INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES
IJPAES
V
olume-8, Issue-3 July-Sept-2018 Coden:IJPAJX-CAS-USA, Copyrights@2018 ISSN-2231-4490
Received: 24th Aug-2018 Revised: 12th-Sep-2018 Accepted: 13th Sep-2018
DOI:10.21276/Ijpaes http://dx.doi.org/10.21276/ijpaes *Research Article*

ECOTOURISM AND LOCAL COMMUNITY ACTIVITIES ON ECOSYSTEM CHANGES IN AND AROUND VOLCANOES NATIONAL PARK

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ABSTRACT: Globally land use activities have had a profound impact on the ecosystem services, ecosystems as well as their functioning activities. Many ecosystems are exposed to the effects of man, activities and land use in different measures. Land-use change and related habitat loss and fragmentation have long been recognized as important drivers of past and present ecosystem change. High population density, high poverty and dependence on natural resources especially in and around Volcanoes National Park are major threats for the conservation of the protected area. Eco-tourism as one of the main economic activity has also been promoted by government to eradicate poverty as well as empower the local communities around the park. Not only, that ecotourism as one of ecosystem services derived by the local community, needs to be sustained for the wellbeing of the local community but it has a multiplier effect in a destination. The main aim was to determine how the local community and ecotourism activities impact on ecosystem and ecosystem services in and around Volcanoes national park. The area of study was Volcanoes National Park in northern part of Rwanda. The research design was descriptive and included both qualitative and quantitative data that comprised of statistical or measurable variables. These were obtained through use of primary and secondary data. Purposive random sampling was utilized and data collection was through questionnaires and oral interviews. Analysis of data was be done by use of ANOVA, correlation coefficients, frequencies plus percentages by SPSS software. Critical results indicated that human activities such as deforestation, population density, agriculture and encroachment had a significant impact on the ecosystems. It was concluded that human activities had significant influence on the ecosystems and thus services derived. It was also recommended that for sustainable purposes, all stake holders should be involved in conservation.
Key words: Ecosystem services, ecosystems, eco-tourism, anthropogenic impacts and protected areas.

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INTRODUCTION

Globally tourism has been promoted as a tool for economic development especially in the developing countries. Sustainability has emerged as a paradigm in tourism planning and development and has to consider economic, social, and environmental demands of sustainable development (Fadahunsi 2011; Abidin, 1995). Similarly, tourism activities generally can create various negative impacts on the surrounding environment and existing ecological processes. These problems can be reflected in degrading natural resources, vegetation structure and the size of the habitat patch, increasing deforestation and decreasing upstream water flows (Li., 2004; WSC, 2009; Tewodros, 2010).

The ecotourism concept tries to address some of the possible negative outcomes of tourism. In that regard it emphasizes the need for a sustainable tourism development that involves local interests. Thus, ecotourism is defined by International Ecotourism Society (TIES, 2007) as responsible travel to natural areas that conserves the environment and improves the local people well-being.

The assumption is that local communities can get involved in tourism and gain an income, and thereby reduce pressure on the natural resources by abandoning over exploitation and developing positive conservation attitudes (TIES, 2007 and Li., 2004). The study was set out to investigate ecotourism and local community activities that lead to ecosystem changes in and around Volcanoes National Park. World Travel & Tourism Council *et al* (2002) suggest that ecotourism experiences an outstanding annual growth of 20 % in tourism revenues. However, it is yet to be demonstrated whether ecotourism satisfies the high expectations in practice. This is because a very common criticism is that ecotourism is similar to nature tourism or is a marketing gimmick (green washing). Possibly, expectations in ecotourism's ability to address all problems of unsustainable development are overvalued, as Honey (1999) points out. Around the world, ecotourism has been hailed as a panacea that is a way to fund conservation and scientific research, protect fragile and pristine ecosystems, benefit rural communities, promote development in poor countries, enhance ecological and cultural sensitivity, instill environmental awareness and a social conscience in the travel industry, satisfy and educate the discriminating tourists, and, some claim, build world peace (Ashley and Hussein, 2000).

Additionally, Ashley (2000) and Isaacs (2002) suggests that ecotourism can be differentiated from nature tourism by its emphasis on conservation, education, traveler responsibility and active community participation. Ecotourism encompasses the following key aspects that include the primary attraction which is the natural environment; but socio-cultural attractions within the destination area also play an important role. Secondly, ecotourism strives towards (proactively) addressing the three dimensions of sustainable development which include ecological, socio-cultural and socio-economic sustainability (Eadington and Smith, 1992; Li., 2004; Isaacs, 2002). It is therefore aimed at minimizing the impact on the natural and cultural environment and at the same time providing benefits to host communities. Similarly, other authors (Fennell, 2001 and Blamey, 2001) highlight the importance of environmental and cultural education. It therefore reconciles economic development and nature conservation. Ross and Wall (1996) importantly noted that, favorable institutional environment that include; NGOs, government and local communities is crucial for successful ecotourism.

In the same way, Ashley (2000), Ashley and Hussein (2000), Bhattacharya and Kumari (2004), Campbell (1999), Clifton and Benson (2006), Ross and Wall (1999) define economic benefits by incorporating the concept of livelihoods. Additionally, dimensions of poverty that must be addressed include food insecurity, social inferiority, exclusion, lack of physical assets, and vulnerability. Also Ashley and Elliott (2003) point out that measuring tourism's contribution to local economic development does not just mean taking key macro growth indicators, such as output and employment, down to a destination level. Local multiplier effects are so important, and include both formal and informal sector employment, as well as indirect impacts such as improved infrastructure and public services, and more abstract benefits such as participation, empowerment and improved governance (Godratollah, *et al*., 2011). Non-financial benefits include, most importantly, community infrastructure like transportation, communication, education and health. Further, compatibility with and enrichment of local livelihoods is important, besides measuring the monetary impact (Millennium Ecosystem Assessment, 2005).

Additionally, economic gains through tourism link community benefits and conservation which has in the long time formed part of the Kenya Wildlife Service (KWS) strategy by "directing greater economic benefits from parks to local people is an expressed goal of the Kenya government. The principles underlying revenue include the local people who bear the cost of wildlife conservation by tolerating crop and livestock losses, and foregoing potential income from alternative land uses. In addition, 'local communities will continue supporting parks and reserves if they are perceived to assist in people's development" (KWS, 1990, cited in Sindiga 1995). Studies show that a growing number of those who were poachers and illegal resource users across the developing world are engaging in tourism and, for instance using their wide cultural and environmental knowledge sustainably as guides (Eadington and Smith 1992)

Studies carried out by Twining-ward (2002), indicated that ecotourism ventures to be considered 'successful', local communities should have some measure of control over them and if benefits resulting from these ecotourism activities are equally shared among all stakeholders. One form of ecotourism that maximises community participation in decision-making and benefit-sharing is Community-Based Ecotourism (CBET). Further, Boyd (1996) also argues that the term CBET should be reserved for those ventures which are based on a high degree of community control (and hence where communities command a large proportion of the benefits) rather than those almost entirely controlled by outside operators. However, it is rare in literature to find examples of community-based initiatives which are not managed, co-managed, or initiated from outside the community (Twining-ward, 2002; Bukenya, 2000; Li, 2004). In the case of a co-management it is crucial for the community to retain control over the land and improve their livelihood.

Similarly, Li (2004) suggests that livelihood refers to the means of gaining a living, including livelihood capabilities, tangible assets and intangible assets. To associate livelihoods with sustainable development, Godratollah, *et al*., (2011) argues that livelihood must comprise of people, their capabilities and their means of living, including food, income and assets.

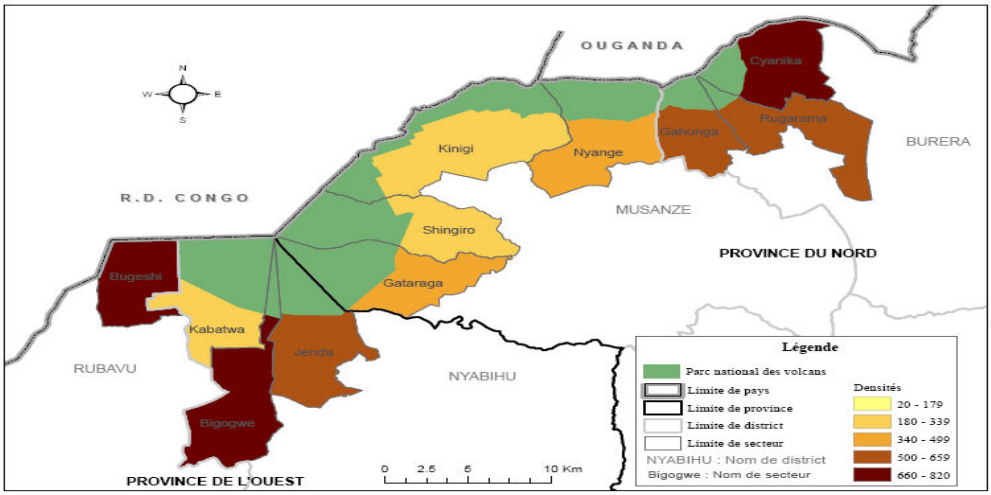
A livelihood is environmentally sustainable when it maintains or enhances the local and global assets in which livelihoods depend, and has net beneficial effects on other livelihoods. Also livelihood is socially sustainable which can cope with and recover from stress and shocks, and provide for future generations (cited in IDS, 2007 and Godratollah, *et al.*, 2011). Gomez-Sal *et al.* (2003); Nautiyal and Kaechele (2007) agree that on the global scale there is growing consensus about sustainable eco-tourism due to land-use practices as a result of human activities on ecosystem. It is challenging to deal with conservation and utilization of the resources especially in those areas with high population densities and experience a number of conflicting interests. Conversely natural landscapes are an important ecological, economic, and socio-cultural resource that gives the foundation for the sustainability of any region and contribute significantly to the quality of life of the local people (Millennium Environment Report 2005; Brabyn, 2005).

In Rwanda a large and growing human population around Volcanoes National park relies on the landscape's rich natural capital (RDB, 2015). Forest products provide up to a third of peoples' incomes, supplementing revenue from small scale agriculture and fisheries. The watershed provides millions of people with fresh water for drinking and farming. This magnificent landscape is gravely threatened by poaching, unregulated agricultural expansion, and overharvesting of fuel-wood and timber. The capacity of communities and governments to respond is compromised by poverty and civil unrest (WCS, 2009). The authors have majorly focused on community benefits but not the local community activities on ecosystem characteristics and services in and around Volcanoes National Park and that was the aim of the study. The objectives of the study were to determine the local communities activities that effected the ecosystems and their perception about the ecosystem services derived from the park.

MATERIALS AND METHODS

Description of study area

The Volcanoes National Park is one of the most renowned ecosystems and biodiversity niche in the Central Albertine Rift of the Great Lakes Region and in the World. It is located at 1°30'5, 29O'E or 1°21'-1° 35' South, 29°22'- 29°44' East, in the North of Rwanda bordering Democratic Republic of Congo (DRC) and Uganda. Its length is 40km and its width varies from 8km to 1km and the interface with the local population is 60km. This Park is worldwide best known as one of the unique and rare sanctuaries of the endangered mountain gorillas in the world but also as having one of the richest biodiversity in Africa. It is the most important Park in Rwanda, in terms of tourism attraction, despite being the smallest amongst the three national Parks of the Country with only a surface area of 160 km2. A part from the mountain gorillas, the afro mountain forest that composes the Volcanoes National Park is of high biological diversity. It is located in one of the most densely populated parts of Africa. The Northern part of Rwanda, where the large part of the Volcanoes National Park is situated, is the most populated with an average of 528 inhabitants per sq.km. The remaining part bordering the Park situated in the Western part of Rwanda has also the highest population density with 1,041 inhabitants per sq.km in Rubavu District and 556 inhabitant per sq.km in Nyabihu District. The Mountain Gorillas are mainly endangered because of the high population density and the severe encroachment on their remaining small natural habitat by the surrounding poor population that depends on agriculture and the natural resources from the Park (fire wood, water and more often poaching) for their livelihood and survival.



(Source: Rwanyiziri G., 2009)

Fig. 1: Map of Volcanoes National Park and Population density around.

The most useful and efficient strategy to protect and conserve Volcanoes National Park goes toward actions that focus on the improvement of livelihoods of the people who live around the Park and depend on the resources from the park. An intensive conservation program contributed significantly to the increase of the Mountain Gorilla population in the Virunga Massif, from 380 individuals to 480 individuals. Economic benefits from the park to the neighboring population and / or supporting the diversification of livelihoods near the park are contributing the most to poverty reduction and livelihoods development. In terms of investments, tourism registered 323.8 Million USD in 2012, an increase of 175% from 117.3 million USD in 2011(RDB Annual report, 2012)

Research Approach

Investigating the main local community activities on ecosystems

To investigate the main ecotourism and community activities in the park and adjacent sectors, the study utilized household questionnaires and a focus group discussion guide, which were prepared. The questionnaires were preferred in this study because they give an insight into ecotourism activities as well as the driving factors of land use/cover change for community livelihood (Jan *et al.,* 2005). The respondents included in the study were randomly selected from the local council members list for questionnaire administration and participation in focus group discussions from twelve sectors and randomly sampled cells. This approach was utilized because it ensured that all members and villages were appropriately represented in the study whereas purposive sampling was conducted on only the key informants because of their knowledge on the catchment's natural resources usage. The main ecotourism activities and local community economic activities were examined through an administration of 142 personal questionnaire interviews to both the local residents and key informants (RDB staff) in the study. The questionnaire interviews were conducted on an individual basis to minimize the peer influence and improve the quality of data (Phillips & Gentry, 1993) while the focus group discussions were conducted at a village level comprising of 11 households in 12 sectors plus 10 RDB staff. The socio-economic data from questionnaires was coded and entered in SPSS Windows Programme (10.0) and subjected to Logistic Regression to determine the main ecotourism activities and economic activities of land use/cover change in the sectors (Jan *et al,* 2005).

RESULTS AND DISCUSSION

The results indicated a fairly strong relationship between anthropogenic activities and ecosystem characteristics in and around the park. This means that the increase in the anthropogenic activities significantly affected the ecosystem characteristics. Analysis of data revealed in the model summary Table 1 below showed the R square values as R^2 = 0.432 (0.432%), $p < .001$ indicated a significant of impact of the human activities. So the observed variability indicated that the anthropogenic activities significantly impacted ecosystem characteristics in and around the national Parks explained by the three independent variables that is; plant harvesting, Pole-wood cutting and Firewood collection. R = 0.312, $p < .001$ is the correlation coefficient between the observed value of the dependent variable and the predicted value based on the regression model showed that there is a significant impact. The null hypothesis that Ecosystem characteristics in the two national parks were not affected by anthropogenic activities was rejected. The Adj. R^2 = 0.431 (43.1%) indicated a significant impact basing on the proportion of the variability in the dependent variable explained by the linear regression (Table 1) below.

Table 1: Model Summary of predictors that affect ecosystem characteristics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.312[a]	.432	.431	5.165

a. Predictors: (Constant), plant harvesting, Pole-wood cutting, Firewood collection

Local community perception on benefits derived from ecosystems

Majority of participants 31% agreed that the forest provided home (habitats) for animals which was the key benefit as compared to an average of 5.7% for ornamental resources, while average number of 28.5% respondents said timber was another important benefit derived from the forest and average number of 25,71% pointed out that ecotourism was among the top benefits derived also from the forest and these were the highest benefits obtained from the park as compared to 8.57% for research (Fig. 1) below.

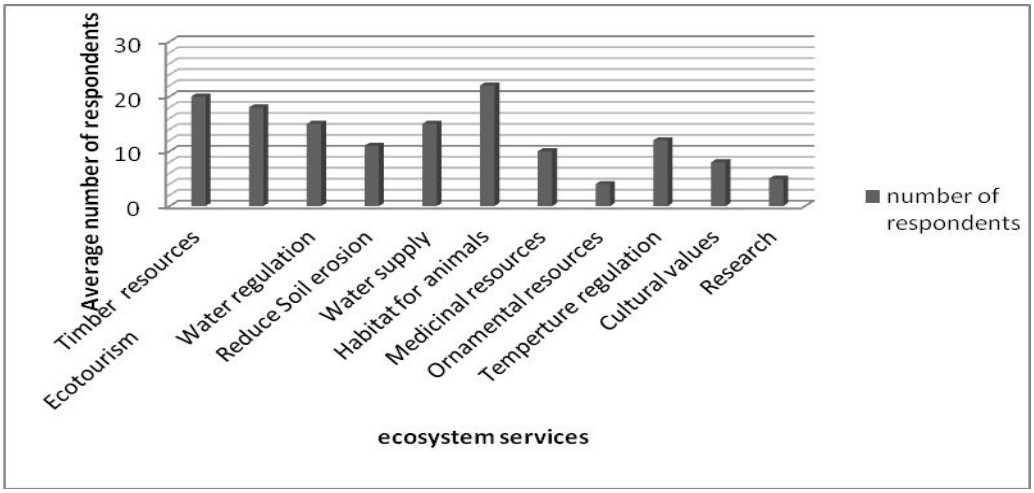


Figure 1: Different ecosystem services derived from ecosystems

The results indicated that an increase in the independent variables resulted into a corresponding increase in dependent variable. This further indicated that anthropogenic activities significantly affected eco-tourism activities and visitor trends in the two national parks The analysis-of-variance (ANOVA) table was also used by the study to test the equivalent null hypothesis. The $F(3) = 1534.133$, $p < .001$, the null hypothesis that Eco-tourism activities in the two national parks and visitor trends are not affected by anthropogenic activities was rejected, meaning that at least one of the population regression coefficient is not zero (Table 2).

Table 2: ANOVA[a] of parameters affecting ecotourism activities

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1908.975	3	636.325	1534.133	.000[b]
	Residual	2064.169	4361	.473		
	Total	3973.144	4364			

a. Dependent Variable: Eco-tourism activities

b. Predictors: (Constant), plant harvesting, Poaching , encroachment

CONCLUSION AND RECOMMENDATIONS

Basing on the results and discussions above it can be concluded that for any protected area that is to benefit from ecotourism and remain sustainable, there has to be community involvement. The local communities are an important element in the conservation of the resources that are used for ecotourism activities. In addition it can be concluded that involving the communities around the protected areas helps to empower them thereby reducing stress on ecosystems. Ecotourism as an economic activity has a multiplier effect which reduces poverty and improves the well-being of the local community. Therefore in conclusion pressure on the ecosystems will only decline when all the stakeholders are involved in order to attain sustainability of the ecosystems that are important in providing the goods and services. Finally minimizing the factors that stress and affect the health of the ecosystems such as plant harvesting, pole wood cutting and encroachment will in the long run lead to sustainable ecotourism development. Therefore it is recommended that the park management has to intensify creating awareness amongst the community about the benefits of ecotourism and ecosystems. Further it was recommended that natural capital should be sustainably exploited to ensure the future generation can also benefit from its goods and services. Finally involving all the stakeholders in conservation should be the strategy used to achieve sustainable tourism.

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INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES

ISSN 2231-4490

International Journal of Plant, Animal and Environmental Sciences