from RDB and we advised the way of creating a win-win approach for sustainable conservation of Nyungwe National Park. Giving funds to the people without training them, corruption, bias in fundable project selection, lack of monitoring and evaluation are the huge challenges that the RS scheme met in those 13 years. Also there is the lack of co-management where the local people are not involved in decision making of the projects that are funded through RS. In 1990, the World Parks Commission set a goal of protecting 10% of the planet's surface. In Sub-Saharan Africa, over a million km² of land has been set aside as national parks and game reserves, yet they have been remarkably unsuccessful at protecting wildlife. Although Rwanda is a small country (26,338 km²), the country has a remarkable variety of ecosystems and a variety of flora and fauna. Rwanda's vegetation is a regional mosaic comprising Guinea Congolese and Sudanese vegetation types which includes savannah with grasses, bushes and trees; mountain rainforests and mountain meadows; forest galleries, swamps and aquatic vegetation [39].

At International level, NNP is part of the Albertine Rift, a very important geological and ecological structure in the region of eastern and central Africa. As such, the park is a home to a bigger number of the fauna and flora species that are endemic to the sub region. The park has the privilege of sheltering 13 primate species including some that are on International Union for Conservation of Nature (IUCN) red list. The diversity of ecosystems in NNP and its endemic richness gives scientific, national and international community extended opportunities on research are either fundamental or applied [39]. At national level, climate regulation and ecological services: Regional Natural forests play an important role on the regulation plan of

precipitation. At local level, NNP is very important to the neighbouring communities due to its ecosystem services it provides to the people.

It provides them with vital ecological services ranging from watershed protection, rain formation, climate control and soil erosion control among others. Some community members have benefited directly from NNP through direct employment as park rangers, trackers and guides. Others have received regular income from tourism as porters, and through selling of arts and crafts, honey and other products to tourists [40]. A healthy forest provides benefits to both forest habitats and human. This includes maintaining the conditions for a viable watershed, which in turn provides clean water.

For the conservation of NNP, RDB undertakes different activities through the different operational departments. Main activities at park level include: firstly, the Ranger Based Monitoring (RBM) combines activities of enforcing protection laws and monitoring of both illegal activities in the park and keeping healthy the fauna and flora of the park. It also serves as planning tool through the identifications and mapping of illegal activities and other specific situation in certain zone of the park. Secondly regulated tourism concerns activities of organizing and keeping rules of tourism while entering the park for primates tracking and other attractions. Organizing refers to the customer care and giving information on important sites inside and outside the park. Thirdly, there is the community conservation department that aims at ensuring an active and effective participation of neighbouring communities in the conservation of NNP. Among others the main tasks are to: improve relations with local communities, develop environmental education, reduce conflicts related to wild animals, develop a system of park benefits sharing, develop a program of sharing revenues from tourism, involve communities in development of tourism, ensure coordination with strategic partners and contribute to poverty reduction.

Searching for viable and sustainable strategies of wildlife conservation in developing countries, which are typically rich in biodiversity, traces back to the times when the fence and fines approach, also known as American National Park model, was done by a number of researchers due to the role of ecosystems in human daily life [41]. This has led to the design and establishment of protected areas and reserves to ensure a meaningful conservation that responds the problems of the surrounding communities. For strengthening the biological integrity of the national parks, this model has been improved to the more attractive protected areas outreach model which encourages working and educating local communities about the benefits of wildlife conservation and sharing with them the revenues especially the profits made in ecotourism. Thus, there has been a shift from this 'protectionist' concept or states' centralized management strategy towards a community based model, which emphasizes on transfer of social wildlife rights and responsibilities to local institutions. The revenue sharing schemes were developed by different countries to ensure a win-win approach of conserving biodiversity while promoting the local community livelihoods.

Over the past two decades, several developing countries in Sub-Saharan Africa including Rwanda have adopted the community-based conservation (CBC) approach, which is often implemented in form of integrated conservation and development projects (ICDPs). Such projects include the Communal Area Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe, Luangwa Integrated Rural Development Programme (LIRDIP) in Zambia and Community-based Wildlife Management in Tanzania. Although this approach has helped to tackle some of the shortcomings of the centralized approach, it has some significant limitations to implementation and

therefore some of the ICDPs have not been successful [42,43]. In the United States of America, they have an approach of Conservation Easements where they buy the rights from the people to use their land for conservation purpose. In Kenya, the adoption of co-management is favored by owning titles to land. For instance, the Golini-Mwaluganje co-managed project in Coastal Province did not start off until the community members had acquired title deeds to their land a process that was mainly driven by the relatively high incidences of human-wildlife conflicts [44,45].

From 2003 to 2014 snares and tree cutting were the most prominent illegal activities. In 2014, the months of May and December had high rates of encountered illegal activities. In 2014, 69 rangers were deployed to 11 ranger posts and every post had a staff of five or six. Rangers surveyed 7847 km of forest and performed 2,172 patrols. In 2014, many threats were observed in April, May, June, and December. The lowest rate of threats was observed in August. In 2014, 93 people were arrested for illegal activity in the park; 76 of them were poachers, 26 were miners, and one was a farmer.

Poaching, mining, tree cutting, illegal beekeeping, and forest fire were in top five of illegal activities encountered in NNP and according to RBM data poaching, mining, and tree cutting were encountered as high threats (Figures 8-11).

The low threats identified by RBM data (Figure 11) such as debarking trees, mushroom collection, and medicinal plant collection were not mentioned by the surveyed community members. Similarities were seen between RBM data and local community perceptions for medium threats (Table 1 and Figure 12). Both local participants and RBM data report mentioned beekeeping, honey collection, bush fire, and agriculture as threats at a moderate level. For the local community, cattle are among the lowest threats (Figures 13-20).

Resources encroachment within protected areas especially in Nyungwe National Park indicates the danger of human pressures for resources as shown in the above results. From the RBM report in 2003 to 2013 and 2014 to 2017, different threats on resources from Nyungwe National Park were encountered and for better information they were recorded separately from major treats, minor threats and low threats.

As the results above indicate, Ranger-based Monitoring covering the year from 2003 to 2013 show that encounter rates for illegal activities varied from an average of 0.031/km the lowest (2007) to 0.079/km the highest (2013) (Figure 5). This shows that the overall encounter rate for illegal activities were increasingly high between 2007 and 2013 with a difference of 0.048 increase compared to 2013 to 2017 where the encounter rates were 0.07 in 2013, 0.1 in 2015-2016 and 0.09 in 2017 where there is an increase of 0.03 between 2013 to 2016 and a slight reduction of 0.01 (Figure 11). This may be attributed to the increased effort made to increase park rangers, covering a large area for patrols and increase the number to the ranger posts and this was due to the facts in 2014 many threats were observed mainly in April, May, June, and December with the reason that many park rangers were engaged and deployed to different ranger posts to strengthen Park protection where 69 rangers were deployed to 11 ranger posts and every post had a staff of five or six.

The major threats encountered for the period between 2003 and 2013 were snares (animal poaching) with encounter rates of 0.43/km of all illegal activities recorded, tree harvesting encounter rates of 0.12/km, bamboo cutting and people with 0.04 /km encounter rates (Figure 5). From Figure 6 above, the snares were identified increasingly high in 2004, 2011 and 2013 respectively and tree cutting were increasingly high in 2003 and 2013 respectively (Figure 6). Illegal hunting in the Nyungwe National Park is dramatically higher than any other

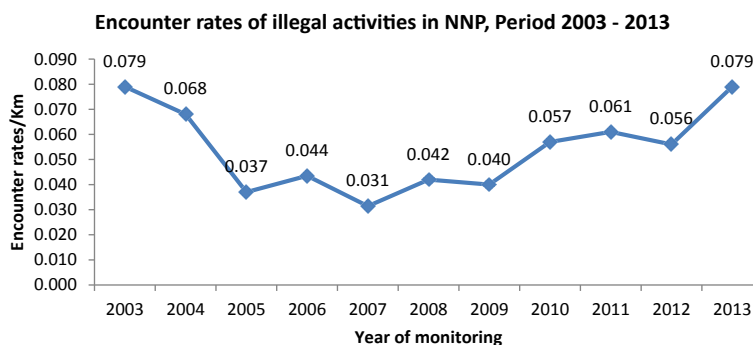


Figure 8: Encounter rates of illegal activities in NNP from 2003 to 2013.

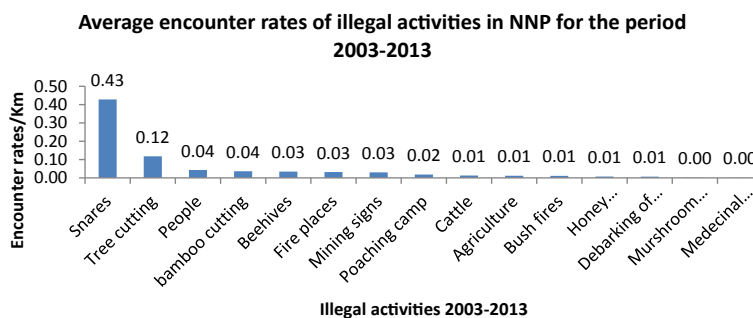
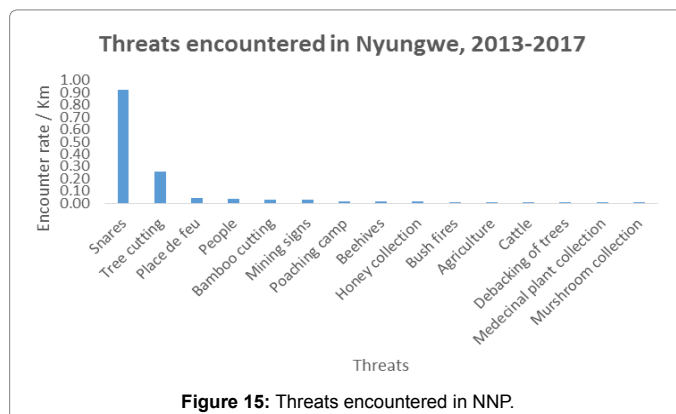
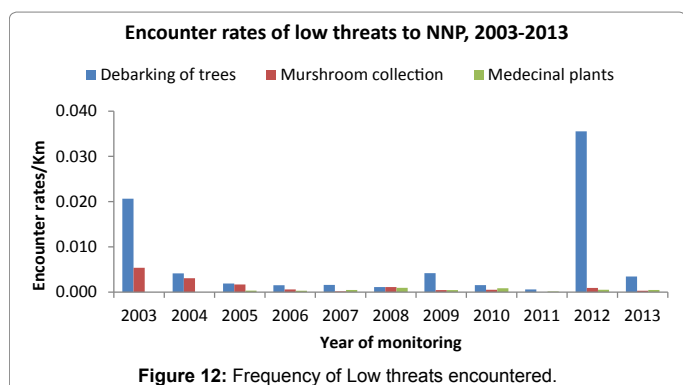
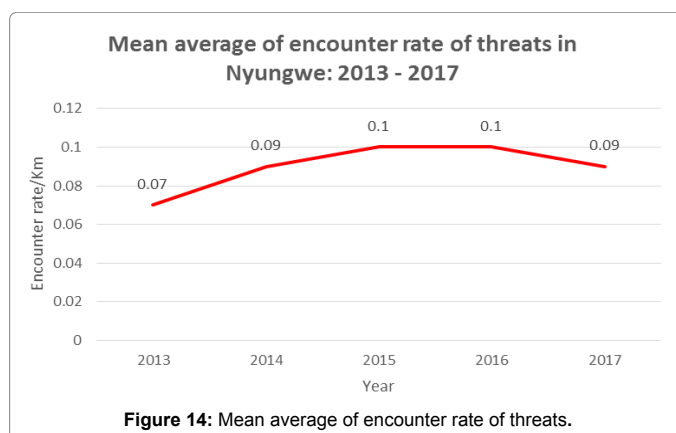
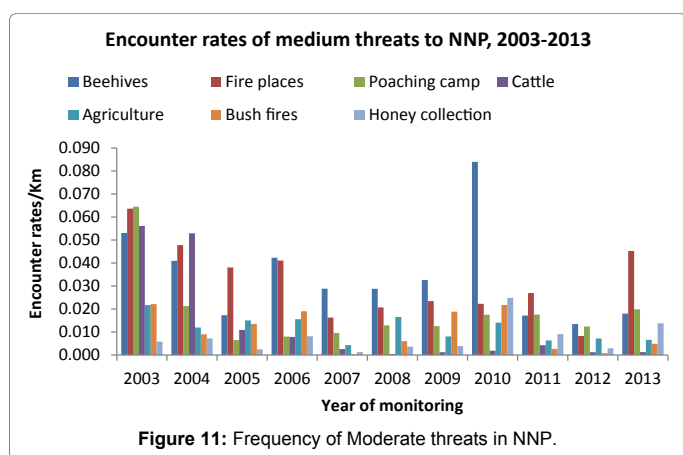
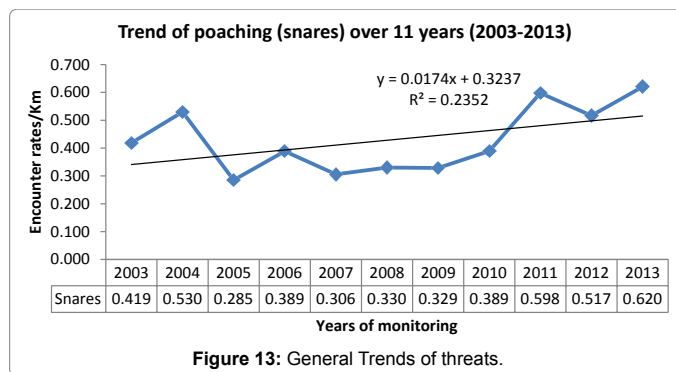
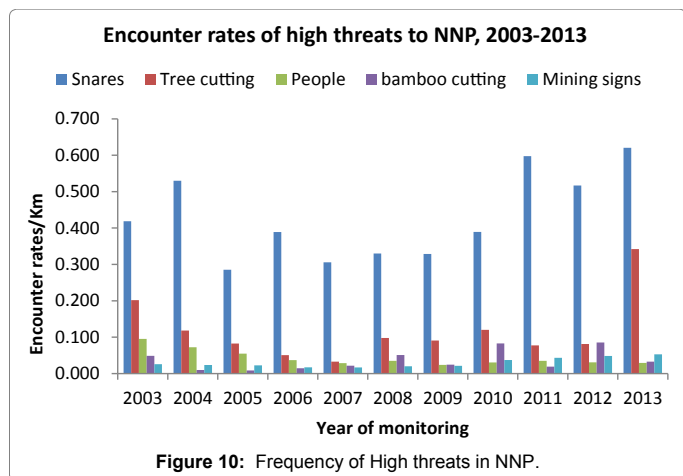


Figure 9: Average of encounter rates of illegal activities in eleven years (2003-2013).



threats recorded throughout this period. Bush fires, honey collection, Mushroom collection and medicinal plant were present at very low encounter rates per kilometer walked.

Compared to the period between 2013 and 2017, the major threats encountered were snares with encounter rate of 0.90/km, tree cutting with 0.25/km followed by fire places and people. From the above results, Snares were identified to be at high counts of 42678 where 13639 counts were in 2016 and there was significant decrease to 9421 counts in 2017 which shows the efforts in ranger patrols, tree cutting were also recorded to be the second threats in this period which shows the reduction where 12050 total counts were recorded and 3273 in 2015 to 2386 counts in 2017 (Figure 13) also this shows the attributes of the

increased effort in ranger patrols and park protection. Bamboo cutting were recorded for a number of 1447 in total where 541 counts were in 2014 with a tremendous reduction to 135 in 2017.

For the moderates threats in period between 2003 to 2013, Beehives were the highly recorded moderate treat with high increase in 2010 but high reduction in 2013, fire places with high increase in 2003 and high reduction in 2013 followed by poaching camp which were reducingly high in 2013 (Figure 7). By comparing with the period between 2013 to 2017 the fire Ha have reduced from 135.8ha in 2016 to 39.1ha in 2017, fire counts from 27 in 2013 to 21 in 2017 and mining from encounter rate of 0.04 in 2014 to 0.02 in 2017 (Figure 15). And also this shows that the low enforcement has streighned in 2017 to reduce illegal threats in the park. The low threats identified by RBM data (Figure 8) such as debarking trees, mushroom collection, and medicinal plant collection were not mentioned as having a high increase in a period between 2003

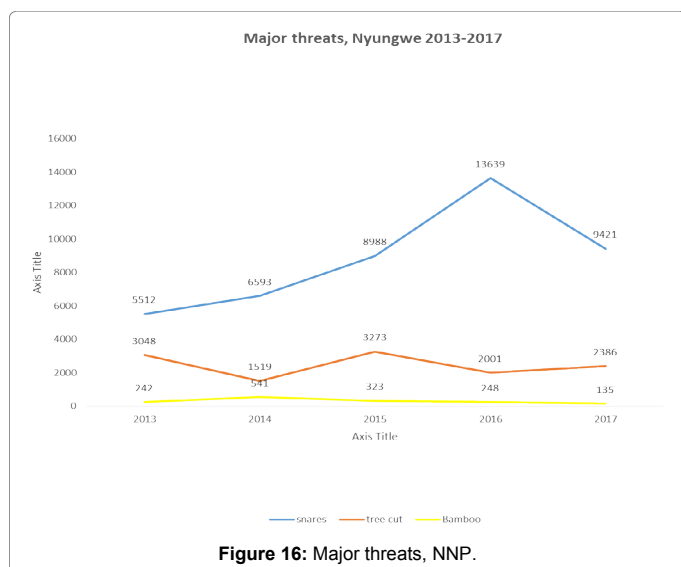


Figure 16: Major threats, NNP.

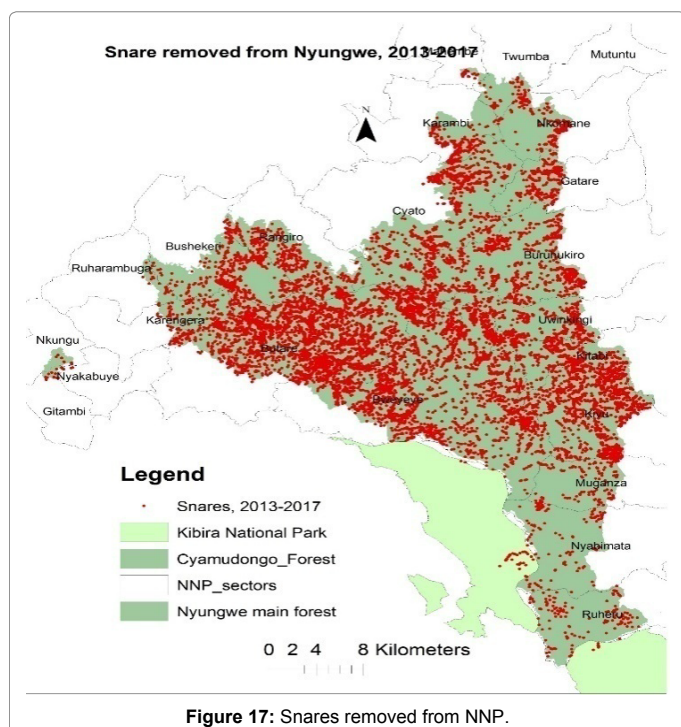


Figure 17: Snares removed from NNP.

to 2013 except in 2012 where there was an increase in debarking of trees but also a tremendous reduction was noted in 2013. By comparing with the row threats in a period between 2013 to 2017 the threats were too row in this period where agriculture, debarking of trees and mushroom collection were recorded as row threats (Figure 16).

Generally, the evidence of the illegal threats in period between 2003 to 2013 were high compared to the results in a period between 2013 to 2017 and this is due to the increase in the efforts for straightening low enforcement in charge of park protection whereby in 2014 more park rangers were engaged and deployed to different ranger posts. Apart from that, poaching activities were the mostly carried out threats as the results shows and traditional methods were used either with spears or snares targeting large to small sized mammals as well as birds. Poaching is still believed to be carried out mainly for subsistence

needs due to poverty and malnutrition although there is evidence that it is sometimes also commercial in nature-serving local markets. The devastating effect of poaching is evident through the low abundances of medium and large-bodied mammals in the park. During this period, at least 42,678 snares were removed (average of 10669.5 snare per/year and 889.12 snares per/month) with an encounter rate of 0.92 snares removed per/km patrolled. However, the concern now is that the total counts of snares between 2013 and 2017 have shown further reduction especially between 2016 and 2017. There was actually an increase in efforts, possibly because of the combination of increased patrol effort, mobilization and initiation of joint patrols with ex-poachers.

Revenue sharing and biodiversity conservation

Biodiversity conservation in protected areas were challenged by human activities by applying high pressures on resources within those protected areas especially Nyungwe National Park where poaching, tree cutting, mining and bamboo cutting are mostly encountered by the management of the park. Poverty increase, lack of conservation ethics as well as misunderstanding of communities about biodiversity conservation are among the causes of people encroachment in the park. From here, some methodological approaches were required to straighten park management by low enforcement together with local communities. There were various approaches for involving local communities in conservation by involving community in level of decision making through community based conservation and this require some approaches of developing community perceptions on conservation and involving them in conservation.

The idea of revenue sharing from tourism revenue to the local communities' projects was developed to improve living conditions of people which will reduce the pressure on the park and instead of poaching they engage in conservation because they are benefiting from tourism activities and this has created a win-win situation. Uncertainty about threats on the park as identified in RBM, they are still existing in the park but the more the project of communities are being financed the more the threats are reducing highly and this implies that by improving people's living conditions around the park will reduce the pressure on the park. And the revenues sharing should be increased to support more projects of communities to ensure sustainable conservation of today, tomorrow and after tomorrow.

Conclusion

The human health depends on biodiversity that provide ecosystem services we all depend on. The biodiversity is also safe and secured when people protect them. People are also part of biodiversity, damaging biodiversity is damaging oneself. There is a very direct linkage between biodiversity conservation, ecosystem services, and the improvement of community livelihoods. Biodiversity conservation in protected areas were challenged by human activities by high pressures on resources within those protected areas especially Nyungwe National Park where poaching, tree cutting, mining and bamboo cutting are mostly encountered by the management of the park. Poverty increase, lack of conservation ethics as well as misunderstanding of communities about biodiversity conservation are among the causes of people encroachment in the park. Although this are still happening, Biodiversity conservation is our duties and it should be ensured whether in protected areas or outside the protected and this will be achieved by ensuring multi-disciplinary collaboration to conserve and protected the reserves and protected areas such as National Parks and forests. It is obvious that there is a good biodiversity policy in Rwanda that considers the adjacent communities around the National Park.

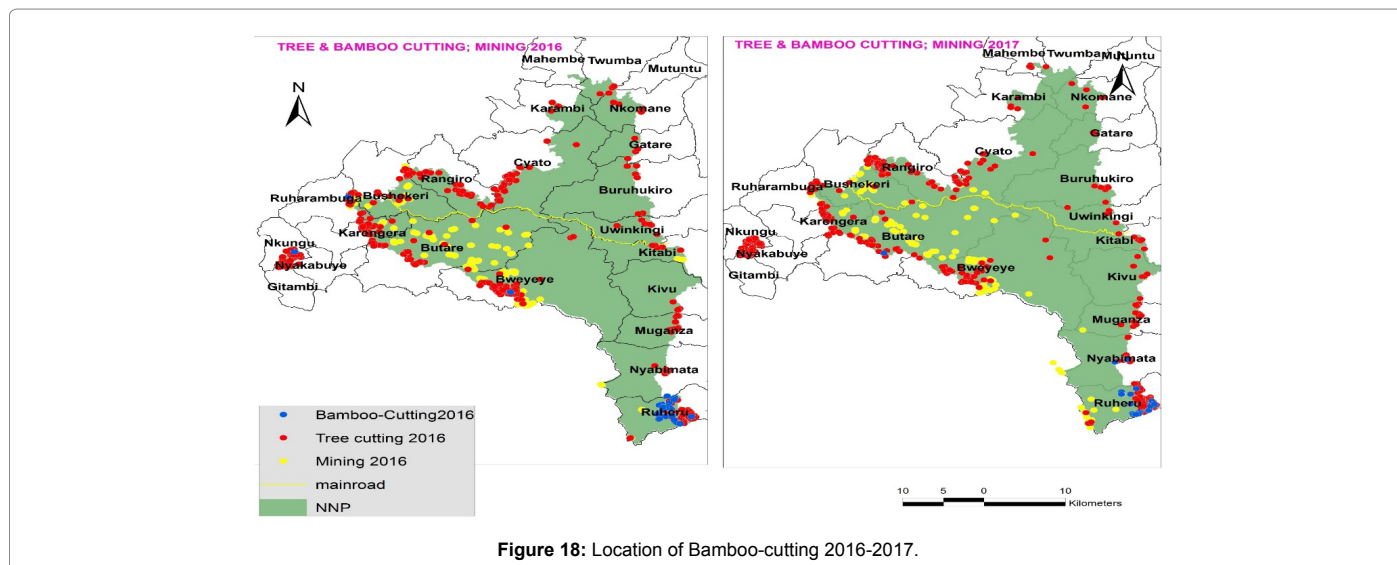


Figure 18: Location of Bamboo-cutting 2016-2017.

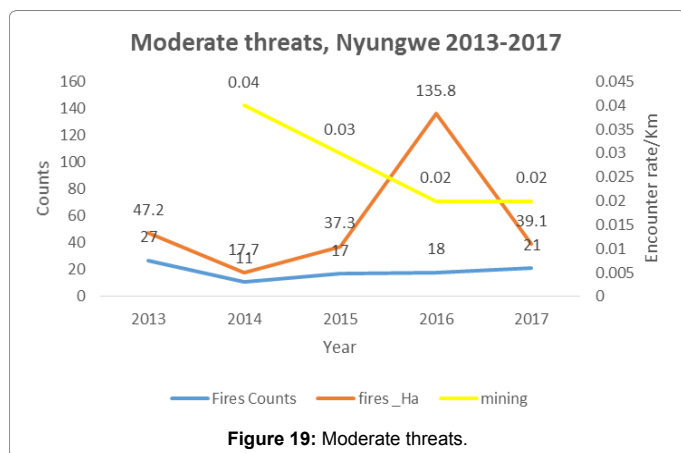


Figure 19: Moderate threats.

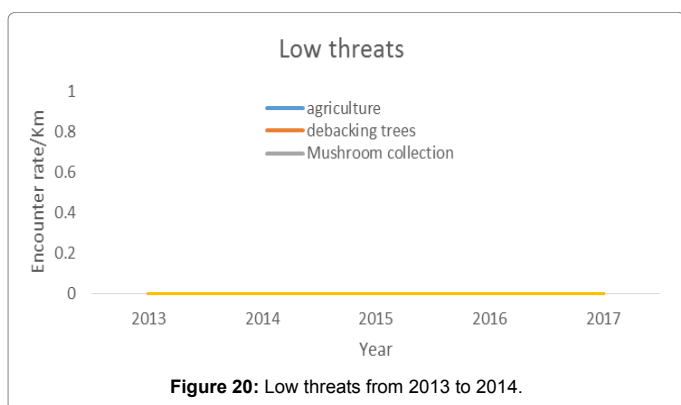


Figure 20: Low threats from 2013 to 2014.

It is justified by data that the community engagement has reduced the forest fires and also the threats to the park. Through revenue sharing, local communities have developed different projects and among the supported people ex-poachers were taken into priorities to ensure that they will be aware of conservation and take initiative to teach others. Different infrastructures were developed, cooperatives were supported through revenue sharing and this has created a positive impact on community development, park management and biodiversity conservation. The fact that after 2015, it seems like illegal

activities have increased, this is related to the efforts in increasing the number of field staff and enforcement in patrols that resulted in detecting more threats in Nyungwe National Park. If illegal activities are very frequent in the park, we assume that there is a low mindset that needs education for change and there is also food insecurity that needs economic empowerment.

The revenue sharing focused on developmental projects that didn't engage many people and it didn't focus a lot on conservation education. It is recommended here that efforts in conservation education can be enhanced and the Park can celebrate the safety in this coming future. The revenue sharing scheme in these 13 years was not capable to meet its goals and didn't show a measurable change in community livelihoods. There is a need to assess the perceptions of the local people on the contribution of Revenue Sharing projects in their social welfare. An assessment on the effectiveness of revenue sharing to promote community livelihoods around the park is needed. We highly recommend that there can be a special program of RS Monitoring and Evaluation in Rwanda Development Board to ensure the consistency in project identification and implementation. The impact evaluation is also advised to ensure the Sustainable Conservation of Nyungwe National Park.

References

- Child B, Dalal-Clayton B (2004) Transforming approaches to CBNRM: learning from the Luangwa experience in Zambia. In: McShane TO, Wells MP (Eds.) Getting biodiversity projects to work: towards better conservation and development. Columbia University Press, New York, USA.
- Campbell LM, Vainio-Mattila A (2003) Participatory development and community-based conservation: opportunities missed for lessons learned? *Human Ecology* 31: 417-436.
- Franks P, Blomley T (2004) Fitting ICD into a project framework: a CARE perspective. In: McShane TO, Wells MP (Eds.) Getting biodiversity projects to work: towards better conservation and development. Columbia University Press, New York, USA.
- Adams WM, Aveling R, Brockington D, Dickson B, Elliott J, et al. (2004) Biodiversity conservation and the eradication of poverty. *Science* 306: 1146-1149.
- McShane TO, Wells MP (2004) Integrated conservation and development? In: McShane TO, Wells MP, editors. Getting biodiversity projects to work: towards better conservation and development. Columbia University Press, New York, USA.

6. Robinson JG, Redford KH (2004) Jack of all trades, master of none: inherent contradictions among ICD approaches. In: McShane TO, Wells MP (Eds.) *Getting biodiversity projects to work: towards better conservation and development*. Columbia University Press, New York, USA.
7. Salafsky N, Margoulis R, Redford KH, Robinson JG (2002) Improving the practice of conservation: a conceptual framework and research agenda for conservation science. *Conservation Biology* 16: 1469-1479.
8. Wells MP, McShane TO, Dublin HT, O'Connor S, Redford KH (2004) The future of integrated conservation projects: building on what works. In: McShane TO, Wells MP (Eds.) *Getting biodiversity projects to work: towards better conservation and development*. Columbia University Press, New York, New York, USA.
9. Sayer J, Campbell B (2004) *The science of sustainable development*. Cambridge University Press, Cambridge, UK.
10. Carney D (1998) *Sustainable rural livelihoods. What contribution can we make?* Department for Internal Development, London, UK.
11. Bebbington A (1999) Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty. *World Development* 27: 2021-2044.
12. Campbell B, Sayer JA, Frost P, Vermeulen S, Ruiz Pérez M, et al. (2001) Assessing the performance of natural resource systems. *Conservation Ecology* 5: 22.
13. Wunder S (2001) *The economics of deforestation: the example of Ecuador*. Palgrave Macmillan, Basingstoke, UK.
14. Salafsky N, Cauley G, Balachander B, Cordes J, Parkes C, et al. (2001) A systematic test of an enterprise strategy for community-based biodiversity conservation. *Conservation Biology* 15: 1585-1595.
15. Gunderson L, Holling CS (2002) *Panarchy: Understanding transformations in human and natural systems*. Island Press, Washington, D.C., USA.
16. McShane TO, Newby SA (2004) Expecting the unattainable: the assumptions behind ICDPs. In: McShane TO, Wells MP (Eds.) *Getting biodiversity projects to work: towards better conservation and development*. Columbia University Press, New York, USA.
17. Rogers PJ (2005) Africa, Africanists, and wildlife conservation. *African Studies Review* 48: 143-153.
18. Ostrom E (1990) *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press, Cambridge, UK.
19. Agrawal A, Chhatre A (2006) Explaining success on the commons: community forest governance in the Indian Himalaya. *World Development* 34: 149-166.
20. Smith RJ, Walpole MJ (2005) Should conservationists pay more attention to corruption? *Oryx* 39: 251-256.
21. Gartlan S (2004) Land tenure and state property: a comparison of the Korup and Kilum ICDPs in Cameroun. In: McShane TO, Wells MP (Eds.) *Getting biodiversity projects to work: towards better conservation and development*. Columbia University Press, New York, USA.
22. Knotts HG (2006) Sticks, bricks, and social capital: the challenge of community development corporations in the American deep south. *Community Development J* 41: 37-49.
23. Hellquist A (2004) Are divergent preferences between benefactors and beneficiaries an obstacle to community-based conservation? A case study of the Palas Valley, northern Pakistan. Lund University, Lund, Sweden.
24. Fedderke JW, Perkins P, Luiz JM (2006) Infrastructural investment in long-run economic growth: South Africa 1875–2001. *World Development* 34: 1037-1059.
25. Scott JC (1998) *Seeing like a state: how certain schemes to improve the human condition have failed*. Yale University Press, New Haven, Connecticut, USA.
26. Lam WF (1996) Improving the performance of small-scale irrigation systems: the effects of technological investments and governance structure on irrigation performance in Nepal. *World Development* 24: 1301-1315.
27. Kremen C, Niles JO, Dalton MG, Daily GC, Ehrlich PR, et al. (2000) Economic incentives for rainforest conservation across scales. *Science* 288: 1828-1832.
28. Kiss A (2004b) Making biodiversity conservation a land-use priority. In: McShane TO, Wells MP (Eds.) *Getting biodiversity projects to work: towards better conservation and development*. Columbia University Press, New York, USA.
29. Sivaraksa S (1989) Development and environment in south-east Asia. *Zulak* 24: 429-436.
30. Sharma S, Rikhari HC, Palni LS (1999) Conservation of natural resources through religion: a case study from central Himalaya. *Society and Natural Resources* 12: 599-612.
31. Levang P, Dounias E, Sitorus S (2003) Out of the forest, out of poverty? In: *Proceedings of the International Conference on Rural Livelihoods, Forests and Biodiversity*. Center for International Forestry Research, Jakarta, Indonesia.
32. Botton AD (2004) *Status anxiety*. Hamish Hamilton, London, UK.
33. Ashley C, Boyd C, Goodwin H (2000) Pro-poor tourism: putting poverty at the heart of the tourism agenda. *Natural Resource Perspectives* 51: 1-6.
34. Musabe T (2002) Use of Non Timber Forest Products (NTFPs) and it Ecological Impact on the Conservation of Nyungwe Forest Reserve in Rwanda. A Thesis Submitted in Partial Fulfilment for the Award of the Degree of Master of Environmental Studies (Science), Kenyatta University.
35. Plumptre A, Masozera M, Fashing PJ, McNeilage A, Ewango C, et al. (2002) Biodiversity surveys of the Nyungwe Forest Reserve. In: Rwanda SW (eds.) *WCS Working Paper*.
36. Weber W (1987) *Ruhengeri and its resources. An Environmental Profile of the Ruhengeri Prefecture, Rwanda*.
37. Dowsett RJ (1990) *Enquete Faunistique et Floristique dans la Forêt de Nyungwe, Rwanda*. Tauraco Research Report.
38. Kanyambwa S (1992) The biodiversity of Rwanda's mountain forests and the problems of their conservation. Minagri Conference, National Day of the Tree.
39. ORTPN (2005) *General Management Plan of Volcanoes National Park*. Musanze, Rwanda Government of Rwanda.
40. Plumptre AJ (2003) Lessons learned from on the-ground conservation in Rwanda and the Democratic Republic of Congo. In: Price SV (Eds.) *War and Tropical Forests: Conservation in areas of armed conflict*. The Haworth Press Inc, New York.
41. Borrini-Feyerabend G (1996) Collaborative Management of Protected Areas: Tailoring the Approach to the Context. *Issues in Social Policy*, IUCN, Gland, Switzerland.
42. Kiss A (2004a) Is community-based ecotourism a good use of biodiversity conservation funds? *Trends in Ecology and Evolution* 19: 232-237.
43. Leach M, Mearns R, Scoones I (1999) Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Dev* 27: 225-247.
44. Zerner C (2000) *People, plants, and justice: The politics of nature conservation*. Columbia University Press, New York.
45. Wunder S (2005) *Payments for environmental services: some nuts and bolts*. CIFOR, Bogor, Indonesia.