

# Critical Solutions for Critical Problems: Threats to Sustainable Use and Management of Nech Sar National Park (NSNP): Ethiopia

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## Abstract

In flawless speaking, National parks are considered as 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, thus, was 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 main sources of data. Apart this, interview and personal observation 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: using of the park as primary source of livelihood : using it as grazing land, expansion of agriculture, establishment of settlement, and investment center are the most important factors that are threatening and challenging the management of the park., conflict of interests, lack of political commitment, lack of clear demarcations, and capacity problems were also other factors that constraint the sustainability of the park. Therefore, in order to use the park for its primary management objectives, overcome the chronic threats of the management, and reap the benefits in a sustainable way, all stakeholders should work hand in hand rather than starving to meet its own individual interest with the expense of the park and its objectives.

**Keywords:** Park Management, Threats and NSNP

## 1. Introduction

Currently, one of the greatest proximate threats facing biodiversity and its services is habitat destruction which is primarily resulted from human population growth coupled with expansion of land demand for different uses (Vial, 2010); small scale farming, investment, urbanization and construction of infrastructures. 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 escalates the socio-economic and ecological services.

Protected areas; like national parks, game reservoirs and sanctuaries are conceived as the most important strategies for conservation of biodiversity and its socioeconomic, cultural and environmental values (Tafesse, 2008) and critical to establish harmonious relation between nature and human (INCN, 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 managed through legal or other effective ways (IUCN, 1993 cited in Phillips and Harrison, 1997). It encompasses the conservation strategies that range from areas strictly protects human intervention to those that allow for sustainable human use and planned innervations (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, in the world almost all countries have designated sites for wildlife protection and adopted bylaws for protection and managements of the biological diversifies within and around the protected areas. Supporting it, many public, private, community and voluntary organizations are active in involving in management process and practices. In addition, there is also international network of protected areas created under global conventions and regional agreements (IUCN, 2007). As the result, currently there are 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 critically endangered species both flora and fauna, currently the management of those areas has been challenged by conflict of interests between the local community for economic, livelihood, social and cultural values 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 and Stellmacher, 2012; Lemlem and Fassil, 2010; Phillips and Harrison, 1997,...). Furthermore, the UNEP-WCMC (2017) and IUCN (2007) reports endorsed that climate change and extreme weather conditions and its resultant effects have been also the critical challenges that limited the protection and sustainable management of protected areas as well as its biodiversity throughout the globe.

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

In Ethiopia, therefore, it is conceived that protected areas especially national parks have played peculiar contributions to conservation and regeneration of both flora and fauna species particularly for plants and wild animals that have limited geographical coverage and number of individuals which are critically endangered. The concept of conservation and designation of national park has long history in the country. In different regimes, the Ethiopian government has taken steps to sustainable conservation of biodiversity and address the constraints of the conservation and management activities. For example, the government in different time adopted legal frameworks, established institutions and signed and ratified international conventions and agreements related with protection and sustainable use of biodiversity (FDRE, 2005). The first legal wildlife regulation in Ethiopia was issued in 1908 by Emperor Menelik II. And then 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> land is allocated for wild life conservation (IBD, 2012).

Many scientific research reports pinpointed that owing to all-round socioeconomic and political problems, most of the parks have failed to achieve the 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 and Fassil, 2010; Girma and Stellmacher, 2012; ...). Moreover, there are many problems resulted from long lasting unwise and unplanned use of natural resources, which have been aggravated by chronic food insecurity and prolonged drought as well as widespread poverty (Freeman, 2006 and Tafesse, 2008).

Furthermore, the 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 impact on the management of the parks (Anteneh, et al., 2014 and Girma and Stellmacher, 2012). In conclusion, from the above empirical literature it can be understood that national parks in Ethiopia are under all rounded 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 the major tourist attraction natural sites, it has been one of strongly threatened and serious degraded parks that needs immediate responses to recover and conserve its biodiversity and landscape resources (Aramde, et al., 2012 and 14). The park management is constrained by different interconnected and complex socioeconomic, political and administrative problems starting from the last few decades (Schubert, 2015); which are significantly daunting the biodiversity and its overall services. In general, different interrelated factors are destructing and becoming the grave challenges to the management and sustainability of the park. Having these things in to consideration, this paper attempted 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 escalate sustainable use of resource and lowering the threats of management?

## 2. Methods of the study

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

## 3. The profile and short history of the study area

NSNP, one of the early-established and major tourist attraction parks in Ethiopia, is located in South western part of country in 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  $5^{\circ}51'6''$ N Latitude and  $37^{\circ}32'37''$ E Longitude (Aramde, et al., 2012). It also covers an area of  $514 \text{ km}^2$  of which  $436 \text{ km}^2$  and  $78 \text{ km}^2$  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 is adopted in 1908 by Menelik II. Regarding establishment and governance of protected areas, however, remarkable achievement is observed starting from 1960s as consequence of UNESCO's experts involved in identification and delineation of protected areas in the country. In 1962 at the UNESCO conference held in Paris, Ethiopia requested assistance of world community, particularly UNESCO for developing and managing national parks and wildlife areas. As the result, UNESCO assigned game warden experts to assist in the establishment of national parks and reserves and providing technical and skill supports for Ethiopian staff from 1964-65 (Blower, 1968 cited in Abyot, 2009). Based on the recommendation of UNESCO assigned team, Awash, Omo valley and Semien Mountain became the first national parks in the park history of the country.

Later in 1967 UNESCO has also suggested including the Nech Sar plain as a game reserve (freeman, 2006 and 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 and Freeman, 2006). The original area of the game reserve does not 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 (SFC) 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 SFC 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; it constitutes nearly 20% of the biodiversity of the country (look table1). Many flora and fauna species are found in the park. The lakes and the natural vegetations of the park are the home for different wild animals and 40% of bird species of the country; that have great power of 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 and Stellmacher, 2012 and Molla, 2017), over woodland and shrub land on the volcanic hills between the two lakes (known as the "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

A part from numerous ecological services and tourism values, it has undeniable roles of socio economic development and survival of the people of Arba Minch town and surrounding rural areas (Aramide, et al., 2012; Freeman, 2006 and Samson, et al., 2010). According to the park's manger, it has also vital contribution to income generation for jobless youths and women and livelihood diversification to people settled around the park.

However, the manager stressed that balancing the community's demand and conservation of the park for its intended objective [protection of the flora and fauna] is becoming 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 the critical problem of the park. Apart these, studies have shown that lack of political commitment, conflict of interests, weak management capacity and lack of clear demarcation strongly limit and challenge the management of NSNP (Freeman, 2006; Girma and Stellmacher, 2012; Schubert, 2015).

#### 4. Result and Discussion

##### Major Natural Resources in NSNP

This section of 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 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 one. However, in recent years, the forest is under heavy pressure from firewood collectors and charcoal burners from nearby Arba Minch town 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 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 existing in Ethiopia, 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 wild lives is under severe threat. Consequently, the number of animals in and around the park is declining and leading to the extinction because of destruction of habitat

**3. Flora:** The floristic composition of the park contained ranges between 700-1000 plant species, of which only 276 species have been so far identified and documented. These different plants species have multiple functions: provision of food, edible fruits, medicinal value and 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 park which give 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 larger grazing areas around the Guji and Kore residence. Like other resources of the park, however, grasslands are being trampled and destroyed due to over grazing and 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 way to make local

fishing boats, stools and fencing which only cause decline in the *Sokke* itself but also loss and decline 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 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 for hippos.

**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 water supply. The springs are also a significant in 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 local community.

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

In order to meet the objectives of national parks effective and for the sustainable utilization of its resources as well as adequate management; free from any constraints and challenges; has significant contributions in terms of protection of the natural resources, rehabilitation of biodiversity and properly utilizations 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 increase in population, increasing users expectation and its resultant effects encounter 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.

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

Human population growth accompanied with unsustainable use of natural resources has been causing tremendous impact 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 seasonal migrants who are engaged in illegal wood collection and fishery are the primary beneficiary of the park for a long time (Abyot, 2009 and 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 park (Schubert, 2015). For example, since the last three decades, the population of Arba-Minch town has shown a tremendous growth. According to the CSA report, the number of total population 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 population growth of the town. The park manager assured that those immigrants have also been the critical problem for the management of the park because most of the immigrants have preferred the park resources for their job opportunity and livelihood generation hoping that it may help them escape from or at least reduce challenges of living cost in the town. He further stated that lack of job in the town that can accommodate the increasing human population has been causing 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, fire wood, and income generation which unprecedentedly exacerbating the destruction of the park and significantly challenging the management of the park for sustainable use and to meet its objective. Similarly, the research conducted in Berazil at Catimbau national park displayed that protected areas are the main strategy for environmental conservation but the ever growing of human population and increasing of demand of the park for economic and other benefits resulted in sizably affect the biodiversity and became main challenge of management practices (Machado, 2017).

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

It is obvious; urbanization; 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 and Nick, et al., 2014). Urban growth increases the demand for forest and other resources for different uses. Arba Minch is one of the fast 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 solid contribution for distraction of the resources and facing critical threat on sustainable management of the park.

Furthermore, the construction of new settlements and the expansion of the existed villages especially in Selle Kebele have brought observable 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 very fertile land. Although this land is part of forest; currently it is being utilized for establishment of 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 great problem on conservation and management of the park. (freemand, 2006 and Schubert, 2015).

### C. Using of the park area as agricultural Investment center

The establishment and expansion of investment, epically commercial agriculture, with in and around the Nech Sar Park has played its on part for the destruction of biodiversity and unsustainable use of resources. The forest, wetlands and the aquatic life including fish species are strongly threatened by the expansion of agricultural investment and the chemical 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 (to the side of the Air Port) and the South West (to 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 the big challenge for management of protected areas and sustainable use of its resources (Jachmann, et al., 2011).



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

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

### D. Using of 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 the boundaries of it. Is used for the grazing and fuel wood collection by Arba Minch town people, 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 forest, grass land and fish resource is important socio-economic driver to 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 majority of the smallholder farmers in the surrounding areas are agricultural dependant and confined to subsistence life, they strongly need the park for livelihood diversification to support their income generated from agriculture especially when there is 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 production of fuel wood and charcoal from forest to Arba Minch town. As the interviewee’s explanation indicates that using of the park and its natural resources as permanent and/or temporary source of livelihood and employment opportunity by the local people, it will have challenge 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 to environmental protection and conservation (Nick, et al, 2014).

### E. using NSNP as primary source for wood production

Still now, in developing countries including Ethiopia forests are the primary source of wood to construction, and energy demand. Majority of Arba Minch town dwellers and almost all the rural population those 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 weighs of 45 kg each fire wood & grass and suck of charcoal are daily extracted from the forest and enter to Arba Minch town. The 98% of Arba Minch town population demands 122.5000 kg fuel wood from 7500 hectare of natural forest which returning 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 the highest number engaged in fuel wood for collection with 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

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**Fig.4 Wood collection for different purposes**

According to the manager, illegal wood cutters have also significant direct contribution for degradation of the forest. Illegal woodcutters are those individuals seasonally moved from the Gamo Highlands and other surrounding rural areas to the town and who use the forest as 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 fuel wood in order to generate additional income. Some of them stay in rental house in Arba Minch town and the rest stay in side of the forest. They have considered the forest as means of livelihood diversification. During field observation the researchers have observed charcoal production sites which are established by those illegal woodcutters inside the park. Thus, it can be concluded that the high demand of wood especially for: fuel wood, charcoal production and construction materials seeming beyond the carry capacity which eventually have direct consequences on sustainable management and use of the park.

### F.Using of the Park as grazing land and source of fodder

In most national parks of Ethiopia, the community living closer to and around the park claims the park land as grazing land and open for browsing. Since majority of the surrounding community in Arba Minch are relied on livestock production in a mixed manner of farming, they have been using the forest, grass land and wetland areas as main source of grazing land for a long period of time. In addition to this, numerous number of the town dwellers are relied on the urban agriculture particular livestock raising dependent on the surrounding available fodder. This becomes worst when many of elderly and retired people in the town and rural people especially Guji pastoralists have increasing number of cattle for their livelihood generation and survival. In the interview, the park manager has confirmed his frustration that the number of the livestock is inclining to be beyond the relative carry capacity of the grass land; which causes for degradation. Thus, the overcrowded livestock creates a direct pressure on the forest and wetland and destroying 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 impact of the wild life in particular and may exert its influence on sustainability of the park in general.



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

### **G. 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 significantly increases in Arba Minch town. The park manager; and the study 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 taken by key stakeholders, this unsustainable tourism development have impacted significantly the natural resources and its services of the park (Mulugeta and Erchafo 2017 and Schubert, 2015). It will be also critical threat for the management of the park in the near future.

### **H. Policy Failure and Disagreement**

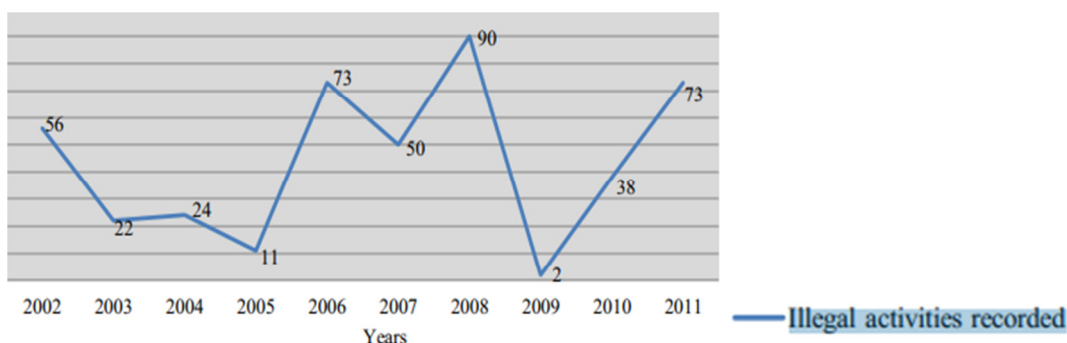
As equal as formulation, implementation of policies and regulations is essential for management of protected areas and its natural resources. The NSNP manager explained that Ethiopia has smart environmental and wildlife rules, regulations, and proclamations for protection and sustainable use of environmental resources including protected areas. However, due to numerous reasons: lack of full implementation of those policies, strategies and regulations; especially at local level remains the critical bottleneck in conservation and proper management of parks. Likewise the great failure in 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 unresolved problem in management of natural resources and NSNP. In general, lack of implementation of legal frameworks and the disagreement among different socio-economic and environmental policies sizably accelerate rate of resources degradation and holdback the management practices of the park.

### **I. Land use Conflicts Among the Stakeholders**

The interest conflict among the local communities and the disagreement among stakeholders especially between the Oromia and SNNPRS regarding the demarcation of the park have significant role for limiting the management of the park (Girma and Stellmacher, 2012 and 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 for fuel wood, charcoal and livelihood base and the park administration wants for conservation and protection of biodiversity. As the park manger 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 objectives.

It is a naked reality that stable and well organized administration institutions is assumed to be very crucial for management of protected areas. In contrary, administrative instability is not uncommon and it is also one of another big challenge for 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 taken by the federal government in one time and non-governmental organization (African Parks Foundation) and regional government (SNNPRS) in other time (Schubert, 2015). This administrative instability increases the occurrence of illegal activities and can be the cause of weak management and governance practices. The following graph displays the recoded 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, lack of clear demarcation of the national park from the sounding areas is source of conflict among stakeholders and aggravating factor to resources destruction particularly the forest and grass lands. Here, the park manager strongly explained that starting from the park establishment till now, number of negotiations and discussions have been made with stakeholders; however, still it is hardly possible to reach on consensus to demarcate 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 significantly supported the ideas of the manager. In general, Conflict of interests, administrative instability and lack of well-defined boundaries can have irreversible power to enhance illegal utilization and exhaustive distraction of important resources. It has also resulted in very complex and poor the management of the park. This problem continues to be so unless, all stake holders that have responsibilities and concerns for the park work together to avoid the problems; socio-economic and political problems and harness the common benefits of the park sustainably with effective conservation and management practices.

#### **J. Expansion of Invasive Species**

While deforestation, overgrazing and over utilization of resources undertake on fragile ecosystems coupled with the current climate change, fertile grounds will be created for easily spread of invasive species which totally distress and dominate the existed ecosystem. Currently, there are many invasive species that are increasingly spreading around NSNP which have influence 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** ©Schubert, (2015).

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

#### **5. Consequences of NSNP degradation**

NSNP is one of the protected areas and 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 application of legal policies and legislations due to different direct and indirect factors (freeman, 2006). The discussion result also shows that due to lack of political commitments of the local leaders of government observable and multiple adverse consequences have been recorded on 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 continuing problem. The over consumption of 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 table bellow, 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. In contrary, there was analysis revealed that expansion of farm land (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		Area		Area		Rate of Change
	(ha)1985	%	(ha)1995	%	(ha)2015	%	
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)

These natural forest and wood lands are the habitats of important large and small animals. In NSNP, we found different animals: Zebra, Grant's Gazelle, Kudu and Lion. Despite to home services, the provision of food and water for these animals and birds is the other extreme importance of the forest and wood land (Lemlem and Fasil, 2006). However their habitat is currently being destroyed by the over-grazing of the cattle and 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 the critical problem in NSNP. The density and abundance of both plants and animals is significantly declining from time to time and now reach at critical stage (NSNP, 2010 cited in Samson, et al, 2010). Plants that have multiple uses: food, fodder, timber production, charcoal making and medicinal values are over consumed and reach at stage of extinction. For example, *Cordia Africana*, *Trichilia dregeana* *Teclea nobilis* are the most threatened and critically endanger plant species in the park as the result of over consumption and weak management (Lemlem and 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 transited though the contact of wild animals with the domestic cows, sheep and dogs. As the result of the mixing of domestic animals with the wild one; Zebra is the most threatening and dying wild animal (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 fishes, birds, and small and big mammals that live in the park ecosystem 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) © 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 established from federal, to 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 made different policies, strategies, laws, guidelines and proclamations. It has also engaged in working with other countries and NGOs and adaption of different international Conventions that have relation with biodiversity and environmental protection.

Despite the constrains and gaps at local level, the NSNP administration office is working in full of its effort to withstand the current threats and problems of the management of the park and 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 provision of materials, seedlings and technical helps. It has signed agreements with the rural administrations to apply Sustainable Participatory Park Management Project. The other specific measures taken by the office are; with collaboration of stakeholders are some of illegal wood cutters ceased and others employed as scouts; many illegal firewood collectors employed as temporary laborers in park; jobless youths from Arba Minch town are grouped using Small and Micro-enterprises and engaged in forestry activities: fire wood collection, honey production, animal production and eco-tourism; with collaboration of the local community reforestation programs were undertaken. Agreement also made with the Oromia and SNNPRS governments to solve the demarcation problem. The park has also made agreement with academic institutions to undertake scientific research on the problems, and design ultimate solutions. The office also is working to empower its capacity, in human, material and financial resources with collaboration of NGOs (Discussion with park manager, 2018).

## **6. Conclusion and Recommendation**

### **Conclusion**

NSNP is one of the national parks in Ethiopia aimed for the conservation of biodiversity 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 tourism development of Arba Minch town and surrounding areas the contribution of the park has taken the lion share. The analysis shows that due to multiple factors and inadequate management, the wide range values of the park are continuously declining at significant level from time to time. Using of the park for different economic activities such as expansion of agricultural land, grazing land, investment center, establishment of new settlement, source of livelihood for migrant, both temporary and permanent; jobless people significantly threaten the sustainable management and use of the park. Lack of political commitment among local leaders, conflict of interests between local community and the park administration and regional governments, lack of clear demarcation, and administrative instability have strong influence to hold back the management practices and strategies as well as for unsustainable use of resources especially the forest, grass land, fish and wetlands. Exhaustive deforestation, habitat destruction, loss of biodiversity and death of wild animals are the consequences resulting from unsustainable use of and inadequate park management. Despite the gaps and constrains, the government at different levels and the Park administration office have tried to control the problem by taking different measurements actions. But still now the problem is perpetuating at 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 sustainable manner all stake holders must work in full of their effort in collaboration way.

### Recommendation

Based on the analysis of data the following recommendations are forwarded to overcome the threats and challenge 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 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 works with the local, national and international stakeholders to implement and enforcement of different legal frameworks: rules, regulations and management strategies.
- The local community, regional governments should leave out from conflict over the use of the park and work jointly to reap the benefits of at local and national level 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 to use 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 strengthen 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 collaboration of the local community, government and NGOs the capacity of the park management should be improved and empower: human power, 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 linkage 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 local community.

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