A Study on Illegal Wildlife Trade in Tanzania Based on Multi-source Data Fusion

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Abstract. This study on the illegal wildlife trade crisis in Tanzania is methodically divided into three phases: planning, policy, and application. Initially, data preprocessing methods such as null processing, interpolation, and max-min normalization were applied to construct a client impact assessment model utilizing AHP and hierarchical evaluation methods. WWF emerged as the most influential client. The policy phase introduced a comprehensive five-year strategy across economic, social, cultural, and environmental sectors. This strategy was supported by three quantitative models, which were used to evaluate the impact of the illegal wildlife trade. The economic model assessed the contribution to GDP growth from the integration of illegal trappers into the workforce. The social model applied crime economics to optimize time allocation under uncertainty. The cultural impact was measured through educational guidelines and a literacy score. Finally, environmental policies were analyzed by adjusting nature reserve areas and poaching difficulty parameter Z. In the application phase, Tanzania's National Forest Park was selected to serve as a pilot site for the models, with the projected outcomes including an increase in species richness and a reduction in poaching ease over a five-year period.

Keywords: Illegal Wildlife Trade, WWF, AHP, State-space model.

1. Introduction

With an annual turnover of $26.5 billion, the illegal wildlife trade is the fourth largest illegal trade globally, posing significant threats to humans and biodiversity [1]. This trade often involves criminal gangs that violate laws and spread diseases, linked to global health crises such as SARS and COVID-19. Over 70% of emerging infectious diseases originate from animals, with human consumption of wild animals or habitat destruction increasing virus transmission risks, especially with modern transportation and population mobility [2]. Additionally, the trade drastically reduces many species' populations, leading to extinction and disrupting ecological balance, even within protected areas [3]. Wildlife is crucial for ecological balance and society-economic development. Illegal trade is a major cause of biodiversity decline, endangering many rare species. Combating illegal wildlife trade, protecting rare species, and preserving biodiversity is imperative to ensure a sustainable future for global ecology and human health [4].The objective of study is to propose a five-year policy framework that encompasses four domains (economic, social, cultural, and environmental) for Tanzania. In order to assess the impact of the proposed policy framework, study have developed three quantitative models. The first is an effective labor force model that examines the economic consequences of illegal trappers as human capital. The second is a state-space model that links GDP, capital, and human capital. The third is a time allocation model under uncertainty from crime economics. On the environmental side, study quantify the impact of the policy on species richness by varying the area of nature reserves and poaching difficulty parameter Z. The key innovations lie in the holistic approach that integrates multiple domains and the predictive power of our models, which demonstrate feasible policy outcomes that can be achieved to achieve sustainable development goals.

2. Client selection planning model

2.1. Indicator marker selection

The role of authoritative leadership organizations in combating the illegal wildlife trade is indispensable but often underestimated. To scientifically assess their impact, study screened eight key institutions: World Wide Fund for Nature (WWF),International Union for Conservation of Nature (IUCN),U.S. Fish and Wildlife Service (USFWS),Wildlife Trade Regulatory Agency under the World Trade Organization, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)Implementing Agencies, Wildlife Conservation Society of the United States of America (WCS),International Fund for the Prevention of Cruelty to Animals (IFAW) and The Nature Conservancy (TNC) [5].

According to the principle of evaluation index selection proposed by Anderson [6], study set four principles of client impact evaluation indexes, i.e., reference principle, feasibility principle, comprehensive principle and dominant principle. By referring to various influence evaluation methods at home and abroad, and combining the characteristics of international organizations, study finally established a customer influence evaluation index system.

2.2. Establishment of the indicator system

In the first stage of the research on the influence of leading organizations, three level 1 indicators and their weights were formed on the basis of the above views and expert comments on the basic volume, institutional energy and public opinion volume of the influence of leading organizations: Organizational impact (Tier 1, Indicator A, weighted at 30%),Policy Impact (Tier 1, Indicator B, weighted at 40%),Dissemination impact (Tier 1, Indicator C, weighted at 30%).Each of the three tier-1 indicators is subdivided into six tier-2 indicators, for a total of 18 tier-2 indicators, (from FY2022 to FY2023).

Tier-2 indicators of A are number of members, number of "Five Constants" among members, number of covering continents, number of secondary departments, annual budget and professional level, representing A1, A2, A3, A4, A5, and A6 respectively.

Tier-2 indicators of B are number of international conferences, number members for international conferences, number of resolution or statements issued, number of other file releases, number of attendances at UN conferences and number of speeches at UN conferences, representing B1, B2, B3, B4, B5, and B6 respectively.

Tier-2 indicators of C are the total number of languages on the official website, number of official languages of UN, whether to publish a newsletter, number of social media followers, social media popularity and mainstream media popularity, representing C1, C2, C3, C4, C5, and C6 respectively.

2.3. Establishment of evaluation system

Given the varying degrees of information disclosure by the selected international organizations, there are varying degrees of missing data for the 18 secondary indicators. Given that the percentage of missing values of each secondary indicator varies, so in the process of index ranking calculation, the missing values are treated as null values without using the mean substitution method to make up the values, so as not to have a greater impact on the ranking, the following are the missing values of the data of the organizational impact (FL indicator A), the percentage of missing values of the data of the six secondary indicators of the organizational impact, A1, A2, A3, A4, A5, and A6, respectively, is as follows 1.89%, 1.89%, 0.94%, 9.43%, 79.72%, and 2.36%. B1, B2, B3, B4, B5, and B6, respectively, is as follows 4.78%, 3.9%, 28.41%, 9.29%, 20.2%, and 33.43%. C1, C2, C3, C4, C5, and C6, respectively, is as follows 21.35%, 23.47%, 0.89%, 15.36%, 10.04%, and 28.89%.

Since the secondary indicators of the index are positive indicators, i.e., the bigger the better, so in the data processing, this study adopts the normalization (MMS) to tackle the data, emphasizing on the characteristics of letting the number keep the bigger the better and compressing the data unit, the specific formula of the normalization as follows:

$$x_{MMS}=\frac{x-x_{min}}{x_{max}-x_{min}} \tag{1}$$

Where x_{max} refers to the maximum value under a single metric, while x_{min} refers to the minimum value under a single metric, and the larger x_{MMS} is, the larger is its original value. When x_{max} = 1, x_{MMS} = 1, and when x_{min} = 0, x_{MMS} = 1. The data interval is between [0, 1].

Considering that the grading of international organizations is determined by more than one factor and that each component has a different impact on the grading. In confirming the calculation indicators and their weights and calculation formula, the study adopts the hierarchical analysis method and comprehensive evaluation method for the evaluation of international organizations.

Specifically, after the hierarchical model of the two-level indicators was determined, the relative importance of each secondary indicator was determined by comparing the six secondary indicators in each level using the Delphi method and the pairwise comparison method, respectively. Finally, a judgment matrix was obtained by calculating the average of the expert scoring scale to confirm the priority of the second-level indicators.

The comprehensive evaluation model of the influence of the leading organization (customer) is to "synthesize" the evaluation value of multiple indicators into a comprehensive evaluation value through a certain mathematical model or algorithm, so as to realize the comprehensive evaluation of the customer to grade. Let x_P be the evaluation value obtained from the pth level evaluation index, x_{pq} be the evaluation value obtained from the qth level evaluation index of the pth level evaluation index, and then weight the evaluation value obtained from the evaluation indexes of the integrated assessment of the influence of the client by the corresponding weight coefficient. The evaluation value obtained from the comprehensive assessment indicators of the influence of the client is weighted by the corresponding weighting coefficients, and the weighted sum is the comprehensive evaluation value y of the influence of the client:

$$y=\sum w_p(x_p)x_p \tag{2}$$

$$x_p=\sum w_{pq}(x_{pq})x_{pq} \tag{3}$$

In summary, the comprehensive assessment model of leadership organization (client) influence is

$$\begin{cases} y=\sum w_p(x_p)x_p \\ x_p=\sum w_{pq}(x_{pq})x_{pq} \\ x_p=f(R_q) \\ x_{pq}=f(R_{pq}) \end{cases} \tag{4}$$

Where $w_p(x_p)$ is the weight value of the pth first-level evaluation indicator, and $w_{pq}(x_{pq})$ is the weight value of the qth second-level evaluation indicator of the pth first-level evaluation indicator, and its value is shown in the summary table of the weight of each influence grading degree indicator.

The size of the comprehensive evaluation value Y is positively correlated with the rank of the leading organization, i.e., the larger the comprehensive evaluation value Y is, the greater the influence of the leading organization and the higher the rank.

The evaluation value Y of the leadership organization is graded, the higher the evaluation value of the leadership organization, the more advanced (smaller) the number of levels, and vice versa. Thus, a hierarchical ladder model is established to determine the number of levels B. The criteria for the segmented ladder model for assessing value Y are determined as shown in Table 1:

Table 1. Segmented ladder model.

rank B	super	1st	2nd	3rd	4th	5th	6th	7th
Y	[0.8,1]	[0.7,0.8]	[0.6,0.7]	[0.5,0.6]	[0.4,0.5]	[0.3,0.4]	[0.2,0.3]	(0,0.2)

Then there is a hierarchical ladder model of leadership organization as:

$$B=f(y)=\begin{cases} \text{super}, & 0.8\leq y\leq 10 \\ 1^{st}, & 0.7\leq y<0.8 \\ 2^{nd}, & 0.6\leq y<0.7 \\ 3^{rd}, & 0.5\leq y<0.6 \\ 4^{th}, & 0.4\leq y<0.5 \\ 5^{th}, & 0.3\leq y<0.4 \\ 6^{th}, & 0.2\leq y<0.3 \\ 7^{th}, & 0\leq y<0.2 \end{cases} \tag{5}$$

2.4. Solution of the Model

The values and grading of the comprehensive evaluation indicators for each leadership organization were obtained as follows. WWF has the highest international influence index, and study should choose it as the client to implement this project, as shown in Table 2.

Table 2. Comprehensive evaluation.

name	WWF	IUCN	USFWs	WTO	CITES	WCS	IFAW	TNC
score	8.343	7.12	8.156	6.984	7.225	7.492	6.926	6.208
rank	1st	5th	2nd	6th	4th	3rd	7th	8th

3. Policies' Models for WWF and their Impacts

3.1. The policies

The Convention on Biological Diversity (CBD) recognizes that the conservation of biodiversity requires substantial investment [7]. The problem of illegal wildlife trade is extremely serious in Tanzania in Africa, so study have chosen this as a proxy for developing appropriate policies for Tanzania.

Based on the social hazards of illegal hunting and the characteristics of biodiversity, study propose a five-year WWF policy recommendation in four different areas: economic, social, cultural, and environmental, and design three sub-models to measure the impacts on the illegal wildlife trade, and to improve and optimize the policy.

Economic policies include advocating for developed countries to support Tanzania economically, provide job training and employment opportunities, and reduce illegal poaching.

Social policies include lobbying the United Nations to deploy peacekeeping forces and helping to raise the economic costs of illegal poaching to reduce crime rates and increase the amount of time that illegal producers have to engage in legal product activities.

Cultural policies include educational programs in schools and communities to raise public awareness of the dangers of poaching.

Environmental policies include WWF's support for increasing the size of protected areas and security measures such as infrared surveillance and drone technology, as well as the introduction of endangered species that have been hunted in certain areas to help populations recover.

3.2. The Impact of Economic and Social Policies

Tanzania needs to adopt expansionary fiscal and monetary policies to a certain extent with the assistance of WWF to enable illegal hunters to change their status and participate in production as a large and effective labor force, thus generating GDP growth. At the same time, the return of illegal hunters' production can also expand the domestic consumer market, thus boosting the domestic economy. As study have seen, crime rates are very high in some areas. This has caused serious social unrest. But the main reason for this is that Tanzania does not have suitable policies that can be used to guide the population. From an economic point of view, the key to reducing the crime rate of illegal trappers is to increase the opportunity cost of crime committed by illegal trappers. The implementation of the above policy can improve the standard of living of the population and at the same time increase the opportunity cost of crime. In the long run, it will help Tanzania to expand its labor force, market and GDP.

Study developed an effective labor model [8] to analyze the impact of the conversion of illegal trappers into human capital and then into the human resource market on the country's economic growth. The effective labor model is shown in equation 6:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} \tag{6}$$

H_t, K_t, Y_t is the function, Kt is the human capital stock, Y_t is the capital input and t is the total output. The factor of the level of human capital is introduced into the model with full consideration of its functional characteristics. α, β denote the marginal output elasticity coefficient of capital inputs and the boundary output elasticity coefficient of human capital, i.e., the share of capital and human in output, respectively.

Share of human capital contribution = β, this gives the contribution of human capital to economic growth (CHE).

$$CHE = \beta \frac{\Delta H_t Y_t}{H_t \Delta Y_t} \tag{7}$$

Since technological progress A_t is real-time and unobserved, study uses state-space models for estimation. Here study assume that A_t corresponding to equation 8.

$$\ln A_t = \gamma + \theta \ln A_{t-1} + v \tag{8}$$

This coefficient can be determined from annual data on GDP, capital stock and human capital stock. Study then includes illegal trappers as the contribution of human capital training to GDP growth. Using Australia as an example, equations 7 and 8 are estimated based on data provided by the International Monetary Fund (IMF) for Tanzania's GDP, capital stock K, and human capital stock H for the years 2000 - 2015 to obtain a model of economic growth for African countries.

$$\ln Y_t = \ln A_t + 0.573 \ln K_t + 0.923 \ln H_t \tag{9}$$

$$\ln A_t = 0.690 + 0.738 A_{t-1} \tag{10}$$

The human capital output elasticity can be obtained β=0.328.

$$CHE = \frac{(\text{Factor growth rate} \times \text{Factor yield elasticity})}{\text{Output growth rate}} \times 100\% \tag{11}$$

Thus, for Tanzania, the contribution of human capital to GDP growth is

$$CHE = \frac{241 \times 0.328}{316} \times 100\% = 25.01\% \tag{12}$$

In the case of Tanzania, the absorption of illegal hunters into the labor market is highly beneficial to GDP growth and economic development through the adoption of expansionary fiscal and monetary policies to a certain extent with the assistance of WWF. They are positively correlated.

The optimal time allocation model under uncertainty is developed for the illegal behavior of trappers and the crime rate [9]. The economics of crime assumes that crime is a rational choice of people based on weighing costs and benefits, and not due to moral depravity or psychological distortion. Thus, whether a person commits a crime or not determines how he allocates his time to maximize results in both legal and illegal activities.

Assume that income from both activities is a concave function of time worked. Study set the legal wage income to $w_1(t_1)$ and the illegal wage income to $w_i(t_i)$. Since illegal behavior violates legal norms, once a violation is detected, the violator is penalized by the system and has to pay an additional penalty fee. Study set the probability that an individual's illegal behavior is detected to be P. Meanwhile, the penalty cost paid by the violator, $f_i(t_i)$, is a concave function of the time spent in illegal activities. To incorporate the effect of social welfare on individual time allocation into the model, study consider unemployment. Study set the social unemployment rate to be u. Individuals who are unemployed can receive social security payments from the government W. At this point, individuals will have the following four decision states.

One is that someone has a job and his illegal activities go undetected. His personal income consists of legal salary $w_1(t_1)$ and illegal income $w_i(t_i)$. Two is that someone is in employment and his illegal activity has been detected. In this case, the individual income includes the legal wage income (LI) and the illegal income $w_i(t_i)$ minus the penalty cost $f_i(t_i)$. Three is that someone is unemployed and his illegal behavior has not been discovered. In this case, individual income is equal to illegal income and social security income W received from the government. Four is that someone is unemployed and his illegal behavior has not been discovered. In this case, individual income is equal to illegal income $w_i(t_i)$. And social income W received from the government.

In the above four states, the happiness I of an individual decision can be expressed as

$$\begin{aligned} &I_1=w_1(t_1)+w_i(t_i),\text{withprob.}(1\text{-}p)(1\text{-}u)\\ &I_2=w_1(t_1)+w_i(t_i)\text{-}f(t_i),\text{withprob.}p(1\text{-}u)\\ &I_3=w_i(t_i)+w,\text{withprob.}(1\text{-}p)u^+\\ &I_4=w_i(t_i)\text{-}f(t_i),\text{withprob.}pu \end{aligned} \tag{13}$$

In order to maximize expected utility, individuals choose the optimal allocation of time resources between legal and illegal activities:

$$\begin{gathered} \text{Max:}EU(I_s)=\textstyle\sum_{s=1}^{4}\ \pi_s U(I_s)\\ \text{s.t.}t_i+t_l\leq t_0 \end{gathered} \tag{14}$$

Π_s Denotes the probability that the individual is in state s, and t_o denotes the time constraint faced by the individual. According to the Kuhn-Tucker condition, the first order condition of the program is

$$(1\text{-}p)(1\text{-}u)\left(w_i^{'}\text{-}w_1^{'}\right)U_1^{'}+p(1\text{-}u)\left(w_i^{'}\text{-}f_i^{'}\text{-}w_1^{'}\right)U_2^{'}+(1\text{-}p)uw_i^{'}+pu\left(w_i^{'}\text{-}f_i^{'}\right)U_4^{'}=0 \tag{15}$$

The second order condition $\Delta\leq 0$ is satisfied when individuals are risk averse. By deriving the implicit function of the above equation, we can get

$$\frac{\partial t_i^*}{\partial w}=\frac{\left[(1\text{-}p)uw_i^{'}U_3^{''}\right]}{\Delta}<0 \tag{16}$$

Therefore, study concludes that increased social welfare spending in Tanzania with assistance from WWF can reduce the amount of time residents spend on illegal wildlife hunting. For illegal hunters, a small amount of social welfare assistance from the government can be effective in reducing crime rates.

3.3. The Impact of Cultural Policies

Assume that the education strategy can consistently and evenly affect every resident and achieve a perfect transition from illegal hunters to law-abiding residents. Exclude the many factors that can influence population change, such as disease, migration, and economic change and policy interventions [10].

If the strategy has an excellent effect on the education of Tanzanian trappers, then with the increase of time, the residents' awareness of wildlife conservation will increase, the number of law-abiding residents will increase, and the number of illegal trappers will decrease, so study have the following formula:

$$NB=A(1+BR)^t-B(1-DR)^t \quad (17)$$

Where NB = number of Tanzanian residents in year t, BR = birth rate, DR = death rate, A is the initial number of law-abiding residents, and B is the initial number of illegal hunters.

Introduce a parameter ω_1 as a measure of the effectiveness of the strategy developed by WWF when it comes into effect, i.e., the ratio of the number of law-aware residents to the number of illegal hunters at year t. The parameter ω_1 is the ratio of the number of hunters to the number of illegal hunters:

$$\omega_1=A(1+BR)^t/B(1-DR)^t \quad (18)$$

However, if the Tanzanian government does not support us in developing strategies to protect wildlife, more Tanzanians will be tempted to hunt wildlife by the high returns from illegal hunting.

$$WB=A(1-DR)^t-B(+BR)^t \quad (19)$$

Where WB = the number of Tanzanian residents in year t. Here it is assumed that illegal trappers experience population growth due to increased income and subsistence pressures. Here study introduce another parameter, ω_2 , as a measure of the benefits when WWF does not have a strategy in place to protect wildlife, i.e., the ratio of the number of law-aware residents to the number of illegal trappers in year t:

$$\omega_2=A(1-DR)^t/B(1+BR)^t \quad (20)$$

When t=5, according to the data given by WWF, it can be concluded that ω_1 = 13.055 and ω_2 =7.659.

By comparing ω_1 and ω_2 , it is obvious that the value of ω_1 is much larger than that of ω_2 , which means that the number of residents who know the law and understand the law will be much larger than the number of illegal trappers after WWF formulates and implements the relevant strategies.

If Tanzania does not control this, it can be predicted that the number of illegal hunters will increase greatly, human activities cause more and more pressure on the environment and wildlife, and wildlife is likely to face extinction in a few decades; if wildlife conservation is encouraged and an effective system is established, wildlife can be prevented from being hunted in large quantities, the sustainability of the community is improving, and the number of wildlife and the ecological balance have the opportunity to be restored and protected, as shown in Figure 1 .

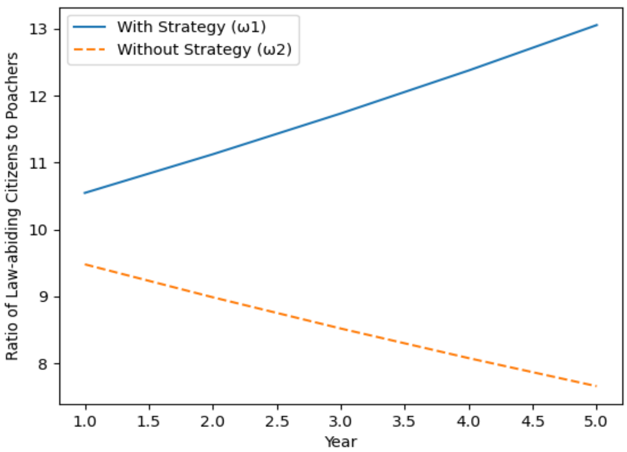

Figure 1. Projection of law-abiding citizens to poacher's ratio over 5 years.

3.4. The Impact of Environmental Policies

If the illegal wildlife trade is not curbed in time, not only will hunting cause a direct decline in the number of wild animals, but the destruction of nature reserves caused by hunting will also indirectly affect their numbers. In the process of hunting, the illegal elements are willing to sacrifice the environment to capture more wild animals for profit, and the use of chemicals and firearms greatly affects the habitats of the animals, whose survival is threatened by both the hunters and the environment.

In response, study plan to gradually increase the physical area of the nature reserve and strengthen its security, as well as reintroducing endangered species that have been hunted in specific areas when appropriate, to help populations recover.

Based on the above analysis and the quantitative species-area relationship (SAR) model proposed by Robert MacArthur and E. O. Wilson for different communities, the relationship between the abundance of animal species and the area of nature reserves on the African continent was quantitatively illustrated , and the relationship equation is as follows[11]:

$$S = cA^{z} \tag{21}$$

In the formula, S represents the species richness, A represents the area of the nature reserve, C is the fitting constant reflecting the change of the geographical location of the nature reserve, and Z is the fitting parameter related to the ease of poaching. In the practical research, the theoretical value of Z is often adopted as 0.263, which usually changes between 0.18 and 0.45.

When project is effective in stopping illegal hunting of wildlife, the number of certain rare and endangered wildlife rises, and the population moves into the nature reserve on a large scale. However, because of the limited number of vacancies in the ecological niche of the nature reserve, the more the number of species that have already settled, the lower the probability that the newly migrated species will be able to settle successfully; and the higher the probability of extinction for any given settling species.

$$\begin{aligned} &\frac{dS(t)}{dt} = I - E \\ &I(s) = I_0[S - S(t)] \\ &E(s) = E_0 S(t) \end{aligned} \tag{22}$$

I is the rate of species immigration, I_0 is the rate of species immigration per unit, E is the rate of extinction, and E_0 is the rate of extinction per unit; I and E are assumed to be homogeneous, additive, and stable over time, and they should change linearly with increasing species richness.

Therefore, in order to quantify environmental policy, our project will work with WWF to increase the size of nature reserves according to equation 20, and to strengthen security measures to make poaching easier for illegal hunters.

3.5. Quantified Policies for WWF

Continue to apply model using Tanzania as an example. Currently, Tanzania has a land area of 945,087 square kilometers, and the total area of protected areas in Tanzania (including national parks, nature reserves, wildlife management areas, etc.) accounts for about 38% of the national territory. The project plans to expand nature reserves by 2% per year over a 5-year horizon, and to gradually increase the poaching ease parameter Z, which the project expects to increase by 0.01 per year over the 5-year horizon, by strengthening security in nature reserves as shown in Figure 2.

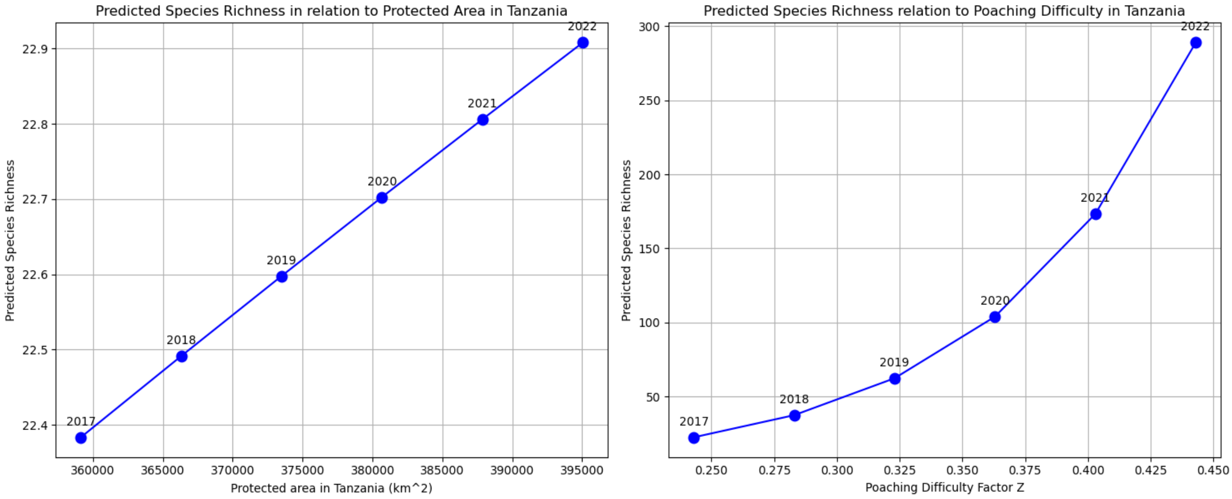

Figure 2. Protected area in Tanzania.

The model predicts that as the area of nature reserves steadily increases by 2 per cent per year, species richness also shows an increase, and is expected to rise by about 0.1 units per year; and as the parameter Z for the ease of poaching increases by 0.01 per year, species richness shows an exponential increase, with increases of 0.066, 0.1, 0.165, 0.25, and 0.4, respectively, for a total of about 0.981 units. Considering Tanzania's problems of economic backwardness, dependence on international aid, and war, study assess that WWF will only be able to achieve about 70-80 per cent overall.

4. Testing the Model

4.1. AHP Consistency Test

This is the consistency index (CI) of matrices A, B, and C (6 × 6)

$$CI = \frac{\lambda_{max} - n}{n-1} \tag{23}$$

Where n is the rank of the matrix. The matrices A, B, and C all have rank 6. Another parameter RI can be obtained by constructing 500 6 × 6 sample matrices by a random method: A positive inverse matrix is constructed by randomly drawing numbers from 1-9 and their reciprocals to obtain the average of the largest eigenvalue I_0 max, then there are

$$CI = \frac{\lambda' - n}{n-1} \tag{24}$$

Therefore, the consistency ratio (CR) can be obtained

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{CR}} \tag{25}$$

When CR < 0.1, here consider the consistency of the matrix to be acceptable. The final consistency index (CR value) of organizational influence is 0.032, the CR value of policy influence is 0.032, and the CR value of communication influence is 0.055, all three of which are less than the threshold of 0.1, meeting the standard of consistency test, and the calculated weights are consistent. The objective quantitative analysis derives specific parameters from the scientific decisions of the experts, avoiding the ambiguity and randomness that may exist in the manual assignment of weights.

4.2. Test of effective labor model

In the effective labor model, the study has determined the human capital output elasticity and capital output elasticity through Tanzania's data for 2000 - 2015.

Since the economic structure of the country will not change significantly in a short period of time, the accuracy of this model will be verified through the data for 2017 - 2021 as shown in Figure 3.

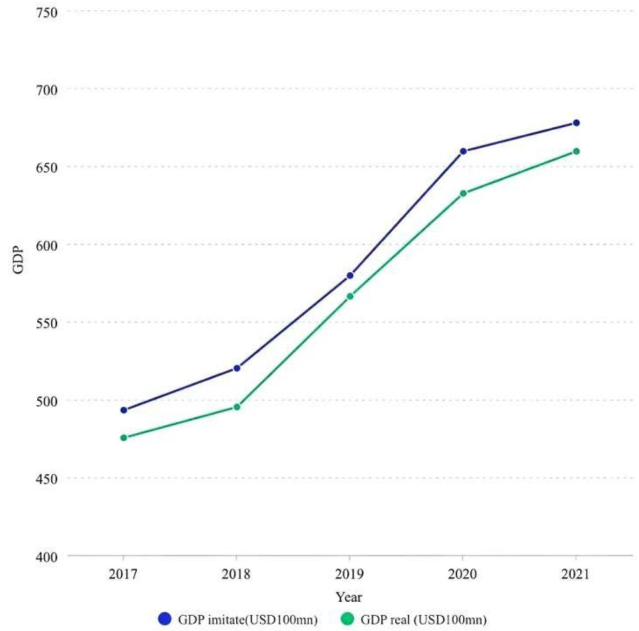

Figure 3. Changes in Tanzania's GDP from 2017 to 2021.

The errors in the model's estimated GDP figures for 2017 - 2021 are 3.6%, 4.8%, 2.3%, 4.1%, and 2.7%, respectively, when compared to actual data. These errors are within acceptable limits.

5. Conclusions

The paper concludes that WWF is the most influential client for tackling illegal wildlife trade, based on a detailed impact assessment model using AHP and hierarchical evaluation methods. The proposed five-year policies cover economic, social, cultural, and environmental areas, showing that increased social welfare can reduce illegal hunting, human capital reformation contributes to GDP growth, and educational policies can significantly raise literacy. The model predicts positive impacts on species richness through reserve expansion and increased poaching difficulty in Tanzania, though economic constraints may limit WWF's success to 70-80%. The model is distinguished by its interdisciplinary, innovative, and practical approach, highlighting its potential effectiveness and feasibility.

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