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Conflict Governance between Protected Areas and Surrounding Communities: Willingness and Behaviors of Communities—Empirical Evidence from Tanzania

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Abstract: Under the dual pressures of climate change and human activities, the restrictions imposed by conservation policies, along with the increasing overlap between wildlife protected areas (PAs) and community living areas, have intensified the contradictions and conflicts between PAs and surrounding communities. Effective governance of such conflicts is particularly crucial to reconciling the contradictions between conservation and development. This study takes the Mikumi–Selous areas in Tanzania, Africa, as a case study. Through questionnaires and semi-structured interviews, it explores the current state of conflicts between PAs and communities in the study area and summarizes conflict governance measures. Moreover, this research focuses on identifying various factors that influence the conservation willingness and action of community residents, further validating the relationships between residents' household characteristics, conservation costs and benefits, conservation cognition, willingness, and behaviors through empirical analysis methods. The results indicate that residents' conservation cognition significantly positively impacts their conservation willingness and behaviors, while conservation willingness also positively affects their conservation behaviors. Additionally, it was found that conservation costs inhibit residents' conservation willingness and behaviors. This study primarily explores, from a community governance perspective, the participation willingness and behaviors of core stakeholders in conflict governance, emphasizing the critical role of community involvement in achieving biodiversity conservation and coordinated community development and providing a new perspective for alleviating conservation and development issues.

Keywords: biodiversity conservation; conflict governance; community residents; conservation willingness; conservation behaviors

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1. Introduction

Protected Areas (PAs) play a crucial role in conserving biodiversity, mitigating climate change, maintaining the health of human and natural environments, and ensuring sustainable development. With the establishment of PAs becoming a significant assessment criterion for the Aichi Biodiversity Targets [1], their establishment has emerged as a priority for countries globally over the past decade. According to the Protected Planet Report 2020, at least 22.5 million square kilometers (16.64%) of terrestrial and inland water ecosystems are located within globally recorded PAs and reserves [2]. The establishment of PAs has effectively safeguarded wildlife and plant resources, ensuring the integrity and stability of ecosystems [3].

While PAs provide sanctuaries for wildlife, curtail the loss of biodiversity, and offer new opportunities for a common global response to climate change, they are also venues where conflicts occur [4–6]. The types of PA conflicts, their causes, locations, and management approaches vary between developed and developing countries, contingent upon geographic location as well as specific socio-economic and cultural contexts. In developing

countries, conflicts within PAs are primarily driven by impacts on livelihoods, whereas in developed countries, conflicts are propelled by social factors, including emotional attachment to PAs, recreational activities, and cultural values [7].

While the majority of benefits derived from establishing PAs are shared among the administrative areas and even nations where these PAs are located, communities residing within or adjacent to these PAs might bear a portion of the conservation costs [8,9]. This situation presents significant challenges to local community development and leads to the continuous emergence and evolution of conflicts. The establishment of PAs in early Africa was largely influenced by North America's tradition of creating national parks, utilizing a top–down, exclusionary approach that gave local communities little to no say in the establishment and management of these conservation areas [10,11]. It was not until the late 1970s and early 1980s that this situation began to ease. However, this top–down, exclusionary approach has left a legacy of issues that have contributed to hostile attitudes towards conservation strategies [12,13]. Meanwhile, the ongoing global population growth accentuates potential issues that have long existed between wildlife PAs and human community living spaces, such as the overlap of spatial regions and unclear land ownership [14–16]. Additionally, the majority of community residents rely on natural resources, to maintain their basic needs. In most instances, it is imperative for the administration to preserve the PAs and implement important regulations, such as management plans. However, this often results in restrictions or prohibitions on traditional resource utilization methods by the residents, leading to conflicts over resource use, land ownership, development objectives, and the distribution of benefits [17–21].

The governance of conflicts is not only a technical issue that needs to be addressed in the process of biodiversity conservation but also a human development issue that is closely related to socio-economics. Fortunately, the conflict between conservation and development, in some cases, is receiving increasing attention, and natural resource management policies have shifted from a purely "conservationist approach" to more decentralized and participatory approaches [22–25]. These decentralized and participatory approaches incentivize local people to participate in and support conservation and promote benefit sharing [26,27], aligning development needs with conservation objectives. To mitigate the contradictions between conservation and development, management authorities, NGOs, and other social organizations have provided numerous development projects for communities. These include implementing ecological conservation compensation, developing eco-tourism in suitable areas, distributing equipment to reduce environmental pollution for production and daily life, and voluntarily offering technical training for the development of community agriculture and forestry [28–31]. Although some scholars have argued that community co-management and other methods of involving communities in conservation and development have indeed strengthened the state's control, distribution, and management of resources, they have marginalized local communities and have not played a role in improving the livelihood capabilities or well-being of local communities [32]. However, a vast body of studies have shown that the long-term and stable existence and development of PAs must be supported by local residents, and the direct participation of communities in the establishment and management of PAs as well as in conservation decision-making is more conducive to the development of PAs [33]. Furthermore, most of the research with positive outcomes for well-being and conservation comes from situations where indigenous peoples and local communities play a central role [34].

The effectiveness of governance depends to a large extent on the capacity and level of community participation, where the willingness and behaviors to participate are critical indicators. Residents of communities are not only important participants in conflict management [35], but also their conservation cognition, willingness, and behaviors are key factors influencing biodiversity conservation. Compared with passive participation in development projects, the conservation willingness and behaviors of community residents are crucial in resolving the contradictions between conservation and development. Previous studies have paid more attention to the role of funds, technology, and resources provided by

government agencies and environmental organizations in alleviating the conflicts between PAs and communities and less attention to the subjective initiative of residents [36–38]. Moreover, there are also numerous studies that have shown that even with local support, local people's impact on conservation outcomes can be negative [39,40]. Furthermore, large-scale immigration into conservation areas because of the economic opportunities associated with conservation funding has often resulted in local support being overwhelmed by immigrants that do not have a history or vested interest in conservation [41,42]. In addition, there are numerous methodological approaches to studying the factors influencing conservation willingness and behaviors, such as linear regression analysis, multiple regression analysis, analysis of variance, and time series analysis [43–46]. These studies often consider the individual characteristics of community residents, household characteristics, and policy features as influencing factors for conservation attitudes and actions. Among these, age, education level, per capita family income, and policy features have been identified as the most significant factors [43–46]. Previous studies have lacked the ability to synergistically analyze the influencing processes and mechanisms by putting together the community's resource endowment, socio-economic conditions, conservation costs–benefits for relevant stakeholders, and residents' conservation cognition, willingness, and behaviors.

Our study focuses on the role played by community residents in conflict governance and analyzes the mechanisms and effects of subjective community participation in conflict resolution. It specifically examines the effects of natural resource endowments, conservation benefits and costs, conservation cognition, conservation willingness, and conservation behaviors to explore effective governance strategies for conflicts between PAs and communities. Our research is conducted adjacent to Mikumi–Selous ecosystem of Tanzania, selecting communities with significant conflicts with PAs. Semi-structured interviews were conducted with PA managers and community residents, primarily addressing the following questions: (1) What is the current state of conflicts between the PAs and surrounding communities in the study area? (2) What are the outcomes of PA governance actions involving community residents' participation? (3) What factors influence the residents' willingness and behaviors towards conservation?

2. Materials and Methods

2.1. Study Areas

This article focuses on the communities surrounding Mikumi National Park and Nyerere National Park (formerly the Selous Game Reserve) in Tanzania, Africa, as research area. It encompassing over 5000 km^2 and renowned for its diversified landscapes and abundance of wildlife (Figure 1). Home to habitat types such as woodlands, grasslands, riverine forests, and swamps, it serves as an essential habitat for species including African Savanna Elephant (*Loxodonta africana*), Cheetah (*Acinonyx jubatus*), Giraffe (*Giraffa camelopardalis*), Hippopotamus (*Hippopotamus amphibius*), and Nile Crocodile (*Crocodylus niloticus*).

Established in 1964, Mikumi National Park is located in southern Tanzania. A highway that cuts through the park divides it into the northwest and southeast sections, each belonging to different ecosystems. The northwest is characterized by vast alluvial plains populated with acacia trees and baobabs, hosting a larger variety of wildlife. In contrast, the other section is denser with shrub vegetation, virtually devoid of wildlife, and less developed. The Selous Game Reserve (now divided into two parts namely Nyerere National Park and Selous Game Reserve), positioned in the southern part of Tanzania and designated as a hunting reserve in 1905, is world-renowned, drawing numerous tourists from abroad, thereby generating significant popularity and income. The Selous Game Reserve consists of a vast wilderness, forests, grasslands, mountains, and open woodlands. The northern region of Selous, which occupies only about 5% of the total area of the reserve, is designated exclusively for photographic tourism. The southern half of Selous is divided into several independent hunting blocks, each covering an area of about 1000 km^2.

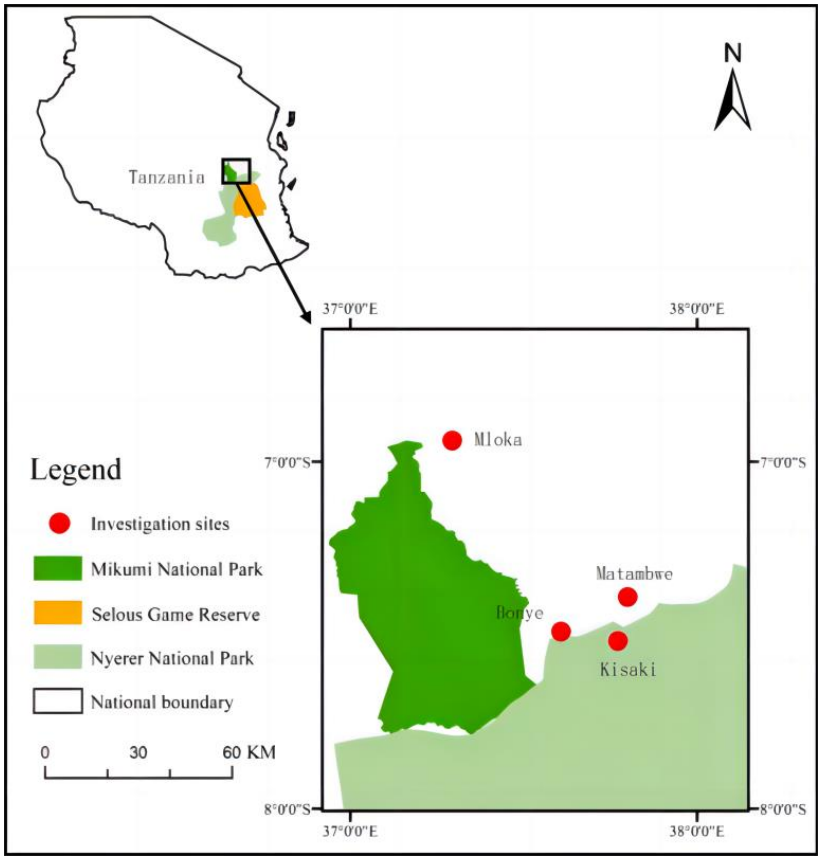

Figure 1. Map of the study area.

Communities around Mikumi National Park and the Selous Game Reserve benefit from the ecological added value brought by wildlife through participation in tourism services related to PAs. Located to the south of Mikumi National Park, the Selous Game Reserve shares the same ecosystem with Mikumi, allowing wildlife to migrate between these two parks. Conflicts often arise between humans and wildlife when animals damage crops, livestock, and houses in the surrounding communities. All villages are located outside the national parks, which restricts human activities within their boundaries. In recent years, with the growing human population and the increasing demand for natural resources, the fertile soil of the peripheral zones adjacent to the conservation areas has attracted residents interested in cultivation and livestock development. The management plans for PAs stipulate strict control by the Tanzania Ministry of Natural Resources and Tourism's Wildlife Division over human access to conservation areas; they limit and regulate the use of wildlife resources. Activities such as cultivation, settlement, and sometimes even livestock grazing on lands designated as wildlife PAs are prohibited. This creates a notable conflict between conservation and development within the study area. Thus, exploring and researching the willingness and behaviors of community residents to participate in conservation is crucial for mitigating the impacts of these conflicts, emphasizing the importance of community involvement in biodiversity protection.

2.2. Data Collection

In 2019, our research team conducted a preliminary survey in the Mikumi–Selous area of Tanzania, primarily utilizing semi-structured interviews. The objectives of this preliminary survey included understanding the current state of conflicts between wildlife within PAs and the surrounding communities; collecting related secondary data; hearing the opinions of various stakeholders to revise and improve the questionnaire and its applicability; and selecting appropriate areas for subsequent surveys of community residents.

Our survey targeted local government departments, scientific research institutions, and communities where conflicts have occurred. We visited the Tanzania Wildlife Management Authority (TAWA), the Morogoro District Council, and the Mvomero District Council, as well as three different types of PAs (the original Selous Game Reserve, Mikumi National Park, and Jukumu Wildlife Management Area) and four surrounding communities (Mkata, Bonye, Kisaki, and Matambwe). Semi-structured interviews were conducted with several experienced staff members to obtain relevant information. Through the pre-survey, we selected 4 villages in the Mikumi–Selous area as the official research area and used the questionnaire method to obtain data at the level of the community residents. Based on the pre-survey and semi-structured interviews, we listened to all the parties and adjusted the questionnaire by deleting and modifying the options that did not fit the local conditions to make the questionnaire more comprehensible.

Due to COVID-19, our formal research was postponed until November 2022. We visited 4 villages located around Mikumi National Park and Nyerere National Park to conduct a questionnaire survey with local residents. Due to the difficulty of finding residents who had the time to participate in our interviews, the respondents were either community leaders, persons of esteem referred to us, or those we happened to encounter on the village roads. Moreover, considering the understanding and cognitive levels of some residents, we conducted interviews only with adult family members who were knowledgeable about their family situations and had cognitive capabilities. The survey was conducted in Swahili and English, the common languages of Tanzania, with a team of four investigators, including one local university student who volunteered to assist us with translations to facilitate our survey smoothly. Each questionnaire took approximately 30 min to complete. The investigators began by providing a detailed introduction to the purpose and questions of the survey to the residents, aiming to minimize the potential impacts of misunderstandings or misconceptions during their responses. Once residents completed the survey, they received a token of appreciation. The questionnaire was divided into 3 parts (see Supplementary Materials). The first part dealt with basic demographic and household information, including sex, age, education level, occupation, and income from agriculture, forestry, and animal husbandry. The second part investigated the conflict between the national park and the community residents, including the type of conflict, conflict losses, etc. And the third part investigated the residents' protection cognition, attitudes toward protecting the national park, and protection actions taken to protect it. We distributed 210 questionnaires in total and obtained 200 valid samples. The basic information of the questionnaire respondents is shown in Table 1.

We also conducted interviews with experienced employees of Mikumi National Park and Nyerere National Park, as well as staff from the Tanzania National Parks Authority. Managers of the executive committee and tourists were also invited to discuss some key issues, totaling 14 participants. With the permission of the participants, the majority of the interviews were recorded.

Table 1. Basic profile of respondents.

Basic Characteristics of Respondents	Specific Categories for Each Characteristic	Frequency	Percentage of Respondents (%)
Gender	Male	139	69.5
	Female	61	30.5
Age	30 years and under	56	28
	30–50 years	105	52.5
	50 years and over	39	19.5

Table 1. *Cont.*

Basic Characteristics of Respondents	Specific Categories for Each Characteristic	Frequency	Percentage of Respondents (%)
Education level	Junior middle school and below	109	54.5
	Senior high school	37	18.5
	Junior college	21	10.5
	University undergraduate degree	19	9.5
	Master's degree or above	14	7
Occupation	Government or public institution employee	2	1
	Professional and technical staff	11	5.5
	Industry	9	1.5
	Merchant	33	16.5
	Farmer	92	46
	Service industry	28	14
	Freelancer	4	2
	Housewife/househusband	21	10.5
Length of residence	1–10 years	37	18.5
	11–20 years	52	26
	21–30 years	45	22.5
	31–40 years	39	19.5
	More than 40 years	27	13.5
Area of residence	Mloka	47	23.5
	Bonye	35	17.5
	Matambwe	61	30.5
	Kisaki	57	28.5

2.3. Variable Selection

To a certain extent, residents' conservation willingness and behaviors can reflect the willingness of the whole community to participate in and respond to conflict governance. The stronger the residents' conservation willingness or the more positive their conservation behaviors, the more inclined they are to engage in conflict management [35]. Therefore, household characteristics, conservation benefits, conservation costs, conservation cognition, conservation willingness, and conservation behaviors were selected as the main research variables in this study. Since the aforementioned variables are latent and not directly observable, we drew on existing research to define them. For household characteristics, we included land size, distance from residence to the boundary of PAs, household income, and duration of residence in the community; for conservation benefits, we selected tourism income and job opportunities that may be provided by community development projects and PAs to describe the benefits residents receive from conservation policies; for conservation costs, we chose the economic losses borne by residents due to conservation, including restrictions on natural resource use imposed by conservation policies and damages to houses, livestock, and crops caused by wildlife; for conservation cognition, we included improvements in residents' livelihoods and living conditions due to conservation policies and development measures for PAs; for conservation willingness, we primarily considered residents' willingness to establish and improve PAs, including the willingness to spend money and time; and for conservation behaviors, we characterized these by residents' actual participation in conservation actions. Detailed explanations of these variables can be found in Table 2.

Table 2. Variable definitions and measurements.

Variable Type	Latent Variables	Observed Variables	Variable Code	Methods for Measuring Observed Variables
Explained variable	Conservation behaviors	Participating in conservation behaviors carried out by local governments or NGOs	Behavior 1	1 = Yes; 0 = No
		Participating in community-organized awareness-raising actions or training on ecosystem conservation in PAs	Behavior 2	
	Conservation willingness	Supporting the establishment and development of PAs from the outset	Willingness 1	
		Willingness to spend money to improve protection of PAs if necessary	Willingness 2	
		Willingness to spend spare time to improve the protection of PAs if necessary	Willingness 3	
Explaining variable	Conservation cognition	Community-participatory conservation policies and development measures for PAs have resulted in increased incomes for the population	Cognition 1	1 = Strongly disagree; 2 = Mildly disagree; 3 = Unsure; 4 = Mildly agree; 5 = Strongly agree
		Knowledge dissemination and technical training provided by the PAs improved the personal qualities and livelihood capacities of the population	Cognition 2	
		PAs' conservation policies and development measures improve the conditions of the surrounding natural environment	Cognition 3	
		PAs' conservation policies and development measures have increased the capacity of local infrastructure, such as health care and transport, to provide security	Cognition 4	
	Conservation costs	Whether conservation policy restrictions affect natural resource use	Cost 1	1 = Yes; 0 = No
		Whether wildlife destroys crops	Cost 2	
		Whether wild animals attack livestock	Cost 3	
		Did wildlife damage the house?	Cost 4	

Table 2. *Cont.*

Variable Type	Latent Variables	Observed Variables	Variable Code	Methods for Measuring Observed Variables
Explaining variable	Conservation benefits	Tourism income	Income 1	1 = USD 500 and below; 2 = USD 500–1000; 3 = USD 1000–1500; 4 = USD 1500–2000; 5 = USD 2000 and above
		Good conservation of PAs leads to increased incomes for the population	Income 2	1 = Strongly disagree; 2 = Mildly disagree; 3 = Unsure; 4 = Mildly agree; 5 = Strongly agree
	Household characteristics	Land size	Household 1	1 = 300 m^2 and below; 2 = 400–600 m^2; 3 = 700–1000 m^2; 4 = 1100–1300 m^2; 5 = more than 1300 m^2
		Distance from residence to the boundary of PAs	Household 2	1 = 50 km or more; 2 = 30–50 km; 3 = 10–30 km; 4 = 1–10 km; 5 = within 1 km
		Annual household income (other than income from tourism)	Household 3	1 = USD 500 and below; 2 = USD 500–1000; 3 = USD 1000–1500; 4 = USD 1500–2000; 5 = USD 2000 and above
		Duration of residence in the community	Household 4	1 = 10 years and less; 2 = 11–20 years; 3 = 21–30 years; 4 = 31–40 years; 5 = more than 40 years

2.4. Model Setting

Traditional measurement methods, such as linear and multiple regression analyses, have certain limitations due to their assumption that while the dependent variable may contain measurement errors, independent variables do not. Hence, traditional econometrics cannot handle cases where independent variables are not directly measurable. In contrast, structural equation modeling (SEM) can simultaneously manage latent variables and their indicators, making it the chosen method to analyze the connections between them. The theoretical framework diagram constructed based on the SEM model in this study is shown in Figure 2.

Currently, SEM is divided into two mainstream research methodologies: Covariance-Based Structural Equation Modeling (CB-SEM) and Partial Least Squares Structural Equation Modeling (PLS-SEM). CB-SEM utilizes the covariance matrix of the data and estimates model parameters by considering only the shared variance. It focuses on testing the applicability of theories, making it suitable for confirmatory testing of theoretical models. On the other hand, PLS-SEM is a causal prediction method within structural equation modeling that accounts for and uses total variance to estimate parameters, emphasizing the prediction of statistical models. Its structure aims to provide causal explanations, making it more applicable to the inference of causal relationships. In recent years, the PLS-SEM method has been increasingly used to model complex real-world problems [47,48]. Unlike CB-SEM, PLS-SEM adopts a variance-based rather than covariance-based analytical approach, enabling it to handle errors in variable measurement more effectively and find

the most suitable relationships between latent variables. It remains robust even when data do not conform to normal distribution, maximizes predictive validity for complex models, brings model analysis closer to the data, and enhances the precision of exploratory research and data analysis by reflecting the influence relationships between variables more accurately. Additionally, this model well meets the research analysis needs of this study with a smaller sample size. Therefore, given the data requirements and research objectives, PLS-SEM is suitable for this study.

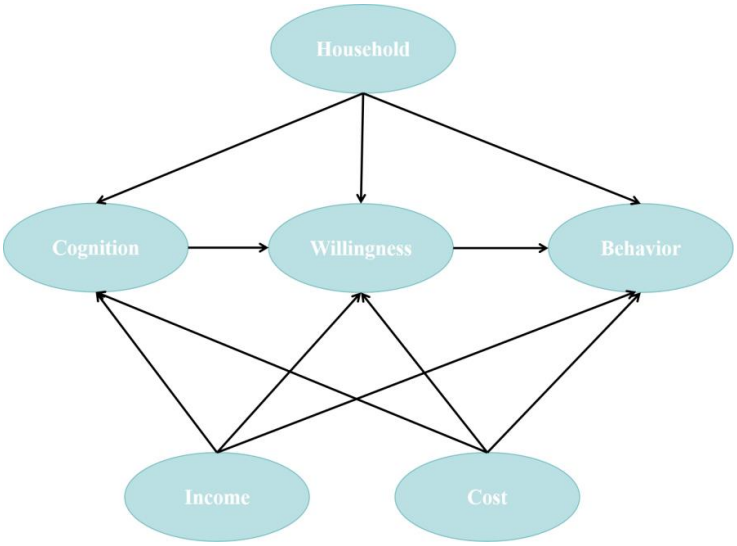

Figure 2. Theoretical framework based on SEM.

PLS-SEM consists of two sets of theoretical models: the structural model, which defines the linear relationships between latent independent variables and latent dependent variables, and the measurement model, which defines the relationships between latent variables and observed variables. The equation expression for the measurement model is the following:

$$R_i = \sum\nolimits_n \lambda_{ji} a_{ji} + \zeta_i, \quad (1)$$

In Equation (1), R_i represents the latent variables, which in this study include household characteristics, conservation costs, conservation benefits, conservation cognition, conservation willingness, and conservation behaviors; a_{ji} represents the observed variables, which are the directly measurable indicators; λ_{ji} is the loading coefficient of observed variable a_{ji} on latent variable R_i, depicting the relationship between the latent and observed variables; and ζ_i is the error-correction term.

The structural model describes the relationships between latent variables, and its equation expression is the following:

$$R_i = \sum_{i \neq j} \beta_{ji} R_j + \varepsilon_i \quad (2)$$

In Equation (2), R_i and R_j represent two different latent variables; β_{ji} is the path coefficient between the two latent variables, characterizing the effect relationship between them; and ε_i is the error-correction term.

The parameter estimation in PLS-SEM is achieved through two steps: (1) obtaining estimates of latent variables through iterative iterations; and (2) applying the Partial Least Squares method for linear regression to obtain parameter estimates for both the measurement model and the structural model. Let Y_i be the external estimate of latent

variable R_i, and since latent variable R_i can be represented by a linear combination of i groups of observed variables a_{ji}, the equation can be formulated as follows:

$$Y_i = w_{ji} S(a_{ji}) \quad (3)$$

In Equation (3), w_{ji} represents the outer weights, and $S(*)$ denotes the standardization of the data. Furthermore, since Y_j is the external estimate of latent variable R_i, it can be used to estimate latent variable R_i, with its estimated value denoted as G_i, referred to as the internal estimate. The equation can be formulated as follows:

$$G_i = \sum_{i \neq j} e_{ji} Y_j \quad (4)$$

In Equation (4), e_{ji} represents the inner weights and is equal to the sign function value of the correlation coefficient between Y_i and its connected Y_j, that is, $e_{ji} = sign(cor(Y_i, Y_j))$. Since Y_i and G_i are the external and internal estimates of R_i, respectively, the equation can be formulated as follows:

$$\hat{w}_{ji} = cor\ (a_{ji}, G_i) \quad (5)$$

In Equation (5), $\hat{w}_{ji}$ represents the new outer weights. The estimated values of the latent variables are obtained through iterative iterations. If the error between w_{ji} and $\hat{w}_{ji}$ is less than a predetermined threshold, the iteration converges, allowing the estimation of latent variables based on the determined weights.

3. Results

3.1. Status of Conflicts between PAs and Neighboring Communities

Conflicts between PAs and communities are mainly characterized by biodiversity conservation policies that severely restrict the use and exploitation of natural resources by community residents, as well as wildlife–human conflicts. The latter is a two-pronged conflict that includes both the problems of wildlife habitat destruction and poaching of wildlife by residents and the problems of wildlife damaging crops (stealing and eating crops, trampling on farmland and pasture, etc.), harming livestock and poultry (preying on and attacking livestock), damaging household property (destroying houses, breaking into yards, destroying means of production used by residents, etc.), and harming personal safety (stepping on and hitting residents, attacking residents, etc.). According to the results shown in Figure 3, t 126 households (63% of the respondents) indicated that they had restricted use of natural resources, while 73, 65, and 25 households (36.5%, 32.5%, and 12.5%) were affected by wild animals destroying crops, attacking livestock, and damaging houses, respectively.

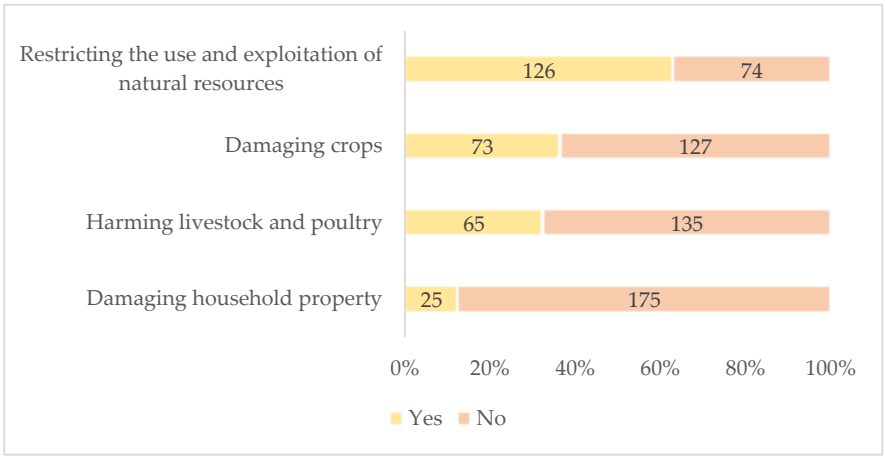

Figure 3. Status of conflicts between PAs and neighboring communities in the Mikumi–Selous region of Tanzania.

3.2. Community Residents' Cognition, Willingness, and Behaviors towards Biodiversity Conservation

The survey results show that nearly half of the residents have a positive attitude towards conservation. A total of 82 respondents, or 41%, believe that community-involved PAs enhance community development, leading to increased residents' income; 96 respondents, or 48%, feel that the knowledge dissemination and technical training provided by the PAs' management bodies and NGOs have improved residents' personal qualities and livelihoods; 98 respondents, or 49%, view that conservation policies and development measures have improved the surrounding natural environment; and 96 respondents, or 48%, think that conservation policies and development measures have improved local healthcare, transport, and other infrastructural conditions (Figure 4).

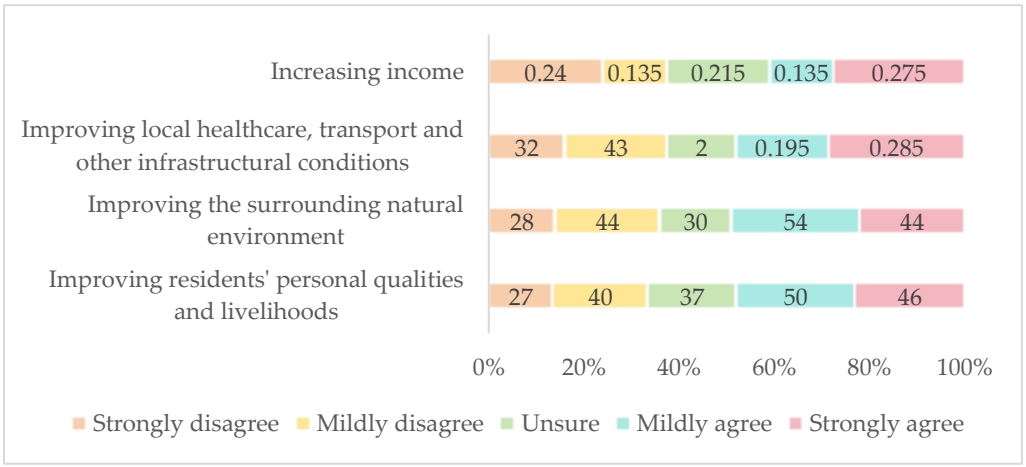

Figure 4. Community residents' conservation cognition.

In our survey on the willingness and behaviors of community residents towards conservation, it was observed that 80% of the respondents support the establishment of PAs and are willing to spend time and money to improve conservation efforts for these PAs. Moreover, nearly 90% of the residents have already participated in conservation or awareness-raising activities related to PAs (as shown in Figure 5).

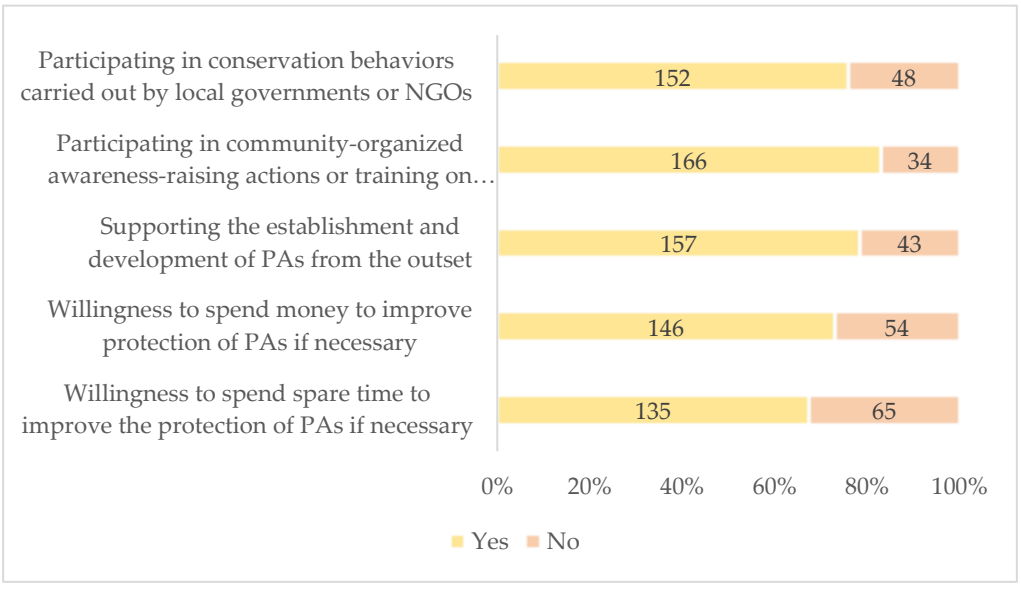

Figure 5. Status of community residents' conservation willingness and behaviors.

3.3. Model Reliability and Validity Tests

The measurement model needs to be validated before the model test, which contains the reliability test and validity test. Cronbach's α coefficient and composite reliability (CR) were used as tests of internal consistency. Usually, a Cronbach's α of <0.35 indicates low reliability; 0.35 ≤ Cronbach's α < 0.70 indicates moderate reliability; and a Cronbach's α > 0.70 indicates high reliability. The higher the CR value, the higher the reliability. As a rule of thumb, a CR value between 0.60 and 0.70 is considered "acceptable in exploratory studies", and a CR value between 0.7 and 0.9 indicates "satisfactory-to-good" reliability. As can be seen in Table 3, the CR values and Cronbach's α for all latent variables satisfy the criteria, providing evidence of good internal consistency in the measurement model. In addition, in general, the standardized factor loading of the observed variables is greater than 0.5, indicating that each observed variable has good explanatory power for the corresponding latent variable. All the standardized factor loadings in this study are greater than the test criteria, which again indicates that the measurement model has high reliability. In addition, a Variance Inflation Factor (VIF) value of less than 5 indicates that there is no problem with multicollinearity.

Table 3. Results of model reliability test.

Latent Variables	Observed Variables	Factor Loadings	VIF	Cronbach's α	CR	AVE
Behavior	Behavior 1	0.955	2.233	0.853	0.929	0.868
	Behavior 2	0.908	2.233			
Cognition	Cognition 1	0.800	1.351	0.715	0.82	0.535
	Cognition 2	0.682	1.421			
	Cognition 3	0.783	1.524			
	Cognition 4	0.648	1.257			
Cost	Cost 1	0.785	1.44	0.762	0.85	0.589
	Cost 2	0.848	2.258			
	Cost 3	0.803	2.15			
	Cost 4	0.613	1.164			
Household	Household 1	0.888	2.252	0.736	0.831	0.561
	Household 2	0.809	1.46			
	Household 3	0.519	1.266			
	Household 4	0.728	1.618			
Income	Income 1	0.628	1.626	0.766	0.814	0.697
	Income 2	1.000	1.626			
Willingness	Willingness 1	0.920	2.206	0.705	0.837	0.636
	Willingness 2	0.631	1.328			
	Willingness 3	0.816	1.778			

Next, the validity of the measurement model needs to be assessed by testing convergent validity and discriminant validity. The metric used to assess convergent validity is the average variance of all items extracted on each construct, i.e., the average variance extracted (AVE). An acceptable value for the AVE is 0.50 or higher, which indicates that the construct explains at least 50% of the variance in its items. According to Table 3, it can be seen that the data in this part of our study meet the requirements. As for discriminant validity, which represents the degree of effective differentiation between latent variables, it can be tested by the criterion that the square root of the AVE value is greater than the correlation coefficient of the other latent variables. From Table 4, it can be seen that the square root of the AVE of the latent variables in this part is greater than the correlation coefficient between the latent variables, which indicates that the measurement model has good discriminant validity.

Table 4. Square root of AVE and correlation coefficient between latent variables.

	Behavior	Cognition	Cost	Household	Income	Willingness
Behavior	0.932					
Cognition	0.536	0.731				
Cost	−0.105	−0.338	0.768			
Household	−0.002	−0.234	0.386	0.749		
Income	0.202	0.264	−0.02	0.068	0.835	
Willingness	0.545	0.548	−0.49	−0.212	0.045	0.798

In addition, recent research suggests that this criterion may not be sufficiently robust in discriminant validity assessments, especially when structured with only slightly different indicator loadings (e.g., all factor loadings between 0.65 and 0.85) [49]. As an alternative, Henseler proposed the heterotrait–monotrait ratio (HTMT) as a new metric for discriminant validity assessment [49]. A high HTMT value indicates low discriminant validity, and Henseler et al. [49] proposed a threshold of 0.9 for the structural model. As can be seen in Table 5, the HTMT values for all latent variables in this part of the study were lower than 0.9, indicating high discriminant validity of the measurement model.

Table 5. HTMT results.

	Behavior	Cognition	Cost	Household	Income	Willingness
Behavior	-					
Cognition	0.603	-				
Cost	0.142	0.453	-			
Household	0.053	0.315	0.51	-		
Income	0.181	0.249	0.141	0.12	-	
Willingness	0.681	0.739	0.652	0.27	0.119	-

3.4. Overall Model Testing

Based on the good results of the model reliability and validity tests, this study used SmartPLS 4.0 (version: 4.0.9.8) software to calculate the T-statistic of each path coefficient after 5000 sample repetitions using the Bootstrapping method. The T-value is a significance level indicator used to indicate the sample size and the significance of the statistical model.

3.4.1. Analysis of Direct Effects

Figure 6 illustrates the path coefficients and significance results between the latent variables to characterize the direct effect relationship between the latent variables.

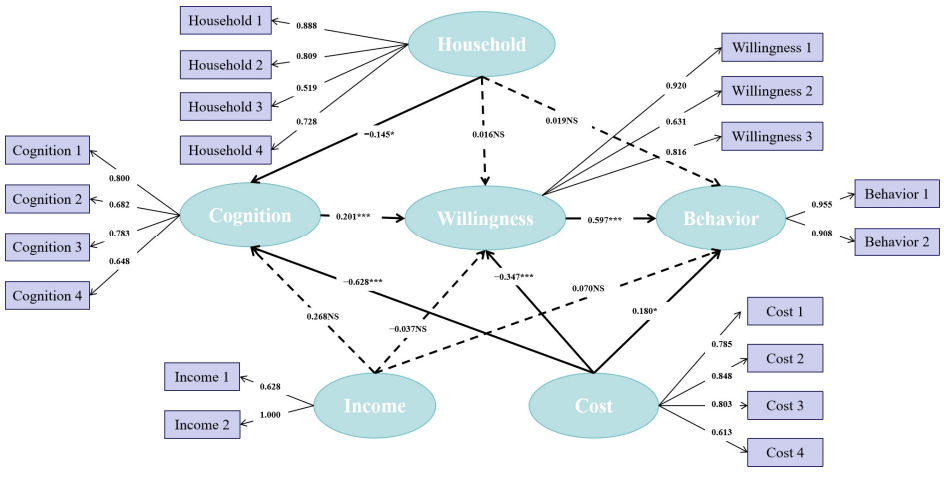

Figure 6. Model path coefficient analysis results. Note: *** and * indicate significance at the 1% and 10% significance levels, respectively; NS indicates that the pathway effect is not significant.

Firstly, household characteristics have a significant negative effect on conservation cognition and no significant effect on conservation willingness and behaviors. The possible reason for this is that a larger land area, higher income from agriculture and forestry, closer proximity to PAs, or longer duration of residence in the household characteristics imply that there is a greater demand for land exploitation and use by the community's residents. This may contribute to increased pressure on natural resource use, aggravate conflicts with wildlife, and thus pose a threat to conservation efforts. Consequently, conservation cognition may decrease. Although, theoretically, household characteristics may influence the conservation willingness and behaviors of community residents, in practice, residents' decisions are often influenced by considerations of economic interests.

Secondly, conservation cost has a significant positive effect on conservation behaviors and a significant negative effect on conservation cognition and willingness. The possible reason for this is that the most serious conflict between the community and the PAs is the conflict between people and wildlife, which is also affected by conservation policies that prohibit actions to harm wildlife; hence, residents voluntarily participate in the use of physical isolation measures (e.g., setting up fences, hedges, etc.) to mitigate wildlife's harm to people, which in itself is a kind of conservation behavior. However, if conservation cost is too high, residents will have a strong conservation willingness, which will be manifested in their negative attitude toward conservation cognition and willingness.

Thirdly, conservation benefits do not have a significant effect on conservation cognition, willingness, or behaviors. The possible reason for this is that residents of communities around PAs may face trade-offs between economic benefits and ecological conservation. Although eco-tourism and other methods can bring economic benefits to families, they may have a limited role and not be able to satisfy the basic needs of life, in which case residents attach less importance to conservation willingness and behaviors and prefer one-sided economic rationality to achieve a rapid increase in income. This may also cause some pressure and damage to the ecological environment if overexploitation behavior occurs due to excessive demand for economic benefits. In addition, the variability of residents' cognition of conservation benefits may also contribute to this result; e.g., some residents believe that PAs can bring them economic and non-economic benefits, while others do not benefit from them or have fewer benefits, which may also lead to the positive non-significance of conservation benefits on conservation cognition and willingness.

Fourthly, conservation cognition has a significant positive effect on willingness, and conservation willingness has a significant positive effect on conservation behaviors. This suggests that residents have a high perception of ecological and biodiversity conservation, which leads to a high willingness to participate in conservation, which ultimately manifests itself in participation in the practice of conservation behaviors.

3.4.2. Analysis of Indirect and Total Effects

Table 6 reports the indirect and total effects of all path endpoints on conservation willingness and behaviors. The analysis of indirect effects shows that, on the one hand, cognition and willingness are good bridges from conservation cost to conservation behaviors, and the three paths of "cognition -> willingness -> behaviors; cost -> cognition -> willingness -> behaviors; and cost -> willingness -> behaviors" all passed the test ($p < 0.01$ or $p < 0.1$). The path coefficients of the path of conservation cognition–conservation willingness are positive, and the other two paths are negative. This suggests that willingness not only has a direct effect on behaviors but also mediates the effects of conservation cognition and conservation costs on conservation behaviors. The other paths are not significant because household characteristics and the benefits of protection themselves have a low association with conservation behaviors, making it difficult for cognition and willingness to play a mediating role.

Table 6. Indirect effect and total effect test results.

Trails	Path Coefficients	Standard Deviation	T Statistics	*p* Values
Specific indirect effects				
Cognition -> Willingness -> Behavior	0.12	0.022	5.461	0
Cost -> Cognition -> Willingness -> Behavior	−0.075	0.022	3.405	0.001
Cost -> Willingness -> Behavior	−0.207	0.044	4.665	0
Household -> Cognition -> Willingness -> Behavior	−0.017	0.01	1.821	0.069
Household -> Willingness -> Behavior	0.01	0.017	0.574	0.566
Income -> Cognition -> Willingness -> Behavior	0.032	0.019	1.726	0.084
Income -> Willingness -> Behavior	−0.022	0.019	1.159	0.246
Total effect				
Cognition -> Behavior	0.12	0.022	5.461	0
Cognition -> Willingness	0.201	0.026	7.643	0
Cost -> Behavior	−0.102	0.075	1.363	0.173
Cost -> Cognition	−0.628	0.157	3.996	0
Cost -> Willingness	−0.473	0.064	7.428	0
Household -> Behavior	0.011	0.032	0.35	0.726
Household -> Cognition	−0.145	0.072	2.019	0.044
Household -> Willingness	−0.013	0.028	0.46	0.646
Income -> Behavior	0.08	0.066	1.211	0.226
Income -> Cognition	0.268	0.148	1.817	0.069
Income -> Willingness	0.016	0.047	0.354	0.723
Willingness -> Behavior	0.597	0.056	10.63	0

By comparing the total effects of different latent variables on the paths to conservation behaviors, it can be found that conservation cognition has a significant positive effect on conservation willingness and behaviors, conservation cost has a significant negative effect on cognition and willingness, household characteristics have a significant positive effect on cognition, and willingness has a significant positive effect on conservation behaviors. The construction and development of PAs is closely related to the lives of the surrounding residents, and the surrounding community is constantly involved in the construction and management of PAs, so the residents' conservation cognition of PAs affects their conservation willingness and behaviors. From an economic perspective, residents, as rational economic individuals, may find that high costs during the process of protection will inevitably have a negative impact on their conservation behaviors; hence, protection work should also take into account the inhibition effect of conservation cost on residents' willingness and behaviors. Natural resource endowment, economic base, geographic location, and length of residence are all important reflections of household capital and productive capacity, which, in turn, affect household perceptions of conservation.

4. Discussion

4.1. Status of Conflicts between PAs and Neighboring Communities

For the time being, the conflicts between the Mikumi–Selous area in Tanzania and surrounding communities can be summarized in two areas: The first main aspect is the restricted use of natural resources, since PAs impose certain constraints on the use of resources by residents. Within Mikumi National Park and Nyerere National Park, it is justified to limit the surrounding residents' utilization of natural resources. However, outside these national parks, on lands designated for conservation, activities such as logging, grazing, and wild plant gathering are also prohibited. Our research findings reveal that the livelihoods of many residents have been severely affected due to biodiversity conservation policies, which is consistent with the results of other researchers [50].

Moreover, this might also lead to a partial loss of development opportunities for residents. The strict conservation measures significantly impact the local attraction of capital investment activities. To enhance ecological functions and improve environmental quality, there will be a reduction in resource development and pollution emissions by high-

environmental-risk industries, which may decrease community employment opportunities and sources of income [51]. This viewpoint was actively shared with us by interviewees, who were not initially asked related questions in the research survey, but this analysis was not included in the current situation analysis. However, it is a topic worthy of discussion. This viewpoint extends the residents' conservation cognition, with some interviewees not only focusing on the current conflict situation but also extending to issues related to opportunity costs in economics.

The second main aspect is the frequent conflicts between humans and wildlife. This conflict is mutual, encompassing both the damage to wildlife and their habitats by residents and the negative impact on the livelihoods of residents by wildlife, such as crop destruction, harm to poultry and livestock, damage to household property, and harm to personal safety. This aligns with the research of other scholars, indicating that human–wildlife conflict manifests in various forms and has, to a significant extent, become a common issue faced by conservation areas globally [52].

4.2. Status and Effectiveness of Community Participation in Conflict Governance

To alleviate the contradictions between conservation and development, the management authorities of Mikumi National Park and Nyerere National Park, along with NGOs, have provided numerous benefit-sharing mechanisms for the community. Investigations revealed that these mechanisms primarily encompass direct benefits offered by conservation agencies to communities and community-based natural resource management (CBNRM). The implementation of these benefit-sharing initiatives contributes to enhancing community participation in natural resource management and the capacity to improve biodiversity conservation outcomes. The analysis of residents' conservation cognition showed that nearly 50% of respondents believed these benefit-sharing mechanisms have increased residents' incomes, as well as improved their personal qualities and livelihood capabilities, ameliorated the natural environmental conditions surrounding the community, and enhanced the provision of local medical, transportation, and other basic infrastructure. These findings are consistent with those of other scholars [29,31,45,53,54].

Benefit-sharing mechanisms benefit community residents, who are naturally more inclined to participate in conservation behaviors. Over 80% of respondents supported the establishment of PAs and are willing to spend time and money on biodiversity conservation, with nearly 90% of residents already involved in conservation or promotional activities for PAs. These results indicated a high level of identification and responsibility towards wildlife conservation among residents, who recognize the importance of PAs for maintaining ecological balance and biodiversity and are willing to actively participate in conservation efforts [35].

Moreover, residents' involvement in conflict management has achieved positive outcomes for both livelihood levels and biodiversity conservation. The interviews with community residents revealed that those participating in the benefit-sharing mechanisms of CBNRM have seen the most significant improvements in their livelihoods. The conflict management model for improving livelihoods operates on the principle of reducing pressure on ecological conservation by enhancing the living standards of community residents, thereby improving ecological conservation effects. Additionally, respondents universally acknowledged significant social benefits from participating in conservation efforts. Organizations such as management authorities and NGOs, in collaboration with community residents, provided public social services to meet the needs necessary to improve various aspects of community infrastructure. By enhancing residents' well-being, these efforts strengthened conservation awareness among residents, thereby promoting conflict resolution. The interviews with management departments also highlighted the ecological benefits of community residents' participation in conflict management. CBNRM, under the premise of empowering communities and the rational use of collective public land through collective governance, has led to improvements in social services and livelihoods,

directly resulting in enhanced habitats for wildlife and thereby more noticeable effects on biodiversity conservation.

4.3. Analysis of Factors Influencing Community Residents' Conservation Willingness and Behaviors

The results of the SEM analysis indicated that, firstly, the household characteristic variables within the study area had no significant impact on conservation willingness and behaviors. This contradicts the findings of other studies, which suggest that factors such as natural and economic capital in household characteristics generally have a combined effect on willingness and behaviors [55]. For instance, if a family has more abundant natural capital and sufficient economic capital, residents may have more time and capital to invest in conservation efforts. A possible explanation is that larger land areas, higher agricultural and forestry incomes, closer proximity to PAs, or longer residence durations in household characteristics imply a greater demand for land development and utilization among community residents. This may increase the pressure on natural resource utilization, exacerbate conflicts with wildlife, and thus pose a threat to conservation, ultimately having no impact on conservation willingness and behaviors.

Secondly, the impact of conservation benefits on conservation cognition, willingness, and behaviors was not significant. This is contrary to the findings of other studies, which generally indicated that conservation benefits were positively correlated with residents' conservation willingness [56–58]. A possible reason is that residents living near PAs may face a trade-off between economic interests and ecological conservation. Although participation in eco-tourism development can bring economic benefits to families, field investigations have revealed that only a small portion of families can benefit from this, which does not address the survival and development issues of all residents.

Thirdly, from the perspective of direct effects, conservation costs had a significant positive impact on conservation behavior while having a significant negative impact on conservation cognition and willingness. From the perspective of total effects, conservation costs had a significant negative impact on conservation willingness and behaviors. This conclusion is consistent with the findings of other scholars [46,59,60]. Most residents believed that conservation behaviors increased the economic cost of living without increasing economic benefits. Therefore, the more costs community residents bore in conservation behaviors, the more likely it was for their willingness and behaviors towards conservation to decrease.

Fourthly, conservation cognition had a significant positive impact on conservation willingness and behaviors. This is consistent with the findings of other studies [61–63]. Generally speaking, an individual's internal cognition can change their behavioral willingness. The higher the level of residents' cognition, the stronger their willingness to conserve, and conservation willingness is the internal driving force for conservation behaviors.

5. Conclusions

This study took the Mikumi–Selous areas in Tanzania, Africa, as a case study and employed questionnaire surveys and semi-structured interviews to examine the current state of conflicts between PAs and surrounding communities, as well as to summarize the willingness and behaviors of community participation in conflict management. Additionally, we applied the PLS-SEM method to identify the factors influencing community residents' conservation willingness and behaviors. Our research emphasizes the crucial role of community involvement in achieving biodiversity conservation and coordinated community development, aiming to provide new insights for alleviating conservation and development issues.

Through the categorization and analysis of conflict types, we identified two main forms of conflict in the study area: the contradiction between the restrictions on natural resource utilization and development by management departments and the resource utilization demands of community residents, and the conflict between humans and wildlife, with the

latter being more intense. The analysis of the current state of community participation in conflict management showed that the benefit-sharing mechanisms provided by national park management agencies and NGOs could effectively improve residents' livelihoods and stimulate their enthusiasm for participating in conservation behaviors.

An empirical analysis revealed that residents' conservation cognition has a significant positive impact on their conservation willingness and behaviors, and conservation willingness also positively influences residents' conservation behaviors. This indicates that the higher the residents' conservation cognition, the stronger their conservation willingness and the more active their participation in conservation behaviors. Compared to the variables of residents' household characteristics and conservation benefits, the conservation cost variable negatively affects residents' conservation willingness and behaviors. Therefore, it is recommended to enhance residents' cognitive levels, stimulate conservation willingness, encourage positive conservation behaviors, and find effective measures to reduce the conservation costs borne by residents. This would allow residents living in and around PAs to have more opportunities to participate in benefit-sharing mechanisms, thereby more effectively resolving conflicts and achieving harmonious coexistence between the PAs and surrounding communities.

The conflict between conservation and development is a global problem, and its formation and development are complex and gradual evolutionary processes. The mitigation and management of the conflict cannot be achieved overnight. Although governance and research on the conflict have been almost anthropocentric, the participation of multiple interest groups is an important direction of modern conflict governance. It is suggested that future research pay more attention to the co-governance and co-funding of multi-interest groups in conflict governance by governments, enterprises, communities, international organizations, and universities, so as to enhance the community's motivation to participate in protection efforts and jointly promote conflict resolution.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The data are not publicly available because of privacy concerns.

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