Awareness of urban communities on biodiversity conservation in Tanzania's protected areas

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A B S T R A C T

This study used semi-structured interviews in two cities, Dodoma and Arusha, in Tanzania, to assess the difference in people's conservation awareness between the two cities. Our results revealed that urban people were generally positive towards most statements related to biodiversity conservation in protected areas, and in a few cases, variations between people from different occupations and education levels were significant. For instance, 87% (n = 376) of our respondents agreed with the statement "The knowledge obtained through conservation education is very important in changing our attitude towards protected areas," as well as 71% (n = 376) of our respondents agreed with the statement that "It is important to involve school children in conservation education." We predicted that people in Arusha would be more positive toward all six conservation statements than people in Dodoma (the capital city) because Arusha is close to many protected areas and is a tourist hub. We also predicted that people in Arusha would have more knowledge and awareness of biodiversity conservation than those in Dodoma. However, this prediction was not supported as people from Dodoma were significantly more positive than people from Arusha. This indicates that people in Dodoma are more concerned about biodiversity conservation than people in Arusha. This variation might be influenced by the costs associated with conservation, as people in urban Dodoma live far from conservation challenges such as livestock depredation and/or crop raiding compared to people in urban Arusha.

1. Introduction

Since the world's first national park was established in Yellowstone, USA in 1872 (Wuerthner, 2015), protected areas have had an outstanding history of global conservation. The international community now recognizes them as the solution to conserving the majority of the remaining nature (Bongaarts, 2019; Bruner et al., 2001; Gaston et al., 2008). As only 17% of the world's terrestrial area is protected (Geldmann et al., 2019; Jones et al., 2018), protected areas are considered as a last resort to conserve the remaining vulnerable ecosystems. However, due to human population growth in Africa since the colonial era, pressure on natural resources has increased dramatically (Gray et al., 2016; Mbise et al., 2021a). Many protected areas are becoming increasingly encroached upon as human pressure increases on the fringes of such reserves (Kideghesho et al., 2007; Mbise, 2021; Nyahongo et al., 2010). Most of the time, people are looking for arable land to sustain their livelihoods (Mbise et al., 2020). In addition, adjacent to such reserves, the soil is more fertile due to the fact that they are virgin land. Therefore, such areas attract many people who are interested in occupying land for

farming as well as for livestock use (Mbise et al., 2018; Nyhus and Tilson, 2010; Shivik, 2006). The current human population increase in developing countries has been causing threats to biodiversity due to associated activities like infrastructure development, animal husbandry, illegal hunting, and mining (Geldmann et al., 2019).

The current increase in the human population in Africa in general, particularly in Tanzania, affects protected areas, especially when people immigrate to the surroundings of protected areas (Sodhi and Ehrlich, 2010). Human life is either directly or indirectly connected to the surroundings, while their demand affects nature directly or indirectly. In many cases, humans act like a "double-edged sword" that may either harm or conserve nature. Due to the current human population increase in Africa, demand for natural resources will increase proportionally. This leads to a great loss of natural resources, from single species to ecosystems at large (Sodhi and Ehrlich, 2010). Some of the impacts of human population growth are that some organisms tend to lose their natural habitat while others experience edge effects (Jones et al., 2018; Kideghesho et al., 2007; Nyahongo et al., 2010).

Conservation awareness is the state of being well informed about biodiversity, including its status, value, and threats (Zhang and Yin, 2014). Conservation efforts in any country must pay close attention to the role of city dwellers in sustainable conservation of natural resources. This is because urban people depend either directly or indirectly on nature to sustain their lives. Since the colonial era, more emphasis on nature conservation has been invested in people near protected areas. For instance, in areas where local communities hold positive attitudes towards biodiversity conservation, the cost of conserving nature is lower (Lyamuya et al., 2016). In such areas, few resources are dedicated to buying firearms and fuel for patrolling. This is not the case in areas where people are negative toward conservation, as people in such areas frequently bear the costs associated with wildlife and nature (Bitanyi et al., 2012).

Many African countries, including Tanzania, rarely focus on examining people's perceptions as a tool for long-term conservation of natural resources. Instead, authorities use forceful methods against local people (fences and fines) to implement policy and regulations towards nature protection and conservation (Lindemann-Matthies, 2002). However, in most cases, such approaches fail as it is difficult to care for or conserve something that the local people are not affiliated with or have little knowledge of (Weilbacher, 1993). Local people need a variety of techniques and approaches to develop awareness about the value of nature and how different life processes depend on each other to understand a functioning ecosystem (Nyahongo et al., 2010). Such methods of awareness will make them more concerned about the importance of conserving nature for present and future generations. Limited knowledge and understanding of nature and its value leads to negative attitudes towards biodiversity conservation, harming nature and causing species extinctions
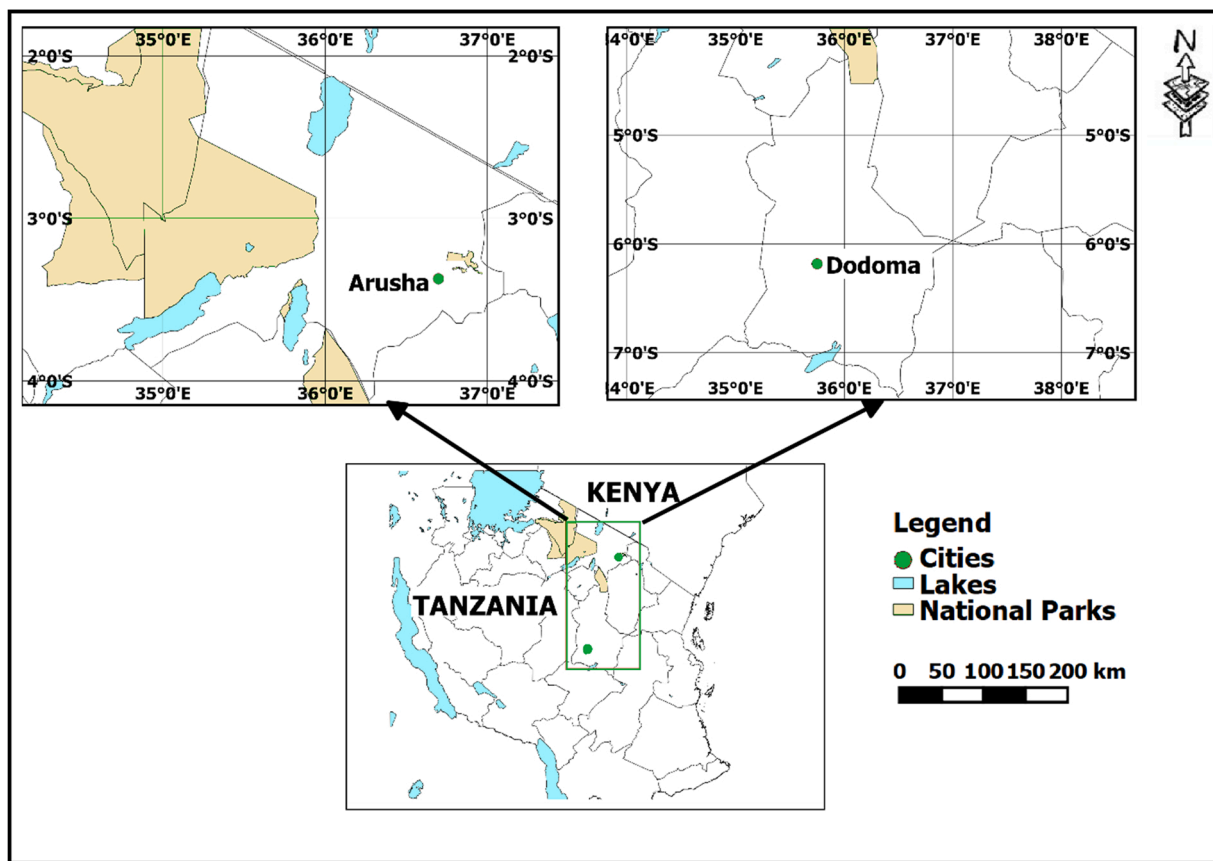

Fig. 1. Map of Tanzania showing the two surveyed cities; Arusha (upper left) and Dodoma (upper right), both in green dots, with the neighboring national parks (in light yellow).

(Abukari and Mwalyosi, 2020; Bitanyi et al., 2012; Hariohay et al., 2018; Lyamuya et al., 2014).

It is the right time for conservationists to think on a better way to rescue nature from such alarming threats due to the current human population increase in Africa (Abukari and Mwalyosi, 2020; Bitanyi et al., 2012; Hariohay et al., 2018; Lyamuya et al., 2014). Assessing the awareness and conservation knowledge by local people living in urban areas will help to change the attitudes of local people to be more positive towards biodiversity conservation. In Tanzania, a few studies have been conducted testing people's perceptions towards biodiversity conservation (Abukari and Mwalyosi, 2020; Bitanyi et al., 2012; Hariohay et al., 2018; Lyamuya et al., 2014). These few studies have focused on local communities living close to protected areas and hence have failed to include communities living in urban centers. Although there have been a few studies in Africa that gave insights on the urban local biodiversity and reflected on the conservation of biodiversity, and protection of ecosystem services (Bux et al., 2021; Cilliers and Siebert, 2012; Stålhammar, 2021).

The aim of the current study was to assess awareness of people living in urban areas on issues related to biodiversity conservation in Tanzania. Two cities; Dodoma being the capital city of Tanzania, and Arusha, which is surrounded by many protected areas, were used as examples of urban populations in this study. The findings from this study will help conservation practitioners in Tanzania as well as elsewhere in the world to broaden the scale of biodiversity conservation to include both communities living adjacent to protected areas as well as urban dwellers when developing new conservation implementation strategies. We hypothesize that people in the two cities will differ in their awareness's towards biodiversity conservation, this could probably be due to their different roles in the biodiversity conservation sector in Tanzania based on the geographical location and human activities conducted in the area. Because of the closeness to many protected areas as well as being a tourism hub, we predict that people in Arusha will show a better knowledge and higher awareness of biodiversity conservation than those in Dodoma.

2. Methods

2.1. Study cities

The two cities involved in this study, Dodoma and Arusha (Fig. 1), were chosen to assess urban residents' awareness of biodiversity conservation issues in Tanzania. In this study, two cities were used as examples of urban populations: Dodoma, Tanzania's capital, and Arusha, which is surrounded by many protected areas of different status. The two cities have comparable population sizes and temperatures, but they differ in altitude and annual precipitation.

Arusha City is the headquarters of the East African Community and is situated in north-eastern Tanzania, with a human population of 416,442 (NBS, 2017). Arusha is found at − 3.386925 Latitude and 36.682995 Longitude at an elevation of ca. 1400 m (Fig. 1). Average annual temperature varies between 22.9 °C and 28.2 °C, while annual precipitation is 873 mm. Arusha's temperate climate is affected by Mount Meru on the eastern edge of the eastern branch of the Great Rift Valley. The city is well located to connect with many of the national parks in northern Tanzania, such as Serengeti (ca. 220 km), Lake Manyara (ca. 100 km), Tarangire (ca. 87 km), Mount Kilimanjaro (ca 0.160 km), and Arusha (ca. 30 km), as well as the Ngorongoro Conservation Area (ca. 140 km). Arusha is also visited by the majority of international tourists who visit Tanzania; thus, Arusha is known as the safari capital of the world (Salazar, 2007, 2010).

Dodoma is officially the capital city of Tanzania with a total population of 410,956 (NBS, 2017). Dodoma is found at − 6.161184 Latitude and 35.745426 Longitude at an elevation of ca. 1120 m (Fig. 1). Average annual temperature varies between 20.2 °C and 29 °C, while annual precipitation is 570 mm. It lies in the center of the country, 453 kilometers west of the former capital of Dar es Salaam on its eastern side and 441 kilometers south of Arusha. Dodoma covers an area of 2669 km2 of which 625 km2 is urbanized. Dodoma is named as the heartland of Tanzania because it is the nation's official political capital city and the seat of the Tanzanian government. Dodoma city is also selected in this study because it has recently experienced an abrupt increase in the human population due to the official shift of the governmental offices from Dar es Salaam (NBS, 2017). Moreover, unlike Arusha, Dodoma is far from protected areas (ca. 500 km), hence its people experience a low cost of biodiversity conservation. This has triggered businesspeople and other street vendors to immigrate to the city. It is also the center of Tanzania's growing wine industry and the Tanganyika Vineyards Company, which is active in promoting its products.

2.2. Data collection

In this study, data was collected using semi-structured questionnaires. The choice of the two cities was purposefully made. However, the choice of respondents was made randomly (n = 376), and a total of 188 respondents were interviewed in each city. Verbal Informed Consent was obtained from all the respondents prior to participation. The respondents constituted 0.4% of the total population. Due to time, fund constraints, and the difficulties of knocking on doors, we interviewed our respondents on the street. This study included only respondents over the age of 18, and we also attempted to balance age and gender, but the exercise proved ineffective. The questionnaire survey was conducted only in the city centers, aiming to test people's awareness on issues related to conservation and the value of nature in protected areas in Tanzania. Each respondent was interviewed separately, and to ensure privacy of the respondent's names, they were not associated with the questionnaire; instead, each questionnaire was assigned a number. The researchers ensured that there was no repetition of the interviewed respondents. Questionnaires were prepared in the Swahili language, a language all respondents understood. The questions were raised as statements from which respondents had to choose to agree or disagree with the statements. There were three statements that, if agreed with, showed a positive approach, and three other statements that, if agreed with, showed a negative approach. The following statements were used:

a) *The knowledge obtained through conservation education is very important in changing our attitude towards protected areas*
b) *Tree overharvesting due to charcoal and fuel wood will lead to habitat loss.*
c) *Conservation education is not relevant for local people, and such education should therefore be given to experts only.*
d) *It is important to involve schoolchildren in conservation education.*
e) *Conservation of nature in protected areas should only involve people in the vicinity of protected areas.*
f) *The government should reduce the size of protected areas to ensure more land for local communities.*

2.3. Statistical analyses

In this study, six conservation statements were used as dependent variables and six socio-demographic variables (city, occupation, age, education, religion, and gender) were used as independent variables. All data was analyzed using SPSS version 26 (IBM, 2019), with various statistical tests performed and descriptive statistics used to generate means, percentages, and frequencies. Initially, Chi-square tests were used to identify significant differences between different variables. Finally, binary logistic regression analyses were carried out to identify the best predictors, and the p-value was set at $p < 0.05$.

3. Results

Our findings show that people in Dodoma were more positive about most conservation statements, whereas those in Arusha were negative. The conservation statements used in this study are explained in detail;.

In total, 87% (n = 376) of our respondents agreed with the conservation statement, "The knowledge obtained through conservation education is very important in changing our attitude towards protected areas". A binary logistic regression analysis was conducted with conservation statement (agree/disagree) as a dependent variable, and city, age, gender, occupation, religion, and education level were used as the predictors. All independent variables were not statistically significant in explaining the variation in people's awareness of conservation education (Table 1).

Almost 54.3% (n = 376) of our respondents agreed with the statement that "Tree overharvesting due to charcoal and fuel wood will lead to habitat loss". The most important independent variables that explained 45.7% of the variation in people's awareness of habitat loss due to tree overharvesting were as follows: city was the most significant variable (Table 2), and occupation the second most important variable (Table 2). Age, gender, religion, and education were not significant as indicated in Table 2. In Dodoma, 80.3% agreed with this statement, while in Arusha, 28.2% agreed. Among the different occupations, the following agreed with the statement: farmers 35.4% (n = 48), pastoralists 71.4% (n = 5), own business 59.5% (n = 75), government staff 55.4% (n = 41), no formal employment 54.5% (n = 66).

Nearly 49.7% (n = 376) of the respondents agreed with the statement "Conservation education is not relevant for local people and such education should therefore be given to experts only". The only independent variable that explained 50.3% of the variation in people's awareness of conservation education was city (Table 3), while age, gender, religion, occupation, and education were not significant as indicated in Table 3. In Dodoma, 30.3% agreed, while in Arusha, 69.1% agreed with the statement.

Out of 71% (n = 376) of our respondents agreed with the statement that "It is important to involve school children in conservation education". The most important independent variables that explained 29% of the variation in people's awareness of conservation education were city and religion (Table 4), while age, gender, occupation, and education were not significant as indicated in Table 4. In Dodoma, 89.4% agreed, while in Arusha, 52.7% agreed with the statement. Among the different religions, the following agreed with the statement: Christians 63.8% (n = 163), Muslims 77.1% (n = 83), and others 76.2% (n = 130).

Approximately 52.4% (n = 376) agreed with the statement, "Conservation of nature in protected areas should only involve people in the vicinity of protected areas". The most important independent variables that explained 47.6% of the variation in people's awareness of involving local people in biodiversity conservation involvement included city and occupation (Table 5), while age, gender, religion, and education were not significant as indicated in Table 5. In Dodoma, 28.9% agreed, while in Arusha, 75% agreed with the statement. Among the different occupations, the following agreed with the statement: farmers 64.6% (n = 31), pastoralists 14.3% (n = 1), own business 57.1% (n = 72), government staff 39.2% (29), no formal employment 52.9% (n = 64).

Totally, 65.4% (n = 376) of our respondents agreed with the statement that "The government should reduce the size of protected areas to ensure more land for local communities". The most important independent variables that explained 34.6% of the variation in people's awareness of reducing the size of protected areas to ensure land for local communities included city and religion (Table 6).

Table 1
Model output from a binary logistic regression analysis testing the statement "The knowledge obtained through conservation education is very important in changing our attitude towards protected areas" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent variable	B	S.E.	Wald	df	P-value
City	-0.071	0.402	0.031	1	0.859
Age	-0.389	0.203	3.657	1	0.056
Gender	0.258	0.335	0.593	1	0.441
Occupation	0.049	0.106	0.217	1	0.641
Religion	-0.083	0.186	0.201	1	0.654
Education	0.117	0.261	0.202	1	0.653

Table 2
Model output from a binary logistic regression analysis testing the statement "Tree overharvesting due to charcoal and fuel wood will lead to habitat loss" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent Variable	B	S.E.	Wald	df	P-value
City	-2.156	0.301	51.25	1	< 0.001
Occupation	-0.165	0.081	4.14	1	0.042
Age	0.226	0.150	2.27	1	0.132
Education	0.281	0.200	1.98	1	0.160
Religion	-0.061	0.150	0.166	1	0.683
Gender	0.031	0.266	0.014	1	0.907

Table 3
Model output from a binary logistic regression analysis testing the statement "Conservation education is not relevant for local people and such education should therefore be given to experts only" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent Variable	B	S.E.	Wald	df	P≤
City	1.526	0.279	29.80	1	< 0.001
Occupation	-0.069	0.074	0.870	1	0.351
Gender	0.192	0.243	0.622	1	0.430
Education	-0.138	0.183	0.573	1	0.449
Religion	-0.103	0.136	0.574	1	0.449
Age	0.084	0.136	0.375	1	0.540

Table 4
Model output from a binary logistic regression analysis testing the statement "It is important to involve school children in conservation education" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent variable	B	S.E.	Wald	df	P≤
City	-1.908	0.341	31.297	1	< 0.001
Religion	-0.357	0.155	5.289	1	0.021
Occupation	-0.084	0.083	1.033	1	0.309
Education	0.186	0.218	0.730	1	0.393
Age	-0.121	0.154	0.615	1	0.433
Gender	0.015	0.274	0.003	1	0.955

Table 5
Model output from a binary logistic regression analysis testing the statement "Conservation of nature in protected areas should only involve people in the vicinity of protected areas" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent Variable	B	S.E.	Wald	df	P≤
City	1.820	0.291	39.147	1	< 0.001
Occupation	0.153	0.077	3.932	1	0.047
Gender	-0.464	0.255	3.324	1	0.068
Age	-0.149	0.143	1.084	1	0.298
Education	-0.183	0.189	0.933	1	0.334
Religion	0.091	0.142	0.411	1	0.521

Table 6
Model output from a binary logistic regression analysis testing the statement "The government should reduce the size of protected areas to ensure more land for local communities" (agree/disagree) as a dependent variable and city, age, gender, occupation, religion, and education level were used as the predictors.

Independent Variables	B	S.E.	Wald	df	P≤
City	1.781	0.312	32.542	1	< 0.001
Religion	-0.298	0.150	3.950	1	0.047
Education	-0.352	0.193	3.336	1	0.068
Gender	0.329	0.266	1.539	1	0.215
Occupation	0.066	0.081	0.675	1	0.411
Age	-0.117	0.151	0.601	1	0.438

Education was also nearly significant (Table 6). Age, gender, and occupation were not significant, as indicated in Table 6. In Dodoma, 44.7% agreed, while in Arusha, 86.2% agreed with the statement. Among the different religious groups, the following agreed with the statement: Christians 62.0% (n = 101), Muslims 62.7% (n = 52), and others 71.5% (n = 93).

4. Discussion

Generally, urban people demonstrated positive opinions towards most conservation statements related to biodiversity conservation in protected areas. However, we found significant differences between the two cities for five statements, and in few cases variation between people from different occupations was significant (2 statements). In addition, variations between religions (2 statements) and partly between different education levels (1 statement) were found in few cases. The prediction was that people from Arusha should support more conservation statements compared to people from Dodoma because Arusha is surrounded by many protected areas and therefore visited by many international tourists. However, surprisingly, people in Dodoma supported positively all six conservation statements more frequently than did people in Arusha. People in Dodoma are far away from conservation problems compared to people in Arusha. Despite the people of Arusha living in town, they have relatives and friends who live in the vicinities of protected areas (Mbise et al., 2021b). Perhaps they hear about the problems associated with protected areas and indirectly support these relatives and friends after bearing conservation costs such as crop damage and/or livestock depredation. In addition, lessons learnt from a 25-year-old conservation program in the Kondoa Highlands of the Dodoma Region in central Tanzania might have influenced the awareness of local and urban communities on conservation of nature in Dodoma. The area has been the focus of an oil and water conservation program commonly known as Hifadhi Ardhi Dodoma (HADO), which started being implemented during the 1973/74 financial year (Kikula, 1999).

Globally, studies on the awareness of people towards conservation of nature have been conducted by several scholars (Htay et al., 2022; Jones et al., 2018; Kideghesho et al., 2007; Lyamuya et al., 2014; Nyahongo et al., 2010; Venuste et al., 2017), but most studies have been restricted to rural areas close to protected areas. A few studies have compared urban and rural people (Hariohay et al., 2018; Lyamuya et al., 2016). Our study is probably the first of its kind to be conducted in urban areas, with a focus on Tanzania. The findings from Arusha and Dodoma emphasize the importance of filling the knowledge gap about the value of conservation education in cities. Moreover, the influx of international tourists seems to bring advantages to people in Arusha in their daily lives because of the money brought by these tourists and other incentives like supporting local-initiated projects (i.e., water, schools, dispensaries, roads, etc.). However, the Arusha people, perhaps due to a lack of conservation education, fail to link the availability of protected areas with biodiversity conservation. This failure might explain why Arusha people were more negative towards most conservation statements than those in Dodoma. Our results indicate that people in Dodoma are more concerned about conservation than people in Arusha, which might have many causes, as will be discussed below.

The intention of the statement about tree overharvesting was to test if people understand that the current charcoal and fuel wood use leads to overharvesting of trees, causing loss of habitats and biodiversity (Kideghesho, 2015). Overall, most people supported this statement, as more than 50% of the participants agreed that firewood and charcoal production lead to overharvesting and thereby have a negative impact on biodiversity conservation in their surroundings. However, most of the people that supported this statement were in Dodoma, with only 30% of interviewees in Arusha agreeing with the statement. One explanation for this disparity is the semi-arid climate of Dodoma and the use of most tree species here for charcoal making (Allen, 1985; Jumbe, 2013). Dodoma has been a source of charcoal for the neighboring regions like Arusha, Singida, and Morogoro. For instance, the price of charcoal is currently cheaper in Dodoma (20,000 Tshs. (8 USD) per bag) than in Arusha around 50,000 Tshs. (20 USD) (R. Ulimboka personal observation). Furthermore, people in Arusha are experiencing a shortage of fuel wood, charcoal, and timber (R. Ulimboka personal observation). As these goods are mostly found in the surroundings of protected areas (Htay et al., 2022), we speculate that they do not see the connection between the use of charcoal and habitat loss.

Farmers and the cattle owners also agreed more with the statement that the use of charcoal might lead to habitat loss. About 90% of the subsistence farmers include trees on their farm, for either wood, shade, soil conservation, or fodder (Zomer et al., 2009). In addition, about 90% of pastoralists suffer from a shortage of pasture for their cattle due to tree overharvesting (Derero and Kitaw, 2018). Hence, their awareness of the statement might be influenced by their lifestyle because they need a good and sustainable pastureland, on which trees are the most important product (Maselli et al., 2011).

The motive behind the statement that conservation education is not relevant for local people was to test if people understand that conservation education is a sustainable tool for biodiversity conservation. Should such education therefore be offered to experts only? For decades, most conservation initiatives have been carried out by trained personnel. However, people in Dodoma were more positive towards this statement, suggesting a collaborative approach in biodiversity conservation. As a result, sustainable conservation of nature in protected areas should involve not only experts but also local people because their knowledge, views, and attitudes are important in biodiversity conservation (Hariohay et al., 2018; Lyamuya et al., 2016).

Because conservation laws are often enforced in protected area networks in Arusha, it may have changed how people there think about conservation. However, the implementation of conservation education programs has greater potential for influencing the relationships between conservation managers and communities around protected areas (Dickman et al., 2014; Mbise et al., 2021a). A study by Lyamuya et al. (2016), for instance, explains that increased awareness about nature can develop skills and expertise in conserving nature for future generations. Therefore, if conservation education is offered to the communities around protected areas, this will lead to synergy in the conservation of nature in the area (Lyamuya et al., 2016; Mbise et al., 2021b), while urban people in Arusha do not yet see such benefits.

The intention of the statement of involving schoolchildren in conservation education was to see if people understood the

importance of involving schoolchildren in conservation education training. In most cases, children are ignored and most conservation education is targeted towards adults (Lyamuya et al., 2016). To ensure sustainable conservation of nature, schoolchildren have to be involved as it is easy for them to grow up with sufficient knowledge (Andersen, 2018). Teachers and schoolchildren can easily transfer their knowledge to the general public if they are well informed about biodiversity conservation (Venuste et al., 2017). As conservation education is a continuing learning process that needs to be included in primary and secondary school curricula, this will ensure a favorable mutual coexistence between wildlife and humans (Lyamuya et al., 2016; Mutisya et al., 2013). We found that people in Dodoma were more aware of supporting conservation than people in Arusha. We further found that respondents with formal education were more positive towards conservation education (Hariohay et al., 2018; Lyamuya et al., 2016; Mbise et al., 2021b). Therefore, involvement of schoolchildren in formal conservation education, also in urban areas, is important as it can also be used as a means of transferring knowledge through different campaigns like biodiversity conservation clubs, artwork, and plays (Lyamuya et al., 2016).

The statement that the government should reduce the size of protected areas to secure more land for community use was supported more by people in Arusha. This may be because, in Arusha, people have experienced a shortage of land for community use as larger parts of land might have been gazetted for different protected areas in their vicinity (Ojalammi, 2006). Furthermore, people believe that bush land that has been gazetted as a protected area is more fertile than other areas (Shivik, 2006). If this land is cultivated, it will likely result in more yields (Bitanyi et al., 2012). However, reducing the size of protected areas will furthermore, lead to loss of life of living organism that coevolved in these habitats (Keles et al., 2020). Education has a positive effect on people's answers to this statement as knowledge in general allows people to think, learn, and do their own reflections about biodiversity conservation (Hariohay et al., 2018; Lyamuya et al., 2016). In addition, religion plays an important role in shaping people's attitudes towards conservation (Mikusiński et al., 2014). However, for this statement, Christians and Muslims nearly agreed equally, but the trend was primarily influenced by those who had no religion or preferred not to say it.

As discussed above, people in the capital city of Dodoma were more positive towards all the six conservation statements than those from Arusha (Dodoma is far and Arusha is close). People living further away from protected areas still use natural resources that are collected in protected areas, like bush meat, charcoal, fuel wood, etc. (Kideghesho et al., 2007). Such resources are found at marketplaces in villages near the protected areas as well as in city centers (Kyando et al., 2019). Therefore, conserving nature in protected areas cannot be successful if only people living around such areas are involved (Galvin et al., 2020). In order to ensure the sustainable conservation of nature, the contributions of local and urban people must be shared (Bongaarts, 2019). People's occupations also had an influence on their responses to the statements. The focus of this study was to interview people in city centers, where business owners and government employees are more readily available than in rural areas. However, farmers were less positive (Ciocănea et al., 2016). Normally, people close to protected areas are positive towards being involved in conservation (Hariohay et al., 2018; Lyamuya et al., 2016; Mbise et al., 2021b) because they feel they are part of nature (Htay et al., 2022).

5. Conclusion and recommendations

We found that urban people were mostly aware of the importance of biodiversity conservation as a useful tool towards sustainable conservation of nature in protected areas (Shwartz et al., 2012). Protected areas are the only remaining safe places for nature and human life. However, this awareness differed significantly between Dodoma and Arusha, which were two cities of similar populations that differed in their distance to protected areas. People in Dodoma far from protected areas were generally more positive about biodiversity conservation, community engagement, and education programs than people in Arusha. This surprising result might have many causes, but there is no doubt that we found that Dodoma people understand and support conservation more than people in Arusha. More research is needed on the reasons why people in Arusha are generally more negative than people in Dodoma. Because our study only compared two cities, future research should compare cities with the differences in the number of protected areas to better explain why these patterns exist.

Our results give more insight into the importance of research about awareness differences between different stakeholders and groups of people on biodiversity conservation between two cities in Tanzania. We recommend that awareness of biodiversity conservation in protected areas be highlighted among people living in urban areas, as natural resources in protected areas have direct and indirect impacts on their daily lives. Biodiversity conservation education should furthermore be incorporated into the school curriculum in both rural and urban areas, as it then will be easily transferred over generations (Lyamuya et al., 2016). For instance, since protected areas are the only available safe place for biodiversity conservation in Africa and other places in the world (Bongaarts, 2019; Bruner et al., 2001; Gaston et al., 2008), more effort should be invested to raise people's awareness of the value of protected areas and biodiversity conservation instead of buying firearms and patrolling them (fortress and fence policy), as this will foster understanding that can easily lead to an admiration to conserve nature sustainably for future generations (Wuerthner, 2015). Surprisingly, the presence of many international tourists does not seem to have any impact on people's awareness of biodiversity conservation in Arusha. We recommend more studies that should concentrate on a better understanding of why people in Arusha show such a low level of awareness about nature when compared to people in Dodoma.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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