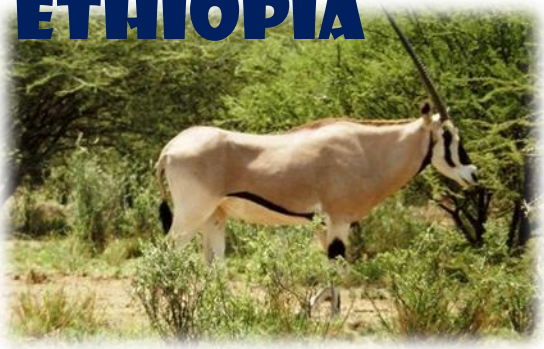
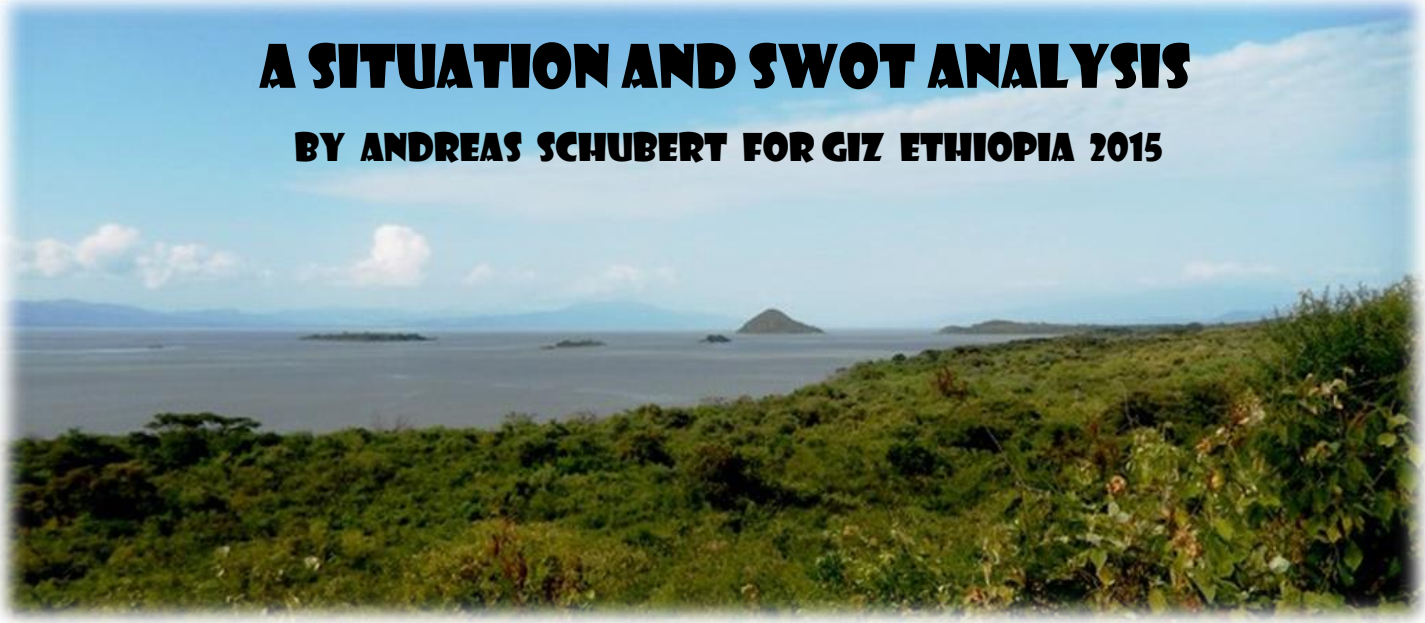
AWASH AND NECH SAR NATIONAL PARKS, ETHIOPIA



A SITUATION AND SWOT ANALYSIS

BY ANDREAS SCHUBERT FOR GIZ ETHIOPIA 2015



Awash and Nech Ssar National Parks, Ethiopia

A Situation and SWOT Analysis

For the

GIZ Biodiversity Conservation Program

In Ethiopia

presented by

Andreas Schubert

(Short-term Consultant for GIZ)

Addis Ababa, 31 – 08 – 2015

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I. The Biodiversity and its conservation in Ethiopia

1.1 Biodiversity in Ethiopia

The flora of Ethiopia is very heterogeneous and has many endemic elements. The Simien and Bale Mountains have been identified as areas of plant endemism of continental importance. Their flora is diverse and the afro-montane representative show affinities to South African, Eurasian and Himalayan elements. The Southwestern broad-leaved evergreen forests show affinities to the Congolian forests of western Africa.

Vegetation types in Ethiopia are highly diverse ranging from afro-alpine to desert vegetation. It has a large number of plant species and a recent work indicated that the number of higher plants was over 7000 species from which 12 % are probably endemic.

Likewise, Ethiopia is also unquestionably a critical region for faunistic diversity. With the limited studies that have been undertaken in the country, numerous categories of terrestrial and aquatic resources such as mammals with 320 species of which 36 are endemic, birds with 862 species – 16 endemics, reptiles with 201 species (9 endemics), amphibians with 63 species (24 endemics) and fishes (180 species out of which 40 are endemics).

Domestic animal species that are known to have originated elsewhere have also developed secondary diversification in Ethiopia. This diversity of biological resources is a clear demonstration of ecosystem diversity and biological wealth existing in the country.

The diversity of organisms in an ecosystem provides essential foods, medicines, and industrial materials. In Ethiopia, no less than 80 percent of the rural community and a significant proportion of the urban dwellers depend on herbal medicines for their primary health care delivery system. In addition to foods, medicine, fuel wood, and construction materials, biological resource especially forests provide wildlife habitat and recreational opportunities, prevent soil erosion and flooding, and help provide clean air and water. Biological resources are also important biotic checks to pests and diseases and serve as defense line against global climate change.

Ethiopia is considered as one of the richest genetic resources centers in the world in terms of crop diversity ever since the expedition and plant collector N.I Vavilov in the 1920s. This is principally attributed to socio-economic, cultural diversity and complex topography. Crop plants such as coffee (*Coffea abyssinica*), Safflower (*Carthamus tinctorius*), teff (*Eragrostis tef*), noog (*Guizotia abyssinica*), anchote (*Coccinia abyssinica*) are known to have originated in Ethiopia. Local farmers grow a great variety of crops like wheat, barley, sorghum, field pea, faba bean. Relatives of some of the world's important crops with enormous genetic diversity are abundant in the Ethiopian region.

Threats to biological resources. Unfortunately, human activities have greatly reduced biodiversity around the world. The greatest threat to biodiversity is loss of habitat as humans develop land for agriculture, grazing livestock, draining wetlands and clear-cutting forests for agricultural land. On the other hand humans pollute air, soil, and water through unwise use of chemical compound like pesticides. Human population increases and its encroachment on natural habitats expand, having detrimental effects on the ecosystems on which they depend. In the Ethiopian context, the most drastic damage has occurred in the natural high forests and their biological resources that have once covered more than 42 million ha, which was 35% of total land area.

1.2 Theoretical Framework for this Analysis

In the Strategic Plan of the Biodiversity Convention (2011-2020), the Aichi Biodiversity Targets were defined. They are 20 targets, under 5 strategic goals. Four of these goals and 15 targets (shown below) are relevant for this analysis and should be addressed in the strategies of the Biodiversity Program.

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: Biodiversity values are integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4: Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6: Fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well -connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12: The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

The Targets 17 to 20 focus on the government policy level and have little relevance for protected areas on the local scale.

The Ethiopian Government is implementing a set of activities in order to reach these 20 targets until 2020. In the national parks of Awash-Alledeghi and Nech Sar 15 of these targets can be used in order to induce an important change towards a sustainable land use and towards an effective protection and improvements in issues related to biodiversity and reliance to climate change.

Climate-Resilient Green Economy

In 2011 Ethiopia created a Climate-Resilient Green Economy Strategy CRGE. This strategy intends to achieve middle-income status for Ethiopia by 2025 in a climate-resilient green economy. Two of its four main pillars are relevant to the national parks and their surroundings, in the framework of this analysis:

1. Improving crop and livestock production practices for higher food security and farmer income while reducing emissions
2. Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks

At present the agriculture and livestock as well as the forest sectors play a key role in carbon dioxide production and sequestration. Improvements in these sectors will have a very important impact on adaptation and mitigation in climate related questions, as well as they do in terms of biodiversity protection and restoration as well as in soil protection and fertility.

Growth and Transformation Plan

The Ethiopian Growth and Transformation Plan (GTP) from 2010 mentions in its chapter 8.5 on Culture and Tourism that: … a wildlife conservation policy shall create conducive environment whereby the country's wildlife and their habitats are protected and developed in a sustainable manner:

- providing a leading service through the materials collected and organized through books, magazines, newspapers, archives, microfilm, audio-visual, internet,
- developing existing and new destination's as well as tourism products in kind, number and quality,
- conducting tourism marketing and promotional activities through a strong marketing network in order to be competent in the international tourism market competition,
- improving the standard of tourist service giving facilities, assess their competence, and conduct strong inspection and controlling activities,
- strengthening the cooperation between actors participating in tourism development,
- alleviating limitations of the capacity of the industry,
- re-demarcating existing protected areas with full participation of community and gazette and to establish new PAs,
- strengthening protected areas located at the boundaries of the country and transfer them to trans-frontier protected areas,
- promoting researches and studies on endemic wildlife resources ecology, genetic sources, population, distribution and biology and complete the data for better conservation,
- facilitating Ex-situ conservation mechanisms for species under the risk of extinction,
- controlling disease transmitting wild animals, building capacity in order to identify the etiology of the diseases, design prevention and control action,
- controlling illegal live wildlife and products trafficking at check-points,
- creating a conducive and enabling environment, to promote sustainable eco-tourism activities in line with internationally accepted standards.

II. Short-term Consultancy for Situation Analysis in Nech Sar and Awash National Parks

Background. Based on the intergovernmental negotiations held in September 2014, the German and Ethiopian Governments agreed to cooperate in the field of biodiversity conservation. Four areas have been identified for the German Development Cooperation to support conservation and sustainable use and management of biodiversity Technical Cooperation (TC), which is implemented by GIZ. GIZ is planning to start the operation of this Program soon. The Program will be implemented in Biodiversity Protected Areas: Nech Sar NP, Awash NP and in two Biosphere Reserves: Sheka and Yayu. The main purpose of the Program is to build the capacity of implementing partners at federal and local levels. Therefore, before the inauguration of the Program in these protected areas (Nech Sar and Awash), GIZ-Biodiversity Program hired an international consultant to conduct a Situation Analysis and SWOT analysis in these parks. The information will be used also as an input for the planning workshop for the Program.

Main Tasks of the consultancy

- Travel to both National Parks and collect data on:
  - Collect Biological data on mammals, birds, plants…
  - Tourism situation
  - Infrastructure of the park
  - Management of the park
  - Local communities involvement
  - Climate Change issues
  - Availability alternative livelihoods for the local communities
  - Invasive species
  - Illegal fishing in Nech Sar NP
- Conduct SWOT Analysis for both protected areas
- Elaborate Situation Analysis of the two parks, mainly;
  - On collected biological data: Mammals, Birds and Plants
  - On the Management of the park
  - On the infrastructure of the park
  - On the involvement of local communities
  - On the immediate, short-term and long-term needs of the park,…
- Conduct discussions with park management authorities at park level and with EWCA at HQ level regarding the results of the SWOT and situation analysis

Applied Methods during the studies

- Studies on available literature:
  - Published scientific articles on different subjects related to the two national parks and their surroundings
  - Management related documents
  - Articles and blogs from the internet
- Organization of these documents to create a virtual library for this analysis and future uses
- Visit to important institutions and organizations at the national level
  - EWCA and SDPASE project
  - PHE SCIP project
- Visit to the protected areas
  - Visit to the main attractions and resources
  - Interviews with authorities and the most important stakeholders

- Visiting project activities

➢ SWOT Analysis together with staff of the corresponding parks

➢ Presentation of Situation – and SWOT Analysis to authorities at national level

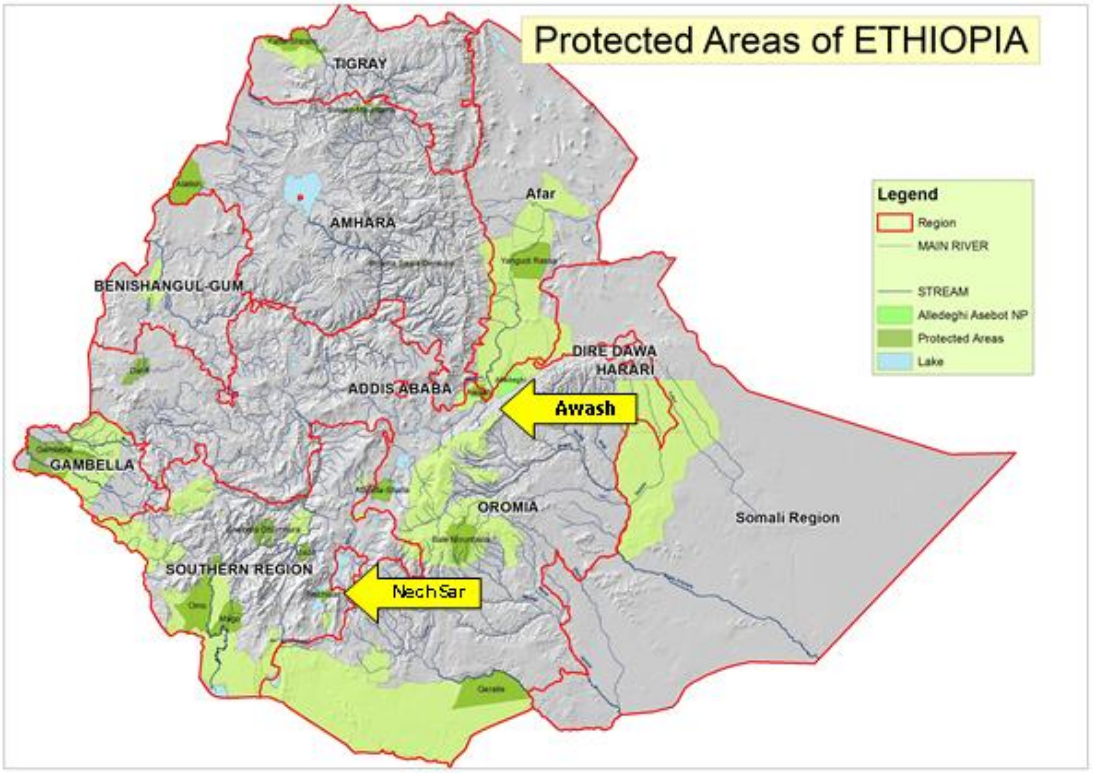

Figure 1: Location of the two national park areas Awash with Alledeghi – Asebot next to it and Nech Sar, both located in the Ethiopian Rift valley.

Awash and Alledeghi are about 200 km from Addis Ababa in the northern part of the Rift valley, while Nech Sar is at 500 km to the south of Addis. Both parks were visited by car.

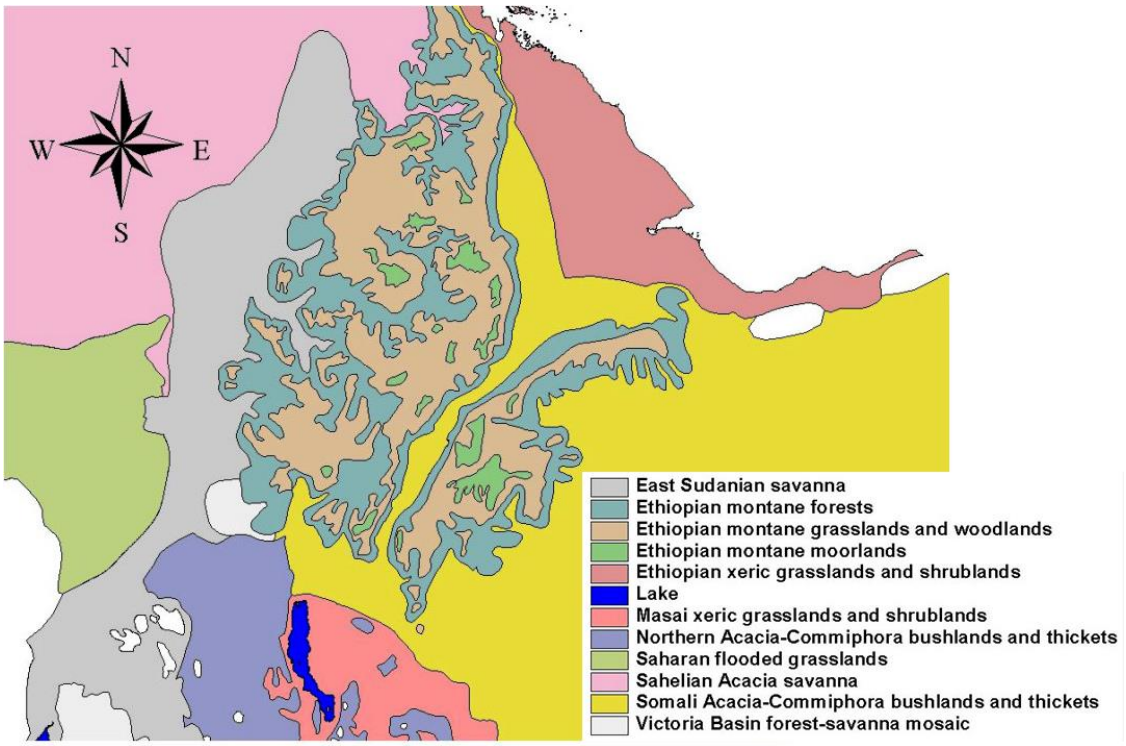

Figure 2: Vegetation types of Ethiopia and surrounding countries

III. Awash National Park (with Alledeghi – Asebot NP)

3.1 Physical conditions

Awash National Park and Alledeghi Asebot NP are located in the northern Ethiopian Rift Valley, just at the point, where this valley starts to widen into a funnel. To the southeast the area is bordered by the Somalian plateau, which reaches an elevation of about 4000 masl. To the northwest there are important escarpments from the plateau between Addis Ababa and Debre Birhan (2400 – 3000 masl) down to the floor of the rift valley. The valley floor in this area has an elevation of 750 to 1100 masl.

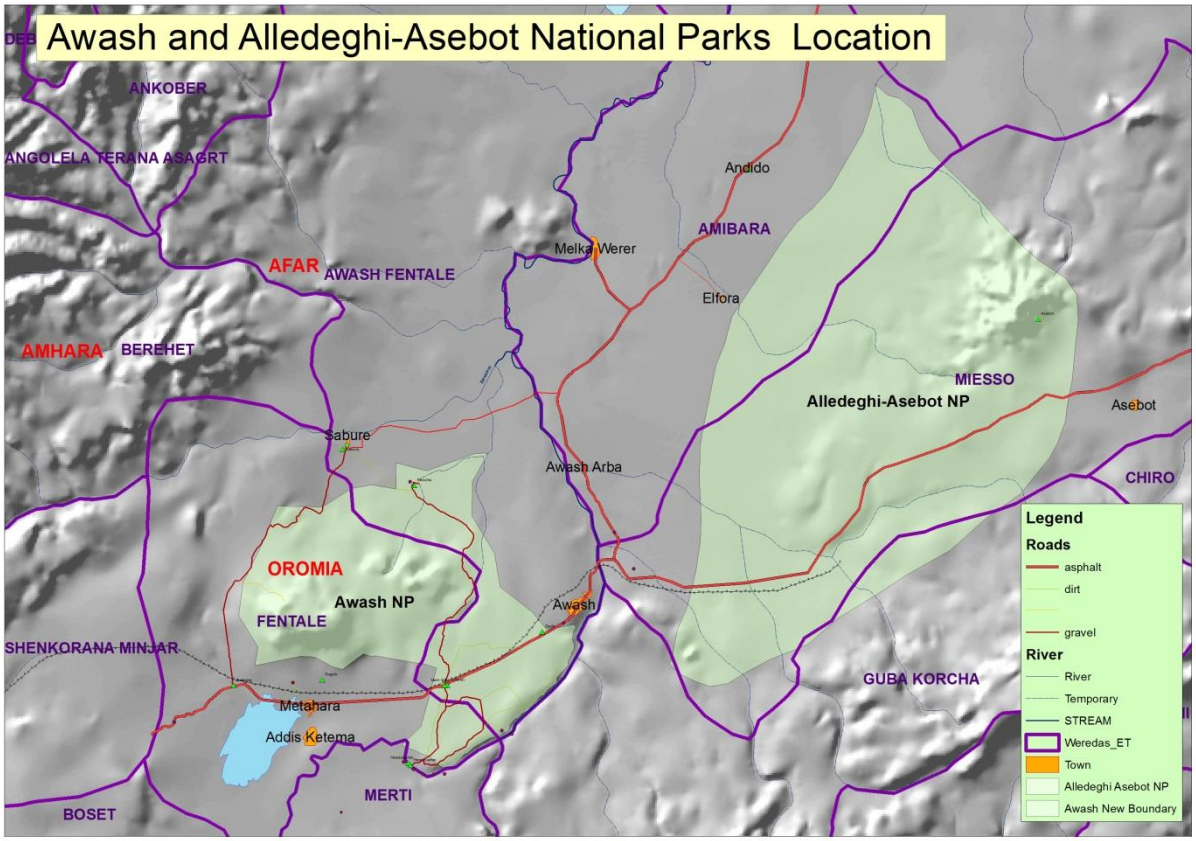

Figure 3: Location of Awash and Alledeghi-Asebot National Parks.

All along the Ethiopian rift valley there are volcanos; most of them are not active. In the Awash NP area mount Fentale arises, a volcano with an east-west running ecliptic caldera of 4 km length and 2.7 km width. At the highest point the rim reaches about 1870 masl. To the north and south there volcanos of minor height, like Dofen, Beru, Kone etc. They are generally at a distance of 20 to 40 km from each other.

The geomorphological features of the Awash-Alledeghi area include the Fentale volcano, with a caldera covering about 10 km^2. The surrounding rim arises to altitudes between 1400 and 1870 masl, from the rift floor at 850 to 1100 masl. To the north-east of the volcano there is smaller mountain area. Altogether the mountains cover an area of more than 300 km^2. These mountains were formed by volcanic activities and tectonic movement. They consist of volcanic rocks like basalt and tuff, as well as lava from recent eruptions at the mountain slopes.

Figure 4: Mount Fentale, important element in the Awash landscape

There are alluvial plains surrounding Fentale, like Ilala Sala plain to the southeast, stretching all the way to the Awash River gorge. It covers more than 100 km^2; most of it is included in Awash NP

- The plains around Metahara to the south of Mount Fentale, an area mainly used by agriculture, like sugar cane and other permanent or seasonally irrigated plantations. This area includes Lake Baseka, which has risen considerably in the last 4 decades. Its surface has augmented tenfold since the 1970s. However, the reason for this rising is not quite understood at the moment
- Sobober plains to the west of the crater. These plains extend for about 20 km between the foot of Fentale to the foot of the western escarpment of the rift valley.
- Plains to the north of Fentale, with agricultural areas east of Sabure, wetlands and palm stands around Filwoha hotsprings
- Plains to the northeast of Fentale reaching up to the Awash river gorge north of Awash town

Figure 5: Awash falls

- The Awash River gorge between Awash falls and Awash town, later from Awash town to the bridge north of Awash Arba. This gorge reaches a depth of up to 200 m in some places. It was carved into the plains during millions of years by the force of Awash River waters.
- The Alledeghi plains are composed of the following geographical features:
    1. Asebot Mountain: is a single mountain rising to almost 2500 masl from the surrounding plains. On its top grows a unique afro-montane forest, dominated by *Juniperus procera*.
    2. Alledeghi plains: Most of the plain is covered by grassland (632 km^2) in their central part. The surrounding areas are covered by shrub- and bushland, especially on both sides of the Addis Ababa – Djibouti highway.
    3. Drop to Awash River plain. This drop is a 5 to 10 km wide stretch that is covered by bushland in its upper part and by grassland or barren areas in the lower part. In the valley floor there are important wetlands covered by reeds. These areas serve as shelters for many animals, especially for lions

Geology and soils. The rocks in the rift valley and the escarpments are mainly of volcanic origin, including basalt, tuff and lava. Erosion and sedimentation processes have created large plains all along the Awash valley. Here alluvial soils are dominant.

Figure 6: Alledeghi plains

Climate and hydrological importance. The middle and lower Awash river basin have an arid or semi-arid climate with mean annual precipitations of less than 700 mm. There generally are two dry seasons, the first in June, the second between October and January and two rainy seasons, from February to May and from July to September.

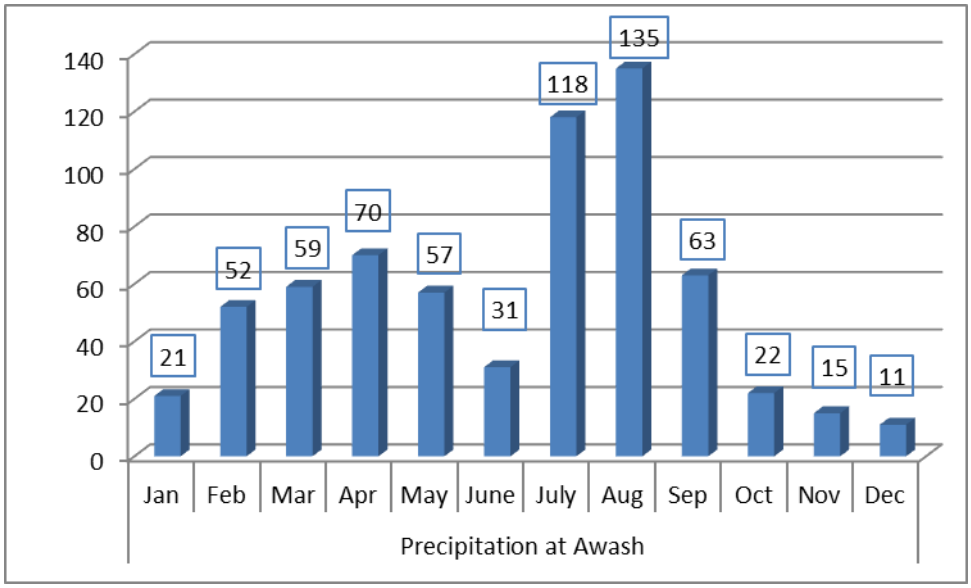

Figure 7: Mean annual precipitation at Awash town

The temperatures range from a low at about 15°C in January to a maximum of more than 35°C in June. During the rainy season in July and August temperatures tend to drop. Precipitation and temperature regimes change in the higher elevations like at Fentale mountains and along the escarpment of the rift valley.

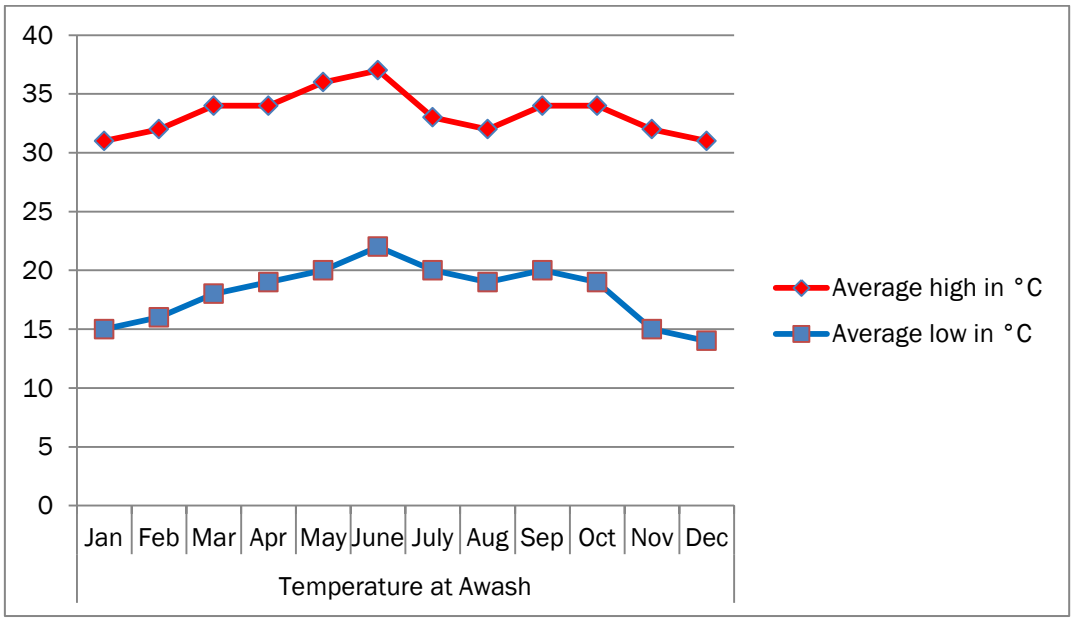

Figure 8: Average high and low temperatures at Awash town

The main source of water to the Awash – Alledeghi area is certainly Awash River. There are also three permanent tributaries entering Awash River from the mountains of Somalia plateau: Arba river and Hulo river. From the Ethiopian plateau to the west Kerem River runs down through a deep canyon, joining Awash River north of Awash National Park.

There are also a great number of temporary rivers or wadi that only carries water during the rainy seasons or after heavy rainfalls. Some of them do not reach Awash River, but end on an alluvial plain which can be flooded temporarily.

To the north of Mount Fentale a great number of hot springs and other sources of water come to the surface. This way extensive wetlands have been created just where the volcanic rocks give way to alluvial areas.

Much of the water from the rivers and the hotsprings run-off is being used to irrigate large areas for sugar cane and other plantations to the south and the north of Fentale, as well as to the west of Alledeghi.

Figure 9: Hotsprings at Filwoha

3.2 Biological conditions

Biogeographic settings. Like most of the rift valley the Awash – Alledeghi area belongs to the Somalia – Massai Vegetation Zone (according to White 1983). Both Awash NP and Alledeghi Wildlife Sanctuary include the ecosystems that are typical for this vegetation zone: grassland, shrubland and woodland, according to prevailing soil conditions. Besides, there are areas influenced by the existence of water, like the riparian woodland along Awash River and the swamps and palm areas in the northern part of the park, mainly around the Filwoha hotsprings area.

Grassland. The park's grasslands cover a total of about 118 km^2, most of it in the Ilala Sala plains and maybe some other 20 km in different parts of the northern slopes of Fentale volcano. Grasslands in Awash occur mainly on alluvial soils. They are dominated by *Chrysopogon plumulosus* and *Bothriochloa radicans* in the lower elevations, and Hypharrenia hirta and Themeda triandra at higher elevations. The Awash grasslands are very important for the oryx and the Summering's gazelles. The grassland can be in conditions of alteration, mainly as the result of impacts caused by overgrazing: with smaller or larger amount of bare soil, due to compaction by herding animals or by shrub encroachment, also triggered by overgrazing combined with drought. More than half of the grasslands suffer from this encroachment, while less than 20% can be considered dense or in a good state of conservation.

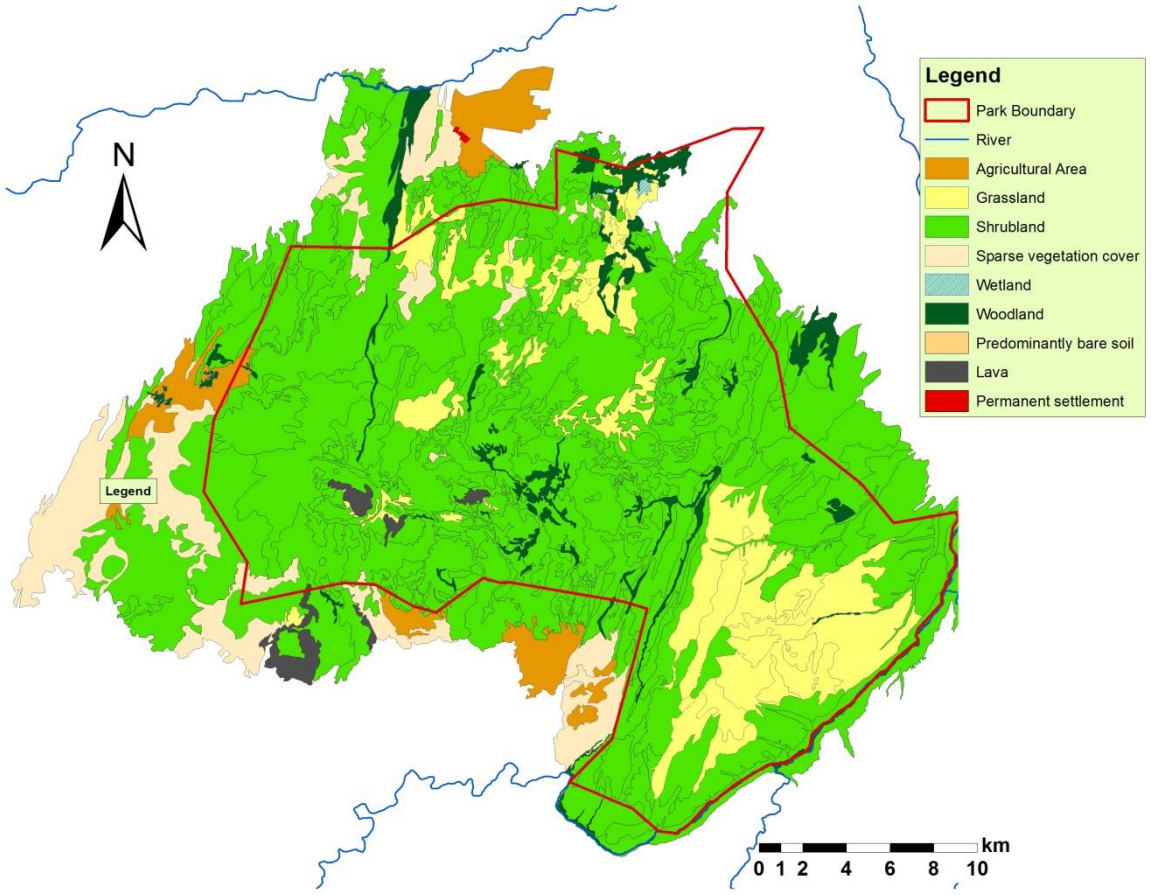

Figure 10: Vegetation of Awash National Park, according to M. Borsdorff and R. Tabea Klute

Shrubland. The shrubland is the most common type of habitat in Awash National Park. It covers more than two thirds of the park's surface and can be formed by different plant associations, dominated by different Acacia species, like *A. nubica, A. senegal and A. mellifera.* or by *Dichrostachys cinerea* or *Grewia* spp. The shrubland occurs in areas of welded tuff, andosols, regosols and solonchaks, although where grassland has been heavily grazed, shrubland may form on alluvial soils. About 25% of the scrubland can be considered as dense, some of it even with high trees among. The rest is either of irregular density or open, in many cases with many patches of barren soil.

Bush- or Woodland covers mainly areas with higher soil humidity and a more humid micro-climate. This is why it can be found mainly in valleys and along rivers, like Awash River, where it is forming riparian forests. Altogether wooded areas cover some 30 km2 in the park. This includes the Doug palm (*Hyphaene thebaica*) forests around the Filwoha hotsprings.

Wetlands. Especially in the northern part of the park there are important wetland areas. They include the hotsprings, ponds that have formed in the area and humid meadows. South of Filwoha newly formed wetlands were seen. Their water has a normal temperature – it is not hot. Extensive areas with former wetlands north and south of Awash NP have been changed to plantations (sugar cane and tropical fruits).

In several areas in and around Fentale volcano there are lava fields from relatively recent eruptions. Little by little these fields are taken over, first by pioneer vegetation, later by scrubs and bushes. Around the national park there extend areas with sparse vegetation and areas under agricultural use or cattle pastures. Many of these areas have been excluded from the park recently.

Figure 11: Newly formed wetlands near Filwoha

Awash Wildlife

Mammals. Jacobs and Schloeder (1993) identify 85 mammals, of which eight probably no longer occur in the park. For this reason only 76 mammal species were identified only a few years later (Tilahun et al. 1996). Since then the endangered Swayne's hartebeest (*Alcellaphus buselaphus swaynei*), reintroduced to Awash in the 1970s from Senkele Wildlife Sanctuary also went locally extinct.

The mammals found in the ANP that are listed on the IUCN Red List and/ or are endemic to Ethiopia includes five vulnerable species: Lesser horseshoe bat (*Rhinolophus hipposideros minimus*), Trident leaf-nosed bat (*Asellia patrizii*), Spot-necked otter (*Lutra maculicollis*), Lion (*Panthera leo*), Soemmerring's gazelle (*Gazella soemmerringi*).

Wild animals like Klipspringer (*Oreotragus oreotragus*), Salt's dikdik (*Madoqua saltiana*), mountain Reedbuck (*Redunca fulvorufula*), Jackal, and Crested Porcupine (*Hystrix cristata*) inhabit the bush land as well as the shrubland. Caracal (*Felis caracal*) favors shrubland as well grassland. Lesser kudus (*Tragelaphus imberbis*) can be seen near water bodies.

One Ethio-Eritrean mammal endemic species is the Trident leaf-nosed bat (*Asellia patrizii*) - also a vulnerable species. Also there are those mammals that contribute to the park's uniqueness, which include:

- Key antelope populations including: Beisa oryx (*Oryx beisa*), greater and lesser kudu (*Tragelaphus strepsiceros and T. imberbis*), in addition to those listed above. Population

estimates from the 2002 aerial survey were 1 395 Beisa oryx, 189 Lesser kudu and 97 Soemmerring's gazelles. In the present oryx numbers are believed to be around 400 in Awash NP.

The other species were not observed:

- Defassa waterbuck (*Kobus ellipsyprimnus defassa*),
- Salt's dikdik (*Madoqua saltiana*),
- Anubis and hamadryas baboons (*Papio anubis and P. hamadryas*), a focus for international research
- Leopard (*Panthera pardus*)
- Ardwolf (*Proteles cristata*)
- Bat-eared fox (*Otocyon megalotis*)

Figures 12 and 13: Bee-eater and Beisa Oryx, possible flagship species for Awash

Birds. More than 460 species have been recorded for Awash NP. *Serinus flavigula* is not uncommon (over 35 birds) on Fentale Mountain where a very small population of *Cercomela dubia* can also be found. Both *Falco naumanni* and *Circus macrourus* occur in small numbers during spring and autumn passage, with some individuals of both species overwintering. Other passage species include *Aquila heliaca* (rare) and *Acrocephalus griseldis* (uncommon). Nearly half the Somali–Massai biome species occur in the park. Of particular note are *Pterocles decoratus, Caprimulgus stellatus, Mirafra gilletti, Cisticola cinereolus, Cisticola bodessa, Lanius somalicus* and *Onychognathus salvadorii*.

The park is situated on a major flyway for Palearctic migrants, with large numbers of warblers and other species moving south through the area in September. Large numbers of waterbirds have been recorded from the park—though some of these were probably recorded from Lake Beseka which, when it was much smaller and probably less chemically contaminated, was more productive than it is currently. During the early 1970s, the eastern side of the lake was sometimes covered in flamingoes. The presence of an as-yet-undescribed Hirundo cliff swallow and an unidentified Serinus suggests that the avifauna of the park is far from completely known.

Endemic and threatened species. The yellow-throated seedeater (*Crithagra flavigula*) is a species of finch in the Fringillidae family. It is found only in Ethiopia. Its natural habitats are subtropical or tropical dry shrubland and subtropical or tropical dry lowland grassland. It is threatened by habitat

loss. This bird favors semi-arid areas with thick patches of scrub on rocky hill sides, scattered trees in savanna type areas.

Amphibians. There are not many studies on Amphibians and reptiles for Awash NP. Among the reported frogs there is *Ptychadena taenioscelis, Rana angolensis, Ptychadena cf. mascareniensis* and the toad *Bufo dodsoni*, which is living in temporary riverbeds.

The Hotsprings grass frog (*Ptychadena filwoha*) was first described in the 1970s. So far it has only been found in the ponds of the Filwoha hotsprings, where it is relatively common. This species is associated with permanent water, in which it breeds. It is found in pools among lava boulders, fed by effluent streams from a hot spring. It is unknown whether the species is tolerant to habitat alterations. Another frog, *Amietophrynus langanoensis* is known only from the northern Rift Valley of Ethiopia, where it has been recorded from two localities: Lake Langano and Awash NP. Both species are considered as data deficient DD.

Reptiles. In the 1970s a list of the species of reptiles known from Awash National Park was presented. It includes 39 species, most of them are also found in Northwest Somalia. *Coluber taylori* and *Philochortus phillipsi* appear to be new records for Ethiopia. A notorious reptile is the Leopard tortoise (*Geochelone pardalis*), which can be seen frequently, also outside of the park boundaries. In Awash River Nile crocodiles (*Crocodylus niloticus*) are present.

Figures 14 and 15: Leopard tortoise and Nile crocodile

3.3 Invasive Plant Species

When deforestation and forest degradation are exercised in fragile ecosystems, the productivity and holding capacity of the area decline and it becomes suitable for evasive species that aggressively take over the area and change the ecosystem and ecological dynamics of the area. Currently there are many invasive species that are flourishing around ANP such as *Prosopis juliflora, Lantana camara, Calotropis procera, Parkinsonia aculeata, Parthenium hysterophorus, Cryptostegia grandiflora, Senna occidentalis* etc. (Ayana et al. 2013). Conservation of the natural ecosystems is the primary means to controlling the expansion of invasive species and regulating the ecosystem dynamics.

The mesquite tree (*Prosopis juliflora*) is native to the Americas. It grows to a height of up to 12 m. A mature plant can produce hundreds of thousands of seeds. Seeds remain viable for up to 10 years. The tree reproduces by way of seeds, not vegetatively. Seeds are spread by cattle and other animals that consume the seed pods and spread the seeds in their droppings.

In the Afar Region in Ethiopia, where the mesquite was introduced in the late 1970s and early 1980s, its aggressive growth leads to a monoculture, denying native plants water and sunlight, and not providing food for native animals and cattle. The Afar Regional government and the NGO FARM-Africa are looking for ways to commercialize the tree's wood, but pastoralists who call it the "Devil Tree" insist that *P. juliflora* be eradicated. *Prosopis juliflora* threatens agricultural land and protected areas in the Awash National Park. It is aggressively invading pastoral areas in the Middle and Upper Awash Valley, and Eastern Hararghe, destroying natural pasture, displacing native trees, forming impenetrable thickets, and reducing grazing . In Awash NP the mesquite started invading from along the highway. At present it can be found also in the interior of the park: there are more than 20 sites registered, that are monitored and their plants are counted.
https://en.wikipedia.org/wiki/Prosopis_juliflora In Awash NP *Prosopis juliflora* is extensively emerging in places where cattle overnight for a longer period of time. The direction of the introduction of P. juliflora into the Park coincides with the major direction of pastoralist movement to the Park, which is from the northeast and south part of the Park by Afar and Kereyu and Ittu pastoralists.

The sage *Lantana camara* is a small perennial shrub which can grow to around 2 m in height and forms dense thickets in a variety of environments. Due to extensive selective breeding throughout the 17th and 18th Century for use as an ornamental plant there are now many different forms of *L. camara* present throughout the world.

In agricultural areas or secondary forests it can become the dominant understory shrub, crowding out other native species and reducing biodiversity. The formation of dense thickets of *L. camara* can significantly slow down the regeneration of forests by preventing the growth of new trees. Although it is itself resistant to fire, it can change fire patterns in a forest ecosystem by altering the fuel load to cause a buildup of forest fuel which increases the risk of fires spreading to the canopy. This can be particularly destructive in dry, arid areas where fire can spread quickly and lead to the loss of large areas of natural ecosystem.
Factors which have allowed it to establish itself are:

- Wide dispersal range made possible by birds and other animals which eat the berries
- Less prone to being eaten by animals due to toxicity
- Tolerance of a wide range of environmental conditions

- Increase in logging and habitat modification which has been beneficial to L. camara as it prefers disturbed habitats
- Production of toxic chemicals which inhibit competing plant species
- Extremely high seed production (12,000 seeds from each plant per year)

Effective management of invasive L. camara in the long term will require a reduction in activities which create degraded habitats. Maintaining functioning healthy ecosystems is key to preventing invasive species from establishing themselves and outcompeting native fauna and flora.
https://en.wikipedia.org/wiki/Lantana_camara

The Palo Verde tree (*Parkinsonia aculeata*) may be a spiny shrub or a small tree. It grows 2 to 8 m high, with a maximum height of 10 m. It forms dense thickets, preventing access for humans, native animals and livestock to waterways. Being a native species to Mexico*, P. aculeata* has become a major invasive species in Australia and parts of tropical Africa. https://en.wikipedia.org/wiki/Parkinsonia_aculeata

Parthenium hysterophorus is a species of flowering plant in the aster family, native to the American tropics. Common names include Santa Maria Feverfew and Whitetop Weed. It is a common invasive species in parts of Africa, invading disturbed land, including farms, pastures and roadsides. *Parthenium hysterophorus* was introduced accidentally through aid shipments, and is spreading rapidly, causing up to 90% reduction in forage production In some areas, outbreaks have been of almost epidemic proportions, affecting crop production, livestock and human health. It was first present as a contaminant in imported wheat. It can trigger allergies and is a common cause of pollen allergy.

Contact with this plant causes dermatitis and respiratory malfunction in humans, dermatitis in cattle and domestic animals, due to the presence of toxin parthenin. The presence of pollen is responsible for bitter milk disease in livestock fed on grass mixed with its leaves.
https://en.wikipedia.org/wiki/Parthenium_hysterophorus

Parthenium hysterophorus has spread over many parts of the ANP especially along road sides, seasonally inundated areas, following the riverbank of Awash above the camping site, around Kudu valley and in places where cattle overnight for long period of time. Domestic animals play a great role in transporting and disseminating certain weeds like *P. hysterophorus*.

Cryptostegia grandiflora, commonly known as rubber vine, is a woody-perennial vine that is native to south-west Madagascar. It has also been introduced to most other tropical and subtropical regions by man, because of its attractive flowers and the fact that its latex contains commercial quality rubber (hence the name). Seeds germinate after the first rains of the wet season, but growth does not become rapid until well after the wet season begins. However, if enough water is available, rubber vine can grow as much as 5 m in one month. Flowering usually occurs after the wet season ends, along with fruit set. It is usual to find both mature and immature fruit on rubber vine at any one time. Rubber vine seeds are dispersed by winds and flooding. This is particularly important in Australia where very large river floods can occur.

A rubber vine can grow up to 2 m tall as a shrub, but when it is supported on other vegetation as a vine, it can reach up to 30 m in length. Rubber vine prefers areas where annual rainfall is between 400 and 1400 mm. https://en.wikipedia.org/wiki/Cryptostegia_grandiflora

The water hyacinth *Eichhornia crassipes* is present in Ethiopia, and is most serious in the Awash River system, with the usual impacts on ecosystem function and human activities. It might be present also in the vicinity of Awash NP, in areas with little water current and smaller lakes and puddles.

In their survey from 2011 Yohannes et.al conclude that invasive alien species (IAS) are a great threat to the Awash NP biodiversity, together with other natural and human made threats like wildfire, drought, bush encroachment and others; settlement within the Park, agricultural expansion, grazing and browsing by domestic animals, deforestation, illegal charcoal production and fire wood collection, all putting the park's resources at high risk. They conclude that the park's rich biodiversity needs immediate management intervention with the participation of the local community as well as local government for the immediate action.

Potential invasive species which may threaten biodiversity of the Park include species such as *Prosopis juliflora, Parthenium hysterophorus, Cryptostegia grandiflora, Parkinsonia aculeata, Senna occidentalis, Datura ferox* and *Xanthium strumarium*. The direction of the introduction of *P. juliflora* into the Park also coincides with the major directions of pastoralist movement to the Park, which are from the northeast and south part of the Park by Afar and Kereyu/Ittu pastoralists respectively.

Yohannes et.al 2011 make following recommendations:

1) Due attention should be given for the prevention of actual and potential Invasive Alien Species from establishing themselves in the ANP. It may be difficult to eradicate them once established. The case of *Prosopis juliflora* in Afar Regional State continues invading several thousands of hectares of grazing lands despite of the efforts being made to control it.
2) Great care should be taken while planting or introducing new plant species into the park or its vicinity. Even though, so far there is no binding legislation which regulates the use of alien species; national parks should have their own mechanisms to regulate the introduction of new plant species into the Park. There is a strong need for periodical assessment of the sides of the Addis Ababa - Djibouti road which crosses the Park. Eradication of the IAS detected in such places is the easy, fast and effective way to reduce the pressure and likelihood of new invasions, since it is the potential entrance for IAS.
3) The major anthropogenic threats to the biodiversity of ANP are settlement within the Park, agricultural expansion, grazing and browsing by domestic animals, deforestation, illegal charcoal production and fire wood collection. These human actions have association with the sustenance of local communities and their livestock. This issue should be the core focus and major objective of the Park management and should be settled with the active participation of the local communities, political and administrative bodies to have sustainable management of the resources and for better utilization.
4) There are two antagonistic interests in the ANP, one to conserve the biodiversity of the Park and the other the strong need to use land for human activities. This conflicting interest and the anthropogenic degradation of the area will lead to subsequent increase of IAS establishment. Thus, there is a need to compromise between these interests:
    a) Areas should be prioritized to those which are most in need of conservation, better to identify local biodiversity "hotspots".
    b) Core area and buffer zones should be identified.
    c) Continuous awareness creation campaigns should be conducted to enable local communities to implement sustainable resource management, to reduce their dependency on park resources and to improve the relationship with park authorities.
    d) Alternative livelihood options for local communities which do not compete with the Park resources and also which do not have much impact on the Park should be identified for better conservation and sustainable utilization of the resources by the government as well as by the local communities.

e) On the buffer zone of the Park, it is better to practice a Community-Based Natural Resource Management which is a process through which grass roots institutions are involved in the decision making process with rights to manage and control their environment. Also sharing the benefit accrued from the Park to the local communities through community services is very important for its sustainability. Conservation to be successful and sustainable there needs the strong involvement of local communities.

3.4 Climate Change issues

Awash National Park counts with two important studies, carried out within the SCIP program on Climate Change in Ethiopia (PHE-EC):

- A Resource Base and Climate Change Risk Maps for Awash National Park; by Tezera Chernet from ERCAND Consult, 2015, Addis Ababa and
- Determination of Conservation Benefits and Carbon Sequestration Capacity of the Awash National Park of Ethiopia; by: Habtamu Assaye, Bahir Dar University, Addis Ababa, Ethiopia 2014

The first study shows that the identified land cover classes at ANP were subjected to changes of different scale in the past forty years. Among these, the most significant one was the decline in the area size of grassland. The major causes for the decline in area size differ in the time period studied. Significant ones include the deforestation and degradation of the vegetation through extraction of wood, overgrazing and expansion of cultivation. Time-series comparison of census data revealed that there was a decline in the number of Oryx beisa. Changes in the observed land use and cover classes might have significant impact on the composition and abundance of wild animals in the national park. Studies also reveal that the national park was exposed to climatic variations, especially related with temperature. Risk analysis shows that the national park and surrounding areas is exposed to fire, drought and flood hazard of different degrees. Some 64% of ANP is exposed to high fire risks and some 3% to very high risk of flooding. The national park possesses a significant number of wild animals, including mammals and birds that are endemic to Ethiopia. Beyond the ecosystem services, the park has the potential to generate a substantial amount of economic and social benefit from the tourism industry such as livelihood diversification and job creation. These will help contribute to the government plan for poverty reduction.

The study recommends the following activities, in order to support conservation efforts for an overall development of the protected area and resilience to climate change:

- Design and implement a monitoring system, deploying required material and training of personnel to minimize risk and secure an effective response to any identified hazard.
- There is a need to collate the existing documents on traits of wild animals found in the country, if not available, to conduct brainstorming workshops in which wild animal experts would provide the scientific basis that help determine the interaction in face of climate change.
- Develop a geo-data base and migrate all available maps into this for a better retrieval, storage and analysis (can be linked with the existing web page of EWCA, access if necessary, can be with permission).
- Test the water quality of Awash River at different location and salinity level of near-surface water to consider alternatives based on results.

- Achieve sustainable development by allowing local communities to have direct benefit from the ANP, establishing park revenue sharing schemes that can, based on prioritized needs of local community, be directed toward animal health and feed, supplementing current efforts underway by the Fentale woreda office of Pastoralist and Agro-pastoralists in nearby kebeles of Oromia region and improved water supply.
- Conduct carrying capacity assessment of the grassland, composition of the herbaceous layer; including seasonal differences in dry mass.
- Reconcile location, size and length of under and over passes, for the railway, currently under construction, in consideration of biological traits of wild animals in the park and others to be re-introduced into the park.
- Interventions to stop encroachment and overgrazing of domestic animals and to minimize the risk of invasive species intrusion.
- Install road signs, near newly constructed humps, to avoid breakdown of passing vehicles.
- Collect data on wild animal dispersal areas, number and distribution of domestic animals and season of use, as well as fuel collections and use of adjoining kebeles and production and sale of charcoal.

The study on Carbon Sequestration Capacity concludes that Awash National Park is an important wildlife conservation area and critical ecosystem junction where the Great Rift Valley converges suddenly from its wide arid planes to narrow semi-arid and Savanna ecosystem. It has also hydrological role of regulating the water flow and amount of discharge for Awash and Kesem Rivers. Awash NP provides a wide range of economic, social and cultural benefits to the local residents and the country.

The park is undergoing a high rate of resource degradation due to anthropogenic causes such as deforestation and forest degradation for charcoal production, fire wood, and construction wood and due to over grazing and expansion of development activities in and around the park.

Climate change is putting additional pressure and is hampering the resilience capacity of the park and adjacent communities. It is vital to consolidate on the traditional conservation and management of the park, and to address the potential of the park for climate change adaptation and mitigation and thus capitalize carbon sequestration and stock potential of the park for possible carbon marketing so as to enhance the overall management of the park and integrate contemporary issues of climate change adaptation and mitigation.

This study has revealed that ANP has a total carbon stock of 2,775,845 tons or 10,177,272 tons of carbon dioxide equivalents. This carbon stock is estimated to have a financial value of US$ 40,709,088 (calculated at a rate of US$4 per ton CO_2). Considering the current rate of deforestation alone (without considering forest degradation and other uncertainties), the park will lose all its vegetation in 71.5 years. Ongoing development activities and the growing population increasing the probability of uncertainties and aggravating the pressure, it is possible to assume the total carbon stock to be lost in less than 50 years. Therefore, all the current carbon stock can be accounted for REDD+ or other mechanisms in a long term commitment agreement. Tree species diversity is poor (less than 1, Shannon Weaver diversity index). There was no clear relationship between tree species diversity and carbon stock of the different plots. The annual carbon balance between emission and sequestration has been positive; however this balance will be reversed in the next two years, complicating the conservation effort. ANP is therefore, at a critical state from the wildlife protection point of view, as

well as considering general ecosystem sustainability and ability for climate change adaptation and mitigation. Management of the park has to improve urgently to ensure sustainability.

The author made the following recommendations:

- Induce management actions to reduce emission from deforestation and forest degradation and for the preservation of the carbon stock, considering the important role of the park for climate change adaptation, mitigation and resilience
- Strictly control cutting of big trees for the purpose of construction and charcoal production, since it has consequences of carbon stock reduction and huge ecological disturbance
- Establish integrated mechanisms in the park management to reduce the cost of monitoring to make CARBON finance through REDD+,
- Establish emission reduction mechanisms to be integrated into REDD+ schemes, including:
  - improved park management and better control of illegal logging and charcoal production
  - promotion of energy saving cooking stoves
  - promotion of modern livestock management in the park adjacent communities that provide higher yield with few livestock than the traditional higher head of cattle but little production
  - improving agricultural practices in the surrounding, implementing climate smart agricultural practices that provide varieties of food items and revenue to surrounding farmers and increase

3.5 Socioeconomic conditions of human population around the park

Awash National Park includes territory of two regions Oromiya and Afar, with their respective zones, woredas and kebeles.

Awash – Fentale Woreda. Based on the 2007 Census Awash Fentale Woreda has a total population of 29,780, of whom (15,475 male, 14,305 female). With an area of 1,046.41 km2, the population density of 28,5. Some 57% of the population is urban. Only 6% of the woreda population consider themselves as pastoralists. There is an average of 4 people per household. Concerning religion 68% of the population said they were Muslim, 26% were Orthodox Christian, and 5% were Protestant https://en.wikipedia.org/wiki/Awash_Fentale_woreda.
In 2002 there was a total of about 10 000 inhabitants in the rural kebeles of Awash – Fentale Woreda in direct vicinity to the national park.

Kebeles en Awash - Fentale Woreda

	Households 2002	Population 2002	Population 2015
Sabure	876	4.231	
Doho	341	1.581	>4000
Dudub	199	800	
Boloyita	216	1.148	
Kebena	229	1.205	
Awash Town		19000	

Table 1: Rural Kebeles of Awash Fentale Woreda, yellow fields indicate neighborhood to Awash NP

Awash. The town of Awash is located just next to the national park. It was founded, when the railroad Addis Ababa – Djibouti was built in the early 20th century. Its existence has to do a lot with the railway station and the bridge over the Awash River gorge. Later, the road to Djibouti and to Dire Dawa and Harar with its bridge over the river had its importance for the growth of Awash, as service town for all traffic passing through here.

Fentale Woreda – Zone, Oromiya Region. The 2007 national census reported a total population for this woreda of 81,740, (43,266 male, 38,474 female). Some 25% are urban dwellers. Religion: 43% Muslims, 28% orthodox Christians and 19% Protestant. Less than 25% are urban dwellers. With an estimated area of 1,170 km2Fentale has a population density of 75 people / km2, a lot less than the Zone average of 182 for all of Ethiopia. The five largest ethnic groups reported in Fentale are Oromo, Amhara, Kambaata, Hadiya and Welayta (https://en.wikipedia.org/wiki/Fentale).

Kebeles in Fentale Woreda	Housholds	TOTAL
8 pastoralist kebeles		
Fentale Debit	264	1.584
Haro-karsa	1.986	11.911
Elala-Keren	394	2.364
Tututi	349	2.090
Dega-Edu	274	2.017
Kobo	267	1.604
Benti- Mogasa	645	3.865
Gelcha	596	3.581
7 Agro-pastoralist kebeles		
Kanifa	550	3.294
Fate Ledi	238	1.425
Sara-weba	379	2.267
Gidara-kubi	1.003	6.020
Diresaden	339	1.927
Godo-Fafate	201	1.311
Turo-Badanota	317	1.900
3 Settled agro-pastoralist kebeles		
Gara-dima	213	1.280
Golala	256	1.794
Algea	105	374
Total	**8.376**	**50.608**

Table 2: Kebeles of Fentale Woreda (Piguet & Hadgu, 2002), yellow fields indicates interference with Awash National Park

Land cover and land use. A survey of the land in Fentale Woreda shows that 8 % is arable or cultivable, 8% suites for pasture, 29% has forest, and the remaining 55% can be considered degraded or otherwise unusable. The Metahara Sugar Cane Plantation covers 100 km^2. In 11 of the 18 kebeles of Fentale, the predominant agricultural practice is pastoralism. Camels, goats and cattle are the most common livestock; migration to the border areas of Boset woreda for grazing during normal years is common, but in years of low rainfall herdsmen will migrate as far as Negele Arsi. Another source of income is the sale of firewood and charcoal. The vegetation is primarily acacia trees with the bushes and shrubs common to the lowland portions of Ethiopia. Fruits and vegetables are important cash crops.

Industry in the Fentale Woreda includes 31 grain mills and the Metehara Sugar Cane Plantation. There were 593 licensed business enterprises in Fentale, which included 85 wholesalers, 294 retailers and 214 service providers of different types. There are also 16 Farmers Associations with 5,318 members but no Farmers Service Cooperatives. Fentale has 33 km of dry-weather and 157 of all-weather roads. 100% of the urban, 22% of rural and 38% of the total population has access to drinking water.

Metahara. Few people lived in the area until the arrival of the Dutch corporation HVA, which established a factory to process sugar at Metehara, after it had been expelled from Indonesia in 1954. In 1970, the Kereyu staged an armed demonstration in Metehara which destroyed fences and buildings at the HVA plantation. In 1975 the Derg announced that the sugar plantation, including the Dutch investments, would be nationalized. In 2005 Metahara had a total population of 21 350.
To the south and east of Awash NP extend the woredas of Anchar and Miesso. They have various kebeles, whose herding people interfere with the national park. They cross Awash River and herd their animals within the park area.

Herding within and around the park. According to the livestock censuses there has been a severe increase between 2008 and 2013 in all of Fentale Woreda. While number of cattle only about doubled, sheep went up about 10 fold, goats 7 fold and camels 4 fold.

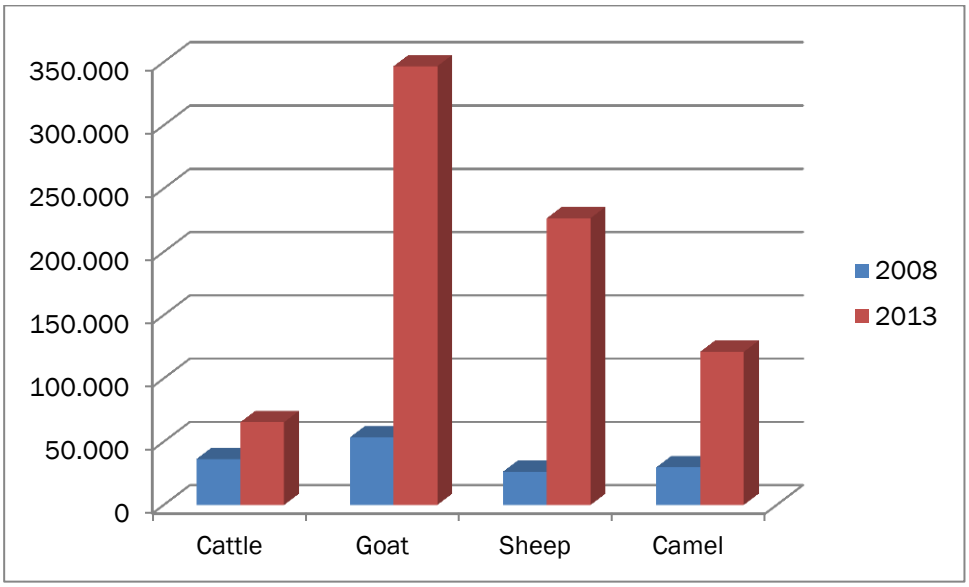

Figure 16: Domestic animals in Fentale Woreda, a comparison between 2008 and 2013

Obviously there is a shift from grazing animals to browsing animals, which has to do with the limited amount of grassland. Goat, sheep and camels feed mainly on the leaves of bushes and trees, rather than on grasses.

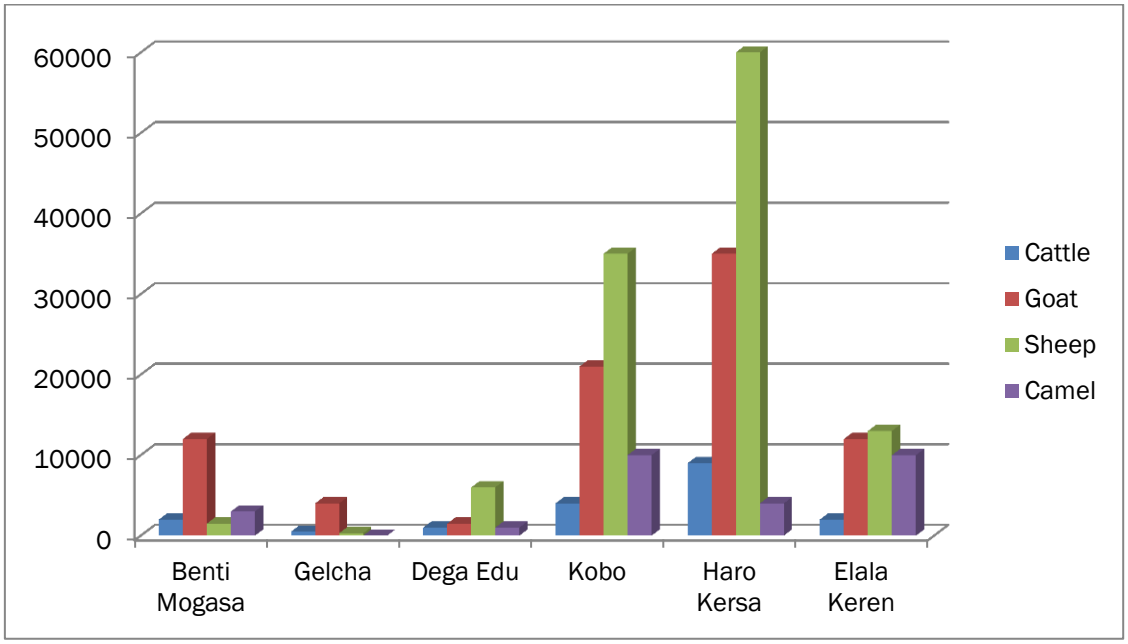

Figure 17: Livestock in kebeles of Fentale Woreda, located in direct neighborhood to Awash NP

Low and erratic rainfall in the Awash – Alledeghi area severely affects the growth of grasses and other forages, thus domestic animals survive only on range vegetation that has low nutritional value for most part of the year. Moreover, the feed resources get scarce in the dry season leading to prolonged period of malnutrition (Tadesse et.al 2014). Herders have developed different strategies to buffer the effects of dry seasons and droughts. Many shift from grazing to browsing, even using the introduced cactus *Opuntia ficus indica*, especially in Miesso Woreda. Others lend or sell their animals, conserve or buy fodder. About 20% migrate temporarily to areas with better conditions, among them the grasslands from Ilala Sala plains in Awash NP.

3.6 History and management of the park and its resources

History. Awash National Park was created in 1966 and legally gazetted in 1969. It is known as the first Ethiopian national park. In 2015 its boundaries were redefined, excluding lands that had been converted to farm land or where people now settle.

Infrastructure, equipment and materials. Awash National Park has its headquarters at Gotu, near Awash falls. It consists of a building with offices, a warehouse, a housing complex for the scouts and a gazebo to have meetings. There are 14 employees stationed at Gotu. Headquarters can be reached by a 10 km long gravel road from the gate. The gate is located at Amareti; here are houses for the nine scouts stationed and a gazebo to have meetings. Awash NP has five outposts within the park or just outside of it:

- Filwoha hotsprings, with four houses and 5 scouts
- Geda outpost with 4 scouts
- Sabober outpost with 1 scout
- Sogida outpost with 1 scout
- Sabure outpost with 1 scout

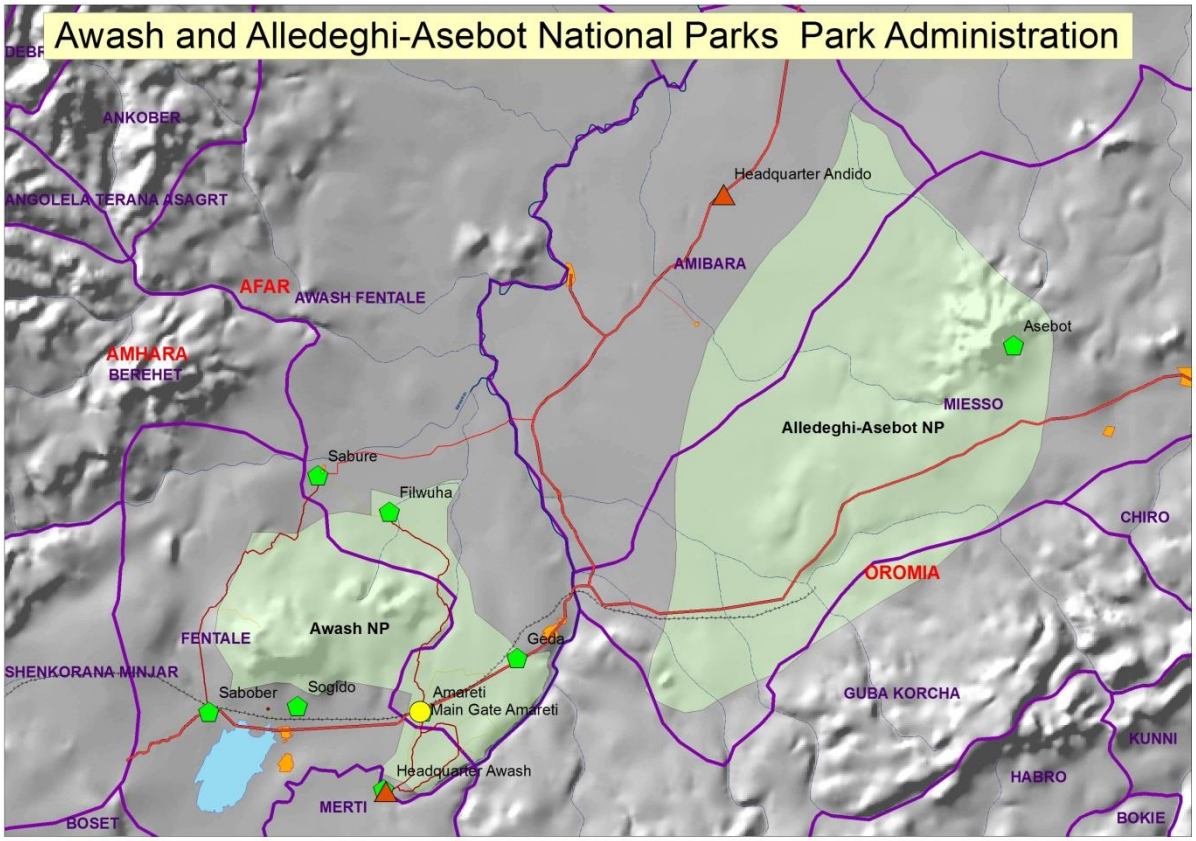

Figure 19: Map of Awash and Alledeghi NP infrastructure for park administration

The Awash National Park administration has 10 vehicles, three are working at the moment, another three could be fixed. There is also a motorcycle that does not work. There are no horses or other animals to be used for transportation. The communication system is by HF radio with stationary units at the headquarter and the outposts, as well as mobile units (walky talkies). At present this system does not function. All scouts have uniforms and firearms. Not all of these arms are working correctly.

Figure 20: Gate of Awash National Park at Amareti

Road system. Highway 1 in crossing the park, it is the main route of access to the gate, from the surrounding towns of Awash and Metahara. There are dirt and gravel roads that go around the park, like the Sogida – Sabober – Sabure road to the west and the road that leads north from Awash town to meet a newly constructed road that connects the sugar cane plantations at Sabure with highway 1. One dirt road cuts right through the park from Amareti to Filwoha hotsprings, to connect later on with Sabure and there is a circle road at Ilala Sala plains, from which there is connection to the old Kereyu lodge.

Awash NP has the following personnel:

Position	Name	Telephone number
Chief warden	Salahadin	0920466178
Deputy warden	Shiteran Mengistiel	0949349590
Community and tourism warden	Zerihun Ketema	0913661554
Community senior officer	Mamo	0941753561
Ecology expert		

There is a whole of 40 scouts in the park, including the levels of chief scout, head of scouts, senior scouts, maiden scouts, beagle scouts and community scouts. Thirteen scouts come from the communities around Awash, the other are from other regions. Three of the 40 have left in recent times and have not been replaced. The minimum requirement to become a scout is to know to read and write. For higher level scouts a higher school education and diplomas are necessary. The scouts are assigned to a either headquarter, gate or an outpost. They rotate every six months.

The scouts have the following duties:

- Patrolling during five days a week, weekends are free
- Escorting tourists in their activities in the park (they get paid by the tourists)
- Cleaning of camps and along roadsides (especially along highway 1)
- Fire control and extinction (there is about one major bush fire in a year), there are no local firefighters in the surrounding communities

Regulations. On January 8th 2015 a new regulation was gazetted for Awash National Park. This regulation redefines the boundaries, reducing them from 756 km^2 to 528 km^2. Much of the plains to the southwest and northwest became excluded, while a great part of the hotsprings area to the northeast was included. The new regulation prohibits the following activities:

Obviously it is completely forbidden to introduce livestock into the park area. Considering the great amount of cattle, sheep, goats and camels, within the park boundaries, domestic animal grazing can be considered as the single most important violation of park regulations.

Law enforcement. According to the law, domestic animals have to be moved to a boma, a fenced enclosure, where they stay until the owner has paid a fine of 50 birr per head of cattle and 10 birr for sheep and goats. In the week before we visited Awash NP domestic animals from five herders were taken to boma. In four cases the owner paid and the animals were released. In the fifth occasion the owner refused to pay and released the animals by force. Later at night the scouts were attacked while sleeping and gun was fired off by the attackers.

	Prohibition of activities within the park	Local herdsmen	Hunters	Tourists
1	Carrying any type of weapon into the park without depositing any of such weapons under custody of the guards at the gates	XX	XX	
2	Causing havocs or noise disturbances arbitrary use of any devices that may result in such effects	X		X
3	Hunting, scarring and chasing wild animals	X	X	X
4	Cutting wild plants	X		X
5	Peaking bird's egg	X		
6	Peaking away, vandalize or spoiling any of the natural resources or man-made materials of the park	X		X
7	Undertaking agricultural activities inside the park	XX		
8	Letting domestic animals enter into the park for grazing	XXX		
9	Set up wild fire	X	X	X
10	Entering in the park holding poisons substances	X		
11	Engaging in any kind of trade activity without authorization	X		
12	Arbitrary disposal of litters and garbage such as packing cases of foodstuff and other similar leftovers of the visitors	X		X
13	Construction any type of dwelling houses, planting grinding mills and instituting other such establishments	XX		
14	Entering to the park with domestic animals; such as dogs	X	X	X
15	Entering into the park with snares or hunting tools	X		

Table 3: Activities that are prohibited in Awash NP, analyzing which park user group would or could mainly be involved in a given activity

3.7 Tourism in and around Awash and Alledeghi parks

Figure 21: Awash Falls Lodge

Services of accommodation and food. There are two towns in the immediate vicinity of Awash NP: Awash town and Metahara. Both are located on highway 1 und have a considerable number of hotels and restaurants. These hotels offer their services mainly to road travelers; they are not focusing much on visitors to the national park.

Hotels at Awash town

Hotel Name	Number of rooms
Buffet Awash	16
Iyasu Hotel	13
Kereyu Hotel	19
Tana Hotel	15
Wollega Hotel	15
Awash Park Hotel	14
Ertale Hotel	12
Genet Hotel	16
Meridian Hotel	14
Axum Pension	14

Altogether there are about 150 hotel rooms in Awash, without counting the lodges. Most hotels also offer meals to their clients and to the public in general. Apparently there are no hotels in Metahara, Andido or Mieso. Visitors to the two parks will have to stay in Awash town or in any of the lodges. At present there are four functioning lodges in the Awash – Alledeghi area:

- Awash Falls Lodge near the park's headquarters and Doho Lodge, in the neighborhood of Doho kebele in the northern part of Awash NP are run by the same owner. They offer activities in Awash NP, like observation of big mammals on the Ilala Sala grasslands and in the bushland, as well as bird watching in different places. Awash Falls Lodge has 25 rooms in traditional huts, as well as spaces for camping.
- Belen and Animalia lodges to the west of Andido kebele (headquarters of Alledeghi), close to the Awash River wetlands with its reeds and a hot spring area. Animalia lodge is focusing on hunters who come to hunt lions and other big game in the wetland area.
- Two lodges, Kereyu Lodge near the confluence of Arba with Awash River and … Lodge on the western side of Lake Beseka are not operating at the moment

Tour guides. At Metahara 20 guides were trained by Wildlife for Sustainable Development WSD and the tourist and culture department of Fentale Woreda, including 11 young men, who are giving the service to show the hyena caves to the north of Lake Beseka.

These caves were formed when lava flows from nearby Mount Fentale cooled down and left open spaces in their interior. At the moment the cave is home to more than 400 hyenas (Crocuta crocuta) dwell in this extensive cave system, together with warthogs. In late afternoon they come out to be exploring the area for food, during night time. Tourists are taken to an area near the caves to see all these animals coming out. The guides also give them information on the hyenas and on other park resources.

Another service offered by the Metahara guides is to take people up to the rim of Mount Fentale to show them the crater. It takes about five hours for a return trip, starting from the west side of the mountain.

Figure 22: Hyena cave near Metahara

A second group of six young people from Metahara was trained to become camel guides and take tourists on camel back to different places in Awash NP, mainly to see the wildlife. However, this group has disintegrated, before the activity was even started. The young people found other work opportunities.

Figures 23/24: Guides near Hyena Caves, deep crack in the volcanic rock near the caves

Figure 25: Touristic attractions and infrastructure in and around Awash National Park

3.8 Local communities' involvement

Since 2014 the STRATEGIC CLIMATE INSTITUTIONS PROGRAMME (SCIP) is executing the project "Building Institutional Capacity and Participatory Leadership in Awash National Park for Resilience, Mitigation and Adaptation to Climate Change". The program's lead organization is the Population, Health and Environment Ethiopia Consortium (PHE-EC), an international NGO.

Project Collaborators are: EWCA / Awash National Park, Culture and Tourism Offices of the Weredas Fentale, Awash Fentale, Miesso and Anchar. The Project Implementing Organization is the NGO "Wildlife for Sustainable Development WSD. The Project Objectives are: Strengthening stakeholder collaboration and partnership, building park management and leadership capacity, building entrepreneurship capacity of women and youths and promoting good practices in the rehabilitation of ecosystems. The Project Implementing Strategies is a multi-sectoral integrated approach in the context of National Growth and Transformation Plan. The project has achieved the creation of three Task Forces on different levels:

1. Regional Level: Regions Oromiya and Afar (34 members)
2. Zonal Level: West Shoa, Hararghe, Afar – Zone Three (34 members)
3. Wereda level: Fentale, Awash Fentale, Miesso, Anchar (93 members)

Through the SCIP program many community projects are carried out, focusing on young people and on women. These include milk production, processing and marketing; promotion of solar energy and energy saving mechanisms, health improvement and family planning to stop uncontrolled population growth. These activities are carried out mainly by woredas and kebeles with the help of WSD and EWCA.

3.8 Availability alternative livelihoods for the local communities

The local communities of both woredas traditionally are living on livestock rearing and grazing. However, this activity has passed the level of sustainability maybe a long time ago. The human population is growing and with it the number of livestock. On the other hand there is an obvious change, first from grazers like cattle to browsers like goats and camels and also from livestock raising to agricultural activities. At the same time there is a trend to change from a nomadic way of life to a more settled way. This can be seen for example in Doho kebele, where Afar people, who lived before in different places to the north of Mount Fentale, since two years live in a settlement with government houses built for them.

Economic development in the Awash – Alledeghi area is related mainly to the existence of the road and the railway. Awash town was founded, when the Djibouti – Addis Ababa railroad was built. Places like Miesso were booming when the railroad stopped here and lost its importance when the trains stopped coming and Ethiopia's lifeline function was taken over by the road, which leads through Afar region and not through Miesso anymore. In the next future the new railroad will be working and an expressway will be built parallel to it, so Miesso and Awash are expecting new impulses for economic growth.

This economic growth is primarily based on services to road and railway users (food and lodging, repair services for cars and trucks, etc.). Apparently most people who offer these services are non-local speaking immigrants from the Ethiopian highlands, rather than Afar or Oromo from the surroundings. There are also important agricultural activities related to the sugar cane and citric plantations around Metahara and Sabore. Here some of the local herders find work during part of the year, mainly during harvesting time.

Tourism development around Awash – Alledeghi is still pretty much at its starting point. So there are many opportunities to come up. Especially new lodges run by local people could be possible. However, this needs a great effort in training and assistance and probably partnerships with the government or with investors. The training of tour guides is already a promising step to involve young people in new alternative livelihoods. In the same direction goes a project where women from Doho kebele are trained to produce handicraft type household utensils from Doum Palm leaves.

Figures 26/27: Decorated thermo bottle to store milk, bags from palm leaves, produced at Doho kebele

3.9 Alledeghi – Asebot National Park

The Alledeghi Plains belong to Afar and Oromiya Regional States. The western part is Amibara Woreda, in the Administrative Zone III of the Afar Region; it comprises 3920 km2. The Woreda head is situated at Andido, at the edge of the asphalt highway. Amibara District includes small towns such as Awash Arba, Melka Werer, Melka Sedi, Awash Sheleko and many permanent villages. In the southern portion of the plain there is an agricultural village called El Fora

The western part belongs to Miesso Woreda, with different villages along the road to Miesso and Mount Asebot, an elevation of almost 2500 masl. The headquarters of this protected area are located in Andido, there is an outpost being constructed at the foot of Mount Asebot, near the road that enters the area from the eastern side. The protected area is known as Alledeghi Wildlife Sanctuary and at present is in the process of being converted into a national park. There boundaries are defined and beacons are set.

Vegetation. The plains are covered mainly with grassland. Along the outer parts there is shrubland, in some cases dominated by acacia. Especially from the road Awash – Semara the alien invasive Prosopis juliflora is encroaching the park area, causing severe alterations (Tadesse Kebede 2009). In the eastern part of Alledeghi the terrain is rising slightly from 850 to about 1150 masl near the road to Miesso. Further north Mount Asebot dominates the scene. Here the vegetation turns greener and denser, leading to the Afro-montane Juniperus forest around the mountains summit.

Wildlife. The most important wildlife species of Alledeghi is the Grevy's zebra (*Equus grevyi*). This endangered species only exists in northern Kenya and southern Ethiopia – and in Alledeghi plains. It numbers have decreased permanently, today there are less than 200 animals (Kebede et.al 2012). While visiting Alledeghi, the first thing we saw, was a dead zebra, killed by a vehicle on the road.

Figure 28: Zebra road-kill, south of Andido

Other grazing animals are Beisa oryx (more than 900 individuals) and Soemmerring's gazelle (1600 ind.). There are also Salt's dikdik, Lesser and Greater kudu, klipspringer and ostrich. The carnivores include lion, cheetah, leopard, serval cat, 3 species of jackal, 3 species of hyena, and Bat-eared fox. In former times the wild ass was present at Alledeghi, but it has disappeared due to pressures by humans.

In the area in and around the park, there are three ethnic groups: Afar people to the west, Oromo to the east and Issa (Somali-speaking) to the north-east. The area is known for its old armed and sometimes violent conflict between Afar and Issa. People say, it is because of the conflict that there is still a considerable amount of wildlife in Alledeghi, leaving the plains like some kind of no-man's land between the two enemies. Lately the conflict has diminished; there is better understanding and peace, due to mediation from the Federal Government.

The higher part of Mount Asebot is covered by a dense so-called church forest, dominated by two tree species, the near-threatened East-African Cedar *Juniperus procera* and the vulnerable Red Stinkwood *Prunus Africana*. Church forests comprise of many rare and unique species that make the preservation of these forests crucially important. These forests are being degraded. Therefore, increased afforestation and efficient use of forest resources need to be promoted.

Figure 29: Church forest on Mount Asebot

The staff from this park is shared with Yangudi-Rassa National Park, further north. There is no chief warden; there is also a lack of specialists in research, financial and administrative matters. The existing vehicle is old.

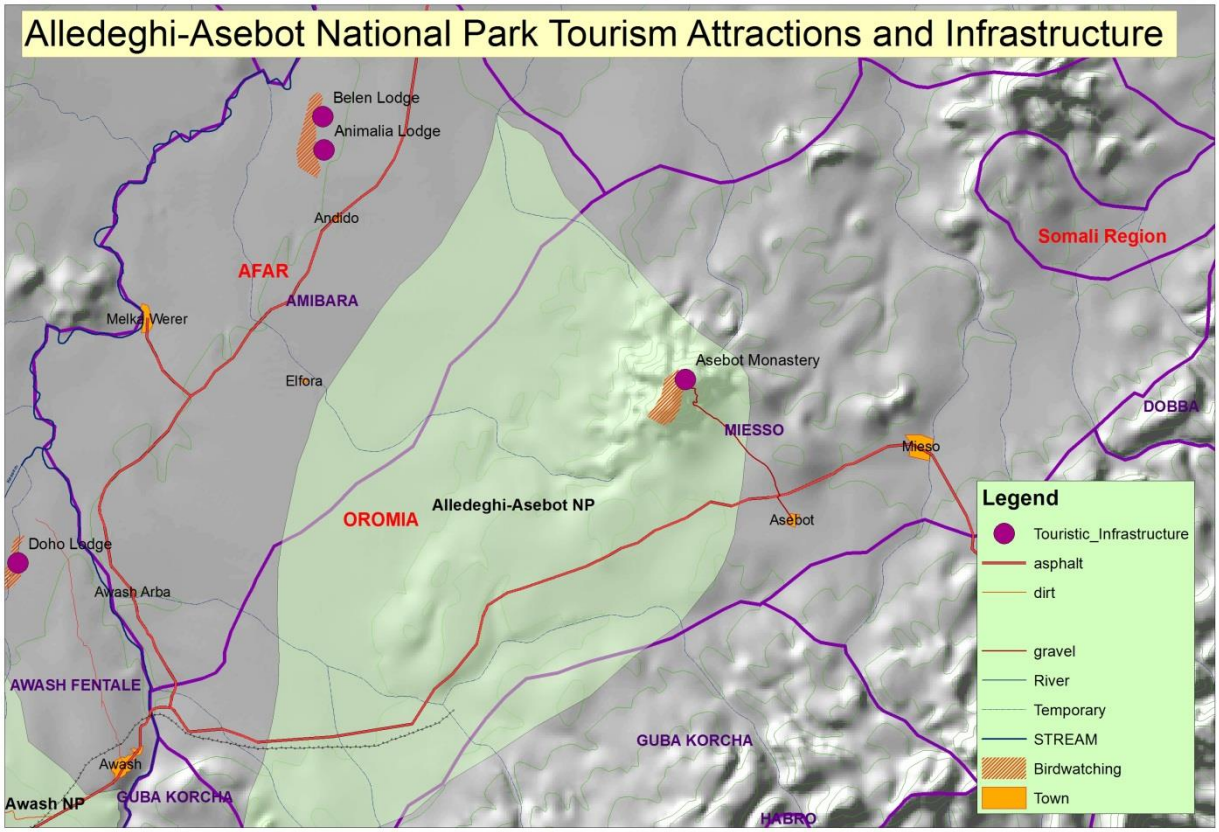

Figure 30: Tourist attractions and possible activities in and around Alledeghi-Asebot National Park

3.10 SWOT Analysis Awash NP

Internal factors like strength and weakness include the park itself, its administration and the stakeholders which use the park's resources. External factors like opportunities and threats include all factors that come from the outside like invasive species, human population growth and increase in livestock, as well as climate change with its prolonged droughts.

The strengths of Awash NP are:

- Diversity of ecosystems, due to variety of climatic and soil conditions
- Great diversity of plants and animals, refuge for threatened species
- More than 100 km^2 of grassland, crucial habitat for oryx and gazelles
- The great majority of herders is in favor of the park and wants to preserve its resources
- Important number of studies on biophysical and socio-economic aspects, including flora and wildlife and climate change
- 2 draft management plans and a 5 year action plan (2009) with important information and guidelines for management activities, guidelines 2015 SCIP
- Park new gazetted recently, new boundaries defined, keeping out all agricultural and much of pasture lands, including habitat around hotsprings
- Support and Leadership by SCIP project to resolve Park Problems, 3 Task forces established and working
- Basic equipment like vehicles, radio-communication, GPS, office equipment, Tourism: Unique and diverse tourist attractions, possibility for different activities, 2 lodges, hotels and restaurants in Awash and Metahara, important bird and mammal fauna

- Basic tourism facilities: roads, access to Awash falls and Filwoha, hyena caves and trail to the crater
- Buildings: Headquarter offices with employee accommodation, Gate, 6 outposts
- Awash river passes along the park - could be an important source for water
- One of the oldest protected areas in Ethiopia
- Awash is close to the capital Addis Ababa and forms part of the Tourist Circuit of Harar and Afar

In a Short-term action plan from EWCA (2009) the following weaknesses in the park management were identified:

- Lack of participatory approach to park management and benefit sharing to local communities
- Poor motivation and commitment of the existing park staff, poor monitoring and patrolling systems
- Inadequate logistic facilities of the park
- Poor monitoring and patrolling systems
- Lack of updated management plan

These weaknesses together with external threats like the boost of population of the different ethnic groups around the park like Kereyu-Ittu and Afar people is leading to:

- An increase of domestic livestock, mainly in cattle, sheep, goats and camels is causing deterioration and loss of grazing areas in the wider area of Afar-Kereyu land
- Frequent droughts and loss of pasture cause livestock intrusion even into the core area of the park,
- which is leading to grassland deterioration, with soil compaction and encroachment of bushes, so habitat conditions for wildlife become worse and population sizes decrease, leading to local extinction of grazing wild animals
- Settlements and agricultural activities near the park borders and –in cases – within the park
- The growing Lake Beseka makes people move nearer to the park

At the same time the two towns of Awash and Metahara and the sugar and citric plantations are expanding leading to

- Pollution problems like plastics, blown into the park by the wind,
- Agro-chemicals being washed into the rivers and potentially causing problems to aquatic animals

The Addis Ababa – Djibouti highway crosses the center of the main ANP core area, the Ilala Sala plains. There were about six wildlife road kills per month. Recently bumps were put which has led to an important decrease of killed wild animals. A new threat is the new railway which goes parallel to the road. Few or no underpasses for wildlife have been built. The road, the railway and a planned expressway to Djibouti, are putting a considerable negative impact on wildlife and ecosystem services, like water runoff. Road and railway, together with Awash River are important structures, from where invasive alien plants enter the park territory. Moreover, there is a railway construction planned north of the park, which might have an impact on possible roots for linking corridors between Awash and Alledeghi.

The weaknesses together with the external threats have led to

- Negative attitudes towards the park from surrounding communities

- A lack of awareness and thus insufficient cooperation from local communities and authorities
- and a lack of awareness and common understanding of all stakeholders on different management matters
- Deforestation: this includes charcoal making and fire wood collection. However, charcoal burning has been prohibited recently in Afar Regional State
- Fire in shrubland and grassland, often caused by humans are normally not very frequent, however in 2012 and 13 there were 8 fires per year reported. They might be caused by charcoal burning, vehicles or escape from burning of sugar cane in the plantations
- Habitat fragmentation and wildlife population decrease

Tourist visitation to the park is weak, considering that it is the country's oldest protected area and that it is easy to be reached, especially from Addis Ababa. Visitors complain that it is not easy to detect wild animals between all the domestic animals and that tourist facilities rather focus on the people who pass through, than on park visitors.

External opportunities

- Job opportunities by growing economy along the road and in the agricultural projects
- ANP can be reached easily by car from urban centers like Addis Ababa and Adama, soon also by rail
- Facilities of accommodation and food in the park vicinity (Awash and Metahara)
- Tour-guides trained, guide associations created
- GIZ Drought Resilience project working near-by in Afar province
- Very low hunting pressure on wildlife within parks
- Redefined boundary excludes agricultural lands, while including palm forests

3.11 Strategies for conservation and sustainable development

Grassland Recovery

Reduce grazing on the grasslands. The greatest challenge to Awash and Alledeghi – Asebot National Parks is to stop and revert the grassland deterioration. Therefore the amount of grazing livestock has to be reduced significantly. This can be achieved by improving feeding conditions outside of the park, starting in two pilot areas, for example in one of the kebeles north of Metahara for Fentale Woreda and in the vicinity of Doho village for the Awash Fentale Woreda. In these areas there seems to be enough water available by runoff as well as ground water. This water can be made available by the construction of hafirs (small dams) or by solar or wind driven pumps.

The water will feed sprinkler systems for irrigation, to grow high quality grasses, which later will be turned into fodder. It can be fed to domestic livestock when it is still fresh or can be dried to get the animals through the dry season and so keep them from invading the park's grassland. The fodder is primarily for the own domestic animals. Surplus production could be sold to other herding people. The irrigation can also be used to grow crops. Part of the people living around Awash NP can already be considered as agro-pastoralists. They cover part of their livelihood by agricultural production.

When successful these activities can be carried out in other areas around Awash and Alledeghi as well as in Nech Sar NP. While the pilot projects should be based on donations, further activities could be financed at least partially by credits. Families participating in these pilot projects shall agree not to

take their domestic animals into park anymore. The fodder can be used by cattle, sheep, goats and camels.

Apart from taking pressure from the national park, this new livestock raising has several advantages for the involved people: domestic animals will not spend their energy in moving long distances. Animal feed can be better balanced, so the animals will be healthier. A shift from meat-producing to dairy cows will be possible. This new system can be completed by improved vet care, genetic improvements and help in commercializing products, maybe under a sustainable use label. It is also possible to use sheep, goats and camels for milk and dairy production (cheese, butter, yoghurt, etc.).

Due to the expanding sugar-cane plantations to the north and south-east of Awash NP communities have been displaced. These communities were promised to be provided with dry season fodder from the sugar canes. It was also agreed to carry out investigation of the use of sugar production by-products like bagasse, molasses, cane tops and cane pith for improving quality of cane fodder and to investigate the current compensation scheme for pastoralist. The question is, if the money paid as compensation to pastoralists by the Metehara sugar factory is reinvested by the pastoralists in further livestock, fuelling the present overuse of park resources by livestock.

For a transition period, before these projects actually show effects, it should be allowed to pastoralists to cut their fodder on the Ilala Sala plain, but not to take their domestic animals there.

Restore degraded grassland habitat. The grasslands of Ilala Sala plains is suffering high rate of habitat degradation and conversion. The grass cover is constantly diminishing, given way to barren soil and to shrubs, including the aggressive introduced *Prosopis juliflora*. After taking pressure from grazing livestock, certain parts of the grassland need a restoration process, including the planting or seeding of grass on barren soil and removing encroaching shrubs and bushes, with emphasis on alien species. This same process should also be carried out on affected areas of the Alledeghi plains.

Mitigate disruption of Ilala Sala plain grassland by roads and railway. The installation of road bumps on the highway has significantly reduced wildlife road kills. Now it is important to put enough bridges and tunnels to the railway, to allow that wild animals can cross from one side to the other. This is crucial for Ilala Sala wildlife. The same has to be applied to the planned new expressway. There need to be fences as well to make sure, that wildlife will not be killed by fast going vehicles and trains.

Shrub- and Woodland Protection

Firewood collection and charcoal burning. Firewood cutting and collection is mainly used in rural areas for domestic cooking purposes. The charcoal burning takes place within the shrub- and woodland areas. Later the charcoal is put into bags and sold in the towns or along the highway. Charcoal is mainly used for cooking in the towns around Awash NP, but also taken to the Ethiopian highland areas. Charcoal production affects both plant diversity and carbon stocks, since charcoal burners prefer to cut big acacia trees. Since 2015 charcoal burning is illegal in Afar region. So no roadside sales were seen in this area.

To control deforestation by wood collectors and charcoal burners, the nationwide demand for charcoal needs to be reduced. There are different activities under way to achieve this goal; one of the most important being the generation of hydro-electric power, which will reduce prices, so charcoal

stoves can eventually be replaced by electric stoves. On the other hand invasive species like Prosopis can be used for charcoal burning. However, this species has a lower quality and therefore achieves lower prices.

Livestock browsing. There is also a considerable amount of livestock in the shrub- and woodlands, browsing on the vegetation or grazing on minor grassland areas, especially in the northern part of Awash NP. The regeneration of the vegetation is been significantly affected by the grazing, browsing and trampling of livestock. Implementing the above mentioned fodder strategies will also reduce livestock pressure on the shrub- and woodlands.

Wetlands and Doum-Palm stands. In the northern part of Awash NP there are important wetland areas, including doum-palm stands, reeds and open water. Doum palm leaves are used for basket weaving and reeds are used for traditional roofing and other purposes. According to the Interim Management Plan from 2003, doum palm utilization is not sustainable. There is a need to study this subject, in order to quantify the use, the rate of reproduction and the possibility to plant palms and increase the area where they grow.

Grazing wildlife. While the mammals that prefer bush-and woodlands apparently do not have greater problems, grazers do have. Many species reported in the 1990 are not present anymore, like Grevy's Zebra, Bush buck, Leopard, Cheetah, Ostrich, Giraffe, Grey duiker, and Swayne's hartebeest. Once the habitat requirements of the grasslands will be back to normal, after heavy reduction of livestock and restoration processes it will be possible to reintroduce these species, from Alledeghi or from other protected areas.

It will be also important to create a corridor between Awash and Alledeghi parks, after the new expressway will be finished and traffic on the road to Djibouti will have decreased. The corridor could exist of a 200 m wide strip of grassland, being planted.

Tourist development

Despite its attractions, landscape beauty, geological features and wildlife, its good connection to Addis Ababa and other urban centres and its facilities for accommodation and food, neither Awash, nor Alledeghi – Asebot receive important amounts of visitors. Partially this is blamed to the herding problem, the deterioration of the grassland and the low visibility of wild animals, compared to domestic animals. However, a main obstacle to tourist development is the lack of adequate offers for activities in these two parks and their surroundings – and the lack of information on the area's resources.

Tourism Alliance. In order to facilitate tourist development, it is crucial that the different stakeholders start to work together. This means the formation of a tourist alliance for Awash – Alledeghi area, including:

- Lodges in and around the two parks
- Hotels and restaurants in Awash and Metahara, maybe later also in other towns like Mieso
- Transport businesses to and from the area (buses, train) and within the area (taxis, local buses, 4x4 vehicles)
- Trained and licensed tour guides, including camel riding guides
- Handicraft producers and sellers

- Cultural initiatives (dances, music, religious events, etc.)
- Park authorities (EWCA)
- Touristic authorities (Woreda and regional level)

It will be important to collect data on all offers and on-going touristic activities in the area, to inform the general public on these offers: website, brochures, consultation by e-mail or telephone. There should be a central office giving information to visitors. This office could be located at the gate of Awash NP or in the towns of Awash and Metahara. It should have a tradition form, using local materials, like basalt rocks, wood, reed and grass for the roofs. It should have a shop inside, where local handicraft people can sell their products, as well as all kind of information material on the parks: books, brochures, posters, maps, videos, photographs and paintings.

The following activities are offered or can be offered:

Activity	Duration	Resources	Who	Where from
Trecking to the Crater	6 h	Landscape, Geology	Guide association	Metahara
Visit to Hyena caves	2 h	Geology, wildlife	Guide association	Metahara
Bird watching	1-2 h	Lake Beseka	NN	Metahara
Wildlife and birds	2-3 h	Ilala Sala plains	NN	Gate / HQ
Waterfall and river	1h	Landscape, crocs	Lodge	Gate / HQ
Wildlife and birding	2-3 h	Kudu Valley	NN	Gate / HQ
Hotsprings, birding	6 h	Filwoha hotsprings	NN	Gate / HQ
Birding and hotsprings	2 h	Doho hotsprings	Lodge	Awash Arba
Hotsprings Belem Lodge	1 h	Hotsprings, landscape	Guide association	Andido
Camel riding	3 h	Alledeghi plains	Guide association	Andido
Camel riding, hiking	3 h	Asebot & Alledeghi	Guide association	Asebot Outpost

Table 4: touristic activities in Awash and Alledeghi NPs

Construction and use of a Training Centre for Environmental Leadership and Sustainable Development near the Awash NP gate. There is a great demand for training in different skills.

- General training in understanding the biophysical and socioeconomic conditions
- EWCA staff in monitoring and surveillance, protected areas management
- Tour guides in tourist related subjects, identification of animals (mammals and birds), camel riding
- Handicraft production and sale strategies
- Young people in Environmental leadership
- Pastoralists in fodder production and animal husbandry, milk production and processing
- Agro-pastoralists: integrated fertility and pest-control, agricultural production
- All interested: identification, collection and commercialization of medical plants and edible fruits from the parks and their surroundings

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IV. Nech Sar National Park

4.1 Physical conditions

Nech Sar National Park (NSNP) is one of the most important national parks in Ethiopia. The park was established in 1974 in the scenic part of the rift valley floor between the two lakes Abaya and Chamo adjacent to Arbaminch town. The park comprises 514 km^2 in which 85% is land and 15% is water body. Nech Sar is named after the white grass that covers the undulating plains and contrasts with the black basalt rocks of the Amaro mountains to the east, and the black soils of the plains. The name derived from two Amharic words “Nech” meaning “White” and “Sar” meaning “Grass”. During the dry season the grass has a yellow-white color.

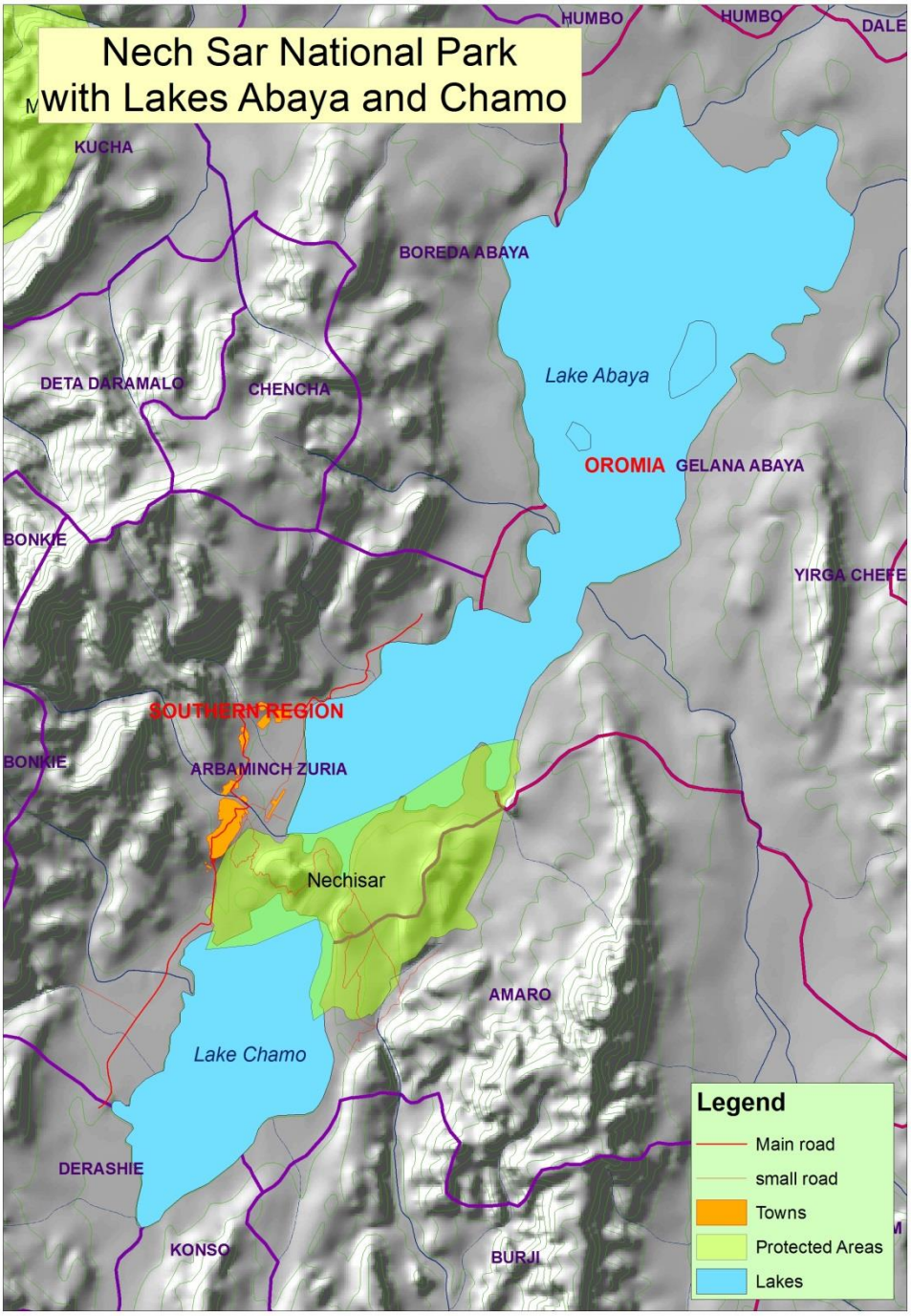

Figure 31: Map of Nech Sar National Park location

The park is located in the southern Ethiopian Rift Valley. The geomorphological features of the Nech Sar park include: The southern part of lake Abaya the northern part of lake Chamo, the land bridge in between these lakes, the white grass plains to the east of the land bridge, the Amaro Mountains, a lower mountain range with up to about 1650 m elevation and the major part of the Sermele River valley.

The water of Lake Abaya is always brown or red-brown, due to high sediment loads carried in by the rivers. Lake Chamo has blue water and white sandy beaches. At the foot of Mt Tabala in the south-east there are hot springs. The altitude ranges from 1,108 m at the shore of Lake Chamo to 1,650 m on Mt Kalia in the north-east.

Geology. The southern part of the Ethiopian Rift Valley is between 30 and 60 km wide. It is composed of a graben or rift floor, with rift escarpments and horsts on both sides. Crystalline basement rocks are exposed especially on the horsts, with 5-10 m thick red sandstone overlaying them. This sandstone is composed of quartz arenite, mudstone and conglomerate layers. There are also younger sections which were formed by volcanic successions and eruptions: basaltic flows and vulcanoclastic deposits like Arba Minch Ignimbrite and Amaro tuff.

To both sides of the park the rift valley escarpment rises from the valley floor with some 1100 masl to more than 3000 masl. The eastern mountains are drained by the Sermele River system, while the main drainage from the mountains on the western side is the Kulfo River. Both rivers spill their waters to Lake Chamo.

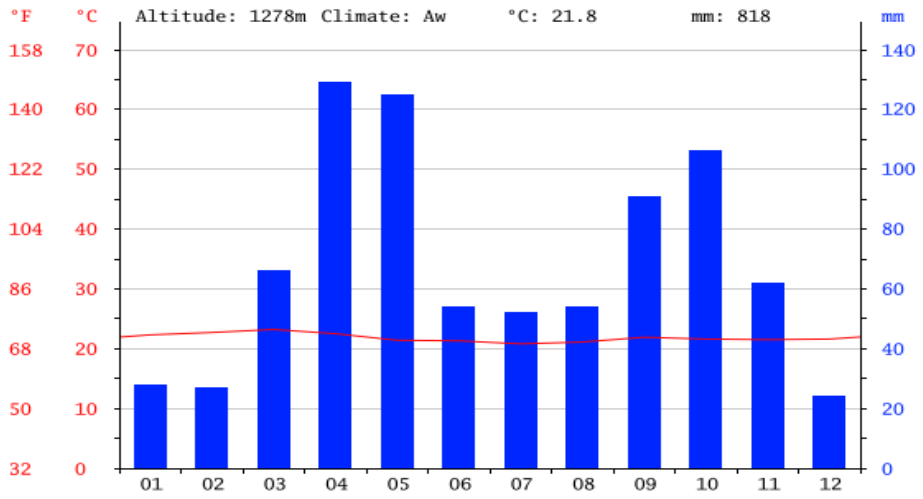

Figure 32: Climate diagram for Arba Minch

Climate in Nechi Sar National Park. Mean temperatures at Arba Minch oscillate between 20 and 25°C throughout the year. They generally do not pass 30°C or go below 15°C. Precipitations show a bimodal regime with two rainy seasons (March – May and September -October) and two dry seasons with sporadic rain shower in between. They are summing a little over 800 mm per year. In the surrounding mountains rainfall is considerably higher.

Evapotranspiration is very high in the southern Ethiopian Rift Valley. It may exceed annual rainfall and lead to water deficits, especially in closed basins.

Hydrology. The two lakes, Abaya and Chamo, are located on the floor of the Rift Valley. They are divided by a natural land bridge. Lake Chamo as well as Lake Abaya does not have any surface outlet. However, both lakes have a very low salinity, which means, that much of its water should be leaving the lakes by subsurface runoffs through the very porous basalt rock or through the soil of the ground

water forest near Arba Minch. In former times existed a surface outflow via Kulfo River. High sedimentation rates have created a levee which has blocked this outflow. Only in times of very high lake levels water will pass over the levee and drain into Lake Chamo. There is evidence that in times of very prolonged rainfall Lake Chamo will spill its water south through the Sermele and Sagan River system to the Chew Bahir swamp and lake area.

It is assumed that in the African Humid Period during early Holocene the lakes in the southern Ethiopian Rift valley were interconnected among each other and through Lake Turkana with the White Nile system. This is why aquatic fauna is very similar to the White Nile.

	Unit	Lake Abaya	Lake Chamo
Length	km	80	30
Width	km	20	13
Surface area	km^2	1.162	317
Max Depth	m	13	14
Volume	km^3	9,8	3,2
Elevation	m asl	1.175	1.110
Catchment area	km^2	**18.750**	
Salinity	g/L	0,6	1,0
pH		8,5	8,7
Diss. Oxygen	mg/L		8,7
Alkalinity	g/L	0,6	1,1
Turbidity	NTU	110	55

Table 5. Limnlogical parameters of Lakes Abaya and Chamo

The lakes Chamo and Abaya are similar in many ways, but also have difference: East of the Sermele River there is an area with several hot springs. However they only produce a minor quantity of water which flows into a swampy area and later on into the river. In former times existed a surface outflow via Kulfo River. High sedimentation rates have created a levee which has blocked this outflow. Only in times of very high lake levels water will pass over the levee and drain into Lake Chamo.

The water of Lake Abaya is of a reddish-brown color caused by sediments transported into the lake by its tributaries. Lake Abaya is fed by Bilate River from the north with a catchment area of more than 5 700 km². Gidabo and Gelana rivers enter from the eastern mountains, while Hare, Hamessa, and Baso rivers enter Lake Abaya from the western side. High sediment yields of the tributaries cause deposition of extended alluvial fans at the base of the Rift Valley flanks, continuing as deltas into the lake and creating wetland areas with swamps and small and shallow lakes in some places.

Besides Kulfo River there are the Sille, Sego, Wozeka, Segen, Dode and Doiso Rivers that drain the surrounding mountain areas into Lake Chamo. Almost all of them are used for irrigation purposes; that is probably why the water level of Lake Chamo has decreased during the last decades.

4.2 Biological conditions

The floor of the Ethiopian Rift Valley belongs to the Somalia – Massai Ecoregion, while the surrounding mountains on both sides are part of the Afro-Montane region. Nech Sar National Park includes the following ecosystems, according to the vegetation map provided by Jargosch 2010:

1. Dense ground water forest, in the Kulfo River valley, and partly in the Sermele valley
2. Dry forest on part of the land bridge between of the two lakes, mainly in the lower areas and along the escarpments between the plains and the lake
3. Shrubland or thorn savanna on the higher parts of the hills of the land bridge and the mountains east of the plains
4. Grassland on the plains
5. Sparse vegetation on the high parts of the eastern hills
6. Wetlands around Chamo lake shore
7. Abaya and Chamo lakes area

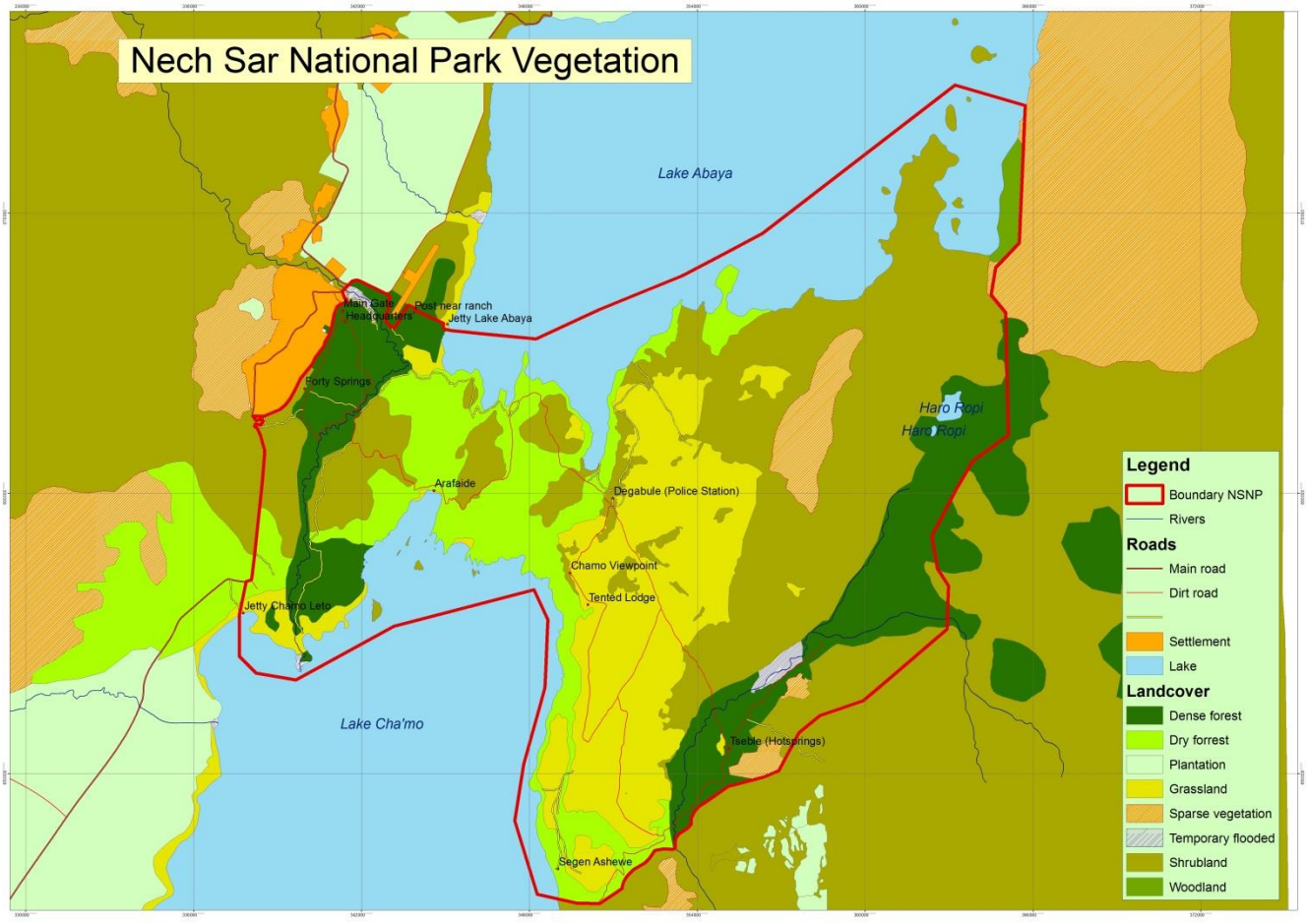

Figure 33: Vegetation cover of Nech Sar National Park and surroundings

Ground water forest. There are two areas with this forest type, the forest around Kulfo River between the two lakes and the forest around Sermele River in the eastern part of the park. The Kulfo forest covers about 26 km2 at the bottom of a valley, which is about 2 km wide in its northern part, and then become very narrow in the area where Kulfo River runs through a canyon while it is dropping more than 50 m down to the Lake Chamo area. The forest consists of high growing trees, dominated by *Ficus sycamorus* with a canopy height of up to 30 m. Some of the plant species usually grow in forests with humid climate, while there are other others that are normally of deciduous nature, but in this forest have become ever-green. Among wildlife the colobus baboons and civets are common. The forest is under heavy pressure by firewood collectors and charcoal burners from nearby Arba Minch town.

Figure 34: Dense ground water forest

The groundwater forest is the home of a lot of wildlife and birds. According to Duckworth et.al (1992) is the home for Leopard, Lion, Aardvark, Bushpig, Warthog, and all pigs, Gunther's Dik-dik, Greater Kudu and Bushbuck. In addition Duckworth et al state that it is also the home for about 60 bird species, several of which are endemic to Ethiopia.

Dry forest – woodland – bushland. Most of the park is covered by bushland, which is thick and impenetrable in places, the taller trees including *Combretum spp., Dichrostachys cinerea, Acacia tortilis, Balanites aegyptiaca* and occasional *Acacia nilotica*. This type of vegetation is found on the isthmus between the two lakes (God's Bridge) and along the escarpment between the rift valley floor and the horsts with their grassland plains. It covers an area of about 51km2. Definition: Tropical dry forest or Woodland is a low-density forest forming open habitats with plenty of sunlight and limited shade. Bushland is a blanket term for land which supports remnant vegetation or land which is disturbed but still retains a predominance of the original flora and structure.

Figure 35: Dry forest or woodland in NSNP

Shrubland or thorn savanna. Shrubland is a plant community characterised by vegetation dominated by shrubs, often also including grasses and herbs. It can either be natural or be caused by human interference like overgrazing of grassland. In Nech Sar the shrubland covers about 115 km2. It is found on the upper parts of the isthmus hills and in hare hills east of the grassland plains. Some parts of these mountains are also considered to have scarce vegetation. In the shrubland of the southern part of the park *Dobera glabra* and *Acacia tortilis* are common.

Figure 36: Shrubland near Lake Chamo

Grassland. The Somalia-Massai edaphic grassland covers a large proportion of the Nech Sar plains. The grassland is edaphic, the underlying soil being calcareous black clay. The most widespread grass species is *Chrysopogon aucheri*. The grassland covers about 70 km2 on the Nech Sar plains. Its area is suffering a decline, since bushes and shrubs are taking over, because of the overgrazing problem.

Figure 37: Grassland near Lake Chamo viewpoint

Wetlands around the two lakes. Along the shores of lakes Abaya and Chamo wetlands are very common. They are forming three belts around the water bodies:

- A 100 m wide belt of herbaceous species, growing in the shallow water, dominated by reeds *Typha angustifolia* as well as *Echinochloa pyramidalis, Cynodon dactylan* and *Cyperus articulate*
- Followed by a belt of leguminous species *like Sesbania sesban, Aeschinomena elaphroxylon*
- An outer belt is covered mainly with shrubs, bushes and smaller trees.

These wetlands are of outstanding importance as reproduction sites for fishes and crocodiles, as well as for many different aquatic birds and for hippos. Only a small portion of the wetlands is protected by the national park.

Figure 38: Wetlands near the shallow shore of Lake Chamo

The two lakes. The south-eastern part of Lake Abaya und 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. There are catfish (*Synodontis schall)*, which is dominant in Lake Chamo and present in substantial numbers in Lake Abaya. In both lakes the tiger fish (*Hydrocyon forskalii*) is also abundant. L. Abaya and L. Chamo which were dominated by the same larger fish species, giant Nile Perch (*Lates niloticus*), and tilapia (*Oreochromis niloticus*).

Figure 39: Lake Chamo with its islands

Flora. The floristic composition of the park is established to contain 700-1000 plant species, of which only 276 species have been so far identified and documented by different authors.

Wildlife of Nech Sar. Due to its broad and complex vegetation structure Nech Sar offers habitat to a great number of wild animals, including more than 90 mammals and 351 bird species. There is also a considerable number of Reptiles and amphibians.

Figure 40: Greater kudu hiding under bushes in the grasslands

Mammals. The most notorious mammals are the ungulates. They can be divided in grazers like the zebras, gazelles and hartebeest, which are common on the grasslands and dik-diks, duikers, lesser and greater kudus which prefer bushland or the interface between bush and grassland, where they can hide from predators.

Among the predators there are the carnivores reported in the area: black backed jackal (*Canis mesomelas*), side striped jackal (*C. adustus*), hunting dog *(Lycaon pictus*), cheetah (*Acinonyx jubatus*), leopards (*Panthera pardus*), lion (*Panthera leo*), serval cat (*Felis serval*), caracal (*F. caracal*) and spotted hyena (*Crocuta crocuta*). There are twenty species of rodents and four species of insectivores in the park, most of them in the grasslands.

Birds. In 1996 Nech Sar NP and its surroundings was declared Important Bird Area (IBA ET056) by Birdlife International. Up to the moment 351 bird species have been recorded for this area, some of them are birds on passage like the Lesser Kestrel *Falco naumanni*, with a few of these birds possibly wintering here and Pallet Harrier *Circus macrourus*. Small numbers of the flamingo *Phoenicopterus minor* occur on Lakes Chamo and Abaya.

Typical bird species for the bushland of Somali–Massai biome are:

- Black-billed Wood Hoopoe *(Phoeniculus somaliensis*)
- Taita Fiscal *Lanius dorsalis*
- Boran Cisticola (*Cisticola bodessa*)

The open plains support three species that are little known in Ethiopia: an isolated population of the white tailed lark (*Mirafra albicauda*), which is unknown elsewhere in Ethiopia, the endemic Nech Sar Nightjar *Caprimulgus solala*, known from just one record and the rare Star-spotted nightjar *Caprimulgus stellatus*. The plains support populations of two other nightjars, *Caprimulgus fraenatus* and *C. donaldsoni*. The south-western corner of Lake Abaya supports one of only two Ethiopian populations of the White-fronted Black chat *Myrmecocichla albifrons*.

Figure 41: Fish eagle near shore of Lake Chamo

Other notable species include the African cuckoo hawk *Aviceda cuculoides*, the Bat hawk (*Macheiramphus alcinus)*, the Scissor-tailed kite (*Chelictinia riocourii*), the Bearded vulture (*Gypaetus barbatus*), the Ovambo sparrowhawk (*Accipiter ovampensis*), the Red-winged francolin (*Francolinus levaillantii*), the African finfoot (*Podica senegalensis*), the Scarce swift (*Schoutedenapus myoptilus)*, the Grey cuckoo-shrike (*Coracina caesia*) and the Reichard's seedeater (*Serinus reichardi*).

Reptiles. The most notorious reptiles are obviously the Nile crocodiles in the lakes Chamo and Abaya. There are also 15 lizard species, including 7 species of skinks, 2 chameleons, 3 geckos and the Nile monitor. There are also 3 species of turtles / tortoises and 13 snake species, many of them are poisonous.

Amphibians. So far eight amphibian species have been identified for Nech Sar park and surroundings, seven of them are frogs and one is a toad *(Bufo regularis*).*Ptychadena erlangeri* is endemic to Ethiopia. It occurs in the area between Nech Sar and the Bale mountains.

Fishes. In the two lakes and their tributaries some 16 fish species have been identified, including the Nile perch, tilapia, and catfish. In the chapter on fisheries in Lake Chamo there will be more detailed information.

Important wildlife species:

- Lion (Panthera leo). At the moment there are probably not more than six lions in Nech Sar NP, which makes this species probably the one which needs most conservation attention. Worldwide lions are listed as vulnerable VU.
- Plain zebra (*Equus quagga*) is a typical Somalia – Massai species. In Ethiopia it is also found in Mago and Omo NP. Concerning the IUCN red list it is of least concern. In Nech Sar it lives mainly in the grassland plains and in the bushland of the hare hills (Doku et.al 2007).
- Swayne's hartebeest (*Alcellaphus buselaphus swaynei*) is one of the most endangered endemic wild animals of Ethiopia. At present Swayne's Hartebeest are found only in few localities in Ethiopia, especially in the Senkele SHB Sanctuary. From here 130 animals were translocated to Nech Sar in 1974. Here they suffered a very strong decline. At the moment, no more than two animals could be observed. The distribution of the endemic Swayne's hartebeest is particularly declining in the NSNP as a result of its narrow range of tolerances to environmental conditions and human activities. Conservation measures are urgently required.

- Defassa waterbuck (*Kobus defassa*) is restricted to a hill of wooded grasslands near to Kulfo River. It also has a narrow tolerance, needing grassland and wetland in close neighbourhood. The waterbuck is considered as near-threatened NT.
- Hippos (*Hippopotamus amphibious*) are listed as vulnerable VU. They live in many sub-Saharan counties. In Ethiopia they can be found in different river and lake systems. No recent information is available on population size and dynamics of hippos in the two lakes
- Nile crocodiles (*Crocodylus niloticus*) are, like the hippos, an important ecotouristic resource. They are not listed as threatened species, but their population may suffer decreases due to environmental changes in the lakes and their surroundings

Irreplaceability of Nech Sar animal species. According to IUCN Database on Protected Areas (http://irreplaceability.cefe.cnrs.fr) there are four species in and around Nech Sar NP that are considered of global importance:

- The Guramba Shrew (*Crocidura phaeura*) is an insectivore of a very restricted range. It is endemic to Ethiopia, only known from the areas of Nech Sar National Park where 13 specimens were collected in the riverine forest bordering the Kulfo and Sermale Rivers (Duckworth et al. 1993) and from the type locality, Sidamo, which is located at the base of Mount Guramba. Its elevational range is considered to be between 1,100 m-2,400 m asl.
- The Ethiopian Thicket Rat (*Grammomys minnae*) is a species is known only from two locations in the Rift Valley of Ethiopia. It has been found close to the forest edge at 1,800 m asl.The habitat and ecology of this species are not well known, as animals were collected at the edge of forest, it may be a forest species.
- The frog *Ptychadena erlangeri* occurs in the Rift Valley and in the highlands on both sides. It is generally found at 1,500-2,500 m asl, though it possibly extends as low as 1,200 m asl near the shore of Lake Abaya (the type locality). Its distribution is spatially fragmented although it probably occurs more widely in suitable habitats across the area (A. Mengistu and S. Loader pers. comm. June 2012).
- The is a bird, only known from one incomplete specimen – a wing found near a dirt road – in the grassland plains of Nech Sar.

	Species	No. Species NSNP	Total Ethiopia	% NSNP / Ethiopia
1	Mammals	91	277	33%
2	Birds	351	861	41%
3	Reptiles	42	201	21%
4	Amphibians	9	63	14%
5	Fishes	16	45	36%
	TOTAL	**509**	**1447**	

Table 6: Vertebrate species registered at Nech Sar NP, and their share on all species of Ethiopia

About 277 species of mammals, 861 species of birds, 201 reptile species (over 87 snakes, 101 lizards and 13 species of tortoises and turtles), 145 species of freshwater fish, of which over 87 species are from Baro River and 16 from Lake Abaya, 324 butterflies and 63 species of amphibians are known from Ethiopia.

Insects are diverse and common features of the park, 69% of the butterfly species in Ethiopia are recorded in NSNP and 20% of them are endemic.18 species of dragon flies are recorded.

4.3 Invasive Alien Species

Invasive alien plant species seems to be a minor problem to the Nech Sar area. There are no major roads, railways or rivers where alien species could be traveling along. So, up to the moment no Prosopis juliflora has been reported to the park. However, there are reports on Abutilon spp. on the grasslands. Abutilon is a genus within the malvaceae family. It includes herbs, vines and bushes. Abidoyo, an invasive shrub is also mentioned in the Guji. There still is a need to study this subject and find out which alien species actually are found in the park and what would be their potential to invade larger areas.

4.4 Climate Change Issues

There are no studies available on climate change and carbon stock in Nech Sar NP and surroundings. These issues should be studied soon. Climate variations affect the levels of Lake Chamo and Abaya, as well as the state of crucial habitat like the grassland.

4.5 Socio-economic and political conditions

The area around Nech Sar NP was sparsely settled before the 1960s. Although founded only a few decades ago, Arba Minch town is marked by a tremendous population growth, physical expansion and development of various institutions. Before, there was only a population between 1500 to and 2000 people in 1964. However, the number of housing units increased to 8776 with a total population of 40,020 in 1994 and 57,223 in 2001 (CSA 1994, Elias Endale 2003). This makes Arba Minch one of the fastest growing towns of Ethiopia. According to the 1984 and 1994 census reports, 66% and 62% of the total population were immigrants, respectively. Lately the rapid population growth of Arba-Minch is related to immigration of people from Gamo highlands, Wolaita and Gofa. In fact several factors could be mentioned for the rapid expansion of the town. The establishment of state farms, the development of different institutions and the potentiality of the town to resources can be mentioned among others (Lemlem & Demeke, 2006).

People living in the wider Nech Sar area before establishing the national park were belonged to the Ganta / Gandule, the Kore and the Guji. A population census in the park area, conducted by conservationists between 1973 and 75 showed 1222 persons living in 302 houses with a livestock population of 5897 head, mostly cattle. 502 of the persons lived in permanent villages whereas others are pastoralists.

As the Military Regime of the Derg took control in 1974, people living in the park were told to settle outside its boundaries. The Ganta and Gandule people who used to live on the lake islands agreed to resettle. They moved to a land area close to the park on its western direction. The Guji did not want to resettle outside the park by justifying their resistance with ancestral rights to the land and their preference to live in the area due to its convenience for their cattle in terms of the grazing land and

water availability. Hence, the government removed them by force from the park. Violent measures taken against Guji and Kore included burning down houses and crops as well as shootings. Nech Sar NP remained free from human settlement until 1991.

Before and after the collapse of the Derg regime there was a very unstable situation in Ethiopia. The park's natural resource degradation was accelerated like in other protected areas of Ethiopia. In the power vacuum during the transition period, the Kore people, Arba Minch town residents and Guji returned back to Nech Sar NP, beginning to indiscriminately cut firewood and timber. The Guji returned with their cattle to the Nech Sar grassland plains and the Kore continued their cultivation in the Sermele River Valley. Later on the massive deforestation and extensive fishing activities were reduced through concerted efforts of the park authorities and Gamo Gofa Zone Police (Kelboro & Stellmacher 2012).

While Kore people agreed to stay out of the park, the Guji remained living within park boundaries and grazing their cattle on the Nech Sar grassland plains. They argue that they live on ancestral lands being used since centuries and that their cattle have co-existed with the wildlife also since centuries. They say, that they are not killing or eating wildlife. Several authors have investigated the "Guji case", advocating for their stay in the area that today is Nech Sar national park, and to form part of the management system of this park (Kelboro & Stellmacher 2012, Asebe Regassa Debelo 2011 and Abiyot Negera Biressu 2009).

The Kore live near in the Amaro Highlands engaged in intensive farming practices producing quality coffee and products of Inset (Itima). They use park resources through by grazing, hunting, cultivation and settlement. The Guji pastoralists living near the shores of Lake Haro-Rapi and inside the park boundaries have traditional culture of dressing, hair styles, decorated milking and household materials and artifacts of body embellish. About 3500 households with more than 50,000 livestock are living in and immediate vicinities of the park which cause serious damage on vegetation and wildlife of the park through settlement, overgrazing and associated diseases transmission and hunting on the Nech Sar plain (Marye, A. 2014).

Figure 42: Guji people at Hotsprings in the south-eastern part of the park

Political and administrative settings. In the early 1990s the Federal Republic of Ethiopia was created. In this process much of the government power was turned over from the national level to the recently

created regional governments. This was also the case in Nech Sar NP, which was handed over to the government of the Southern Nations, Nationalities and People Region SNNPR. However, one small part of the park in the extreme northeast belongs to the Oromiya Region (Woreda of Gelana Abaya) and the Oromo-speaking Guji people live in the SNNPR, in the woredas of Arba Minch – Zuria and Amaro.

	Name of kebele	Family		Persons		Total	Woreda
		M	F	M	F		
1	Ergansa	759	62	3.414	246	3.660	Gelana
2	D. Menana	788	810	4.241	4.250	8.551	Amaro
3	Tifatie	572	579	2.862	2.896	5.758	Amaro
4	Yero	558	591	2.794	2.956	5.750	Amaro
5	Alfacho	299	246	1.495	1.234	2.729	Amaro
6	Abulo	108	76	543	384	927	Amaro
7	Leto	75	64	375	324	699	A.M Zu
8	Arba Minch city	13.025	12.724	52.102	50.898	103.000	11 kebele
	Total	16.184	15.152	67.826	63.188	131.014	
HH 31336 M&F 131014		**Source :-Projected from 2010**					

Table 7: Human population in kebeles around Nech Sar NP

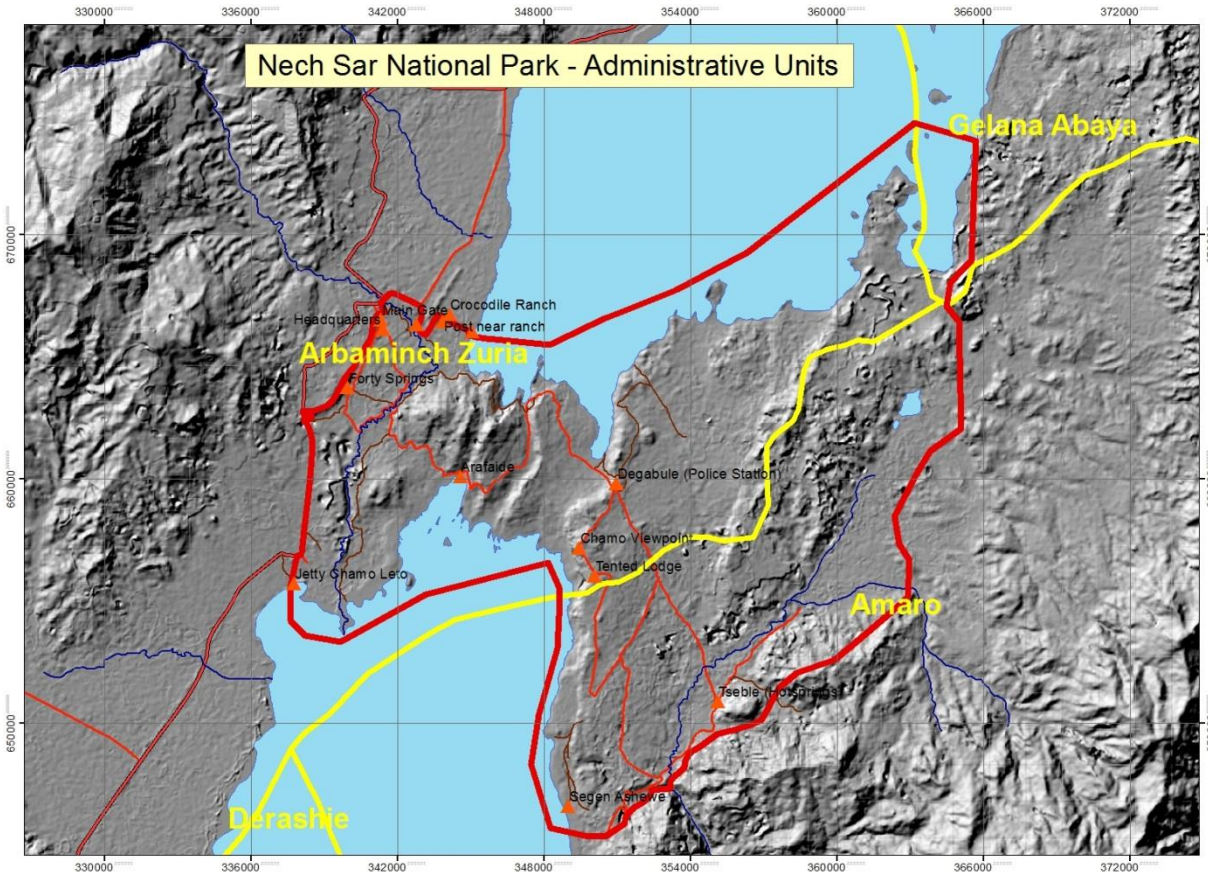

Figure 43: Map of zones and Woredas, Kebeles

	Name of Kebele	Cattle	Goat	Sheep	Horse	Donkey	Mule	Total
1	Ergensa	26.700	4.200	290	-	160	---	31.350
2	D. Menana	4.435	3.936	3.675	154	26	15	12.241
3	Tifatie	4.657	1.298	278	11	24	14	6.282
4	Yero	3.323	1.265	89	5	28	8	4.718
5	Alfacho	5.627	1.805	41	--	16	--	7.489
6	Abulo	1.426	611	5	--	0	--	2.042
7	Leto	1.024	622	123	---	73	---	1.842
8	Arba Minch city	3.264	443	185	---	23	--	3.915
	Total	50.456	14.180	4.686	170	350	37	69.879

Source Projected from 2010 data & field herd inventory

Table 8: Domestic animals in and around Nech Sar NP

4.6 History and Management of Nech Sar National Park

History of the national park. In 1967 the Nech Sar plains were proposed to be converted into a protected area, like a Game Reserve. Later, in 1974 the area officially became a national park. In the 1980s parts of the two lakes were included, for their importance as fish reproduction sites and to protect aquatic animals, especially crocodiles and hippos; also the ground water forest near Arba Minch became part of the park. This area was managed before by the State Forest Conservation Department (SFCD). Guji and Kore people were evicted by force from the park area, and resettled outside of the park boundaries. When the Derg regime collapsed in 1991, they moved back to the park area.

In 1995, with the new constitution, control over protected areas was given to regional governments. The Southern Nations, Nationalities and People Region SNNPR resettled the Kore people, but not the Oromo speaking Guji. Later on they handed over the park to African Parks Foundation, an international NGO, based in the Netherlands, which managed the park for three years, then turned the management back to the regional government. In 2009 EWCA assumed the management of the area.

Year	Management of Nech Sar	Persons / Institutions	Period
1967	Recomendation of Nech Sar Game Reserve	Blower and Bolton	Empire
1974	Designation as a National Park	EWCO	Derg Regime
1984	Arba Minch forest and aquatic areas included	EWCO / SFCD	Derg Regime
1985	Guji moved out of park by force	Military & Scouts	Derg Regime
1991	Return of Guji, Kore, Arba Minch people to NP		Transition
1995	Management was handed to SNNPRS	SNNPRS	Fed. Republic
2004	Kore resettled 15 km south of park	SNNPRS	Fed. Republic
2005	African Parks Network assumes management	APN	Fed. Republic
2008	APN withdraws from NSNP	APN - SNNPRS	Fed. Republic
2009	Management was handed to EWCA	SNNPRS - EWCA	Fed. Republic

Table 9: Important events for the Nech Sar NP management

Despite of an age of more than 40 years, Nech Sar National Park is not gazetted yet, nor has there ever been prepared a management plan. This can be attributed to the ongoing and unresolved problem with the herding people, especially with the Guji. In 2005 an executive summary for a proposed

management plan was presented by Alison Jones. In 2013 a development proposal was presented by the chief warden, including important activities to improve the situation of the park (Abraham Marye 2013). Part of this proposal has been implemented or is on the way of being implemented.

Personnel and budget. While the regional government had 41 employees, during the management of APN their number doubled to 82, then went down to 58, after regional government & EWCA took over the park management in 2008 & 2009 respectively. Because of low human resource in the job structure some of them were expelled from their job. On the other hand discouraging salary, low allowance and minimum man power in the governmental structure than during APN management many of them left their jobs. Again man power structure improved in 2013 & 2014 by EWCA owning 98 & 116 people in the manpower structures at the present 87 persons employed which is 74% of vacancies occupied exceeding from which was 55% in early 2015.

When African Parks was in charge of the national park, its budget went up tenfold, but later it dropped again. At the moment the park faced critical running budget shortage. It consists of **not more than 150,000** ETB per month of which 50,000 running and the rest for salary. To a great amount the budget provided from EWCA goes to salaries and construction, for example of new buildings near the present headquarters, where the employees will live and eventually new headquarter buildings.

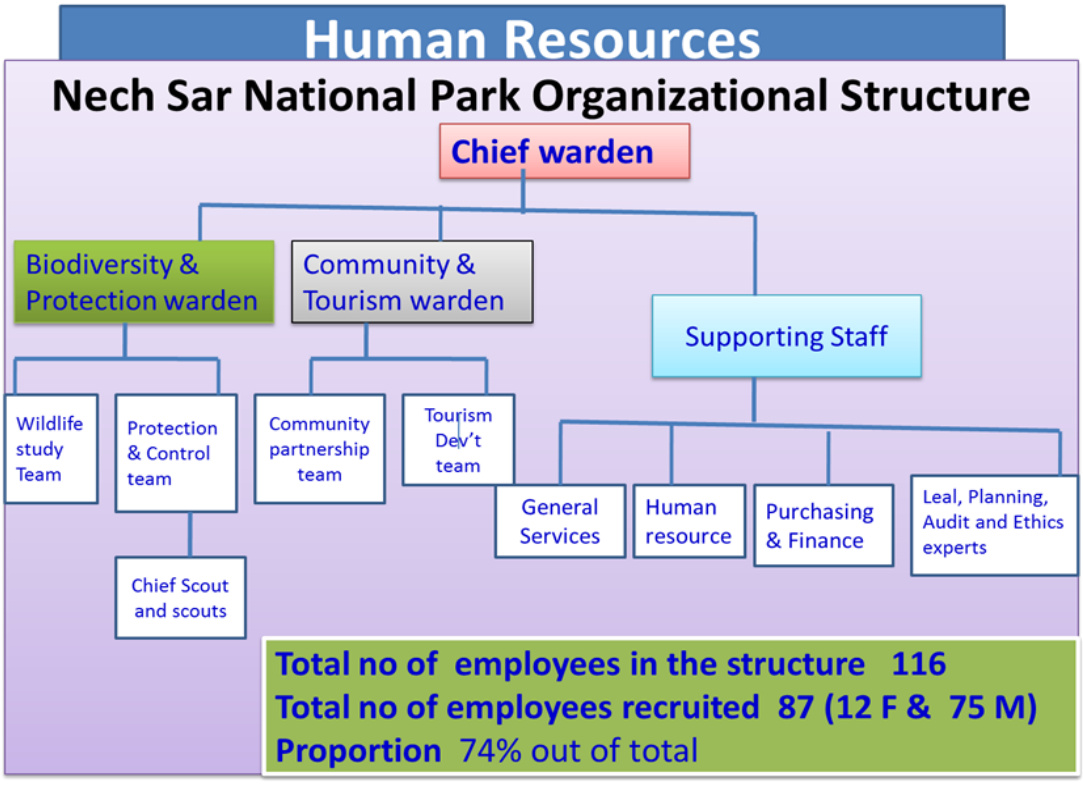

Figure 44: Organizational structure of Nech Sar NP, source Facts and Figures

Part of the existing equipment is from the APN time, like 2 of the 3 vehicles, a boat with 40 hp outboard motor. Other items were purchased through the SDPASE GEF-project, like a 4x4 vehicle, a back loader to improve the road system within the park and to be used for activities related to livelihood improvements of local people (e.g. fish ponds). SDPASE also financed the creation of a radio-based communication system with 1 base station at HQ, a repeater installed on a tower of the telephone company, located in the mountains, 10 km west of Arba Minch. There are 6 mobile units (walky talkies) for the outposts (campsites) and for patrolling scouts.

According to the chief warden, the 5 items that do not work need urgent repair. Putting the back loader and the radio system to function is already on the way. There is a strong need to improve the repair and maintenance system for the existing equipment. It will also be important to purchase the following items, in order to facilitate patrolling and monitoring in the park:

- 4 to 5 motorcycles,
- 2 more boats with outboard motor 40 hp
- Solar energy systems and water collection systems for the outposts
- Internet and telephone services and associated equipment
- Office and field equipment, like camera. GPS, binoculars, etc.

There is an important need for technical training, especially for newly employed radio operator, for the operators of machinery and for the scouts in general.

	No.	TITLE	AREA OF WORK
Park Directive Team	1	Chief warden	
	1	Warden	Community & Tourism
	4	Experts	Community & Tourism
	1	Warden	Protection & Biodiversity Management
	1	Senior expert	Protection & Biodiversity
	1	Junior expert	Protection & Biodiversity
	1	Junior expert	Protection & Biodiversity study leave
	2	Secretary	Head quarter
	2	Cleaner	Head quarter
	1	Message transfer	Head quarter
	14	**Subtotal**	
Support team	1	Head	Finance
	1	Accountant	Finance
	1	Budget regulator	Finance
	1	Cashier	Finance
	2	Cash collectors	Finance
	1	Purchaser	Finance
	1	Officer	Audit
	1	Officer	Ethics officer
	1	Head	Human Resources
	1	Expert	Human Resources
	1	Clerk	Human Resources
	1	Officer	Planning
	1	Officer	Legal matters
	1	Operator	Radio System
	1	Head	General service
	1	Officer	store man
	2	Car Operators	Drivers
	3	Guards	Head quarter
	21	**Subtotal**	
Scouts	1	Head	Scouts
	1	Coordinator	Campsite Degabule (Kudu Camp)
	6	Scouts	Campsite Degabule (Kudu Camp)
	1	Coordinator	Campsite Hotsprings - Tseble (Lion Camp)
	6	Scouts	Campsite Hotsprings - Tseble (Lion Camp)

1	Coordinator	Campsite Chamo Leto (Hippo Camp)
6	Scouts	Campsite Chamo Leto (Hippo Camp)
1	Coordinator	Main Gate
6	Scouts	Main Gate
2	Coordinators	Headquarters
21	Scouts	Headquarters
52	**Subtotal**	
87	**TOTAL**	

Table 10: Employees of Nech Sar National Park, orange fields = budgeted, but vacant at present

Park Infrastructure. It is planned to build new headquarters in 2016. EWCA will pay for the building, but there might not be enough money to equip these headquarters. The existing outposts do not have any electricity, nor do they have a water storage system. Drinking water is brought in plastic tanks by pick-up from Arba Minch. Park authorities plan to establish three more outposts, one at Arafaide, near Lake Chamo, in order to control illegal fishing in the area, one at Segen Ashewe in the southeastern corner of the park to control illegal agriculture and settling and a third one near the crocodile ranch, where to control wood collectors & hippo poaching occurs occasionally.

		Purchased by	Actual State	Action required
1	Vehicle 4 x 4	SDPASE	working	
1	Vehicle 4 x 4	APN	not working	Needs repair
1	Vehicle 4 x 4	APN	not working	Needs repair
1	Bus	leased	working	
1	Tractor	APN	working	
1	Back loader	SDPASE	not working	Needs minor repair
1	Boat & Outboard 40 hp	APN	not working	Boat needs welding
1	Radio System (8 units)	SDPASE	not working	Needs minor repair

Table 11: Equipment of Nech Sar NP (2015)

Roads. The main road in the park leads from Arba Minch to the main gate, from here there is road leading to the Nech Sar plains, and later to the hotsprings area where it meets a road coming up from the south, all along the eastern shore of Lake Chamo, then follows the Sermele River, connecting the upper Sermele River valley, the area used by Guji people. There are two minor roads, connecting the Kudu Camp (Degabule – ex Police Station) with the Abaya viewpoint, and another road leading to the Chamo viewpoint to the south. All these roads are dirt roads and might only be used by 4x4 vehicles and during dry season. The main access road is being improved at the moment, in order to turn it into an all-weather road. Near the headquarters a road turns off, leading to the forty spring area.

At Chamo Leto a jetty was constructed by Africa Oil Ethiopia BV, for their boats that conduct seismic surveys for petrol exploration in Lake Chamo. This jetty will be turned over to the national park in the next future, when exploration has finished.

Trails. In the national park exists a number of hiking or trecking routes that can be used in the future, after receiving some maintenance:

- Trail from 40 springs to Kulfo River bridge, 3 km in the ground water forest
- Trail from main road to Crocodile Market, 7 km through bushland and forest

- Trail from Kulfo River bridge following Lake Abaya shore, leading back to main road after 10 km

On the eastern shore of Lake Chamo, tourist boats land and tourists walk up to the Nech Sar plains on 5 km (back and forth) hike. This trail is in already a good condition.

Figure 45: Map of Nech Sar NP with roads, trails and existing and planned sites for patrolling outposts and tourism facilities (campgrounds, jetties, etc.)

Regulations and law enforcement. Like in all Ethiopian national parks it is forbidden to:

- Cut and collect wood and to burn charcoal
- To remove wild plants or parts of them
- To fish with nets or other fishing gear
- To hunt or kill any wild animal
- To carry out any agricultural activity: plowing, planting, harvesting
- To graze any domestic animals: cattle, goats, sheep
- To settle
- To wear and use any arms, especially fire-arms
- To cause any fires in the forest, bush land or grassland

The scouts are the main responsible to enforce these laws and regulations, mainly in large or medium sized operations, including also park supervisors and policemen, as well as people driving the cars or boats that are used in the operation. Illegal park resource users are arrested, the equipment they used is confiscated and sometimes destroyed (boats, nets, firewood and charcoal, axes, farming tools, arms, etc., as well as provisional shelters that had been built to facilitate the illegal activity).

The persons are taken to a temporary prison at the police station. The legal officer of the national park and the police investigator write an accusation, based on the reports by the involved scouts and policemen. This accusation is handed to the district attorney, and a legal process against the accused starts within 2 days. In former times this accusation process could take one or two weeks.

Generally, a first time convict gets a legal warning, together with a minor fine of less than ETB 1000. People that are caught more than twice can be charged by imprisonment from 2 weeks up 3 years plus fine.

According to the reports, law enforcement is focusing mainly wood cutting, illegal fishing and agricultural activities, while the grazing problem has not been addressed in the whole park, since this would need previous political decisions.

4.7 Tourism in and around Nech Sar National Park

In the few decades that the town of Arba Minch exists it has developed to an important center for southern Ethiopia, also in terms of tourism. Next to Arba Minch is the Nech Sar National Park. Its main tourist attractions are:

- Crocodiles, hippos and water birds along the shores of Chamo Lake, and to a lesser degree at Lake Abaya
- Grazing animals on the Nech Sar plains, they can be reached by boat, crossing Lake Chamo or by car, using the road that crosses the God's bridge
- An outstanding Rift Valley landscape
- The unique and very beautiful groundwater forest with the 40 spring area
- The Sermele River and hotsprings area

On the other side there are other touristic destinations that can be reached from Arba Minch, all of them important in terms of landscape and biodiversity as well as for their ethnological and cultural features:

- Geneta, Dorze and Chencha in the nearby mountains: driving & trekking and cultural activities (food, handicraft, dances), especially on 27 of September
- Konso at 90 km to the south, world heritage site, known for its culture and special landscape
- The lower Omo valley world heritage site region with its nearby Omo National Park protected areas and very special ethnic groups
- Hotsprings near the northern shore of Lake Abaya, in Wolaita zone the way to Arbaminch not yet developed or promoted
- Crocodile ranch near Arba Minch airport

In Arba Minch already exists an important number of hotels and restaurants. There are two lodges and a third is under construction. Arba Minch can be reached easily by plane. There are regular flights from Addis Ababa; they need a little more than an hour. There are also regular buses connecting Arba Minch.

The Nech Sar National Park is visited more or less to an equal amount by Ethiopian and foreign tourist. While Ethiopians prefer the months between June and August, the majority of foreigners come to visit mainly between October and February. Until 2006 less than 4000 visitors entered the park. Since 2007 visitation is increasing steadily, reaching up to 24 000 persons per year. The great majority enters the

park by boat from the jetty at Chamo Leto, to see the crocodiles and hippos around the Crocodile Market, then go on to the eastern shore and walk up to the plains to see the zebras, gazelles and other wildlife.

Figure 46: Boat taking tourist to Nech Sar NP

At the moment only 3 to 5 vehicles with tourists enter to plains through the God's bridge road. It is assumed that this number will go up to 15-20 per day, when the reconstruction of the road has finished and normal cars can use it.

In 2014 more than 1,3 million ETB of revenues from entrance fees have been received by the national park. This money is transferred to EWCA. EWCA passes 85% of these revenues to the SNNPR government. It is not known, what happens with this money later on – an issue that is discussed much in stakeholder meetings. In Mago National Park, managed directly by SNNPR, 40% of the revenues is reinvested in the area, benefiting local communities.

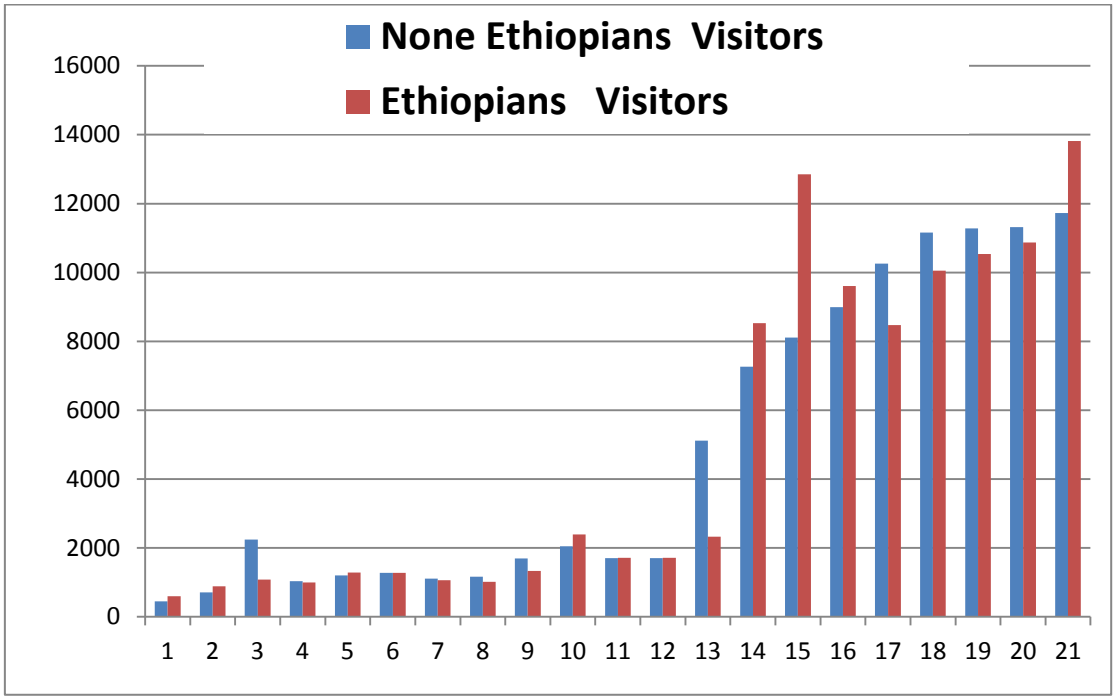

Figure 47: Visitors to Nech Sar NP, separated in Ethiopians and foreigners; 1994 (=1) to 2014 (=21), source: Report on Facts and Figures NSNP

There is no legal base to charge providers of tourist services like terrestrial and aquatic transportation into the park, guidance of tourists by members of the local tourist guide association or by hotel or lodge employees. At the moment there is no lodge within the park area, but there are advanced plans to establish a tented lodge in the vicinity of Chamo Lake View Point, by the investor Roberto Gabresi. Lodges within parks generally pay their fee at the national level, to the ministry of culture and tourism. However all tourism enterprises like hotels as well as tour guide associations are required to pass all important information to the zonal tourist office. The two lodges and six hotels have to pass an annual evaluation in order to renew their license.

In Arba Minch exists a Tour Guide Association with the name SeeUs, they exist since about eight years and have a small office in the upper part of the town. The association has presently 14 members, all of them male. They received their training from the zonal tourist office and are licensed by them. In a week they have somewhere between 0 and 10 client groups to guide. They get their clients through the airlines and from several hotel owners, except for Paradise Lodge, which uses their own people to guide tourists. They also have a website https://seeusarbaminch.wordpress.com . See Us offers different tours to the national park, as well as visits to Dorza and Chencha, Konso and the Omo valley, the latter for a minimum of three days. They charge between 150 and 550 ETB for their guidance. When transportation is needed, like a car to take the tourists or the boat on Chamo lake, the owner of car or boat charges the tourists directly, based in US Dollar. A trip to Nech Sar for example would cost US$ 150. For a one day boat ride we had to pay more than ETB 3500. Considering a prize of ETB 500 for the gasoline, the boat owner made a lot of money out of this visit. It was considered by the tourist office as well as by the guides, that prices for car rental and boat rides should be regulated.

Handicrafts. In the last years two handicraft associations were developed in Arba Minch, one has shop in Paradise Lodge, the other near the main park entrance. They mainly sell textile products produced in Arba Minch and in the mountain town of Chencha, which is famous for its weaving production. The shops also resell handicrafts from other places in Ethiopia, mainly from Addis Ababa, as well as from places in neighboring countries. The different grass species of Nech Sar plains offer a good raw

material for various uses of decorated straw baskets. There is a great potential to improve skills, so local people can learn to produce more items like carvings, pottery, etc.

Figure 48: Handicraft shop at Paradise Lodge

Within the park there is one spot with some kind of local mass visitation, at least on weekends: The Forty Springs area. Here crystalline water comes to the surface near the foot of an almost 200 m high escarpment that separates Arba Minch town from the groundwater forest. Most of the water is pumped up to the town to serve as drinking water, while the rest runs through a little stream which will later join with Kulfo River. In this stream there are deeper areas where people can bathe. However, there are no tourist facilities like improved pools, sanitary facilities or organized parking areas. People are brought to the place and taken back to town, mainly using public transportation.

In the whole Gamo Gofa zone received more than 135 000 visitors in 2015, of which less than 20 % (25 000) entered the national park. This shows that there is a potential to motivate more visitors to see the park. Visitation to Gamo Gofa and especially Arba Minch has been increasing steadily in the last 15 years. About two thirds of the visitors are Ethiopians.

There are about 20 hotels, lodges, and in Arba Minch providing accommodation serving both Ethiopians & none Ethiopian visitors with international standard. Besides, there are great numbers of pensions in Arba Minch. There are many places with food and drink services for visitors and the people who live in Arbaminch. Many of the restaurants provide manly Ethiopian dishes. Those hotels, lodges & pensions are listed below. At the moment there are more than 700 beds available, with an occupancy rate of about 80%. Several new hotels are under construction or are planned.

Almost all tourist offers concentrate in the town of Arba Minch. However, there is a new lodge in Dorza, on the way to Chencha. It is run by local Dorza people. They focus on activities in the mountains, like tracking, cultural interchange and enjoying the great view over the two lakes.

Figure 49: Reception of Paradise Lodge in Arba Minch

Arba Minch crocodile ranch. The crocodile ranch exists since 1984. It is actually run by the Southern Nation's government. The ranch was located near the shore of Lake Abaya and had to move some years ago, when the lake level rose very fast in a period of heavy rainfalls in the Abaya watershed and the farm was flooded. All the crocodiles escaped to the lake, their fate later on is unclear.

Traditionally the hatchlings to stock the ranch are collected from nests along seven beaches of Lake Chamo. Lake Abaya specimens are not collected, because they are supposed to be wilder and more aggressive. There is also a lack of good accessible beaches on this lake. The hatchlings are collected by the end of nesting season (mid-April). All eggs are taken from a given nest. After a period of two years 5% of the juveniles are taken back to nature. They are released in the wetlands around the lake. At the moment there is no research on the crocodiles, not on the wild animals in the lake, or on the released juveniles, in order to determine their survival rate and growth.

Lately the ranch has a problem to sell the hides. This is why two years of crocs have already passed their age and size to be harvested. No more hatchlings are taken from the lake since two years. The only income of the ranch comes from the visitation of tourists, who pay entrance fees.

Figure 50: Crocodiles at Arba Minch crocodile ranch

Nech Sar and Arba Minch have a great potential to improve and diversify tourism offers. There is especially a lack of information, what a tourist can do and what would be the means and rules how to do it. There is no central information office; there are no signs that show where important places to visit are. No tourist maps are available to the public yet. EWCA has a website on the park http://nechisarnationalpark.com/ which offers basic information on the parks, focusing on its wildlife.

4.8 Fishing in Chamo Lake

This chapter is mainly based on the report: Training for Fisheries Management, Planning in Ethiopia; Final Technical Report, project implemented by CARDNO Emerging Markets (UK), financed by European Union, April 2011 Chapter 9: LAKE CHAMO FISHERIES MANAGEMENT PLAN, WORKING DOCUMENT

There is an old fishing tradition in Lake Chamo. Commercially interesting fishes are:

Oreochromis niloticus	Tilapia	Koda	30 cm, both sexes	
Lates niloticus	Nile perch	Nech asa	88 cm males,	108 cm females
Bagrus sp.	Bagrid catfish	Kerkero		
Clarias gariepinus	Catfish	Ambaza	52 cm,	58 cm
Barbus sp.	Barbs	Barbo		
Labeo horie	Labeo	Barbo	52 cm	62 cm

Other three species like Synodontis (*Synodontis schall)*, tiger fish (*Hydrosynus forskali*) and *Mormyrus sp.* have no commercial market. The Nile perch generally lives in the pelagic zone of the lake, but uses the Kulfo River to spawn. Young perches are also found in the shallow areas near the shore, together with tilapia and catfish. The Labeo belonged to the most abundant species until the early 2000s, and

then its population collapsed, probably due to overfishing and water diversion in the rivers, which are important for spawning.

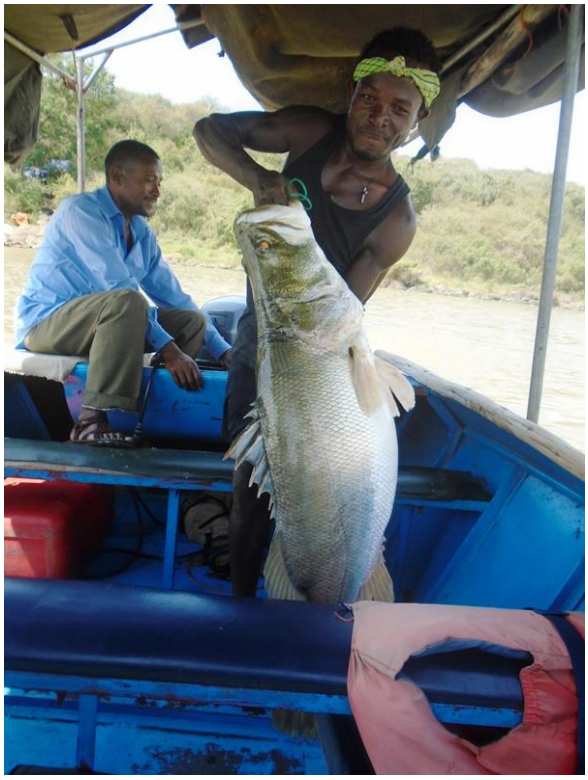

Figure 50: Fisherman holding a 1 m long Nile perch

Main fishing target species are perch, tilapia and Bagrid catfish. Main fishing gear are gillnets and long line hooks. Illegal fishing practices are: the use of seine gill nets near the shore, the use of mono-filament nets and the beating of the water surface to chase fish into the nets. Fishermen mainly use self-made rafts from light and floating wood. Only the cooperatives have motor-driven boats. There are more than 50 fishing camps all along the shores.

There are six active fishing associations at Lake Chamo: Arba Minch 150, Chamo 80, Leto 80, Sedie 80, Arora 80 and Walesa Fishermen Association with 80 members. So there are more than 500 organized fishermen. Fishermen who dedicate themselves to illegal fishing within the national park are generally not organized. Some of the associations own motor boats that are employed to pick up the catch and bring it to the markets.

Fishermen have different ethnic and professional backgrounds. Many of them used to be farmers before. People can earn much more by fishing than by crop growing. Fishing is considered as a job generating industry. People, who sell fishing equipment, fish buyers, and restaurants, all are beneficiaries of this activity. It is assumed, that about 12 000 persons in the Lake Chamo surroundings live directly or indirectly from fishing. For 2011 a total annual yield of more than 2300 tons of fish was achieved for Lake Chamo. This would have a yearly price of about ETB 33 million or more than ETB 14 000 per individual fisherman.

In order to manage the fish resource in a sustainable way a Task Force was created, to establish and enforce the following regulations:

- Closed area within NSNP
- Reed belt and river mouths reserved for subsistence fishing

- Mesh size regulated
- Chase and Trap methods prohibited
- Fish size control on the markets

Application of these measures is by awareness building, control and confiscation of prohibited gear, legal action. However, the success of the task force is limited due to different adverse factors, like lack of participation, financial support, coordination and legal issues. Important ideas to be implemented would be the licensing of all fishermen and the charging of taxes.

Main sources of habitat degradation and pollution of the lake ecosystem con direct effects on the fish populations are:

- Inadequate agricultural practices in the catchment areas
- Agro-industrial projects diverting and polluting waters (fertilizers and pesticides) from important tributaries, occasionally cause algal blooms in the lake, which lead to oxygen shortages and massive fish die-offs
- Destruction of the reed belt, an important breeding area for fish and crocodiles
- Use of plastic bottles as floaters for the nets

An area of about 48 km^2 of the 550 km^2 total lake surface belongs to the Nech Sar National Park. In this area fishing is totally forbidden. This restriction was enforced during the African Parks management. In the present we were counting four fishing camps and more than 50 fishermen within the park limits. In two operations during 2015 five illegal fishermen were arrested, 731 different fishing nets & strings, 39 shelters were destroyed, 179 facilities and fish food preparation tools and 17cutting knifes were confiscated. The five arrested fishermen stayed in police custody for 15 days. The AZW court sentenced them to 3 months in prison; they had to pay a fine of ETB 500 each.

The enforcement of the No-Fishing Area within the Nech Sar NP is a very important piece in the process of constructing sustainable fisheries in Lake Chamo. However, it is important to also address the other problems mentioned above.

4.1 Local communities' involvement

The Nech Sar NP authorities have identified and described the stakeholders. Their roles have been identified and their responsibilities defined in various meetings. Main stakeholders and partners of the Nech Sar NP are:

Authorities

- Zonal, Woreda and local admirations
- Arba Minch city administration
- Arba Minch-Zuriya police and justice offices
- Agricultural and environmental protection department

Research and Education Centers

- Arba Minch university
- Arba Minch Agricultural Research Center
- Primary and secondary schools

Tourism

- Culture and tourism department office
- Hotels and lodges

- Tourism Investors (lodge and other accommodation owners)
- Local Guides, Boat-owners, Ecotourism services provider's associations

Community groups

- Honey production association
- Local communities representatives (e.g. Guji and Kore)
- Lake Chamo fishing associations

Others

- Investment offices
- Association agency offices
- Chamo Environmental protection club

Activities executed in developing community partnership by the park include discussions with local communities on conflicts of interest. There is awareness training on community and park partnership, making clear permitted and prohibited activities in the park, showing options of alternative income, using park resources through non-extractive ways.

Permission to have a working area in the buffer zone of the park and writing supporting letter to respective stakeholders for license and working site delineating a provision of technical training by specialists from respective business development lead sectors of Arbaminch. Former illegal wood and grass cutters, charcoal burners and illegal fishermen were trained on beekeeping, ecotourism, fishing and business management.

Gender aspects. Women are responsible for about 70% illegal wood and grass collection from the park, to support the livelihood of their family. However, associations that had been established before 2012, such as boat renting, fishery and tourist guides had only male members. Associations established after 2012, had mainly female members (up to 71%). Two associations are entirely established by female members.

4.2 Availability alternative livelihoods for the local communities

While urban people from Arba Minch have a broader choice of opportunities for their livelihood, the Guji and Koro communities only depend on livestock grazing and to a certain degree on agricultural activities. It is important to find out whether it is feasible to promote fodder and agricultural production east of Nech Sar NP, in order to decrease grazing pressure on the grassland plains. There is also the possibility to engage Guji and Koro in community based ecotourism, using the experience of the Dorze Lodge which is run by local Dorze people.

The Nech Sar NP authorities are involved in helping people who were formerly engaged in illegal activities related to wood cutting and fishing with the park, to change their livelihoods. Fishermen are involved now in new aquaculture projects, woodcutters are working in honey-production. The park authorities help finance the start of these activities and facilitate the ground in the northwestern outskirts of the park. They also helped with the start of handicraft businesses.

There is still a great potential for local people to be engaged in sustainable non-extractive uses of resources from the park and its surroundings.

4.9 SWOT Analysis on Nech Sar National Park

The Internal Strengths of the national park

Biological aspects. Nech Sar has a great diversity of ecosystems and landscape as well as its value for plant and animal species. The park is a refuge for many threatened species. On the Nech Sar plains extensive grassland forms a crucial habitat for zebras and gazelles. The majority of the existing ecosystems are in good or regular state of conservation. The park includes wetlands and near-shore areas of Lakes Chamo and Abaya with importance as spawning areas and as habitat for juvenile fish and crocodiles.

Knowledge on park resources. There are a great number of studies on biophysical and socio-economic and cultural aspects, including flora and wildlife of Nech Sar and of Lake Chamo.

Park Management. A great number of park management proposals are available, covering different management and development aspects for the park, as well as for Lake Chamo. The staff of the national park is almost complete, counting with important increases in the last years. The park has an important leadership by chief warden. There exists basic equipment like vehicles and boat, radio-communication, GPS, office equipment. Buildings: there is a temporarily used headquarter with employee accommodation, gate nearby, three outposts and a newly built jetty on Lake Chamo.

Tourism. There are basic tourism facilities: roads to and within the park, the recreation site at 40 springs, various trails. Tourist visitation to the national park is increasing considerably in the last years.

The Internal Weaknesses of the park

Impacts on park resources. The Guji people live within park boundaries and use grasslands for cattle grazing, causing severe overgrazing. The Kore people use part of the grasslands for herding cattle. Cattle are in a strong competition with grazing wildlife. The abundance of grazing wildlife and carnivores that feed on them much below carrying capacity. Some species are closed to local extinction, like Swayne's hartebeest and lion. There is Illegal firewood cutting and charcoal burning, mainly in the groundwater forest near Arba Minch, as well as Illegal cutting of grass from grasslands in smaller distance from Arba Minch. It is common to see illegal fishing within the park (Lake Chamo), using inappropriate nets that lead to entanglement of crocodiles.

Knowledge on park resources. There is a very limited knowledge on amphibians and reptiles and on the dense bushland areas between the two lakes

Management limitations. The contribution from EWCA to the park's budget are limited to wages for the staff and for construction, while purchase and maintenance of the equipment depends highly on international projects. There is a limited knowledge of certain staff members, to be able to fulfill all their duties. There is insufficient field monitoring and surveillance due to lack of facilities and training. The boundaries of park are not well defined nor gazetted, the limits between regions not properly defined.

External Opportunities

Improvement of knowledge. There is a great interest in national and international universities to contribute to improve knowledge by studying important biophysical and socioeconomic aspects in and around the park.

Tourism facilities. There is a good accessibility of the park by road and by aircraft from Addis Ababa to draw visitors. There are also good facilities of accommodation and food in the park vicinity, covering different quality and prize categories. An important number of licensed and organized guides from Arba Minch offer their expertise. Terrestrial (buses and 4x4 vehicles) as well as aquatic (boats) transportation is available for park visitation.

Conservation. A great number of fishing associations exist at Lake Chamo; they are willing to contribute to the sustainable use of fish resources and to the implementation of fishing and protected area laws and regulations. There is a general acceptance of the need of protection in the park by local authorities, herdsmen and the public in general. Near the park boundary exists a crocodile ranch. It is an important example to make nature pay for its protection (selling skins and being an important tourist attraction, while contributing to the survival of the species).

External Threats

Socio-economic challenges. Poverty and lack of economic opportunities drive stakeholders to break the law, unsustainable activities (overgrazing, firewood and charcoal, illegal fishing)

Lack of Awareness. National, regional and local authorities are not aware of NSNP importance and do not contribute enough to define borders and regulate uses of the park's resources.

Environmental threats. Pollution from Arba Minch town will keep affecting the park - e.g. rubbish being washed down by Kulfo River. Large scale agricultural projects pollute and divert rivers, affecting Lake Chamo hydrological balance and fish populations. An increased uncontrolled recreational use of 40 springs pollutes and degrades resources. Erosion processes in the upper and middle watershed of Kulfo and Sermele rivers produce an increased load of sediments adversely affecting the lake's ecosystem. Other tribal communities and investors put pressure on Guji and Koro people and push them to perform grazing and agricultural activities in the park. Climate change and overgrazing effects degrade the grassland ecosystem. Due to the lack of corridors and connections with other important areas (especially grassland) species can diminish and become locally extinct (e.g. hartebeest, lion).

4.10 Strategies

Strength-Opportunities Strategy

Research and Management of Information. Create research and information network for national and international research institutions with past, ongoing and future interest on topics related to Nech Sar and surroundings. Promote research in topics with little information available, especially on amphibians and reptiles and on the Nech Sar bushland.

Activities in execution: Digital library on Nech Sar and surroundings under construction. Partnership between EWCA and Arba Minch University (Memorandum of Understanding 2013)

Tourism Alliance. Create the Nech Sar tourism alliance, including all important stakeholders, like lodges and hotels, restaurants, tour guides, terrestrial and aquatic transportation businesses to and from Arba Minch and into the park, improvement of existent and creation of new infrastructure and tourist facilities: roads and trails, campgrounds, signs; creation of information material to promote the park and touristic activities within the park and in the whole area. Regulate prices and proceedings. Interconnect tourism development with other places like Konso, Omo valley Chencha mountains etc. Handicraft production and sale in Arba Minch

Activities in execution: Improvement of the main road to the park, one tour guide association and one tourist boat association formed

Lake Chamo Fishing. Promote network or federation of Chamo fishermen to participate in the park's management, including surveillance, in coordination with EWCA and fisheries department

Activities in execution: Six fishermen associations formed

Crocodile conservation. Assist improving ranch management, skin commercialization, research on crocodile populations of both lakes, with emphasis on the juvenile habitats and survival rates of released juveniles.

Strength - Threats Strategy

Sustainability – alternative livelihoods. Assist stakeholders to improve their income, developing alternatives for their income: aquaculture, handicraft for wood collectors and charcoal burners, for ecotourism enterprises.

Activities in execution: two handicraft associations formed at Arba Minch with 2 shops selling handicrafts, three bee-keeping associations formed, provision of practical training, provision of support materials.

Public Relations. Increase PR activities on situation of park, focusing on its threats and on the great opportunities, in order to gain politicians to participate

Activities in execution: A folder and poster with information on the park has been produced, PowerPoint presentations were elaborated

Improve environmental situation. Assist the municipality to establish an effective solid waste management, PR campaign on this issue. Reorganize and regulate the use of 40 springs and its surroundings. Assist local farmers and herders to construct soil conservation schemes, reforestation of areas highly susceptible to erosion. Carry out studies to determine and quantify socio-environmental impacts and negotiate solutions on these problems. Regulate grazing of domestic livestock in the grassland plains. Intensify monitoring of target species, apply measures to stabilize decreasing populations (e.g. lions and hartebeest). Monitor the spreading of invasive plants and remove them as far as it is possible.

Weakness –Opportunities Strategy

Sustainability – alternative livelihoods. Promote alternative livelihoods for herding Guji and Koro to help them reduce their number of domestic animals in the park.

Research and Management of Information. Promote further studies on amphibians, reptiles, invertebrates and small mammals, as well as studies on bush land habitat and beaches / wetland areas around the two lakes.

Public Relations. Inform decision makers of different government levels and general public on importance NSNP conservation

Weakness - Threats Strategy

Reduction of human impacts. It is necessary to improve law enforcement, including surveillance, confiscation of equipment used in illegal activities, fines and punishment. A better law enforcement is also needed concerning the pollution around 40 springs.

Activities in execution: Operations are carried out on illegal fishing, wood collection and charcoal burning in the groundwater forest, deforestation in Sermele valley

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