

Threats, Opportunities and Community perception of Biological resource conservation in Bale Mountains National Park, a case of Dinsho District, Ethiopia

Israel Petros^{1*}, Kassahun Abie² and Berhanu Esubalew³

¹Department of Ecotourism and Biodiversity Conservation, Madawalabu University, 247, Ethiopia

²Department of Wildlife and Ecotourism Management, Wolkite University, 07, Wolkite, Ethiopia

³Department of Tourism Management, Madawalabu University, 247, Bale Robe, Ethiopia
peterisri.4banch@gmail.com

Available online at: www.isca.in, www.isca.me

Received 11th February 2016, revised 31st March 2016, accepted 2nd April 2016

Abstract

This study was conducted to identify the threats, opportunities and community perception of biological resource conservation in Bale Mountains National Park. It also aimed distinguishing the causes and consequences associated with biological resource threats in the area. The findings are based on primary data from communities, stakeholders and field visits. Questionnaires, interviews and site visits were data collection tools. The result of the study indicated that fuel wood collection, overgrazing and deforestation are the main threats of biological resources. Management and community related factors contribute for the occurrence of the threats. Livestock competitions with wildlife and habitat fragmentations are the major negative environmental impacts in the park. The perception of communities indicated their positive response to the presence of conservation organizations and the relationship between communities and the park. But, communities had negative response to prevalence of alternative job opportunities and existence of community based conservation activities. The identified opportunities for biological resource conservation in the park includes the increasing attitude of communities towards biological resources, prevalence of conservation organizations and the growing political support from governments of different hierarchies.

Keywords: Dinsho, Biological Resources, Conservation, Opportunities, Perception, Threats.

Introduction

The growing human population and the related economic needs are affecting protected areas in developing countries¹. This is also the case of Ethiopia's National Parks that are highly influenced by human activities. The underlying threats of many protected areas in developing nations are related with human activities such as deforestation and fuel wood collection². Access to grazing lands is also a problem associated with the pastoral communities in Ethiopia, and affects protected areas³. Ethiopia comprises a large number of endemism in terms of both fauna and flora in its different protected areas⁴. National parks, wildlife reserves, priority forests, biosphere reserves and community conservation areas are designated protected areas of land in the country⁵. They cover 16.5% of the country's land mass⁶. However, they face many challenges because of local communities influence. Competition between communities and wildlife is also the main problem in various conservation areas of Ethiopia⁷.

Ethiopia also possesses highland massifs that occur at an altitude of 3000m above sea level. Among these is the Bale Mountains National Park (BMNP), having a great deal of continuous Afroalpine and Afromontane forest habitats^{8,9}. It

makes the Eastern section of Afromontane and Afroalpine biological resource sites and, is included under the 34 International Biodiversity Conservation Hotspots¹⁰. It is a relatively intact environment that has not been shattered by ancient history of cultivation and land degradation⁵.

However, the growing negative pressures on natural resources are threatening the sustainability of the environment¹¹. There is also rapid ecological degradation that poses a severe threat to the park biodiversity and its ecosystems⁹. This makes the conservation activities to base on comprehensive evidences of biological resource conservation challenges obtained from anthropogenic factors in areas like BMNP which occupy immense biological resource potential. Therefore, this particular research paper has tried to identify the biological resource threats, factors contributing for the threats, environmental consequences of the threats and the perception communities towards conservation opportunities and activities. Moreover, it assesses the opportunities for biological resource conservation in BMNP.

Materials and Methods

BMNP lies within five woredas of the Bale Zone. Dinsho in the

north, Adaba to the west, Goba to the northeast, Mena-Angetu to the south and Barbare to the east¹². The specific area of this study is Dinsho Woreda. It is 400km far away from Addis Ababa; the capital city of Ethiopia. The Woreda is located in the coordinates of 7010'-7010'02''N Latitude and 39055'-39055'02''E Longitude. It has eight month rainy season from March to October receiving 600-1400mm annual rainfall depending on the altitude of the areas. The annual mean minimum and maximum temperature of the area is 2⁰C and 20⁰C, respectively. The total population of the Woreda is 39,124.

Dinsho Woreda was selected from other Woredas that surround the park because of the highest human settlement and the location of the park head quarter. The Woreda has 9 kebeles. The Kebele is the lowest administrative unit of the current Ethiopia comprising several villages in its local boundary. 2 kebeles (Gojera and Dinsho 01) were purposely selected due to their proximity to the park and the presence of better conservation stakeholders. Gojera Kebele is found inside the park while Dinsho 01 found outside the park (Figure 1). There are 133 households in Gojera kebele while Dinsho 01 has 1215 households. The sample households from two kebeles were selected randomly. Moreover, the sample of respondents from park, government office and NGOs was carried out purposely

due to their familiarity to conservation threats and their impacts. In this way, 24 individuals from park, 5 individuals from government office and 3 from NGOs were selected for this study. However, the total sample size of respondents from communities was determined based on Cochran formula¹³. The sample size for the study site was based on the following equation.

$$n = \frac{\left(\frac{Z\alpha}{2}\right)^2 * P * Q}{(W)^2}$$

Where: 1, $\frac{Z\alpha}{2}$ = 1.96 at α =at 95% confidence interval, 2, P*q= is estimate of marginal variance in which it is 5%, 3, W= Researchers willingness to accept margin of error in which we take 9%, $n = \frac{(1.96)^2 * 0.5 * 0.5}{(0.09)^2}$ n =118 households,

If the value of n is greater than 5% of the population we can apply the Cochran (1977) correction formula which is given by

$$n1 = \frac{no}{1+(no-1)/N} \quad no=118$$

Therefore the sample size for study groups was

$$n1 = \frac{118}{1+(118-1)/133} = 62$$

$$n2 = \frac{118}{1+(118-1)/1215} = 107$$

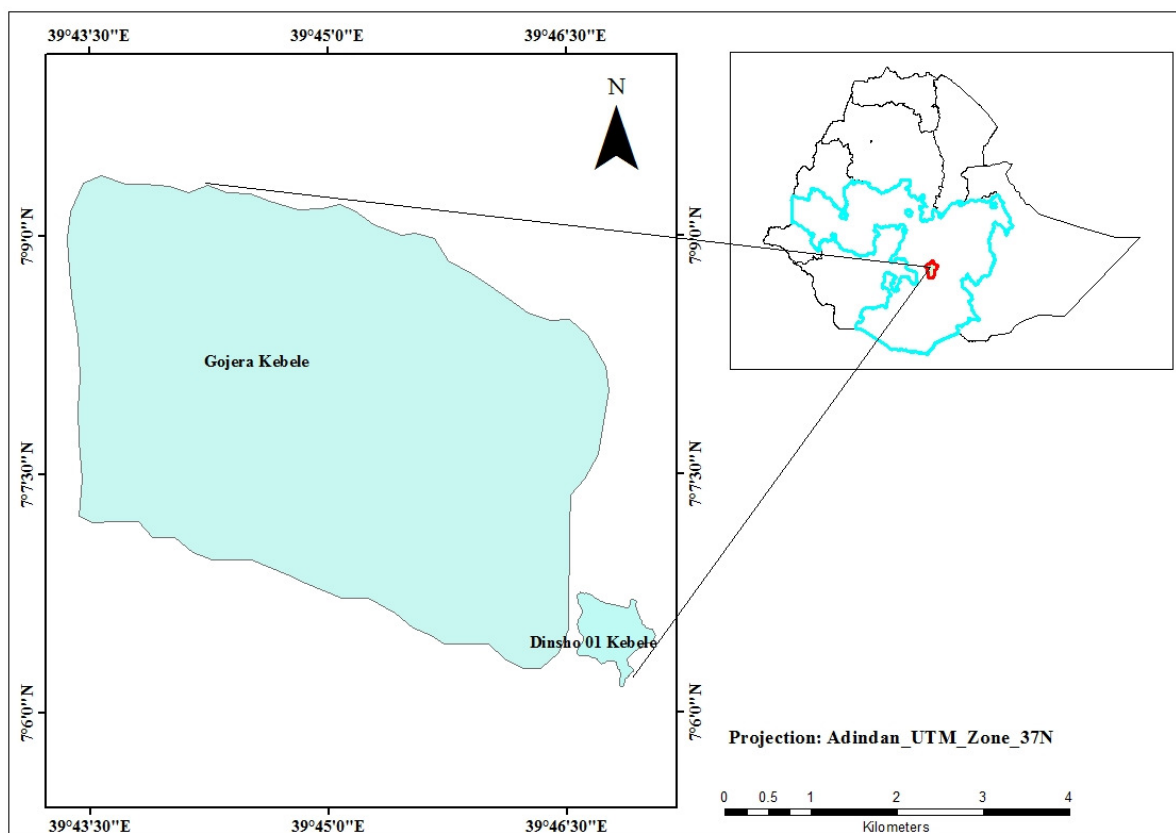


Figure-1
 Map of the study area

Methods of data collection: To assess the threats and opportunities of biological resource conservation in the study area, different data collection methods were employed. Questionnaire was provided to identify the threats, contributing factors for threats, environmental impacts and assess community perception towards conservation of the site. Interview with key informants was carried out to assess the opportunities for biological resource conservation in the area. Moreover, field visit was made to obtain evidences of biological resource threats in the local area.

Questionnaire was administered both for communities and relevant stakeholders. They were prepared to get important details about threats of biological resource conservation from the target respondents. To identify the threats, factors contributing for threats and community perception, semi-structured questionnaires were distributed for communities. They were distributed for 169 respondent households selected from two kebeles (62 Gojera kebele and 107 Dinsho 01). Similarly, they were also provided for park staff members, government office workers and NGOs workers to identify the threats, contributing factors and the negative environmental impacts associated with the threats in the park. Interview was carried out with key informants from communities and various stakeholders to assess the opportunities for biological resource conservation in the area. This was conducted at each sample kebele with systematically selected 8 community leaders and elders of villages and 6 selected stakeholders from park staff, government office and NGOs. The fourteen selected key informants were considered knowledgeable in their view of conservation activities. Observation of the surrounding environment, an overview of the local market, observation of police station and woreda and kebele administrative offices was done for the sake of comparing the result obtained from questionnaire and interview with the reality on the field.

Data analysis techniques: The quantitative data obtained from questionnaire was analyzed using descriptive statistical methods such as percentages. Chi-square test of SPSS 20.0 version software was used to test significant variation between groups. The qualitative data obtained through interview and field visits were analyzed in the form of narrations. Moreover, SWOT analysis technique was employed to identify the overall strong point, weak point, opportunities and threats of the park in addressing biological resource threats in the area.

Result and Discussion

Socio-demographic characteristics: There were 169 respondents selected from communities. About 57.99 percent of them were males whereas 42.01 were females. The number of males was significantly higher than females ($X^2 = 4.314$, $df=1$, $p=0.038$). The age structure of the respondents was characterized by 58 (34.32%) in the interval between 18-32, 70 (41.42%) between 32-44 and the remaining 41(24.26%) were above 45 years.

There has been significant difference in the age category of respondents ($X^2 = 7.538$, $df=2$, $p=0.023$). The educational level of the respondents has shown significant variation ($X^2 = 83.604$, $df=5$, $p=0.000$). 24 (14.20%) of respondents were uneducated, 16 (9.47%) obtained informal education, 68 (40.24%) attended primary education, 37 (21.89%) were at secondary school level, 13(7.69%) have certificate and 11 (6.51%) have diploma and degree. Regarding the occupation of the respondents, 26(15.38%) were civil servant, 30(17.75%) were self employed, 86 (50.90%) were farmers, 19 (11.24%) were house wife and the remaining 8 (4.73%) were others (i.e. drivers, merchants). Occupation has also shown significant difference in job categories of respondents ($X^2 = 109.018$, $df=4$, $p=0.000$).

Threats of biological resources, contributing factors and environmental impacts: Based on the collected data from local communities and stakeholders, different threats that affect biological resource conservation in the park were observed. Fuel wood collection is the main threat of biological resources judged by communities whereas the response of stakeholders indicated overgrazing as the main biological resource threat of the area. Both respondent groups revealed deforestation as among the top three threats of biological resources in the park (Table-1).

The high dependency of the local peoples on the surrounding forest for the source of energy, construction material and economic benefit are provoking deforestation activities in the park. Correspondingly, the local peoples rely on the surrounding park resource to meet the needs of their livestock. This is particularly the case in dry seasons due to shortage of water and other resources, and leading to disturbance of the park and its biological resources. This corresponds with the study in Borena-Saynt National Park of Ethiopia, in which overgrazing, fuel wood collection and deforestation are factors that affect the resources in the area¹⁴. Similarly, threats to several protected areas in Ethiopia are associated with increasing pressure from human and livestock population¹⁵. During the field visit in the area, evidences of biological resource threats were identified in various places. Fire wood deposit and collection of Bamboo tree were observed at local Dinsho market. The local communities were observed when they involve in clearing of forests for various purposes. Collection of wood caught from illegal activities in local administrative kebeles and mass livestock grazing in the park were also observed during the field visit.

The response of stakeholders to the intensity of biological resource threats practiced by the communities in Gojera and Dinsho 01 kebeles revealed the high threat by communities in Gojera kebele 29 (90.63%) whereas 14 (43.75%) has shown the high threat by communities in Dinsho 01 kebele. The chi-square test indicated the threat by communities of Gojera kebele is higher than the threat by communities in Dinsho 01 (Table-2).

Table-1
Threats of biological resource conservation in the park

Threats	NRC	(%)	NRS	(%)
Poaching	27	15.98	2	6.25
Fuel wood collection	38	22.49	6	18.75
Deforestation	34	20.12	5	15.63
Over grazing	29	17.16	7	21.88
Agricultural expansion	15	8.88	4	12.50
Charcoal production	11	6.51	3	9.38
Human encroachment	6	3.55	2	6.25
Uncontrolled fire	7	4.17	1	3.13
Pollution	2	1.18	2	6.25

NRC - Number of respondents from communities, NRS – Number of respondents from stakeholders, (%) - Percentage.

Table-2
Stakeholders’ perception on the intensity of biological resource threats practiced by communities of the two kebeles

Kebeles	Level				X ²	df	p value
	High		Low				
	N	%	N	%			
Gojera	29	90.63	3	9.38	5.233	1	0.022
Dinsho 01	14	43.75	18	56.25			

According to the above table, the response of stakeholders indicated the presence of significantly higher threat level by communities of Gojera kebele. This might be due to the kebele is located within the park boundary that can lead to different anthropogenic impacts in the area.

Both managerial and community related factors were mentioned by communities and stakeholders as they hassle biological

resource of the park. 106 (62.72%) of communities positively responded to managerial factors while 94 (55.62%) responded to community related factors. Similarly, 17 (53.13%) of stakeholders have positively responded to managerial factors whereas 20 (62.50) % responded to community related factors. The chi-square test both for the response of communities and stakeholders has shown no significant variation between the two factors (Table-3).

Table-3
The opinion of respondents towards factors contributing for biological resource threats in Dinsho area

Respondents	Factors								X ²	df	p value
	Managerial				Community related						
	Yes		No		Yes		No				
	N	%	N	%	N	%	N	%			
Communities	106	62.72	63	37.28	94	55.62	75	44.38	0.720	1	0.396
Stakeholders	17	53.13	15	46.88	20	62.50	12	37.50	0.243	1	0.622

The above table reveals that both managerial and community related factors are contributing for biological resource threats in the area. This is due to absence of collaborative approach from communities and management bodies in conserving biological resources of the park. Lack of coordination among stakeholders distress the success of conservation activities¹⁶. Community related biological resource threats were also distinguished by respondents. Perhaps, the less empowerment of communities in terms of economical, educational and managerial aspect is the cause. Unless the communities are not socio-economically empowered and their aspirations are respected, the prevention of threats in protected areas is unsuccessful¹⁷.

The causes of biological resource threats mentioned by respondents revealed, lack of adequate community participation in conservation of resources as the major factor of the threats responded by communities 42 (24.85%) followed by socioeconomic factor 31(18.34%). Lack of incentive was the third factor 29(17.16%) whereas limited resource of the park was the fourth 18(10.65%). Absence of clear boundary, management problems and seasonal movement of communities were factors accounting 15 (8.88%), 13 (7.69%) and 12 (7.10%) respectively. The least factor mentioned for biological resource threats was traditional belief accounting 9(5.33%). Respondents from stakeholders have ranked socioeconomic factors 7 (21.88), shortage of park resource 6 (18.75) and absence of community participation 5 (15.63) as first, second and third causes of biological resource threats in the park, respectively. Absence of direct incentives and lack of clear boundary were both judged as fourth factors each accounting 4 (12.5%). Seasonal movement of communities 3(9.38%) and management problem 2(6.25) were the fifth and sixth factors respectively. Traditional beliefs was the least factor 1(3.13%) mentioned by the stake holders.

Inadequate participation of communities in conservation activities was judged as among the top three causes of biological resource threats both by communities and stake holders in the park. This might be the reason for the inability of the park in impeding illegal extraction of resources. Without involving communities in the conservation of resources and ensuring their benefit, prevention of biological resource threats and illegal resource extractions is complicated¹⁸. In the same manner, inadequate communities' participation to execute management programs contributes for biological resource threats¹⁶. Socio-economic factors were the top two factors affecting biological resource conservation of the area followed by lack of direct incentives which was judged as the top four factors by both groups. The less socio-economic conditions of communities along with lack of direct incentive given for them are enforcing to extract more resources from the park to satisfy their needs. Lower income earning groups and that do not get incentive from the park mostly refuse rules and regulations, and affect biological resources in protected areas⁷. If communities are not benefited and lack compensation for opportunity costs and harm incurred due to resource conservation, then threat to biological

resource occurs at severe level¹⁷. Limited resource of the park and absence of clear boundary were described as top four and five factors contributing for biological resource threats in the park respectively. This is in line with the study in Yabelo Sanctuary in Ethiopia, in which lack of resources such as insufficient funding and, undefined demarcation of the protected area have contributed for biological resource threats in the site¹⁹.

The various threats are aggravating negative environmental impacts in the park. The major impacts described in the area were livestock competition with wildlife 29 (90.63%) and habitat alteration and fragmentation 26 (81.25%). In both cases, only respondents less than 20% disagreed with the impacts. Spoil of habitat corridors, disease outbreak and disturbance and wildlife harassment were negative environmental impacts that accounted 22(68.75%), 21(65.63%) and 19(59.38%) respectively. But, 10 (31.25%) disagreed to spoil of habitat corridors, 11(34.38%) to disease outbreak and 13(40.63%) to disturbance and wildlife harassment. Environmental pollution 14(43.75%) and population decline of dominant species 15(46.88%) were revealed as the least negative environmental impacts in which more than half of the respondents disagreed them. The dominancy of impacts associated with livestock competition with wildlife, habitat alteration and fragmentation and spoil of habitat corridors in the park could be due to the illegal extraction of resources and presence of heavy grazing by livestock. This is similar to the study in Kenya in which most of the threatened protected areas such as natural forests and mountainous ecosystem protected areas have been degraded through livestock grazing and deforestation. The effect caused threats to biological resources through competition with wildlife, deterioration of their habitats and environmental degradation¹⁷. The same result was also obtained in Abijata-Shalla National Park of Ethiopia. The Park habitats have already been greatly changed due to the increased extraction of resources by humans. Such subsequent increase in human activity resulted in increased threats to wildlife and their habitats⁷.

Community perception towards conservation opportunities and activities in the area: The perception of communities towards conservation opportunities and activities indicated positive attitude towards the majority of conservation ideas. However, there were negative attitudes of communities towards the existence of community based conservation and prevalence of alternative job opportunities (Table-4).

The perception of communities towards conservation opportunities and activities indicated, the positive response of communities towards the presence of conservation organizations in the area, relationship of communities and the park, patrolling activities of the park and the increasing awareness of communities towards biological resource conservation. This coincides with the study of Mutanga C.N. et. al.²⁰, agreeing to most of the statements that measured their perception of

conservation, the communities showed an appreciation of conservation. However, they responded negatively to the existence of community based biological resource conservation and prevalence of alternative job opportunities. This is likely because the communities are not involved in conservation of biological resources in an organized manner. Similarly, they have received no financial benefits from park as an incentive or the limited livelihood opportunities to enhance their income. This shows the necessity of alternative income generation mechanisms for communities as well as their involvement in conservation activity²¹. Similarly, it reveals the need of communities' participation in decision-making of the park to change their perception in positive manner²².

Strengths, Weaknesses, Opportunities and Threats of the park for measures against biological resource conservation threats in the area: The authors identified the strong and weak points from the internal environment of the park (interior factors) and the opportunities and threats from the outside environment (exterior factors) (Table-5) of the of the park for measures against biological resource conservation threats in the area based on interview with key informants, and field observations made in the park.

Opportunity for biological resource conservation in the park: There are different opportunities for conservation of biological resources in BMNP. These include the improvement in the attitude of communities towards biological resources and their values, the prevalence of NGOs that work on conservation activities of the park and the presence of good political support from governments at different levels. The positive attitude and ambition of the communities particularly the local elders,

regarding the welfare existence of the park and its conservation activities in Dinsho district is the major opportunity to promote conservation. One interviewee elder in the study area described the situation as; "The occurrence of all problems in the park are not because of the local communities dislike the park, but the high demand of the local communities to improve their socio-economic conditions. Even the local communities have shown their support for the park in occasions the park had faced problems of fire outbreak. The local people desire the safe existence of the park and their contribution to preserve the park is increasing from time to time. Similarly, individuals from communities that involve in illegal resource extraction activities lack cultural respect and acceptance. Hence, if alternative ways are implemented to improve the life of communities, the conservation of the park would be successful". The improvement in the awareness of communities towards biological resources in protected areas is vital for community based conservation activities. This enhances the proper progress in the perception of communities to various forms of biological resource management techniques^{23,24}.

Stake holders such as NGOs are contributing for conservation of biological resources in Dinsho district. The main activities they accomplish to reduce biological resource threats are awareness creation, introducing the park rules and policies and delivering short term training on conservation of natural forest and utilizing plantation forest to full fill their house hold demand. This enables to develop the capacity of communities in terms of resource conservation²⁵. The increasing political support of local, regional and national governments is expected to further enhance the conservation and sustainable existence of the park.

Table-4
Perception of communities towards conservation opportunities and activities

Opportunities	Yes		No	
	N	(%)	N	(%)
The good association of communities and the park	135	79.88	34	20.12
The presence of conservation organizations in the area	160	94.67	9	5.53
The awareness of community towards biodiversity	108	63.91	61	36.09
Prevalence of alternative job opportunities	78	46.15	91	53.85
Existence of community based conservation approach	68	40.24	101	59.76
Strong patrolling activities of the park	118	69.82	51	30.18

N – Number of respondents from communities, % - Percentage

Table-5
SWOT analysis of the park for measures against biological resource conservation threats in the area

Internal Environments	
Strengths:	Weaknesses:
<p>Awareness creation programs on the importance of the park were conducted;</p> <p>The park was involved in the development of social services like educational facilities, livestock clinics and health centre for local communities;</p> <p>The local peoples were made to use plantation forest and obtain fuel wood saving stoves;</p> <p>The plan to undertake volunteer resettlement activities was anticipated;</p> <p>The program to carry out demarcation activities of the park was proposed,</p> <p>Long term and short term plan of the park were made available;</p> <p>The park contributed for the establishment of some ecotourism unions in Dinsho area,</p>	<p>Mitigation measures for human- wildlife conflict in the area are absent,</p> <p>The boundary is not clearly indicated at Dinsho site of the park;</p> <p>Direct incentive is absent for local communities in and around Dinsho area,</p> <p>Alternative job opportunities are not widely available for communities;</p>
External Environments	
Opportunities:	Threats:
<p>Land certification activity was began in Oromia regional state (The region where the BMNP is located),</p> <p>Good political support is provided for the park,</p> <p>Different NGOs participate in the conservation activities of the park,</p> <p>Local peoples disrespect individuals who involve in illegal utilization of park resources,</p> <p>The local communities particularly, the local elders started to realize the importance of maintaining the park and promoting its conservation activities in Dinsho district,</p>	<p>Urbanization is being prevailed in Dinsho area,</p> <p>Occurrence of seasonal drought and famine in different Kebeles of the district,</p> <p>Local peoples are highly dependent on agriculture and domestication of livestock for their livelihood,</p> <p>The number of human population is increasing in the area</p>

Conclusion

Deforestation, collection of fire wood and intensive livestock grazing are the main biological resource threats in Dinsho district. These threats are causing different impacts in the park. Many factors are responsible for the intensification of the threats. Inadequate participation of communities, socio-economic factors and absence of direct incentives provided for communities are the major ones. Communities in the study area positively respond to conservation opportunities and activities, despite their negative feedback for the existence of community based conservation approach and alternative livelihood opportunities. Different opportunities for biological resource conservation are also identified in the park. These include; the improvement in the attitude of communities towards biological resources and their values, the prevalence of NGOs that work on conservation activities of the park and the growing political support from governments at different levels.

Acknowledgments

We would like to forward our gratitude to Madawalabu University for the monetary assistance. We are greatly indebted to the respondents collaborated in providing the honest and credible information. The help provided by Addisu Aseffa and Zegeye Kibret was greatly appreciated.

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