



# Critical solutions for critical problems: Threats to Sustainable use and Management of Nech Sar National Park (NSNP) in Ethiopia

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## Abstract

National parks are considered as the most important instrument for the conservation and protection of biodiversity, particularly for rehabilitation of critically endangered species in Ethiopia. However, the management of most of the national parks is threatened by complex socioeconomic and political factors. This paper, was thus designed to assess the socio-economic and political factors that threaten the management of Nech Sar National Park. Document analysis, previously conducted empirical research and reports were utilized as the main sources of data. In addition, interviews and personal observations were applied as tool to generate supplementary data. The analysis indicates that there are enormous socioeconomic and political factors that limit and challenge the management and sustainable use of the park for example, using the park as a primary source of livelihood and as grazing land, the expansion of agriculture, the establishment of settlements, and investment centers, are the most important factors that are threatening and challenging the management of the park. There are also conflicts of interests, lack of political commitment, lack of clear demarcations, and capacity problems which are additional factors that constrain the sustainability of the park. Therefore, in order to use the park for its primary management objectives, and hopefully overcome the chronic threats of the poor management, and reap the benefits in a sustainable way, all stakeholders should work hand in hand rather than be striving to meet their individual interests at the expense of the park and its conservation objectives.

**Keywords:** Park Management, threats, tourism, Nech Sar National Park, Ethiopia.

## Introduction

Currently, one of the greatest proximate threats facing biodiversity and its services is habitat destruction which is primarily resulting from human population growth coupled with the expansion of land demand for different uses (Vial, 2010). In addition, small scale farming, investment, urbanization and construction of infrastructures all play negative parts. According to Dudley and Stolton (2008), however, it is essential that various goods and services provided by ecosystems ranging from provision of food up to regulation of environmental systems such as hydrological cycle, climate conditions and energy flow in ecosystem should be managed at the regional or local scales in ways that sustain and enhance the socio-economic and ecological services.



Protected areas like national parks, game reserves and sanctuaries are conceived as the most important strategies for conservation of biodiversity and its socioeconomic, cultural and environmental values (Tafesse, 2008) and are critical to establish harmonious relations between nature and humans (INCEN, 2016). Protected areas are areas of land and /or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated socio-cultural resources and are managed through legal or other effective ways (IUCN, 1993 cited in Phillips and Harrison, 1997). They encompasses the conservation strategies that range from areas strictly protected from human intervention to those that allow for sustainable human use and planned innovations (IUCN, 2007).

Over the past 20 years, there has been a dramatic increase in the number and extent of protected areas established globally (IUCN, 2016). By now, almost all countries have designated sites for wildlife protection and have adopted bylaws for protection and managements of the biological diversity within and around the protected areas. Supporting these, are many public, private, community and voluntary organizations which are actively involved in the management process and practices. In addition, there is also an international network of protected areas created under global conventions and regional agreements (IUCN, 2007). As a result, there are currently nearly 202,467 protected areas, covering almost 20 million square kilometres or 14.7% of the world's land (UNEP-WCMC, 2017).

Empirical studies from multiple disciplines reported that, even though protected areas including national parks designated for conservation of biodiversity and regeneration of critically endangered species of both flora and fauna exist, currently the management of those areas has been challenged by conflicts of interests between the local community for economic issues, livelihood generation, social and cultural values on one side and conservation and protection needs by the park management on the other side (e.g, Abyot, 2009; Anteneh, et al., 2014; Aramde, et al.,2012; Girma & Stellmacher, 2012; Lemlem & Fassil, 2010; Phillips & Harrison, 1997). Furthermore, the UNEP-WCMC (2017) and IUCN (2007) reports endorsed that climate change and extreme weather conditions and its resultant effects have also manifested as the critical challenges that limit the protection and sustainable management of protected areas as well as their biodiversity throughout the globe.

Due to the above-mentioned anthropogenic and natural problems, most of the protected areas have been worsening and fail to meet the objectives for which they stand. The problem is more critical in developing countries because of the ever increasing unplanned human intervention and encroachment of agricultural land and other socio-economic activities and political problems (Ahebwa, 2012; Acwquah, 2013; Birner, Maerteens & Zeller, 2006; Girma & Stellmacher, 2012).

The presence of favorable diverse and conducive climate conditions, different soil types and the very wide range of topographic features [ranging from 110 meters below sea level to 4620 meters above sea level) (BIDNF; 2010) jointly with the corresponding diverse socio-culture attributes have created very fertile ground for Ethiopia to be one of richest countries in biodiversity in the world with a high level of endemism (Tewoldebirhan, 1989 cited in Samson, et al., 2010). Owing to this, a country is endowed over 6,000 species of vascular plants (with 625 endemic species and 669 near endemic species), 284 wild animal (29 endemic species), 201 reptile (10 endemic species), 200 fish (40 endemic species), and 63 amphibian (25 endemic species) (IBD, 2014).

However, the biodiversity of the country is under critical threat and degradation. Inadequate management and unsustainable use of natural resources, jointly with weak economic status, high population growth, deforestation, widespread of invasive species, climate change and limited political commitment are the main causes to the biodiversity crisis and loss in the country (Badege, 2001; Belay, 2016; BIDNF; 2010; Feyera, 2007; Kasahun & Demessie, n.d.).



In Ethiopia, therefore, it is conceived that protected areas especially national parks have made contributions to conservation and regeneration of both flora and fauna species particularly for plants and wild animals that have limited geographical coverage and numbers of individuals which are critically endangered. The concept of conservation and designation of national parks has a long history in the country. In different regimes, the Ethiopian government has taken steps to sustainable conservation of biodiversity and addresses the constraints of the conservation and management activities. For example, the government at different times, has adopted legal frameworks, established institutions and signed and ratified international conventions and agreements related to the protection and sustainable use of biodiversity (FDRE, 2005). The first legal wildlife regulation in Ethiopia was issued in 1908 by Emperor Menelik II. By 1965 the Ethiopian Wildlife Conservation Organization (EWCO) was established with the mandate and responsibility to manage wildlife conservation areas and its biota (Abyot, 2009). Following these, the country has designated different protected areas: 20 National parks, 2 wild life sanctuaries, 11 wildlife reserves and 18 controlled hunting areas (EWCA, 2014). Generally, about 213,464km<sup>2</sup> of land is allocated for wild life conservation (IBD, 2012).

Many scientific research reports have pinpointed that owing to all-round socioeconomic and political problems, most of the parks have failed to achieve their intended objectives. Beside this, the management of parks throughout the country is facing constraints from critical challenges that are primarily caused due to the conflict of interests between different groups (Aramde, et al.,2012; Lemlem & Fassil, 2010; Girma & Stellmacher, 2012). Moreover, there are many problems resulting from long lasting unwise and unplanned use of natural resources, which have been aggravated by chronic food insecurity and prolonged droughts as well as widespread poverty (Freeman, 2006; Tafesse, 2008).

Furthermore, studies carried out in different national parks of the country indicate that human population growth, settlement expansion, excessive deforestation, conversion of park lands to other land uses: agricultural, mining and investment lands, and lack clear demarcation of the parks from the surrounding areas are the common bottlenecks to manage and protect the parks adequately (Anteneh et al.,2014; Kassegn and Endalkachew,2018 and Lemlem& Fassil, 2006).

Investment expansion towards national parks and conflict among different communities over use of the natural resources also put negative impacts on the management of the parks (Anteneh et al., 2014; Girma and Stellmacher, 2012). In conclusion, from the above empirical literature it can be understood that national parks in Ethiopia are facing serious problems which need the joint work of all stakeholders ranging from the local community to federal government.

Even though, Nech Sar National Park (hereafter, NSNP) is one of the early-established parks in Ethiopia and one of the major tourist attraction natural sites, it has been one with a strongly threatened and serious degrading park that needs immediate responses to recover and conserve its biodiversity and landscape resources (Aramde, et, al., 2012/14). The park management is constrained by different interconnected and complex socioeconomic, political and administrative problems starting during the last few decades (Schubert, 2015) which are significantly daunting for the biodiversity and its overall services. In general, different interrelated factors are slowly destructing and becoming grave challenges to the management and sustainability of the park. Taking these things into consideration, this paper attempts to explore the basic threats to management and sustainability of the park. In order to meet this stated objective the following specific questions were raised: (1) What are the key natural resources of NSNP? (2) What are the socio-economic, political and natural factors that limit the management of park? (3) What are the consequences resulting from the destruction and inadequate management of the park?



(4) What are the measures taken by key stakeholders in order to escalate the sustainable use of resources and lowering the threats of poor management?

## Methodology

This study is confined to the assessment of the natural resources, the challenges of effective management of NSNP, consequences resulting from the destruction of the park due to inadequate management and/or other driving forces. The remedial actions taken by the local community, government representatives at different levels and other stakeholders were also part of the study.

Regarding data source for this work, a review of literature was intensively conducted using it as the main source of data. Accordingly, articles, reports, theses and other published and non-published materials were utilized as sources of data. In addition, personal observation and in-depth-interviews were used as sources of data in order to supplement and authenticate the data gathered from secondary sources. Interviews and discussions were conducted with the manager [*Chief Warden*] of NSNP. Moreover, an observation checklist was employed as a tool so as to gather data from the field observations. Analysis of the data relied highly on the document analysis with strong argumentative statements. The data collected through observation checklists and interviews was analyzed qualitatively by using narrative statements.

## The profile and short history of the study area

NSNP is one of the early-established and major tourist attraction parks in Ethiopia, and it is located in the South western part of the country in the Southern Nations, Nationalities and People Region near Arba Minch town which is found roughly 500kms away from the capital city of the country; Addis Ababa. Astronomically, the park is positioned 5°51'- 6°05'N Latitude and 37°32'-37°48'E Longitude (Aramde, et al., 2012). It also covers an area of 514 km<sup>2</sup> of which 436 km<sup>2</sup> and 78 km<sup>2</sup> covered by land and water respectively (Samson, et al., 2010).

The wildlife protection in Ethiopia bylaws was started in the early 20<sup>th</sup>C, while the first statutory wildlife regulation was adopted in 1908 by Menelik II. Regarding the establishment and governance of protected areas, however, a remarkable achievement is observed starting from 1960s as consequence of UNESCO's experts involved in the identification and delineation of protected areas in the country. In 1962 at the UNESCO Conference held in Paris, Ethiopia requested assistance from the world community, particularly UNESCO, for developing and managing national parks and wildlife areas. As a result, UNESCO assigned game warden experts to assist in the establishment of national parks and reserves and provided technical and skill support for Ethiopian staff from 1964-65 (Blower, 1968 cited in Abyot, 2009). Based on the recommendation of the UNESCO assigned team, Awash, Omo valley and Semien Mountain became the first national parks in the park history of the country.

In 1967 UNESCO also suggested including the Nech Sar plain as a game reserve (Freeman, 2006; Schubert, 2015). NSNP was officially established in 1974 specifically to conserve the Swayne's hartebeest an antelope endemic to Ethiopia and manage other biological resources; plants and animals, and landscape between lakes of Abaya and Chamo (Aramde, et al., 2014; Freeman, 2006).

The original area of the game reserve does not however include, however, the forest and aquatic habitats of Abaya and Chamo lakes. In the 1970s, the forest of Nech Sar, designated as Arba Minch National Forest Priority Area, was protected by the State



Forest Conservation Department (SFCD) in the Ministry of Agriculture whereas the aquatic habitats were not given a formal recognition probably due to the limited understanding about their resources and potential for biodiversity conservation (Genaye, et, al, 2017). An agreement was reached between EWCO and SFCD in 1984 to form all encompassing protected area that covers an ecologically complete unit comprised of forest, wildlife and landscape, and terrestrial and aquatic habitats ([http://www.protectedplanet.net/sites/Nechisar\\_National\\_Park](http://www.protectedplanet.net/sites/Nechisar_National_Park)).

NSNP is one of richest parks in biological diversity in Ethiopia and it constitutes nearly 20% of the biodiversity of the country (Table1). Many flora and fauna species are found in the park. The lakes and the natural vegetations of the park are the home to different wild animals and 40% of the bird species of the country. Thus it has great power as a tourist attraction jointly with the forty natural springs. The vegetation varies from evergreen forests at the base of the western escarpment which has been described as a biologically rich and rare habitat (Girma & Stellmacher, 2012; Molla, 2017), over woodland and shrub land on the volcanic hills between the two lakes (known as “God’s bridge”), to grasslands on the plains in the eastern part of the park (Genaye, et al., 2017).

**Table 1.** Number of Biodiversity in NSNP

Species	No of species in NSNP	No species in Ethiopia	Species shared by in NSNP (in%)
Mammals	103	320	33
Birds	351	862	41
Reptiles	33	201	16
Amphibians	8	63	13
Fishes	16	150	10
Plants	700-100	6500-7000	7-9

Source; Abraham, 2009

Apart from its numerous ecological services and tourism values, it has an undeniable role in socio economic development and survival of the people of Arba Minch town and the surrounding rural areas (Aramide et al., 2012; Freeman, 2006; Samson, et al., 2010). According to the park’s manager, it also has a vital contribution to support income generation for jobless youths and women and livelihood diversification for people settled around the park.

However, the manager stressed that balancing the community’s demands and conservation of the park for its intended objective [protection of the flora and fauna] is becoming a critical challenge. He further mentioned that deforestation, mainly caused by anthropogenic factors such as illegal cutting of trees, expansion of agricultural investment, villagization and using the park as grazing land by the local community including people of Arba Minch town and Guji pastoralists are all critical problems of the park. Apart from these, studies have shown that a lack of political commitment, conflicts of interest, weak management capacity and a lack of a clear demarcation strongly limit and challenge the management of NSNP (Freeman, 2006; Girma & Stellmacher, 2012; Schubert, 2015).

## Result and Discussion

### Major Natural Resources in NSNP

This section of the paper presents the main natural resources that exist in and around the park. According to the situational analysis of Freeman (2006) and Schubert (2015) for NSNP and a



summary of census report at Nech Sar National Park by Abraham and Bayisa (2015), the following are identified to be the major natural resources that are found in and around of the park.

**1. Forest:** Within the boundaries of NSNP there are more than 35 km<sup>2</sup> of forested area representing one of the few remaining forest areas in Ethiopia. Most of the forested areas of the park are located around Kulfo and Sermele River. The forest including acacia savannah, woodlands, riverine forests, ground water forests have been serving as a home for different wild animals including the rare ones. However, in recent years, the forest is under heavy pressure from firewood collectors and charcoal burners from the nearby town of Arba Minch and seasonal migrants from the surrounding rural districts and encroachment of the local farmers for settlement, crop cultivation and grazing lands.

**2. Wild animals:** Due to its broad and complex vegetation structure and availability of adequate food sources, Nech Sar National Park offers habitat to a great number of wild animals, including more than 90 mammals and 351 bird species. There are also a considerable number of Reptiles and amphibians. A very few wild animals still exist in Ethiopia, and these are found in Nech Sar National Park: Swayne's hartebeest, Zebra, Grant's Gazelle, Kudu and even lion. However, because of unplanned human intervention which eventually leads to over-grazing and deforestation, the continuity of these species is under severe threat. Consequently, the number of animals in and around the park is declining rapidly and leading to their extinction because of the destruction of their natural habitat.

**3. Flora:** The floristic composition of the park contains ranges of between 700-1000 plant species, of which only 276 species have so far been identified and documented. These different plants species have multiple functions: provision of food, are edible fruits, offer medicinal value and serve as wood sources for different uses for the local community beyond its ecological services. But over-utilization has led to degradation of flora and its socio-economic and environmental values.

**4. White Grass:** The White Grass plain is one of the most important natural resources of the park which provide the name of the park and its uniqueness. The area of the Nech Sar grassland plains is estimated to be 100 Km<sup>2</sup>, which is about 19% of the total size of the park. It also provides the habitat and fodder for the wild animals that live within the park. The grassland plains have been identified as the core area of the park due to their importance to conserve grazers including the endemic Swayne's hartebeest as well as zebra, greater kudu and gazelle. This grassland is also considered to be the only large grazing area around the Guji and Kore residence. Like other resources of the park, however, grasslands are being trampled upon and destroyed due to over grazing and a severe lack of adequate management practices.

**5. Sokke:** *Aeschynomene elaphroxylon*, locally known as *Sokke*, is a shrub or small tree which grows in the shallow areas of Lakes, Abaya and Chamo. *Sokke* forms part of the breeding ground for fish, and thus, is very important in the marine eco-system. However, it is currently being cut down at unsustainable rates to use for the construction of local fishing boats, stools and fencing which only cause decline in the *Sokke* itself but also lead to losses and declines in marine species like fish.

**6. The two lakes and Wetland resources:** The south-eastern part of Lake Abaya and the northern part of Lake Chamo form part of the national park. They have a very important phytoplankton and zooplankton on which fish and invertebrates are feeding. Phytoplankton productivity and biomass are higher in Lake Chamo, probably due to its less turbid state. They are the home of different fish species. In the two lakes and their tributaries some 16 fish species have been identified, including the Nile perch, tilapia, and catfish. Lake Chamo used to have a



large fish population. This has now been severely depleted due to over-fishing by cooperatives that fish on Lake Chamo, and the many illegal fishermen who fish without permits. Along the shores of lakes Abaya and Chamo, wetlands are very common. These wetlands are of outstanding importance as reproduction sites for fishes, crocodiles, and many different aquatic birds and also for hippopotami.

**7. Springs:** Inside of the Park there are more than forty natural springs from which the town name Arba Minch (literally translated as forty spring) was derived, and a water supply. The springs are also a significant tourist attraction within the Park. They also supply water to the lakes. There is now a potential threat to this important natural resource due to over-consumption by the local community.

### **Threats and Challenge to sustainability and Management of Nech Sar National Park**

In order to meet the objectives of national parks effectively and for the sustainable utilization of its resources as well as adequate management, they must be free from any constraints and challenges and have significant contributions to make in terms of protection of the natural resources, rehabilitation of biodiversity and proper utilization of the economic, cultural, psycho-social and environmental values (Petit et al., 2018). However, the study done by Chan, et al., (2014) in Hong Kong indicates that increases in population, increasing users expectation and its resultant effects produce different challenges on the management of protected areas. Likewise, the management of and sustainable use of NSNP is now facing challenges that derived from different socioeconomic and political needs (Dessallegn, 2004). Some of the challenges that limit and threaten the management and sustainable use of the park are discussed below in brief.

### **Population growth in and around NSNP**

Human population growth accompanied by the unsustainable use of natural resources has been causing tremendous negative impacts on terrestrial and marine biota of protected areas (Sarmin, et al, 2016). It is also one the challenges that limit the administration's actions of protected areas (Petit et al., 2018). NSNP provides numerous socio-economic and environmental benefits to the people living around and in the park. Arba Minch town residents, Amaro, Guji, Genta [from Gamo highland] and Kore people and also seasonal migrants who are engaged in illegal wood collection and fishery are the primary beneficiaries of the park and have been so for a long time (Abyot, 2009; Freeman, 2006). The rapid population growth within and around the park has created an ever-increasing pressure and serious problems on natural resources and biodiversity of the park (Schubert, 2015). For example, in the last three decades, the population of Arba-Minch town has shown a tremendous growth. According to the CSA report, the number of the total population has increased from 40,020 in 1994 to 74,879 in 2007 (CSA., 2007). The same source has confirmed that the immigration of people from the surrounding rural areas: Gamo highlands, Wolaita and Gofa, which strongly rely on the park, has its own undeniable contribution to the population growth of the town. The park manager assured that these immigrants have also been the critical problem for the management of the park because most of them have preferred the park resources for their job opportunities and livelihood generation, hoping that it may help them escape from, or at least reduce the challenges faced by them of living costs in the town. He further stated that a lack of jobs in the town that can accommodate the increasing human population growth has been placing an added burden on the parks resources.

In general, the rapid population growth in Arba Minch town and the surrounding rural woredas leads to increasing the demand of the natural resources of the park for different purposes:



agricultural land, construction, firewood, and income generation which are unprecedentedly exacerbating the destruction of the park and significantly challenging the management of the park for sustainable use and thwarting it in efforts to meet its objectives. Similarly, the research conducted in Berazil at Catimbau National Park showed that protected areas are the main strategy for environmental conservation but the ever-growing human population and increasing of demand of the park for economic and other benefits has resulted in sizably negatively affecting the biodiversity and it has become the main challenge of management practices (Machado, 2017).

### **Urban Physical expansion and Establishment of new settlements around NSNP**

It is obvious that urbanization and especially the physical expansion of megacities, is the critical aggravating factor to land use conversion, pollution and degradation of biodiversity particularly in developing countries (Almudi, 2008; Nick et al., 2014). Urban growth increases the demand for forest and other resources for different uses. Arba Minch is one of the fastest growing towns in Ethiopia in terms of its physical expansion, development of different institutions, and investment sectors. This rapid urban development coupled with population growth and other socio-economic factors directly or indirectly has made a solid contribution to distraction of the resources and now the park is facing a critical threat to ts sustainable management.

Furthermore, the construction of new settlements and the expansion of the existing villages especially in Selle Kebele, have brought observable negative impacts on of the forest resources of the park becoming another direct challenge for the management of the park. At the western edge of the forest there is much fertile land. Although this land is part of the forest it is currently being utilized for the establishment of a new village by farmers who are migrating from Ganta mountain. Approximately 300 household heads have settled there in recent years, mainly coming from Ganta and a few from other rural areas (discussion with park manager, Dec, 2017). They are unwilling to move away from the park area and critically affect the forest, water and fish resources and have placed a great problem on conservation and the management of the park (Freeman, 2006; Schubert, 2015).

### **Using of the park area as an Agricultural Investment Center**

The establishment and expansion of investment, epically commercial agriculture, with in and around the Nech Sar Park has played its own part in the destruction of biodiversity and unsustainability of resource use. The forest, wetlands and the aquatic life including fish species are strongly threatened by the expansion of agricultural investment and the chemicals used. According to the manager of the park and Lemlem and Fasil (2006), many forest areas have been removed from the park and surrounding areas for agricultural and other investments in the last ten years. To the North (the side of the Airport) and the South West (the side of Sile Kebele) of the forest, new large scale banana and other cash crop farmlands have been emerging. Sile Kebele is also expanding with banana farmlands towards Arba Minch natural forest (personal observation, 2017). Moreover, the manager also stated that the “rapid expansion of investment with the expanse of the forest and other natural resources: lakes, fish, and wild animals will affect the sustainability of the park and it is becoming one of the serious headaches for the administration practices of the park”. Likewise, the study in Ghana on “protected areas performance and tourism” revealed that economic focused investments and tourism development are a big challenge for management of protected areas and the sustainable use of its resources (Jachmann, et al., 2011).



Source: NSNP, 2018

**Fig. 3** Encroachment of agricultural investment to NSNP

Despite the above mentioned facts, in our observation we have also realized there is illegal expansion of investment farms and many areas are fenced off, to begin new investments in and around the forest region of the park. Therefore, the growing of agricultural investment will have a massive destructive impact on the forest. The chemicals being used by investors have also impacted on living things and water resources.

### **Using NSNP as main Sources of Livelihood**

The NSNP has been used as a primary source of livelihood and income for the local community who are living within and around its boundaries. Is used for grazing and fuel wood collection by Arba Minch townsfolk, the Guji pastoralists for grazing land, Amaro and Sele people for farming and seasonal migrants from Gamo Highlands and elsewhere for illegal wood collection and fishing (Schubert, 2015). For the poor people, income generation from the forest, grass land and fish resource is an important socio-economic driver leading to the degradation of the resources in the park (Freeman, 2006). Studies noted that about 350 million of the world's poorest people have used forests and other resources of parks intensively for their subsistence and survival (Nick, et al, 2014). Furthermore, since the majority of the smallholder farmers in the surrounding areas are agriculturally dependant and confined to subsistence life, they need the park for livelihood diversification to support their income generated from agriculture especially when there is a drought and failure of agricultural production (Schubert, 2015).

According to Lemlem and Fasil (2006) the migrants from rural areas (Gamo Highlands, Wolayita, and Arba Minch zuria woreda), women and unemployed youths in Arba Minch town have engaged in the production of fuel wood and charcoal from the forest to Arba Minch town. As the interviewee's explanation indicates, using of the park and its natural resources as permanent and/or temporary sources of livelihood and employment opportunity by the local people, will pose challenges for the wise use of natural resources and management of the park. In line with this study, the study carried out in Liberia confirmed that people with poverty, hunger and unemployment are concerned about services and goods provided by natural resources for their survival with little attention paid to environmental protection and conservation aspects (Nick, et al, 2014).

### **Using NSNP as a primary source for wood production**

In developing countries including Ethiopia, forests are the primary source of wood for construction, and energy demand. The majority of Arba Minch town dwellers and almost all the rural population who are living around the park depend on the park to get wood for various uses (Schubert, 2015). Currently an average of 265 bundles, with an average bundle weighing 45 kg each, fire wood and grass and sacks of charcoal are daily extracted from the forest and enter Arba Minch town. About 98% of Arba Minch town population demands 122.5000 kg fuel wood from 7500 hectares of

natural forest which results in the loss of 12.5 hectares of forest per year( discussion with park manager, June, 2018). Moreover, Aramde et al., (2012) reported that on average, 147 people enter in NSNP per day and of these people are the highest number engaged in the collection of wood for fuel, with a total share of 58%, followed by grass collectors (10%), split wood collectors (3%), pole collectors (5%), and fruit collectors (5%).



A. construction wood



B. illegal charcoal production controlled by scouts



C. Illegal wood collection



D. wood collector women from A/Minch town

**Fig.4** Wood collection for different purposes Source: NSNP, 2018

According to the manager, illegal wood cutters also have a significant direct contribution to play in the degradation of the forest. Illegal woodcutters are those individuals seasonally moving from the Gamo Highlands and other surrounding rural areas to the town and who use the forest as an additional livelihood source. They come to Arba Minch on a seasonal basis, when there is no agricultural work to be done at home, to cut down big trees and sell wood for fuel in order to generate additional income. Some of them stay in rental houses in Arba Minch town, and the rest stay inside the forest. They considered the forest as means of livelihood diversification. During field observations the researcher observed charcoal production sites which are established by illegal woodcutters inside the park. Thus, it can be concluded that the high demand of wood especially for fuel, charcoal production and construction materials is seemingly beyond the carrying capacity which will eventually have very negative direct consequences on sustainable management and the use of the park.

### **Using NSNP as grazing land and as a source of fodder**

In most national parks of Ethiopia, the community living closer to and around the park claims the parkland as grazing land and it is thus open for browsing. Since the majority of the surrounding community in Arba Minch rely on livestock production in a mixed manner of farming, they have been using the forest, grasslands and wetland areas as a main source of grazing land for a long period of time. In addition to this, numerous town dwellers rely on the urban agriculture particularly livestock raising, dependent on the surrounding available fodder. This becomes worse when many of elderly and retired people in the town and rural people especially the Guji pastoralists have increasing number of cattle for their livelihood generation and survival. In the interviews, the park manager confirmed his frustration that the number of the livestock is growing to be beyond

the relative carrying capacity of the grassland, which causes degradation. Thus, the overcrowded livestock creates direct pressure on the forest and wetland and destroys the environment totally (Freeman, 2006). In conclusion, the use of the park as primary source of animal grazing land and over consumption of the grass will have sizable impacts on the wild life in particular, and this may ultimately exert its influence on sustainability of the park in general.



**Fig.5** Encroachment of grazing land to forest areas © NSNP, 2018

### **Tourism and institutions development as a challenge**

Currently, the natural resources and management of NSNP, is also facing critical challenges from unsustainable tourism development and activities related with it (Schubert, 2015). The number of hotels, lodges and recreation centers is significantly increasing in Arba Minch town. The park manager and the studies of Lemlem and Fasil (2006) as well as Mulugeta and Erchafo (2017) noted that most of the wood demand [for construction and energy: cooking and light] by hotels and lodges has been derived from the nearest natural forest of Arba Minch. Unless appropriate measures are taken by key stakeholders, this unsustainable tourism development will impact significantly on the natural resources and its services in the park (Mulugeta & Erchafo, 2017; Schubert, 2015). It will also pose a critical threat for the management of the park in the very near future.

### **Policy Failure and Disagreement**

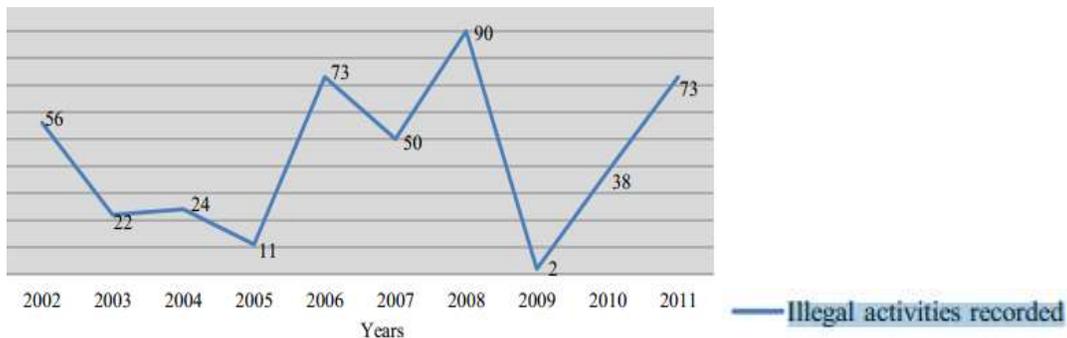
Equally important to policy formulation, the implementation of policies and regulations is essential for the effective management of protected areas and the natural resources. The NSNP manager explained that Ethiopia has smart environmental and wildlife rules, regulations, and proclamations for protection and sustainable use of environmental resources including protected areas. However, due to numerous reasons such as a lack of full implementation of those policies and strategies and regulations, especially at local level, this remains a critical bottleneck in conservation and proper management of parks. Likewise the great failure in the implementation and realization of the policies and strategies already formulated has been evidenced in NSNP. He also added that the clash between environmental legal frameworks with the policies of agriculture, urban growth, tourism and investment development is still a huge unresolved problem in the management of natural resources and NSNP. In general, the lack of implementation of legal frameworks and the disagreements among different socio-economic and environmental policies sizably accelerate the rate of resource degradation and hold back the needed effective management practices of the park.

### **Land use conflicts among the stakeholders**

The interests and conflict among the local communities and the disagreements among stakeholders, especially between the Oromia and SNNPRS regarding the demarcation of the park have all played a significant role in limiting the management of the park (Girma & Stellmacher,

2012; Schubert, 2015). The park is surrounded and used by people who have very diversified and incompatible interests. The rural people need the park for grazing, agricultural land expansion, and wood production; the urban dwellers and immigrants need it for fuel wood, charcoal and as a livelihood base and the park administration wants it for conservation and protection of the rich biodiversity. As the park manager explained, all these groups are striving to meet their own needs which become the cause of disagreement on the sustainable use of the park resources, especially for intended conservation objectives.

It is a naked reality that stable and well organized administration institutions are assumed to be very crucial for management of protected areas. On the contrary, administrative instability is not uncommon and it is also another big challenge for the management of NSNP. Since the time of its designation as a national park in 1974, NSNP has experienced fundamental and repeated changes in its formal organizational status. The administrative responsibilities and governance of the park have been taken over by the federal government and non-governmental organizations (African Parks Foundation) during one period, and then by regional government (SNNPRS) at another time (Schubert, 2015). This administrative instability increases the occurrence of illegal activities and can be the cause of weak management and poor governance practices. The following graph displays the record of illegal activities: deforestation, over grazing, charcoal production, killing of wild animals in NSNP from 2002 to 2011.



**Fig.6** Rate of recurrence illegal activities recorded in NSNP Source: Solomon and Dereje, (2015)

Furthermore, in NSNP, the lack of clear demarcation of the national park from the surrounding areas is a source of conflict among stakeholders and an aggravating factor to resources destruction particularly the forest and grasslands. Here, the park manager strongly explained that starting from the park establishment until now, a number of negotiations and discussions have been held with stakeholders. However, it is still not possible to reach consensus on demarcating the park's boundaries from the surrounding areas. The reflection of mismatched economic, social and political interests from the stakeholders, especially between Oromia and SNNPR has made the demarcation process very complex and difficult. Many empirical researches conducted on the park have significantly supported the ideas of the manager. In general, conflicts of interest, administrative instability and lack of well-defined boundaries all have irreversible power to enhance the illegal utilization and distract the use of important resources. This has also resulted in very complex and poor management of the park. This problem continues exist and unless all stakeholders that have genuine responsibilities and concerns for the park work together to avoid the problems, solve socio-economic and political problems and harness the common benefits of the park sustainably with effective conservation and management practices, success will be a mere dream.

## Expansion of Invasive Species

While there is deforestation, overgrazing and over-utilization of resources undertaken on fragile ecosystems coupled with the current climate change, fertile grounds will be created for easily spreading invasive species which totally distress and dominate the existing natural ecosystem. Currently, there are many invasive species that are increasingly spreading around NSNP which have a negative impact on the sustainable use and conservations of the park. Conservation of the natural ecosystems is the primary means to control the expansion of invasive species and regulating the ecosystem dynamics.



**Fig. 7** Widespread invasive species in the Nech Sar grassland plains Source:Schubert, (2015).

However, according to Yisehak, et al., (2007) there is bush encroachment due to impacts linked to agriculture, cattle grazing and unsustainable firewood collection and also investment around the park. In addition, the park manager argued that the invasive species: *Prosopis*, *Partinium*, *Lantana camara* and Water hyacinths (in lake Abaya) are dominating and significantly aggravating the destruction of the forest and grassland ecosystem and challenging the overall management of the park. It is now beyond the capacity of the park to control and needs the active involvement of the local community and other stakeholders to handle it effectively.

## Consequences of NSNP degradation

NSNP is one of the protected areas and the richest in plant, birds and animal species in Ethiopia. However, in recent years there has been a high degree of destruction and disturbance of the natural resources from inadequate management practice and failure of the application of legal policies and legislation due to different direct and indirect factors (Freeman, 2006). The discussion results shows that due to a lack of political commitment by the local leaders of government, observable and multiple adverse consequences have been recorded on the natural resources of the park. Some of the consequences are presented below.

**Deforestation and wild animal habitat loss:** Loss of the forest resources of the park is critical and it is a continuing problem. The over-consumption in the forest has led to the complete loss of about 10 ha of forest per year with associated ecological and economical benefits (Schubert, 2015). Furthermore, satellite image analysis made by Tadesse et al. (2015) in the table following, displays the change in coverage of riverine natural forest for the last 30 consecutive years (1985-2015). The total forest area estimated to be 34.1%, 34.05% and 27.13% in 1985, 1995 and 2015 respectively. The forest coverage declined by a rate of 20.5% from 1985 to 2015. There was also analysis which revealed that there was expansion of farmlands (5.8%) and bare lands (23.5%) with shrinkage of forest coverage and shrubs within a time range of 1985 - 2015.

**Table 1. The rate of change in natural forest coverage of NSNP**

Land cover	Area (ha) 1985		Area(ha)1 995		Area (ha)2015		Rate of Change
		%		%		%	
Forest	1932	34.1	1929	34.05	1536	27.13	-20.5
Farm Land	432	7.62	438	7.73	457	8.06	+5.8
Shrub Land	1791	31.61	1762	31.1	1754	30.96	-2.1
Bare Land	1399	24.69	1533	27.06	1730	30.53	+23.6
Total	5665	98.979	5665	99.97	5665	99.98	

Source Tadesse, et al.,(2015)

The natural forest and wood lands are the habitats of important large and small animals. In NSNP, we find different animals: Zebra, Grant's Gazelle, Kudu and Lion. Despite the living space, the provision of food and water for these animals and birds, is the other extremely important aspect in a forest and woodland (Lemlem & Fasil, 2006). However their habitat is currently being destroyed by the over-grazing of cattle and rapid deforestation for different purposes (Desallegn, 2004; Freeman, 2006; NSNP report, 2010 cited in Samson, et al., 2010).



**Fig.8** Habitat Destruction © NSNP, 2018

**Biodiversity Degradation:** Due to habitat destruction, and related factors, degradation of biological diversity is also a critical problem in NSNP. The density and abundance of both plants and animals is significantly declining and has now reached a critical stage (NSNP, 2010 cited in Samson, et al, 2010). Plants that have multiple uses: food, fodder, timber production, charcoal making and medicinal value, are over-consumed and are reaching at stage of extinction. For example, *Cordia Africana*, *Trichilia dregeana* *Teclea nobilis* are the most threatened and critically endangered plant species in the park as the result of over consumption and weak management (Lemlem & Fasil, 2006).

It has also been mentioned that the other important factor for loss of biodiversity is the transmission of diseases from domestic animals to wild ones as the result of their mixing and contact. Trypanosomiasis, anthrax and rabies are the main wildlife death-causing diseases that have been transmitted through the contact of wild animals with domestic cows, sheep and dogs. As the result of the mixing of domestic animals with the wild ones, Zebra are the most threatened wild animals (1-5 per month) (Afework, et al., 2015). Our discussion with the manager also

revealed that wild animal migration as result of habitat destruction, is the greatest problem of the park. Many important fish, birds, and small and big mammals that live in the park ecosystem are being affected and their reproduction rate has also been critically disturbed.



**Fig. 9** Sharing of grazing land between the wild and domestic animals (left) and death of zebra by transmitted diseases (right) Source: NSNP, 2018

### **Measures being taken by the Stakeholders**

Currently, the Ethiopian government in general and the administration of the park have taken remarkable steps to address the current destruction of the park and control the impacts of investment projects and local community on the natural resources of NSNP. For example, environmental institutions are now established from the federal to the local level, and environmental issues including protected areas incorporated in the 1995 Constitution of the country- articles 44 and 92- can exemplify the fact. In addition, for the sustainable use and protection of biodiversity the government has crafted new policies, strategies, laws, guidelines and proclamations. It has also engaged in working with other countries and NGOs and adapted different international conventions that have an important relationship with biodiversity and environmental protection issues.

Despite the constrains and gaps at the local level, the NSNP administration office is working fully in its effort to withstand the current threats and problems of the management of the park and is seeking to scale up the existing services of the park. The office is working with the community for successful implementation of community based soil and water conservation practices. It supports the local community in the provision of materials, seedlings and technical help. It has signed agreements with the rural administrations to apply Sustainable Participatory Park Management Project. The other specific measures taken by the office are, collaboration of stakeholders with some of the illegal wood-cutters now ceasing and others now employed as scouts. Many illegal firewood collectors are employed as temporary laborers in park, jobless youths from Arba Minch town are grouped using Small and Miro-enterprises and engaged in forestry activities such as firewood collection, honey production, animal production and eco-tourism. With the collaboration of the local community reforestation programs were undertaken. Agreement have also been made with the Oromia and SNNPRS governments to solve the demarcation of land problem. The park has also made agreements with numerous academic institutions to undertake scientific research on the problems, and design ultimate workable solutions. The office is also working to empower its capacity, in human, material and financial resources with collaboration of some NGOs (Discussion with park manager, 2018).



## Conclusion and Recommendation

NSNP is one of the national parks in Ethiopia aimed at the conservation of biodiversity of both flora and fauna. With regard to values, the park has numerous economic, social, aesthetic and cultural values for the people who are living inside and around the park boundaries. In addition, for the tourism development of Arba Minch town and surrounding areas the contribution of the park has taken the lion's share. The analysis shows that due to multiple factors and inadequate management, the wide range values of the park are continuously declining at significant levels on an ongoing basis. Using the park for different economic activities such as the expansion of agricultural land, grazing land, as an investment center, for the establishment of new settlements, as a source of livelihood for migrants, both temporary and permanent, has been ongoing.

In addition, jobless people significantly threaten the sustainable management and use of the park. Lack of political commitment among local leaders, conflicts of interests between the local community and the park administration and regional governments, lack of clear demarcation, and administrative instability all have a strong negative influence and tend to hold back the management practices and strategies as well as make for the unsustainable use of resources especially the forest, grasslands, fishing areas and wetlands. Exhaustive deforestation, habitat destruction, loss of biodiversity and the untimely death of wild animals are the consequences resulting from unsustainable use of and inadequate park management. Despite the gaps and constraints, the government at different levels and the park administration office have tried to control the problem by taking different measures and actions. But the problem is perpetuating at an alarming rate. Therefore, in order to control the trend and address its impacts as well as to reap the immense values of the park in a sustainable manner all stakeholders must work in full and make efforts to collaborate.

## Recommendations

Based on the analysis of data the following recommendations are forwarded to overcome the threats and challenges of NSNP Management and for sustainable use of the natural resources for socioeconomic development.

- In the first place the boundary of the park should be delineated and then demarcated by discussing it with stakeholders. It is also important to identify and specify the core and buffer zones of the park for better management and sustainable use.
- The Park administration should strengthen its work with the local, national and international stakeholders to implement and enforce different legal frameworks: rules, regulations and management strategies.
- The local community and regional governments, should not conflict over the use of the park and work jointly to reap its benefits at both the local and national level of sustainably and empower the park to meet its objectives.
- Involve local people and authorities in finding a way to stop illegal hunting, cutting of trees, fishing, and encroachment of farming by the local community and design strategies and projects that enable the use of the park for socio-economic development without depletion and destruction of natural resources.
- The investments undertaken around the park should be environmentally sustainable and compatible with objectives of the park
- The reforestation and watershed management projects must be strengthened by mobilizing the local community and other stakeholders including voluntary activists.
- All tourism related activities should be sustainable environmentally and should support the management of the park and nature resources.



- With the collaboration of the local community, government and NGOs, the capacity of the park management should be improved and there should be empowerment of human resources and meeting of good vehicle and financial requirements.
- In collaboration key stakeholders provision of alternative and permanent livelihood strategies for women and jobless youths is also important to reduce the pressure on the park
- It is conceived that environment education is the key strategy for management and conservation of natural resources. Thus adequate and comprehensive education about the park and sustainable use of the resources should be designed and given to the local community and other concerned bodies.
- Create and strengthen the linkages with academics and research institutions that conduct research on the interface between national parks and livelihood improvement is also important to harmonize the interaction of the park management with the local community.

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