

*Full Length Research Paper*

# **Attitudes of local leaders towards wildlife conservation in village areas in southern Ngorongoro Conservation Area, Karatu District, Tanzania**

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**Understanding attitudes of local leaders towards conservation issues in village areas surrounding protected areas is vital for the success of sustainable biodiversity conservation. This is because of the need of designing effective conservation programs outside protected areas and to reduce resource-based conflicts involving local communities and protected areas. Twenty villages in Karatu district located between Ngorongoro Conservation Area (NCA) and Lake Manyara National Park (LMNP) were chosen for this study. The data were collected using semi-structured questionnaires administered to 133 local leaders in 20 villages. Findings indicated that attitudes of local leaders towards conservation in the village areas were positive. We observed that 90.3% of the village government members and 50% of the chairpersons considered charcoal making as detrimental to the environment and insignificant to the development of their villages. Majority of the respondents (80.0%) rated that village environmental conservation bylaws are having inadequate penalties for offenders in dealing with the current state of rapid environmental deterioration in village lands. The position of a leader was an important predictor as 87.4% of village chairpersons and 70.0% of the village government members were positive towards conservation in village lands. The implication of the results could be linked to conservation initiatives outside protected areas and understanding the attitudes and securing the support of local leaders.**

**Key words:** Environmental conservation, Ngorongoro Conservation Area, wildlife conservation, local communities, protected areas.

## **INTRODUCTION**

The term “attitudes” has been used in relation to positive or negative responses towards an entity or object (Karanth and Nepal, 2012), and is defined as a mental evaluation of a particular entity with some degree of favor or disfavor (Gebregziabher and Soltani, 2019). Attitudes

are formed through an individuals’ experience and perceptions (Infield and Namara, 2001). Attitudes of local people can provide insights on how they will behave, how they comply with wildlife protection regulations, how they respond to economic losses caused by wildlife, and the

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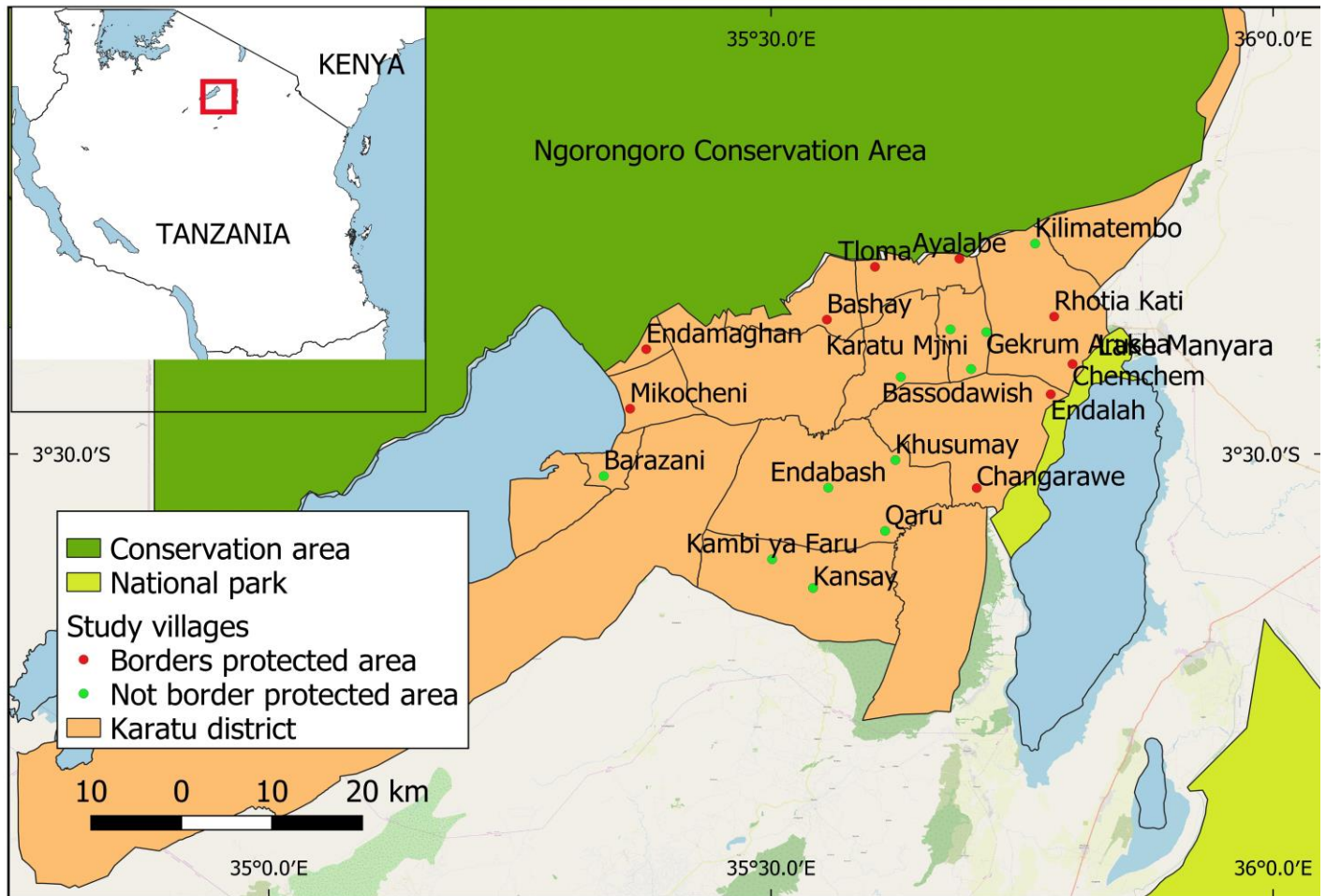
degree to which they are willing to coexist with wildlife (Balakrishnan and Belay, 2017). People's perceptions reflect the beliefs that they derive from their experiences and interactions with a particular phenomenon (Mulrennan et al., 2012; Gebregziabher and Soltani, 2019). The sustainability of biodiversity management programs relies on the nexus of the community's perceptions, knowledge and awareness of the problems of biodiversity deterioration and mitigation measures (Mengistu and Assefa, 2020). Biodiversity awareness campaigns were reported to raise the knowledge and hence the higher level of community participation towards conservation of biodiversity (Montana and Mlambo, 2019). Biodiversity conservation outside protected areas entails the presence of local authorities which form the basic units of community organizations at the grassroots levels (Spenceley et al., 2019). For these local units to realize sustainable conservation issues such as financial and technical requirements, incentives through income and other benefits and commitments of local communities through participation need to be addressed at the outset (Keane et al., 2019).

The Community Based Conservation (CBC) approach was established after the failure of the fences-and-fines approach in delivering conservation goals (Mulrennan et al., 2012; Keane et al., 2019). Fences-and-fines approach disregarded the interests of local inhabitants and excluded them from the management and use of natural resources located in their areas (Aryal et al., 2020; Weldemichel, 2020). The exclusion and other factors such as wildlife induced damages to crops, livestock and humans as well as evictions of people without compensation during establishment of protected areas altogether converged and promoted human-conservation conflicts which derailed trust between various conservation stakeholders (Keane et al., 2019). This thwarted supports of local people for conservation programs in village lands and the surrounding protected areas. The failures in achieving conservation objectives, lack of support of local people for conservation initiatives and the growing hostilities between local people and management of protected areas necessitated the development of CBC with the main purpose of reversing the situations above (Hill et al., 2010; Brown et al., 2018; Keane et al., 2019). In doing so, the CBC approach intended to change local peoples' attitudes and practices and use them as means to reach the desired conservation outcomes (Root-Bernstein, 2020). This considered the fact that when local people felt deceived, they tend to sabotage conservation efforts through for instance burning forests and facilitating poachers (Nilsson et al., 2016; Kaeser and Willcox, 2018). Therefore, the future success of CBC requires collaborative planning that takes into account CBC in a multi-scale and multi-actors' approach (Hill et al., 2010; Balakrishnan and Belay, 2017; Kaaya and Chapman, 2017).

As in many other parts of the world, the main purpose of biodiversity conservation in Tanzania is attached to protected areas while little or no attention is given to areas outside protected areas. These areas provide corridors which are crucial for the movement of wild animals between various habitats. However, human activities in unprotected areas continue to block these corridors which in turn indicate the likely collapse of protected areas in the long term due to the negative effects of the isolation and habitat fragmentations (Newmark, 2008; Caro et al., 2009). Tanzania has set aside more than 35% of its land as protected areas and this contributes to 17.5% of the Gross Domestic Product (Kaaya and Chapman, 2017). These areas are therefore a good representation of the situation where biodiversity is treasured excluding conservation programs in village and general public lands. But resources in areas outside protected areas are getting depleted faster than in protected areas because of unsustainable practices associated with socio-economic activities. Depleted resources in unprotected areas combined with rapidly increasing human population in Tanzania which for the last ten years (2002-2017) has increased by 30% from 34.4 million to approximately 54 million (URT, 2017), exerts huge pressure on the resources of the surrounding protected areas.

Despite the realization of some conservation successes, especially in integrating government and society in living sustainably, biodiversity continues to decline (Rands et al., 2010; Pringle, 2017). The National Biodiversity Strategy and Action Plan (NBSAP) for Tanzania towards Convention on Biological Diversity (CBD) 2010 targets identified inadequate awareness of the public and poverty as the main challenges to improving biodiversity conservation in the country as well as insufficient finances allocated to conservation activities resulting in incapacity to information dissemination (Rush and Solandt, 2017; Johnson et al., 2019). As a way of improving biodiversity conservation, the plan proposed provision of biodiversity education and information to related sectors outside protected areas. However, there exists gaps between biodiversity conservation strategies and the practices of sectors such as agriculture, and thus, the need to be aligned to policies of natural resources managements that consider sustainable healthy ecosystems in the country (Rockström et al., 2010; Brown et al., 2018).

Therefore, the study aimed at assessing and documenting the awareness and attitudes of local leaders towards conservation issues in village areas surrounding protected areas. Understanding the findings could contribute not only in designing effective conservation programs outside protected areas but also in reduction and possible elimination of resource-based conflicts involving local communities and park officers. The main objective of the study was to examine the attitudes, perceptions, knowledge and awareness of local



**Figure 1.** Study villages bordering (red dot) and villages not bordering (green dots) NCA and LMNP in Karatu district, northern Tanzania.

community leaders towards conservation issues in Karatu villages and the neighboring Ngorongoro Conservation Area (NCA) and Lake Manyara National Park (LMNP). Specific objectives were 1) to assess the knowledge and awareness of local leaders on issues related to conservation (water, wildlife presence, cultivation lands, livelihoods and soil erosion). 2) To determine attitudes of local community leaders towards conservation activities in village areas. 3) To determine the attitudes of local community leaders towards the roles of protected areas in the development of surrounding villages.

**MATERIALS AND METHODS**

**Study area**

Karatu is one of the five districts in Arusha Region and is located in the northern part of Tanzania (Figure 1) between latitudes 3°10'–4°00'S and longitude 34°47'–35°56'E. Karatu borders Mbulu district to the south, NCA (established 1959) to the north, LMNP (established 1960) to the east and Meatu district to the west. It is the traditional home to the Iraqw tribe who are agro-pastoralists,

Barbaig tribe who are pastoralists, and the Hadzabe tribe, noted mainly as hunters and gatherers. The district has total land area of 3,300 km<sup>2</sup> and roughly divided into three zones; uplands, midlands and lowlands with altitude ranging from 1,000 to 1,900 m. Rainfall is bimodal and ranges from 300–1200 mm/year. The uplands consist mainly of agriculture while lowlands are woodlands used for grazing, charcoal production and wildlife. The district has 15 administrative wards and more than 45 registered villages with total population of 230,166 people growing at an annual rate of 3.2% and aggregated into 34,000 households (NBS 2012). Locations of study wards are indicated in Figure 1. The average population density is 7–10 person/km<sup>2</sup> and most people live in the uplands mainly around Ngorongoro Northern Highland Forest Reserve of Karatu (Owenya et al., 2011; URT, 2017). The African elephant (*Loxodonta africana*) happen to be the most frequently encountered species, others include dik-dik (*Madoqua kirkii*), spotted hyena (*Crocuta crocuta*), African buffalo (*Syncerus caffer*), yellow boboons (*Papio cynocephalus*).

The major economic activities in Karatu district are crop farming and livestock keeping which lack sustainable practices and continue to create soil degradation (Owenya et al., 2011). The rapidly increasing population and the rate at which natural resources are being degraded, not only negatively affects livelihoods but extends conservation problems such as siltation to the surrounding protected areas such as Lake Manyara, which is

part of LMNP that provides crucial biological habitats (Raphael, 2018).

### Data collection

The data were collected using semi-structured questionnaires with both closed and open-ended questions (Appendix 1). The questionnaire was designed by researchers purposely for this study and pilot tested before conducting the real data collection. The questionnaire survey was conducted from 1<sup>st</sup> June to 10<sup>th</sup> August 2013. Prior to the interview, the main purpose of the study was explained to the village executive officer or chairman. Permission for conducting interviews was then granted. Sensitive questions such as their ideology or religion were avoided and each questionnaire was given a number instead of the name of a respondent. The first part of the questionnaire focused on social demographic information of respondents. The second part focused on knowledge, awareness, attitudes, wild animal species and corridors and the interactions of conservation stakeholders at the village levels. For the purpose of this study three main stakeholders were identified; the management of the surrounding protected areas, NGOs and central government. In general respondents were asked to use the scale provided to tick against statements they agreed with based on four response categories namely: 1=Strongly Disagree, 2=Disagree, 3=Agree and 4=Strongly Agree. Open ended questions enquired answers about resources gotten from the surrounding protected areas.

### Sample selection

Sample study villages were selected by first grouping all villages in Karatu district into two categories based on whether they bordered or did not border the surrounding protected areas. The list for each category was arranged alphabetically and correspondingly assigned numbers in an ascending order. Ten numbers were randomly picked from each category giving a total of twenty study villages from which data was collected.

The random selection of respondents considered the position and gender of the local leaders. Position identification process was done through the ward leader and respondents in various positions were identified. For the purpose of this study two groups were formed. Group one who constituted chairpersons included the village chairpersons, sub-village chairpersons and village executive officers. They run the day to day activities of the village government. Group two which was composed of members was made up of members of the village government council. They plan and formulate policies of the village government and play overall supervisory roles of group one above. Village councils are constituted of between 15 and 25 people depending on the village area and population sizes. For Karatu district the average population size per village was twenty people. Gender proportion considered local government regulations where women must account for at least 25% of all the members of the council. In all the selected villages lists with names of all the local leaders were obtained and sorted into two position groups alphabetically followed by allocation of numbers in ascending order. In each selected village eight numbers were randomly picked. In total, one hundred and sixty respondents (n=160) were selected. However, only one hundred and thirty-three respondents (n=133) were reached for interview (Table 1).

### Data analysis

Data analyses were done using the Statistical Package for Social Sciences (SPSS version 24, NY, USA). Descriptive statistics were

used to summarize the questionnaire response data. Since most of the data were categorical, Pearson's chi-square analyses were performed to determine the differences in the independent variables that explain the attitude of the community about conservation issues in their areas and surrounding protected areas. Furthermore, linear regression analysis was used to determine the factors that contributed most to statistical significance in relation to independent variables such as age, level of education (primary vs secondary), village location (bordering vs not bordering protected area), gender (male vs female) and position of leader (chairpersons group vs members group). The explanatory variables included charcoal making, village conservation bylaws, role and performance of neighbouring protected areas to village development programs, availability of water, cultivation land. The significance level was set at  $P < 0.05$ .

## RESULTS

### General characteristics of the respondents

Socio-demographic characteristics of the respondents included gender (males 76%, n=133), age intervals in years with age group 40-49 having more respondents (43%, n=133), followed by age group 29-39 (29%) and  $\geq 50$  (28%). Most of the respondents were married (94%, n=133) and few were single (6%). Majority of the respondents had attained primary education level (71%, n=133) and secondary education (29%). 51% (n=133) of respondents comes from villages that border with NCA and LMNP and 49% of respondents comes from villages that do not share border surrounding protected areas of NCA and LMNP. Out of 133 respondents, 30 were village chairpersons and 103 were members in the village government.

### Knowledge and awareness on conservation related issues

The issue of water supply was assessed in the sampled village areas. Respondents were asked to describe water availability as either normal or difficult. The majority of respondents (76.5%, n = 68) who came from further away villages and 61.5% (n = 65) of respondents from closest villages to PA described water availability as difficult ( $\chi^2 = 0.12$ , df = 1  $P = 0.062$ ). Most of the chairpersons (96.7%, n = 30) described water availability as difficult while 61.2% (n = 103) of the members group described water availability as difficult; a statistically significant difference ( $\chi^2 = 13.73$ , df = 1  $P < 0.001$ ). The linear regression analysis conducted between water availability assessment as a dependent variable and village location and position of leader as predictors was statistically significant. The two significant variables explain 12.1% of the variation ( $r^2 = 0.12$ ,  $P < 0.001$ ). However, the most important variable in predicting the variations is position of a leader (t = -4.04,  $P < 0.001$ ) followed by the village location (t = 2.17,  $P = 0.032$ ).

The results on the presence of wild animals showed

**Table 1.** Village leaders from each respective village bordering and villages not bordering PA.

Villages bordering PA	Number of respondents	Villages not bordering PA	Number of respondents	Total respondents
Ayalabe	8	Karatu Mjini	8	
Tloma	8	Gekrum Arusha	8	
Endamaghan	8	Barazani	8	
Kambi ya Faru	5	Mikochoeni	7	
Rhotia Kati	6	Bassodawish	6	
Bashay	6	Khusumay	7	
Chemchem	6	Qaru	6	
Kansay	7	Endabash	6	
Endalah	6	Kilimatembo	5	
Changarawe	5	Gekrum Lambo	7	
Total	65		68	133

that wild animal species exist in village areas. Most respondents (78.5%  $n = 65$ ) in villages bordering the protected areas compared to 60.2% ( $n = 68$ ) of respondents from villages not bordering the protected area indicated the presence of wild animals in their village areas. The difference between village locations was statistically significant ( $\chi^2 = 17.78$ ,  $df = 1$ ,  $P < 0.001$ ). Four other issues presented to respondents were shortages of cultivation lands, relationship between conservation and livelihoods, soil erosion and water source location. The linear regression analysis of the four issues as dependent variables against gender, level of education, position of leader and village location as independent predictors gave the following results; For shortages of cultivation lands, the level of education and position of leader were statistically significant explaining 10.3% of the variation ( $r^2 = 0.10$ ,  $P < 0.001$ ). However, the most important variable in predicting the variation was level of education ( $t = 2.56$ ,  $P = 0.012$ ) followed by the position of leader ( $t = 2.18$ ,  $P = 0.031$ ). Gender was not statistically significant ( $t = 0.59$ ,  $P = 0.557$ ). For the relationship between conservation and livelihoods, only the position of leader was a significant predictor and explained 29.7% of the variation ( $r^2 = 0.29$ ,  $P < 0.001$ ,  $t = -7.25$ ,  $P < 0.001$ ). The level of education ( $t = -0.24$ ,  $P = 0.808$ ) was not statistically significant. For soil erosion, the position of a leader explained 54.5% of the variations ( $r^2 = 0.55$ ,  $P < 0.001$ ,  $t = 11.97$ ,  $P < 0.001$ ) while level of education was not statistically significant ( $t = 0.21$ ,  $P = 0.837$ ). For the location of water sources, the village location differed significantly ( $r^2 = 0.06$ ,  $P = 0.003$ ,  $t = -3.01$ ,  $P = 0.003$ ).

#### Attitudes of local leaders towards conservation in village areas

In determining attitudes towards conservation in village lands three key statements were used in obtaining the views of respondents in the study areas. These included

variables are charcoal production, village conservation by-laws and village environmental conservation committees. Most of the respondents from the members group (90.3%,  $n = 103$ ) and 50% ( $n = 30$ ) from the chairperson group considered charcoal making as detrimental to the environment; a statistically significant difference ( $\chi^2 = 33.01$ ,  $df = 1$ ,  $P < 0.001$ ). 84.6% ( $n = 65$ ) of the respondents from villages bordering the protected areas, and 77.9% ( $n = 68$ ) of respondents from villages not bordering protected areas stated that charcoal making is detrimental to the environment; a statistically significant difference ( $\chi^2 = 13.31$ ,  $df = 1$ ,  $P < 0.001$ ). The linear regression analyses of three activities as dependent variables against with age, level of education, village location and position of leader were all statistically significant. For charcoal activities, position of leader, age of respondent and village location were all statistically significant explaining 27.9% of existing variations while level of education was not significant (Table 2).

For village conservation by-laws most of the respondents from the chairperson group (80%,  $n = 30$ ) agreed with the statement that village conservation bylaws have inadequate penalties for offenders while only 36% ( $n = 103$ ) of the members group agreed to the statement; a statistically significant difference ( $\chi^2 = 54.77$ ,  $df = 1$ ,  $P < 0.001$ ). Age of the respondent was the only statistically significant variable in explaining the observed 16.8% of variation while position of leader, village location and education level were not statistically significant (Table 3). For village environmental committee, again the position of leader was the most statistically significant variable in explaining the observed 7.7% of variations while education level, village location and age of respondents were not significant (Table 4).

#### Attitudes of local leaders towards the roles of surrounding protected areas to village developments

Two issues were used to assess the attitudes of local

**Table 2.** Linear regression analysis results with charcoal production activities as dependent variable and age, level of education, village location and position of leader as independent variables.

Independent variable	Unstandardized coefficient		Standardized coefficient	Statistics	
	B	Std. error	Beta	t	P
(Constant)	-0.74	1.90		-3.39	0.009
Village location	-0.19	0.34	-0.05	-6.23	0.001
Position of leader	1.29	0.44	0.25	2.90	0.004
Age	0.44	0.30	0.13	2.617	0.010
Education level	0.46	0.49	0.08	0.93	0.354

<sup>a</sup>Dependent variable: Charcoal production activities in the village

**Table 3.** The linear regression analysis model with village bylaws to environmental conservation as dependent variable versus four independent variables age, level of education, village location and position of leader.

Independent variable	Unstandardized coefficient		Standardized coefficient	Statistics	
	B	Std. error	Beta	t	P
(Constant)	2.41	2.05		1.18	0.242
Position of leader	0.39	0.37	0.10	1.07	0.288
Village location	-0.42	0.48	-0.08	-0.88	0.379
Education level	0.09	0.53	0.02	0.18	0.86
Age	1.01	0.32	0.28	3.14	<b>0.002</b>

<sup>a</sup>Dependent variable: Village bylaws to environmental conservation do not provide adequate penalties for offenders.

**Table 4.** Linear regression analysis results with environmental committee as a dependent variable against age, level of education, village location and position of leader as independent variables.

Independent variable	Unstandardized coefficient		Standardized coefficient	Statistics	
	B	Std. Error	Beta	t	P
(Constant)	4.07	1.63		2.50	0.014
Position of leader	-0.54	0.29	-0.17	-3.323	<b>0.001</b>
Village location	0.63	0.38	0.14	1.65	0.102
Education level	0.24	0.42	0.05	0.56	0.578
Age	0.09	0.26	0.03	0.36	0.716

<sup>a</sup>Dependent Variable: The environmental committee in your village is doing a good job in environmental protection.

leaders towards protected areas. These were “the roles of protected areas contribute to village developments” and the “performance in supporting social services projects at the village level”. 56.7% (n = 30) of the chairperson group agreed with the statement that protected areas considerably contributed to the development of the village while only 13.6% (n = 103) of the respondents from the members group agreed with this statement; a statistically significantly difference ( $\chi^2 = 38.21$ , df = 1 P < 0.001). However, both the members (87.4%, n = 103) and the chairperson groups (70.0%, n = 30) agreed with the statement that protected areas are not doing enough to support social services in villages ( $\chi^2 = 6.69$ , df = 1, P < 0.073). The majority of respondents

(56.9%, n = 65) from villages bordering protected area agreed with the statement that protected areas considerably contributed to the development of the village whereas only 38.2% (n = 68) of the respondents from villages not bordering protected area agreed with the statement; a statistically significantly difference ( $\chi^2 = 10.68$ , df = 1 P = 0.014). 90.8% (n = 65) of respondents from villages bordering protected area and 76.5% (n = 68) of respondents from villages not bordering protected areas agreed with the statement that protected areas are not doing enough to support social services in villages; a statistically significantly difference ( $\chi^2 = 8.82$ , df = 1 P < 0.032).

A linear regression of the roles and performance as

**Table 5.** Linear regression results on the roles of protected areas to village developments as dependent variable and level of education, position of leader and village location as independent predictors.

Independent variable	Unstandardized coefficient		Standardized coefficient	Statistics	
	B	Std. error	Beta	t	P
(Constant)	3.31	1.01		3.28	0.001
Village location	1.02	0.34	0.26	3.03	<b>0.003</b>
Position of leader	-0.25	0.25	-0.09	-1.00	0.322
Education Level	-0.02	0.36	-0.01	-0.05	0.957

<sup>a</sup>Dependent Variable: The surrounding protected areas played significant role for the development of your village.

**Table 6.** Linear regression results on the performance of protected areas support to village social service projects as dependent variable and level of education, position of leader and village location as independent predictors.

Independent variable	Unstandardized coefficient		Standardized coefficient	Statistics	
	B	Std. error	Beta	t	P
(Constant)	9.16	0.89		10.26	<0.0001
Village location	-0.70	0.30	-0.21	-2.37	<b>0.019</b>
Position of leader	0.18	0.22	0.07	0.79	0.429
Education Level	-0.17	0.32	-0.05	-0.52	0.606

<sup>a</sup>Dependent variable: The surrounding protected areas are not doing enough to support social services in your village.

dependent variables and level of education, position of leader and village location as independent predictors was done, and results are shown in Table 5. For the case of roles of protected areas to village developments village location was statistically significant in explaining the variation by 15% while the village location and education level of respondents were not significant (Table 5). In the case of performance of protected areas support to village social service projects only the village location was statistically significant explaining 26.5% of the variation while level of education and position of leader were not significant (Table 6).

## DISCUSSION

### Knowledge and awareness on conservation related issues

Five factors related to conservation issues were used to evaluate the knowledge and awareness. These are water availability, presence of wild animals in village areas, shortage of cultivation land, local community livelihoods and soil erosion. The responses on the description of water availability showed that most of the leaders were aware of the current status of water availability in Karatu district areas and described its availability as difficult. For leaders from villages bordering protected areas they were more likely to indicate the availability as normal. The difference could be explained by the short distances to water sources located in the nearby protected area. The

other reason could be the impact of community conservation programs by the adjacent protected areas that support social service projects which include water supply to local communities (Kaltenborn et al., 2008; Balakrishnan and Belay, 2017). The descriptions of leaders reflected varied water availability among the villages with different locations. This corresponds to the location of water sources for the villages where majority of respondents indicated to be in the surrounding protected areas. The closer the village to protected area the more likely the indication that the water source is in the adjacent protected area. The position of a leader significantly influenced the response patterns. The chairperson of a group was more likely to indicate difficult availability than the member group. This could be connected to their roles in the village, and therefore they might have presented the views on behalf of the whole village as opposed to the member groups. Generally, the views were that protected areas are currently the main source of water for many villages in Karatu district. The availability status was described as becoming insufficient due to climate variability characterized with long-term droughts, degradation of the forests and increasing number of human population (Chaligha et al., 2007; Malley et al., 2009; Nyembo et al., 2020).

Majority of leaders pointed out to the presence of wild animals in the village areas and the crosstab with village location as a predictor was significantly important. Leaders from villages bordering protected areas were more likely to admit the presence of wild animals in their village areas than those from villages not bordering



protected areas. This was expected considering the nature of human-wildlife interactions between local people and the surrounding wildlife species (Matseketsa et al., 2019). The movements of wildlife into human settlements might indicate possible declining resources in the nearby wildlife areas. Some wild animal species such as elephant tend to have wide ranging habitats and migrate between these habitats (Kumar et al., 2018; Neupane et al., 2019).

The increased socio-economic activities of local people cause the encroachments to wildlife areas. If these trends are allowed to continue, then more wildlife species would continue to be seen in village areas and this in turn would heighten the human-wildlife conflicts (Kumar et al., 2018; Hariohay et al., 2019; Matseketsa et al., 2019). The shortage of cultivation lands was highly attributed to increased human population in the village areas by most local leaders. The variables level of education and position of leader were significant predictors. The leaders with higher level of education and chairperson positions were less likely to attribute shortages of cultivation lands to increased human population in village lands. This was expected given the other reasons that could cause shortages of land resources. Higher level of education could be associated to be of those more informed about the other causes. Based on their functions, the leaders in the chairperson category happen to be more involved in the course of addressing development challenges in their respective villages. In this way, they might have encountered related information on other possible reasons for shortages. These could include intensification and inadequate agricultural practices which lead to underutilization of the existing cultivated lands depicted in persistent food insecurity (Pretty and Smith, 2004; MacKenzie, 2018).

The chairperson category was more likely to suggest that conservation programs improve livelihoods than the member category. Again, given their functions these leaders play the frontlines roles in all development initiatives in the villages. This provided more opportunities for them to participate in various conservation programs. Through participation and involvement, they were likely to be more informed on the connections between conservation programs and better community livelihoods (Infield and Namara, 2001; Mariki, 2013; Abebe et al., 2020). Lack of significant relationship was not expected between the villages with different locations. This is because NCA and LMNP community conservation service policies with local community development projects focused on the neighboring villages that share direct boundary with them. Consequently, leaders from villages bordering protected areas had more interactions in terms of contacts and participations in these community conservation projects which received substantial amount of money from the respective protected area (Kaaya and Chapman, 2017).

Soil erosion from the villages causes siltation of Lakes

Manyara and Eyasi (Raphael, 2018). Chairperson category totally opposed the statement compared to member category which supported that soil erosion generated from their areas cause siltation and possible disappearance of the surrounding lakes. Lake Manyara in particular had been continuously subjected to massive degradation as a result of socio-economic activities in the surrounding areas (Yanda and Madulu, 2005; Janssens de Bisthoven et al., 2020). Soil materials deposited into the lake basin make it shallow and susceptible to high evaporation (Nyembo et al., 2020). The volume of water gets reduced and if the current trend is not reversed there are possibilities of converting the lake into a seasonal one and completely disappearing in the long term. Though there was no evidence gathered that shows local leaders were involved in soil erosion initiatives by adjacent protected areas, there was evidence that conservation agriculture projects were being conducted in Karatu district (Owenya et al., 2011). Among other issues, the approach critically addresses the problems of soil erosion. Concisely, the leaders were expected to be highly aware on challenges associated with the problems of soil erosion. However, they showed basic understandings and most of their descriptions were evident during focused group discussions with key informants working in different departments at the Karatu district council.

#### **Attitudes of local leaders towards conservation in village areas**

Local leaders' attitudes were examined using three activities connected to environmental conservation goals in village areas. The activities were charcoal making, village environmental conservation bylaws and village environmental conservation committees. The attitudes of local leaders towards conservation activities in village areas were positive, with 87% of respondents indicating that charcoal making activities were destructive and the village environmental conservation bylaws and committees were not adequately addressing the current situation of rapidly deteriorating resources in the village lands. The results indicated that four independent variables, age, level of education, village location and position of leader were important predictors.

For the charcoal issues the variation was explained by three variables of age, village location and position of leader. The activities were viewed less negatively by the older leaders than the younger ones. This could be linked to the level of education of the respondents and their tradition of high dependence on charcoal and firewood for energy source for domestic cooking. There were many younger leaders with higher level of education compared to the older group. As indicated previously higher level of education entails more understanding of the importance of conservation. Leaders from villages not bordering



protected areas were less negative to charcoal activities than those from villages bordering protected areas. Hence there could be two possible explanations for this variation. First, the activities are carried out in villages not bordering protected areas. The leaders from these villages were beneficiaries of the activities either as individuals or as an institution of the village government. Second, apart from benefits sharing, these programs facilitate training and participation of local leaders in conservation activities involving adjacent villages that share direct boundaries with protected areas. These interactions between local people and protected area management not only improve the attitudes towards protected areas but also towards conservation issues generally (Moreto et al., 2016). With the improved conservational attitudes, people were more negative towards charcoal activities which in most cases were conducted using unsustainable methods. This finding supports our first hypothesis that leaders from villages bordering protected areas will be more positive towards conservation in village areas. The disparity supports other findings which indicated enhanced conservational attitudes resulting from the interactions between local people and protected area managements (Kideghesho et al., 2007; Jagger et al., 2018).

In the case of village environmental conservation bylaws and committees, and position of leader showed significance difference. With the position of a leader as an important predictor, the chairperson group was more likely to rate both bylaws and committees as more inefficient than the member group. This could be associated with bigger responsibilities and roles of the group chairperson in running the village governments and also to a higher level of education where the majority of the group chairpersons had secondary level of education (MacKenzie, 2018). Higher level of education involves more understanding of the linkages of conservation issues (McClanahan et al., 2005; Kideghesho et al., 2007; Jagger et al., 2018). The desires of local leaders were to see more actions towards addressing the current challenges facing resources management in the village areas. For instance, the penalty for defaulting one bylaw was set at TZS 5,000 (about US\$ 3) which according to the village leaders was far below the value of trees that were illegally harvested. In the case of committee underperformance, the reasons indicated were financial constraints and some of the members collude with the defaulters through corruption practices. These suggestions explain the dissatisfaction of local leaders on the ongoing situations. Consequently, they need to promote sustainable practices that enhance the health of the environment in their village areas.

#### **Attitudes of local leaders towards surrounding protected areas**

Generally local leaders held negative attitudes towards

surrounding protected areas in terms of the two issues used to assess them. These were roles they played in the development of villages and performances in supporting social service projects at the village government level. Important predictors were level of education, village location and position of leader. During linear regression analysis the effect of level of education did not appear. Those from villages bordering protected areas were more negative towards the protected areas than the other group from villages located further from protected areas (Mariki, 2013; Kirumira et al., 2019). This supported our second hypothesis that local leaders from villages bordering protected areas will be more negative towards them given the higher conservation-induced costs experienced in these areas. Historically, the costs experienced tend to increase with decreasing distance from the protected areas. For the variable position of leader, the category of chairperson group was less negative than the member group. There can be two possible explanations for the divergence in the given responses. One is the possible influence of level of education where majority of respondents in this group hold higher level of education. Two is on their roles where they have more direct involvement and participation than the other group in community conservation initiatives. Apart from the impact of participation on their attitudes, benefits received could be another reason for the more positive. They form the first contact group for any community conservation programs in village areas. In the process of involvement and participation they are likely to have received more benefits from extra assignments resulting from the conservation programs activities. Consequently, the information and benefits gained through the involvement explain their attitudes towards protected areas. This finding corroborates with that of a similar study conducted in western Serengeti (Kideghesho et al., 2007) in Tanzania where wildlife-related benefits or rather conservation-related benefits had a positive impact on local people's attitudes towards protected areas.

#### **Conclusions**

Our results revealed that village leaders close to protected areas were more positive towards conservation of village areas. Given the indicated positive attitudes of local leaders towards conservation in village areas, conservation initiatives outside protected areas would likely receive the support of local leaders. Currently, one of the big threats facing the existence of protected areas is the huge demands of local communities that depend on natural resources for their daily survival. Among other factors the access to resources in protected areas has been central to conflicts between the local communities and the protected areas. The present study identified the resources that were scarce or not existing in village areas

but highly needed by the local people. These include trees and land for cultivation. The increasing population and unsustainable practices of socio-economic activities in village areas hugely contribute to depletion of these resources. The study villages were in rural areas with no electricity power whereby the major source of energy used is firewood which is now scarce.

We recommend strategies in designing participation of local leaders need to consider their roles and position in community organizations. Another factor that is crucial to bring on board is village location from protected area boundary. Knowing the resources needed by the local people and exploring the possibilities of developing these resources in their areas would be vital for the surrounding protected areas. One of the possible projects that could address several goals is agroforestry and greener energy sources such as biogas and solar power. Establishing trees in these human dominated areas would relieve protected areas of the pressure resulting from the demand of local people for the resources. The conflicts arising from access to resources also would be tackled.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## REFERENCES

- Abebe BA, Jones KW, Solomon J, Galvin K, Evangelista P (2020). Examining social equity in community-based conservation programs: A case study of controlled hunting programs in Bale Mountains, Ethiopia. *World Development* 135:105066.
- Aryal K, Dhungana R, Silwal T (2020). Understanding policy arrangement for wildlife conservation in protected areas of Nepal. *Human Dimensions of Wildlife*, 1-12. Balakrishnan M, Belay G (2017). Human-wildlife conflict and attitude of local people towards conservation of wildlife in Chebera Churchura National Park, Ethiopia AU - Megaze, Aberham. *African Zoology* 52(1):1-8.
- Brown B, Nuberg I, Llewellyn R (2018). Further participatory adaptation is required for community leaders to champion conservation agriculture in Africa. *International Journal of Agricultural Sustainability* 16(3):286-296.
- Caro T, Jones T, Davenport TRB (2009). Realities of documenting wildlife corridors in tropical countries. *Biological Conservation* 142(11):2807-2811.
- Chaligha A, Henjewe F, Kessy A, Mwamb G (2007). Local Governance in Tanzania: Observations from Six Councils 2002-2003. *Dar es Salaam Tanzania: Research on Poverty Alleviation (REPOA)*.
- Gebregziabher D, Soltani A (2019). Enclosures in people's minds: Perceptions and attitudes in the Tigray region, Ethiopia. *Forest Policy and Economics* 101(2019):1-14.
- Hariohay KM, Munuo WA, Røskaft E (2019). Human-elephant interactions in areas surrounding the Rungwa, Kizigo, and Muhesi Game Reserves, Central Tanzania. *Oryx* pp. 1-9.
- Hill R, Williams KJ, Pert PL, Robinson CJ, Dale AP, Westcott DA, Grace RA, O'Malley T (2010). Adaptive community-based biodiversity conservation in Australia's tropical rainforests. *Environmental Conservation* 37(1):73-82.
- Infield M, Namara A (2001). Community attitudes and behaviour towards conservation: An assessment of a community conservation programme around Lake Mburo National Park, Uganda. *Oryx* 35(1):48-60.
- Jagger P, Sellers S, Kittner N, Das I, Bush GK (2018). Looking for Medium-term Conservation and Development Impacts of Community Management Agreements in Uganda's Rwenzori Mountains National Park. *Ecological Economics* 152:199-206.
- Janssens de Bisthoven L, Vanhove MPM, Rochette AJ, Hugé J, Verbesselt S, Machunda R, Munishi L, Wynants M, Steensels A, Malan-Meerkotter M, Henok S, Nhwatiwa T, Casier B, Kiwango YA, Kaitila R, Komakech H, Brendonck L (2020). Social-ecological assessment of Lake Manyara basin, Tanzania: A mixed method approach. *Journal of Environmental Management* 267:110594.
- Johnson BA, Dasgupta R, Mader AD, Scheyvens H (2019). Understanding national biodiversity targets in a REDD+ context. *Environmental Science and Policy* 92:27-33.
- Kaaya E, Chapman M (2017). Micro-Credit and Community Wildlife Management: Complementary Strategies to Improve Conservation Outcomes in Serengeti National Park, Tanzania. *Environmental Management* 60(3):464-475.
- Kaaser A, Willcox A (2018). Identifying women's attitudes and barriers to participating in a proposed community-based conservation group in western Belize. *Ambio* 47(5), 622-633.
- Kaltenborn BP Nyahongo JW, Kideghesho JR, Haaland H (2008). Serengeti National Park and its neighbours - Do they interact? *Journal of Nature Conservation* 16(2):96-108.
- Karant KK, Nepal SK (2012). Local Residents Perception of Benefits and Losses From Protected Areas in India and Nepal. *Environmental Management* 49(2): 372-386.
- Keane A, Lund JF, Bluwstein J, Burgess ND, Nielsen MR, Homewood K (2019). Impact of Tanzania's Wildlife Management Areas on household wealth. *Nature Sustainability*. doi: <https://doi.org/10.1038/s41893-019-0458-0>
- Kideghesho JR, Røskaft E, Kaltenborn BP (2007). Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania. *Biodiversity and Conservation* 16(7):2213-2230.
- Kirumira D, Baranga D, Hartter J, Valenta K, Tumwesigye C, Kagoro W, Chapman CA (2019). Evaluating a Union between Health Care and Conservation a Mobile Clinic Improves Park-People Relations, Yet Poaching Increases. *Conservation and Society* 17(1):51-62.
- Kumar MA, Vijayakrishnan S, Singh M (2018). Whose Habitat Is It Anyway? Role of Natural and Anthropogenic Habitats in Conservation of Charismatic Species. *Tropical Conservation Science* 11(2018):1-5.
- MacKenzie CA (2018). Risk, Reciprocity and Retribution: Choosing to Extract Resources From a Protected Area. *Ecological Economics* 143(2018):314-323.
- Malley ZJU, Taeb M, Matsumoto T, Takeya H (2009). Environmental sustainability and water availability: Analyses of the scarcity and improvement opportunities in the Usungu Plain, Tanzania. *Physics and Chemistry of the Earth, Parts A/B/C* 34(1):3-13.
- Mariki SB (2013). Conservation With a Human Face? Comparing Local Participation and Benefit Sharing From a National Park and a State Forest Plantation in Tanzania. *SAGE Open* 3(4).
- Matseketsa G, Muboko N, Gandiwa E, Kombora DM, Chibememe G (2019). An assessment of human-wildlife conflicts in local communities bordering the western part of Save Valley Conservancy, Zimbabwe. *Global Ecology and Conservation* 20:e00737.
- McClanahan T, Davies J, Maina J (2005). Factors influencing resource users and managers' perceptions towards marine protected area management in Kenya. *Environmental Conservation* 32(1):42-49.
- Mengistu F, Assefa E (2020). Towards sustaining watershed management practices in Ethiopia: A synthesis of local perception, community participation, adoption and livelihoods. *Environmental Science and Policy* 112:414-430.
- Montana M, Mlambo D (2019). Environmental awareness and biodiversity conservation among resettled communal farmers in Gwayi Valley Conservation Area, Zimbabwe. *International Journal of Sustainable Development and World Ecology* 26(3):242-250.
- Moreto WD, Brunson RK, Braga AA (2016). 'Anything We Do, We Have to Include the Communities': Law Enforcement Rangers' Attitudes Towards and Experiences of Community-Ranger Relations in Wildlife Protected Areas in Uganda. *The British Journal of Criminology* 57(4), 924-944.
- Mulrennan ME, Mark R, Scott CH (2012). Revamping community-based conservation through participatory research. *The Canadian*

- Geographer 56(2):243-259.
- Neupane D, Kwon Y, Risch TS, Williams AC, Johnson RL (2019). Habitat use by Asian elephants: Context matters. *Global Ecology and Conservation* 17:e00570.
- Newmark WD (2008). Isolation of African protected areas. *Frontiers in Ecology and the Environment* 6(6):321-328.
- Nilsson D, Baxter G, Butler JRA, McAlpine CA (2016). How do community-based conservation programs in developing countries change human behaviour? A realist synthesis. *Biological Conservation* 200:93-103.
- Nyembo LO, Larbi I, Rwiza MJ (2020). Analysis of spatio-temporal climate variability of a shallow lake catchment in Tanzania. *Journal of Water and Climate Change*, In press. doi: <https://www.doi.org/10.2166/wcc.2020.197>
- Owenya MZ, Mariki WL, Kienzie J, Friedrich T, Kassam A (2011). Conservation agriculture (CA) in Tanzania: The case of the Mwangaza B CA Farmer Field School (FFS), Rhotia Village, Karatu District, Arusha. *International Journal of Agricultural Sustainability* 9(1):145-152.
- Pretty J, Smith DR (2004). Social capital in biodiversity conservation and management. *Conservation Biology* 18(3):631-638.
- Pringle RM (2017). Upgrading protected areas to conserve wild biodiversity. *Nature* 546(7656):91-99.
- Rands MRW, Adams WM, Bennun L, Butchart SHM, Clements A, Coomes D, Entwistle A, Hodge I, Kapos V, Scharlemann JPW, Sutherland WJ, Vira B (2010). Biodiversity Conservation: Challenges Beyond 2010. *Science* 329(5997):1298.
- Raphael LJ (2018). Vegetation Land Cover/Use Dynamics and Their Effects in Mbulu and Karatu Districts in the North-Eastern Highlands of Tanzania. *International Journal of Geospatial and Environmental Research* 5(1).
- Rockström J, Karlberg L, Wani SP, Barron J, Hatibu N, Oweis T, Bruggeman A, Farahani J, Qiang Z (2010). Managing water in rainfed agriculture—The need for a paradigm shift. *Agricultural Water Management* 97(4): 543-550.
- Root-Bernstein M (2020). Tacit working models of human behavioural change I: Implementation of conservation projects. *Ambio*. doi: <http://www.doi.org/10.1007/s13280-019-01298-4>.
- Rush S, Solandt JL (2017). Challenges on providing conservation advice for a growing network of English Marine Protected Areas. *Marine Policy* 83:75-82.
- Spenceley A, Snyman S, Rylance A (2019). Revenue sharing from tourism in terrestrial African protected areas. *Journal of Sustainable Tourism* 27(6):720-734.
- URT (2017). Tanzania Total Population by District-Regions -2016-2017: Sub-Divisional Population Projection for Year 2016, 2017 Based on 2012 Population and Housing Census. Dar es Salaam: Government of Tanzania Retrieved from <http://www.nbs.go.tz/nbstz/index.php/english/statistics-by-subject/population-and-housing-census/844-tanzania-total-population-by-district-regions-2016>.
- Weldemichel TG (2020). Othering Pastoralists, State Violence, and the Remaking of Boundaries in Tanzania's Militarized Wildlife Conservation Sector. *A Radical Journal of Geography* pp. 1-23.
- Yanda PZ, Madulu NF (2005). Water resource management and biodiversity conservation in the Eastern Rift Valley Lakes, Northern Tanzania. *Physics and Chemistry of the Earth, Parts A/B/C* 30(11):717-725.

**APPENDIX**

**Questionnaire survey for 20 villages in Karatu district, Tanzania: June-August 2013**

**I. Socio-demographic characteristic**

**a. The village office**

- 1. Questionnaire No.....
- 2. Date .....
- 3. Village name.....
- 4. GPS reading: S.....E.....
- 5. Village population.....
- 6. Village boundary: Border PA  Not border PA
- 7. Village main economic activities.....

**b. The Respondent**

- 1. Name of Respondent.....
- 2. Position of leader: Chairperson  Member
- 3. Gender: Female  Male
- 4. Age of respondent: 20-29  30-39  40-49  50-on
- 5. Level of education: Primary  Secondary
- 6. Marital status: Single  Married

**II. Knowledge and awareness on conservation related issues**

- 1. How do you describe in one word water availability in your village?  
Normal  Difficult
- 2. Are there wild animals currently found in your village/district?  
Yes  No
- 3. Shortage of cultivation land is due to increase in human population  
1  2  3  4
- 4. There is relationship between conservation and better livelihoods  
1  2  3  4
- 5. Soil erosion from your village is cause siltation of Lakes Manyara and Eyasi  
1  2  3  4
- 6. The water source for your village is located in the nearby protected area  
1  2  3  4

**III. Attitudes towards of conservation village areas**

1. Charcoal making activities are important for your village development  
1  2  3  4
2. Village conservation bylaws have inadequate penalties for offenders  
1  2  3  4
3. The performance village environmental conservation committee is satisfactory  
1  2  3  4

**IV. Attitudes towards the roles of surrounding protected areas**

1. Protected areas considerably contributed to the development of your village  
1  2  3  4
2. Protected areas are not doing enough to support social services in village  
1  2  3  4

**V. Wild animal species and their corridors in village areas**

1. Mention wildlife species most frequently encountered in village areas.....
2. Is there any wildlife corridor in your village/district areas?  
Yes  No

**VI. Conservation stakeholders at the village levels**

1. Which is the main source of information for conservation activities in your areas?  
PA  District council  Central government  NGOs
2. Mention one thing found in PA that you wish to be available in your village.....
3. The central government does not provide support for conservation in your village  
1  2  3  4

**Thank you for your time and participating to fill in this questionnaire**