



Research Article

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The Application of A Refined SWOT-AHP Based planning and Management Approach for the Conservation of Ethiopia's Protected Area Systems

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Abstract

This study analyzes the internal and external factors influencing the conservation and management successes of Ethiopia's Protected Areas (PAs) system by the Ethiopian Wildlife Conservation Authority (EWCA) with special reference to Omo National Park (ONP), Senkelle Swayne's Hartebeest Sanctuary (SSHS), and Simien Mountains National Park (SMNP) using a refined Analytic Hierarchy Process (AHP) of Strengths Weaknesses Opportunities Threats (SWOT) analysis. The indicators used within this multi-criteria assessment are those which improve integration among key factors such as governmental, non-governmental and private stakeholders. As a result the top ten factors prioritized are: enhancing direct economic opportunity; strengthening the law enforcement unit; reducing human wildlife conflict; improving tourism infrastructures; integrating cultural and religious amenities and incorporating bylaws; improving participation and awareness of local community; upsizing reserves boundary to protect surrounding areas; establishing buffer zones; creating connectivity with important biodiversity areas; and enhancing biodiversity and ecosystem conservation with sound scientific methods.

The mean consistency ratio revealed that governance (1.99) and economic influences (1.27) are the most important components for protected areas followed by the socio-cultural dynamics (0.81) and ecological values (0.33). Improving protected areas governance, sustainable tourism, integration of cultural and religious amenities, and formulation of conservation bylaws are critical to improving the management of Ethiopia's protected areas.

Keywords

AHP, Biodiversity, Ecosystem, Protected areas, Sustainability, SWOT

Introduction

Protected Areas (PAs) play a critical role in conserving biodiversity and promoting sustainable development and livelihoods. They have been recognized as a successful management tool for halting the loss of local biodiversity [1] which is, significantly contributing in reducing the reduction of global biodiversity loss [2]. They are recognized across multiple international policy processes including the 2030 Agenda for Sustainable Development, the Convention on Biological Diversity (CBD), and the Ramsar Convention [3].

The SWOT analysis is a strategic planning tool used to evaluate of Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T) in a management system. This process analyses the variables that contribute to achieving the

desired goal and those that do not. A SWOT analysis assesses the variables that influence PA management using the four factors, which are detailed in the SWOT matrix. As such the approach demonstrates how the Strengths are able to take

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advantage of the Opportunities that exist, to deal with the Threats that exist, and how to overcome the Weaknesses associated with these Threats [4].

The Sustainability Wealth of Ethiopia's Protected Areas

Ecological

The flora of Ethiopia is very heterogeneous with many endemic elements. Vegetation types in Ethiopia are highly diverse ranging from afro-alpine to desert vegetation. It has over 6000 plant species from which 12% are probably endemic [5]. Likewise, Ethiopia is also one of the most known and recognized regions for faunal diversity. For example, there are 326 mammal species of which 57 are endemic [6,7], bird species of which 18 are endemics [8], 240 reptiles of which 15 are endemics, 64 amphibians of which 26 are endemic [9] and 200 fish species out of which 41 are endemics [10-12]. These various biodiversity resources are a clear indication of ecosystem diversity and biological wealth of Ethiopia. Ethiopia's protected areas also host some of the richest genetic resources in the world in terms of wild coffee such as (*Coffea abyssinica*) [13].

Socio-cultural

Socio-cultural sustainability aims to preserve social capital by investing and creating services that constitute the framework of the society. The concept accommodates a larger view of the world in relation to communities, cultures, and globalization. It means to understand and help future generations to continue and to acknowledge the impact on others. Socio-cultural sustainability focuses on maintaining and improving social quality with concepts such as cohesion, reciprocity and honesty, and the importance of relationships amongst people. It can be encouraged and supported by laws, information and shared ideas of equality and rights. Socio-cultural sustainability incorporates the idea of sustainable development as defined by the United Nations Sustainable Development Goals (SDGs). The Ethiopian protected areas system is blessed with different societal values. The various bylaws, religious and cultural assets and the community governance systems are an important socio-cultural resource for the development of protected areas in Ethiopia.

Economic

The economic value of 14 selected PAs under EWCA management was estimated to be about \$325 billion per annum [14]. Watershed protection service (42%), harvesting of natural products (21%), and grazing (18%) have accounted the larger portion, respectively. The value associated with tourism of the PAs is estimated to be about \$ 25.2 million per year only 8% of the total estimated values [14].

In addition, various environmental services from Ethiopian PAs system were assessed in 2009 including hydrological services, electric power generation, medicinal plants, carbon sequestration and the biodiversity. The assessment result provided remarkable figures. Among selected services, hydrological services valued US \$432 million, electric power generation valued US \$28 million, medicinal plants valued

US \$13 million, carbon sequestration valued US \$19 million per annum, and the value of biodiversity estimated to be US \$3.75 to 112 million per annum [15]. More recently, the total ecotourism expenditure in federally managed protected areas of Ethiopia was estimated about US \$58.5 million per annum [16].

Governance

The Ethiopian government constitution recognizes the importance of environmental protection and sustainability in the overall development and well-being of the Ethiopian people. Efforts are being undertaken to make-up the framework for the sustainable development and protection of the environment. Cognizant to this fact is, the issuance of the environmental policy and conservation strategy of Ethiopia serving as an umbrella policy and strategy for the conservation and sustainable development of the environment. Ethiopia has signed several conservation articles and conventions at global level including the Convention on Biological Diversity (CBD), the United Nations Sustainable Development Goals (SDGs), African-Eurasian Migratory Water bird Agreement (AEWA), Convention on Migratory Species (CMS) and Convention on the Illegal Trade of Endangered Species (CITES), amongst others.

In 2007, the "Wildlife Development, Conservation and Utilization Proclamation" came into force under proclamation number 541/2007 to reinforcing wildlife conservation and PAs management in the country. The proclamation has two foremost objectives; firstly, to conserve, manage, develop and properly utilize the wildlife resources of Ethiopia; and secondly, to create conditions necessary for discharging government obligations assumed under treaties regarding the conservation, development and utilization of wildlife.

Materials and methods

The study area

This study examines a series of SWOT analyses of three selected PAs such as Omo National Park (ONP), the Simien Mountains National Park (SMNP), and Senkelle Swayne's Hartebeest Sanctuary (SSHS). These protected areas are managed federally by Ethiopian Wildlife Conservation Authority (EWCA) on behalf of the Ethiopian Government. Nationally, EWCA is in charge of the management of 13 PAs. Collectively ONP, SMNP and SSHS cover an area of 5124 km², 412 km² and 54 km², respectively (Figure 1).

Materials

The results of this study were compiled as a result of a consultancy and various research projects in the PAs. The consultancy and research projects were conducted in collaboration with EWCA and its conservation partners. A SWOT analysis was made for each PA in order to obtain the priority SWOT area using indicators which were influencing the conservation and management of PAs. The methodology followed four major analytical steps: 1) the current situation of protected areas was determined (situation analysis); 2) the indicator's significance was prioritized under each categorized pillars of sustainability; 3) A weight value for each criterion

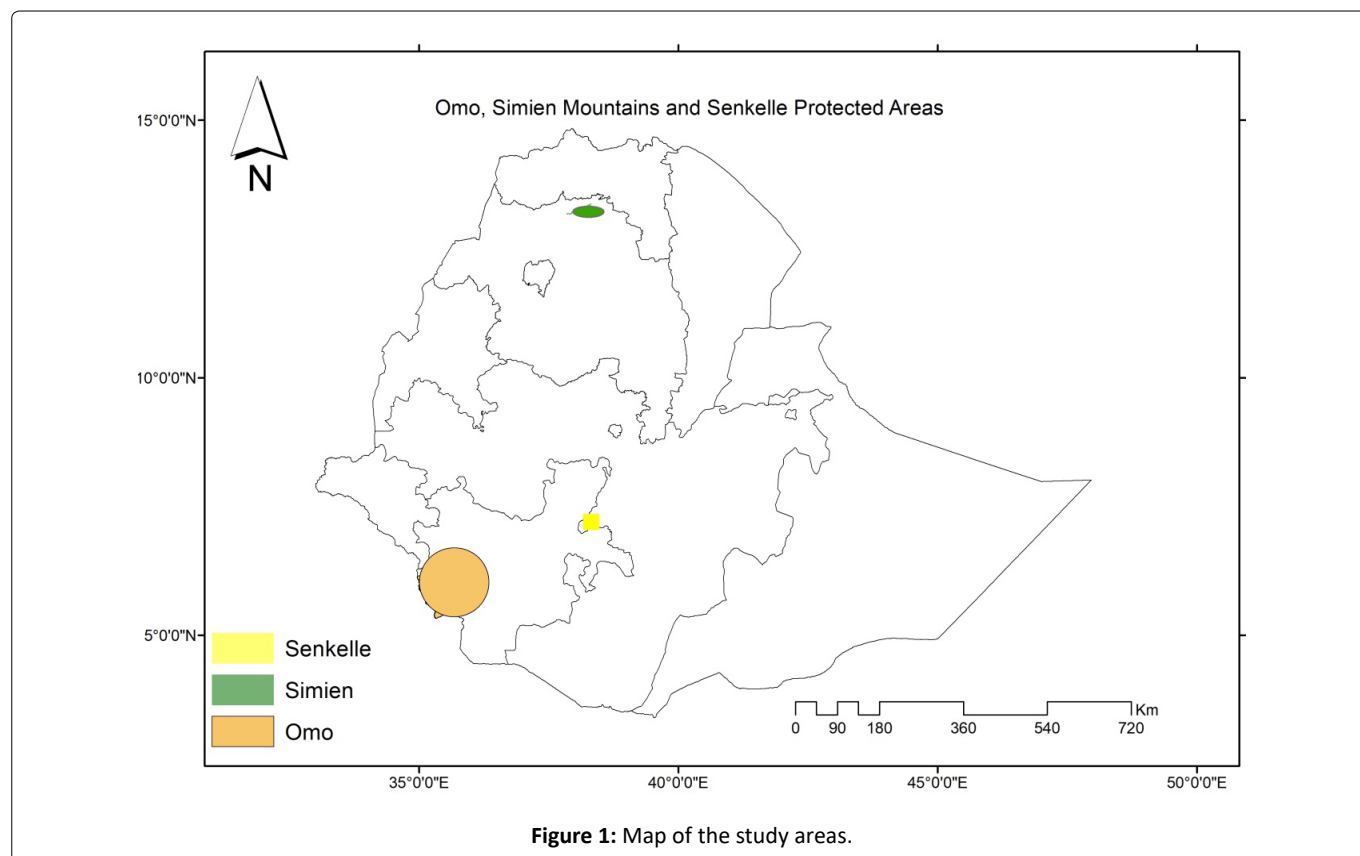


Figure 1: Map of the study areas.

was assigned; and 4) the quantification of SWOT was made for prioritized indicators.

Data collection

Primary and secondary data were collected to determine SWOT analysis in the study areas following a sustainable development approach to determine circumstances related to natural, socio-cultural, economic and governance factors influencing the management of the PA systems. A series of workshops were conducted with PA staff (wardens, experts, rangers), NGO experts and higher education and research institutions to determine the current situation from December 2019 to September 2020. Furthermore, existing literature, internet sources, project documents and publications related to Pa systems of Ethiopia and surrounding areas were also utilized.

Determination of current situation

The current situation of the study area was assessed and determined based on the following four dynamics: The natural/ecosystem; socio-cultural; economic; and governance factors; which have a significant impact on the management of each Pas (Table 1).

Determination of significance of criterion

The significance of criterion for each of the Pas was computed using their relative importance for the natural/ecosystem, socio-cultural, economic, and governance circumstances (Table 2). The top priorities for each PAs were then carefully chosen and the common criterion for each PAs were identified and pooled to form a combined criterion for further comparison (Table 3).

Determining the weight value for each criterion using analytic hierarchy process (ahp)

The AHP is an important Multi-Criteria Decision Making (MCDM) technique. This method provides a structural basis for quantifying the comparison of decision elements and criteria in a pair wise technique [17]. Experts were asked to rank the significance of a criterion for a pair wise matrix comparison [18].

Quantification of strengths, weaknesses, opportunities and threats (SWOT) analysis

SWOT is a qualitative (verbal-subjective) analysis technique. It is a field-based technique derived from observations and used to evaluate verbal data as well as to define problems and provide solutions for both internal and external issues [19-21]. The method evaluates relative significance of all parameters by assigning a weight for each of them in the hierarchical order and, in the last level of the hierarchy; a suitability weight for each class of the used factors is given. Typically, the priority of each factor involved in the AHP analysis is determined based on the suggestions from experts [22]. To ensure the credibility of the relative significance used, AHP also provides measures to determine inconsistency of judgments mathematically [23]. The AHP employs an underlying nine-point recording scale to rate the relative preference on a one-to-one basis of each factor [23,24]. This nine-point scale used in analytical hierarchy studies is ranging from 1 (indifference or equal importance) to 9 (extreme preference or absolute importance). The pair wise comparison of the nine-point rating scale assigns a

Table 1: SWOT Analysis of ONP, SMNP and SSSHs.

PAs	Principal components			
	Natural	Socio-cultural	Economic	Governance
ONP	S1: Abundant wildlife species including large mammals S2: A big reserve possess diverse ecosystems	S3: Cultural and historical amenities	S4: Rich cultural diversity and wilderness nature for tourism development S5: Enormous ecosystem services	S6: Under a process to legally gazette the park S7: Participatory boundary demarcation
	W1: Lack connectivity with the nearby reserves	W2: Lack of local community participation in the management and development process W3: Absence of consolidating indigenous conservation practices W4: Lack of sufficient awareness to mobilize locals support	W5: Limited economic opportunity for neighboring communities W6: Poor infrastructure, services and promotion of the tourism potential of the Park	W7: Poor law enforcement capacity
	O1: Good surrounding area to strengthen biodiversity conservation and ecotourism development	O2: Willingness to collaborate in biodiversity conservation	O3: Increased government attention for rural development in the area. O4: Lower Omo Valley is UNESCO world heritage site	O5: Other law enforcement agencies in the nearby
	T1: Incompatible development such as sugar plantation	T2: HWC mainly with elephant and lion. T3: Conflict over resource use affecting the ecosystem of the area	T4: Pandemic disease T5: Highest poverty level and illiteracy rate	T6: Tribal conflicts mainly between Surma and Nygnatom
SMNP	S1: Endemic fauna and flora S2: Spectacular landscape and scenery	S3: Cultural, historical and spiritual amenities inside the park	S4: Sound benefits from tourism	S5: Boundary expansion, resettlement program and removed from UNESCO red list
	W1: Small and fragmented reserve W2: Lacks buffer zone, decrease biodiversity resilience outside the boundary W3: High livestock incursion in the Park	W4: Absence of consolidating indigenous conservation practices	W5: Poor infrastructure, services and promotion of the tourism potential of the Park	W6: Poor law enforcement capacity
	O1: Good surrounding area to strengthen biodiversity conservation and ecotourism development	O2: Willingness to resettle outside the Park	O3: UNESCO world heritage site O4: Northern tourism circuits and presence of world heritages	O5: Strong sense of ownership and collaboration with regional and lower level administrations
	T1: Agricultural practices in the core habitats of the Park by outside community members T2: Extractive interests on rare and endangered species such as Ethiopian Wolf trophy	T3: HWC mainly with leopard, Gelada monkey	T4: Pandemic disease T5: Highest poverty level and illiteracy rate	T6: Absence of equitable benefit sharing mechanism to the community in remote areas of the Park
SSHS	S1: Endemic species	S2: Local community developed positive attitudes towards the reserve. S3: Sound practical Gedda indigenous conservation practices integrated.	S4: Sound benefits from grass harvest	S5: Participatory governance (active community involvement)
	W1: Small reserve W2: Lacks buffer zone, decrease biodiversity resilience outside the boundary	W3: Lack of pasture land for communities and unsustainable grazing system	W4: Poor infrastructure, services and promotion of the tourism potential of the Park	W5: Lack of adequate collaboration between regional authorities
	O1: Possibility to connect with lake Hawassa then wild animals to access water sources	O2: Seraindigenous bylaws conservation system under process	O3: The southern tourism circuit O4: Presence of extraordinary tourism destination in the nearby	O5: Opportunity of scaling up communities' engagement in conservation for better success
	T1: Lack of buzzer zone	T2: HWC mainly with Warthog	T3: Pandemic disease	T4: Tribal conflicts mainly between Arsi Oromo and Sidama.

Table 2: Significance assessment of indicators.

Factor	Indicators from SWOT Analysis	Significance				Sum	Rank
		Natural	Socio-cultural	Economic	Governance		
Biodiversity conservation	Enhance biodiversity and ecosystem	4	3	4	3	14	3
Improve connectivity	Establish buffer zone and create connectivity	4	3	2	3	12	8
	Boundary expansion to protect surrounding areas	4	3	2	3	12	8
Improve community engagement	Improve participation and awareness of locals	3	4	3	3	13	5
	Integration of cultural and religious amenities and incorporate bylaws with sound science conservation practices	2	4	3	3	12	8
	Reduce human wildlife conflict	4	4	4	4	16	1
Increased economic benefits	Improve tourism infrastructure	3	3	4	3	13	5
	Enhance direct economic opportunity from tourism and other sustainable form of resource utilization	3	4	4	3	14	3
Improved operation	Strengthened law enforcement	4	3	4	4	15	2
	Improve integration among key actors	3	3	3	4	13	5
Development	Decrease unsystematic development such as sugar plantation	4	2	2	2	10	15
	Reduce agricultural practices inside protected areas	4	2	2	2	10	15
Wild animals	Reduce wild animals hunting	4	2	2	2	10	15
Tribal conflict	Reduce conflict over resource use	2	3	2	4	11	11
Resettlement	Undertake volunteer resettlement outside protected areas	4	2	2	3	11	11
Human welfare	Reduce poverty level and illiteracy rate	2	3	4	2	11	11
Overgrazing	Reduce livestock incursion in the Park	4	2	2	3	11	11
Sum		58	50	49	51	208	

Table 3: Pairwise comparison of nine-point rating scale after Saaty and Vargas (2000).

Importance	Definition
1	Equal significance
3	Moderate significance
5	Strong significance
7	Very strong significance
9	Extreme importance
2,4,6,8,	Intermediate values
1/3, 1/5, 1/7, 1/9	Values for inverse comparison

Table 4: Summary of SWOT Analysis of Ethiopia's PAs system.

Sustainability pillars	Criteria of SWOT
Nature/Ecosystem	Enhance biodiversity and ecosystem
	Establish buffer zone and create connectivity
	Boundary expansion to protect surrounding areas
Socio-cultural	Improve participation and awareness of locals
	Reduce human wildlife conflict
Economic	Integration of cultural and religious amenities and incorporate bylaws with sound science conservation practices
	Improve tourism infrastructure
Governance	Enhance direct economic opportunity from tourism and other sustainable form of resource utilization
	Strengthened law enforcement
	Improved integration among key actors

linguistic expression to each of the corresponding numerical values (Table 4).

The consistency of the judgment matrix examined with the calculation of the consistency index (CI) is defined by the below equation [25]:

$$CI = \frac{(\lambda_{max} - n)}{(n - 1)}$$

Where CI is the consistency index, λ_{max} is the most significant or principal eigen value of the matrix that could be calculated from the matrix and n is the order of the matrix [26].

Also, in the AHP, a measure of consistency ratio (CR) was calculated to indicate the randomized probability of matrix judgments as follows:

$$CR = \frac{CI}{RI}$$

Where CI is the average of the resulting consistency index, depending on the order of the matrix given by [27], RI (Random Index) values for matrices of different sizes [28].

Results

According to [23,29], the consistency ratio ranges should be less than 0.1 to indicate the overall acceptable consistency of the pair wise comparison matrix and calculated weighting values. But if it's larger than 0.10, then there are inconsistencies in the evaluation process and the AHP method may not yield meaningful results. In this study, a consistency ratio of -0.67 was obtained which is acceptable to be used in the suitability analysis. The calculations of pair wise comparison matrix, computation of criterion and Pair wise comparison matrix, AHP factor weights and consistency ratio of criteria are given in Tables 5 and Table 6 respectively.

Indicator's significance was computed to obtain top priority factors (Table 3). Thus, enhancing biodiversity and ecosystem conservation, establishing buffer zones, creating connectivity with important biodiversity areas, watering points, and improving PAs boundary to protect surrounding areas are ranked as the important components in the natural

circumstances of each protected areas. Reducing human wildlife conflict, improving participation and awareness of local's communities, integrating the cultural and religious amenities, and incorporating bylaws with sound science conservation practices are the prioritized factors to develop the socio-cultural significance of Ethiopian protected areas.

Improving tourism infrastructure in protected areas, and increasing direct economic opportunity to the local and national economy from tourism and other sustainable forms of resource utilization are considered vital elements to increase the economic benefits from protected areas which is followed by strengthening law enforcement units and improving integration among key actors to develop robust protected area governance are also identified as important.

The quantified results of the SWOT analysis using the AHP method shows that 'governance' was prioritized as the most important component among the pillars for achieving sustainability in the protected areas (Table 6). Improving integration among key factors including governmental, non-governmental, and private stakeholders (1) and strengthening law enforcement units (3) are ranked top. Enhancing direct economic opportunity to local and national economy from tourism and other sustainable form of resource utilization (2), and improving tourism infrastructures are the second highest ranked economic components. Reducing Human Wildlife Conflict (4), integration of cultural and religious amenities, incorporating bylaws with sound science conservation practices (6), and improving participation and awareness of local community are the third top ranked socio-cultural circumstances. Finally, extending reserves boundary to protect surrounding areas (8), establishing buffer zones, and creating connectivity with important biodiversity areas and watering points (9), enhancing biodiversity and ecosystem conservation with sound scientific methods (10), are ranked as important components in the natural factors. The mean consistency ratio of all sustainability criteria of the SWOT analysis revealed that governance (1.99) and economic aspects (1.27) are the most important component for protected areas followed by the socio-cultural dynamics (0.81) and ecological values (0.33).

Table 5: Pairwise comparison of criteria's.

Criterion	N1	N2	N3	S1	S2	S3	E1	E2	G1	G2
Enhance biodiversity and ecosystem (N1)	1									
Establish buffer zone and create connectivity (N2)	9	1								
Boundary expansion to protect surrounding areas (N3)	7	8	1							
Improve participation and awareness of locals (S1)	8	7	7	1						
Integration of cultural/ religious amenities and incorporate bylaws (S2)	5	3	5	5	1					
Reduce human wildlife conflict (S3)	4	3	5	8	7	1				
Improve tourism infrastructure (E1)	7	5	4	6	6	2	1			
Enhance direct economic opportunity (E2)	3	2	7	5	8	2	7	1		
Strengthened law enforcement (G1)	4	6	9	7	2	2	2	2	1	
Improved integration among key actors (G2)	4	9	6	3	2	2	7	6	8	1
Sum	52	44.1	44.2	35.4	26.9	10	18.4	10.9	11.7	3.3

Equal importance = 1, Moderate importance = 3, Strong importance = 5, Very strong importance = 7, Extreme importance = 9, Intermediate values = 2,4,6,8, Values for inverse comparison = 1/3, 1/5, 1/7, 1/9

Table 6: Pairwise comparison matrix, AHP factor weights, consistency ratio of the ten SWOT indicators and rank.

Criterion	N1	N2	N3	S1	S2	S3	E1	E2	G1	G2	Criteria	Weighted sum	AHP
Enhance biodiversity and ecosystem (N1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.020	0.004	0.196
Establish buffer zone and create connectivity (N2)	0.006	0.001	0.000	0.000	0.000	0.001	0.000	0.002	0.001	0.001	0.035	0.012	0.353
Boundary expansion to protect surrounding areas (N3)	0.006	0.008	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.002	0.046	0.021	0.457
Improve participation and awareness of locals (S1)	0.010	0.010	0.010	0.002	0.000	0.001	0.001	0.001	0.001	0.007	0.066	0.043	0.659
Integration of cultural/ religious amenities and incorporate bylaws (S2)	0.007	0.005	0.008	0.010	0.003	0.001	0.001	0.001	0.003	0.010	0.068	0.047	0.685
Reduce human wildlife conflict (S3)	0.009	0.008	0.013	0.025	0.029	0.011	0.003	0.005	0.005	0.017	0.111	0.123	1.111
Improve tourism infrastructure (E1)	0.015	0.012	0.010	0.018	0.024	0.022	0.006	0.001	0.005	0.005	0.108	0.117	1.083
Enhance direct economic opportunity (E2)	0.008	0.007	0.023	0.021	0.043	0.029	0.056	0.013	0.006	0.007	0.146	0.214	1.463
Strengthened law enforcement (G1)	0.010	0.018	0.026	0.026	0.010	0.026	0.014	0.024	0.011	0.005	0.130	0.170	1.302
Improved integration among key actors (G2)	0.021	0.055	0.036	0.023	0.020	0.054	0.102	0.148	0.184	0.082	0.269	0.724	2.692
λ_{max}													1
Consistency index													-1
Random index (constant)													1.49
Consistency Ratio													-0.671

Discussion

Ethiopia's PAs play a critical role in conserving biodiversity and promoting sustainable development. The core principals of sustainable development area are enhancing human well-being, quality of life, the efficient use of resources, and intergenerational equity. The fundamental understanding of sustainable development is recognizing the interdependence of economic, social, and environmental systems [30].

In this study, the criteria for sustainable development of protected areas were identified using a SWOT analysis. This initial verbal analysis was unsatisfactory in establishing priorities in the study area. Thus, an AHP method was employed to further quantify and refine the analysis. This quantitative SWOT analysis, setting priorities for protected areas, was the first time such a method has been applied to scientific research and projects conducted within Ethiopia's Protected Areas. The results of the refined SWOT analysis identified the most positive factors (Strengths and Opportunities) of PA management for which monitoring and protection measures should be envisioned. The SWOT analysis also identified the most exposed factors (Weaknesses) of PAs that need strong supportive intervention and monitoring measures, and also the factors that can adversely affect the management of the PAs (Threats) were identified.

The primary top-ten priority indicators revealed that Good Governance is the most important variable required in PA management. Several studies have indicated that governance is the most critical component in the management of natural resources. In Ethiopia the absence of forceful governance has

resulted in failures in the management of natural resources in Ethiopia. For instance, Grima and Till (2011) [31] reported that the African Parks Network (APN) were unsuccessful in managing the NechSar National Park in southern Ethiopia primary due to problems in engaging appropriate government actors; exclusive negotiation with local people; the political sensitivity of the park management due to its location in the area where two regional states share boundaries; and a lack of common understanding between government and APN.

The secondary important factors that PAs require are 'enhancing economic opportunities' and 'significantly contributing to the local and national economy'. The PAs of Ethiopia mainly contribute to achieving the Sustainable Development Goals by providing protection to the natural core of wider landscapes and watersheds of important ecosystem services, their direct economic contribution particularly to the local communities needs to be improved.

Environmental change as a result of degradation of natural areas is likely to affect an ecosystems ability to provide quality ecosystem services [14]. noted within 20 years, the total value of the EWCA PAs system would decrease from its current value of approximately \$ 325 million/yr to a net value of \$185 million/yr due to the dramatic destruction and conversion of natural ecosystems, which has a negative impact on species resulting in the disturbance of the overall ecosystem function.

The other important component is establishing a strong community-based conservation approach. Engaging surrounding communities in the management of natural

resources is critical for successfully achieving the desired goals. Engaging surrounding community groups and raising their awareness significantly helps to improve the management of the natural resources. There are notable successful community-based conservation practices in Ethiopia such as the Senkelle Swayne's Hartebeest Sanctuary (SSHS), which is a good example of where local communities have proved that they can significantly harm or benefit from natural resources. For example the introduction of indigenous "Oromo Gadda System" in 1993 changed the practices of the illegal killing of the endemic Swayne's Hartebeest, making the community the custodians of conservation for the species, and the overall protection of SSHS. The widespread killing of the endemic Swayne's Hartebeest and other ecologically significant species stopped soon after Abba Gedda declared the species as a member of "Hambentu" clan of the Arsi Oromo of Ethiopia [32].

Another notable initiative that resulted in progressive conservation through ensuring local community involvement is the Menz Guassa Community Conservation Area (MGCCA). The unrestricted resource use of the area had severely affected the unique biodiversity of the area which led to unsustainable overexploitation of the resources. As a result, they introduced the indigenous "Qero" system. It is a land use system that reinstalled the traditional resource management system and significantly safeguarded the valuable biodiversity of the area and secured the long-term livelihoods of surrounding population [33].

In contrast, there are examples of local communities who are against protecting the natural resources in several parts of Ethiopia, who have actively hindered conservation initiatives. Therefore, ensuring the correct governance is a vital requirement when undertaking the management and conservation of natural resources. An innovative governance and conservation approach which allows high-level engagement of local communities and one that integrates local people's indigenous knowledge into its approach is required to meet the desired conservation goals and enhance the benefits.

Conclusions

The fundamental benefits of assessing the SWOT in Ethiopian PAs are: 1. the SWOT analysis will contribute towards a better decision making process by ensuring policy appraisals fully take into account the costs and benefits of protected areas and highlight the implications for human wellbeing while providing policy development with new insights; 2. the result can be used for policy formulation and an integrated program development by government, and conservation and development partners, who are interested in supporting the conservation and management efforts of the PAs.

It is concluded that achieving sustainable development and conservation is the ideal goal of many developing nations. In this current study, the main pillars of sustainable conservation and development were applied to prioritize the key interventions in the study area. The study revealed that the lack of integration with key stakeholders and poor law enforcement are hampering the management of protected areas; thus, resulting in the loss of biological resources and

the continuous degradation of critical ecological components, which has a significant impact on the overall development efforts in PAs.

Improving tourism infrastructure and marketing in PAs is extremely important; however it needs to be guided by holistic approaches in order to attain sustainable development which also safeguards the principal ecological components of the areas. The integration of cultural and religious amenities, and the formulation of conservation bylaws, is also required in order to backstop the management of PAs.

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