Study of Land Use and Land cover Status of Bahir Dar Blue Nile Millennium Park, Ethiopia

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Abstract - One of the major global concerns is the problem of declining land resources that are being threatened by the rapid human population growth. In order to give remarkable decisions on land one needs to have a reliable data or information about the current land use types of the area. The main objective of the study was to assess and map the existing land use and land cover status of the Park. Data of spatial vector and raster as well as attribute of the major variable land use were collected from Satellite imagery. ArcGIS 9.3 and ERDAS 9.1 software's were used in the process of analysis. As a result, the park was found to be dominantly used and/or covered by Forest land, grazing land, cultivated land and water body. The major traits on the conservation and development activities of the park are settlement, water pollution, agriculture and grazing

Key words: Park, Land use, Land cover, GIS, natural resource

1- INTRODUCTION

One of the major global concerns is the problem of declining land resources that are being threatened by the rapid human population growth. There is an increasing need to use resources in a sustainable way, increasing production but at the same time protecting the environment, biodiversity, and global climate systems.

Amhara National Regional state (ANRS) is one of the largest administrative regions endowed with divers Natural resources. Even though the region has a huge natural resource potential, there are no any recognized resource conservation activities, the region is still experiencing severe land degradation and loss in biodiversity which seeks immediate solutions and genuine participation of stakeholders.

To overcome these problems and develop mechanism for conservation and sustainable use of natural resources strategies like establishment of parks, protected areas, and wetland management and in general biodiversity conservation strategies are critically important to the region. The regional government now committed and established a new park called Bahir Dar Blue Nile Millennium Park Hence, studying the land use status of the park will help for proper land use planning of the park as well as enhance decision making ability to select appropriate areas for the infrastructures to be developed in the park and for future sustainable use of the land and conservation activities inside the park.

Land use study helps to get information about the social and economic importance of a given land on the existing natural and manmade features. Decisions on land have always been part of the evolution of human society. Hence, in order to give remarkable decisions one needs to have a reliable data or information about the current land use types of the area. Such information's are important

for sustainable land use planning and monitoring the environment. Therefore, the present study was initiated with the main objective to assess and map the existing land use status of Bahir Dar Blue Nile Millennium Park.

2- METHODOLOGY

Geographic Location

The study area is located between 11°28'49"N and 11°38' 29"N Latitudes and 37°23'28"E to 37°36'34"E longitudes. It lies within Bahir Dar Zuria woreda and Bahir Dar city administration of Ethiopia.

Materials Used

Data of the spatial vector was collected from QuickBird satellite image and GPS. The GIS software such as ArcGIS 9.3 and ERDAS Imagine 9.1 were used in the study.

Methods of Data Collection & Analysis

For the purpose of field work and visual classification hard copy color composite images were made for the data of QuickBird-2. Band combination of 4, 3, 2 in RGB combination was selected for improved vegetation discrimination. The hand-held GPS was prepared and the following conditions were set (set datum to Adindan, Projection to UTM, Spheroid to Clarke 1880 and unit of measurement in to meter).

In developing land use of the study area the satellite images were geo-referenced and the study sites were delineated using the boundary map of the park. Different types of Band combinations were used to discriminate the features in the image. Many ground truthing points were taken for features difficult to identify from the satellite images. The data collection was started by visual image interpretation and visiting of the study area. Then from ArcGIS, on-screen digitization and classification of different features into different feature classes were taken place to get the land use of the area that contains both thematic layer and attribute information, from the QuickBird-2, satellite images with the support of observation points and photographs recorded during field visit. For Each

developed vector polygons the attributes were entered in the table linked with the associated polygon. Each polygon has a class value and seven land use types and its extent in hectare base were identified in the study area. Finally, the land use map of the study area was developed from *Layout* view in ArcGIS.

3- RESULT & DISCUSSION

Overall seven major land use types of the park were distinguished. The land use type and its respective area coverage are summarized in Table A.

Table A. Land Use Types and Their Area Coverage of Bahir Dar Blue Nile Millennium Park

Code	Land use Type	Area (ha)	%
1	Cultivated land	705	15.00
2	Irrigated land	146	3.10
3	Grazing land	1238	26.17
4	Forest land including eucalyptus tree	1352	28.58
5	wetland	267	5.64
6	settlement and existing institutions	91	1.92
7	water body	930	19.66
	Total	**4729**	

Forest Land and Grazing Land

The map in Figure 1 below shows seven land use classes. As recognized from Table 1 the result shows that a significant amount of land in the park is used as Forest land, including eucalyptus plantation, (about 1352 ha or 28.58 %) and Grazing land (about 1238 or 26.17%). Forest land has indispensable economic value in the area. It is used for source of fuel wood and supplementary food for the peoples in the area. It is common to see shepherds and children's collecting the fruits of *Syzygium guineense ("*Dokma) and *Mimusops kummel* (Ishe) to supplement their food needs and even sometimes they take it to the local market to earn some amount of money. *Mimusops kummel* and *Syzygium guineense* are the common native tree species dominant in the area. Grazing lands are also one of the land use type in the park that dominantly observed in different types of land forms including the hills. Grazing land supports animals for grazing in the study area. Currently most grazing areas seem overgrazed and harvested for indoor grazing. According to the people in the area, most people are now reducing the number of livestock they have. They said that, this is because the size and potential of the Grazing land they have now is not enough to feed their animals.

Cultivated Land and Water Body

Cultivated land (705 ha or 15.00%) and water body (930 ha or 19.66 %) have also substantial coverage from the total park land use types. Majority of economically active population in the study area depends on cultivated lands. They grow different types of cereal and pulse crops. Most of the cultivated lands cover the gentle slope areas; however, there are also some farmlands in the "Bezawit" hills. Currently peoples are intensifying their cultivated lands and even they are cultivating the river banks and very hill areas. This shows that the size of cultivated land in the park may be much larger in a few years. Water body majorly from Blue Nile River and Lake Tana, part of the park, serves as the main economic resource center in the area. It is used as source of drinking water for both human and animals in addition to its use for irrigation, hygiene etc. These water body also supports a large variety of fishes. In addition to these, they are habitat for different types of wild animals (e.g. like Hippo) and birds. At present they are receiving different pollutions from factories, municipality, car washes, etc. This pollution from factories, municipality, and car washes highly affects the water and its animals and birds depend on it. Hence, a significant area of the park is covered by water body. This may be related to the major objective of the park that to protect the highly endangered water resources from any unnecessary interference.

Wetland and Irrigated Land

Wetland (267 ha or 5.64%) and Irrigated land (146 ha or 3.10%) have also a considerable coverage from the total park land use types. Wetlands are serving as the major fish breeding areas. There are also many other values associated with wetlands: water quality, flood control, erosion control, wildlife support, recreation and commercial benefits. Different types of vegetations are gown in the wetland areas. Irrigated land used for the production of different types of horticultural crops including the stimulant crop known as *Cata edulis*, etc. *Cata edulis* farm takes the highest area coverage, in which most of the rural and some of the urban dwellers are involved

Settlements and Existing institutions

The remaining 91 ha or 1.92 % of the park is used for settlements and different institutions. Settlement and institutions includes different types of structures like residence, factories, church, etc. Most peoples in the urban area of the park are employs of those factories found inside the park. Majority of peoples use their houses as residence, commercial purpose (e.g. like village shop) and rearing of animal. Factories found inside the park areas are polluting the river as well as the different types of the flora and fauna of the park. The existing settlement and factories found inside the park area makes the planning and implementation activity difficult
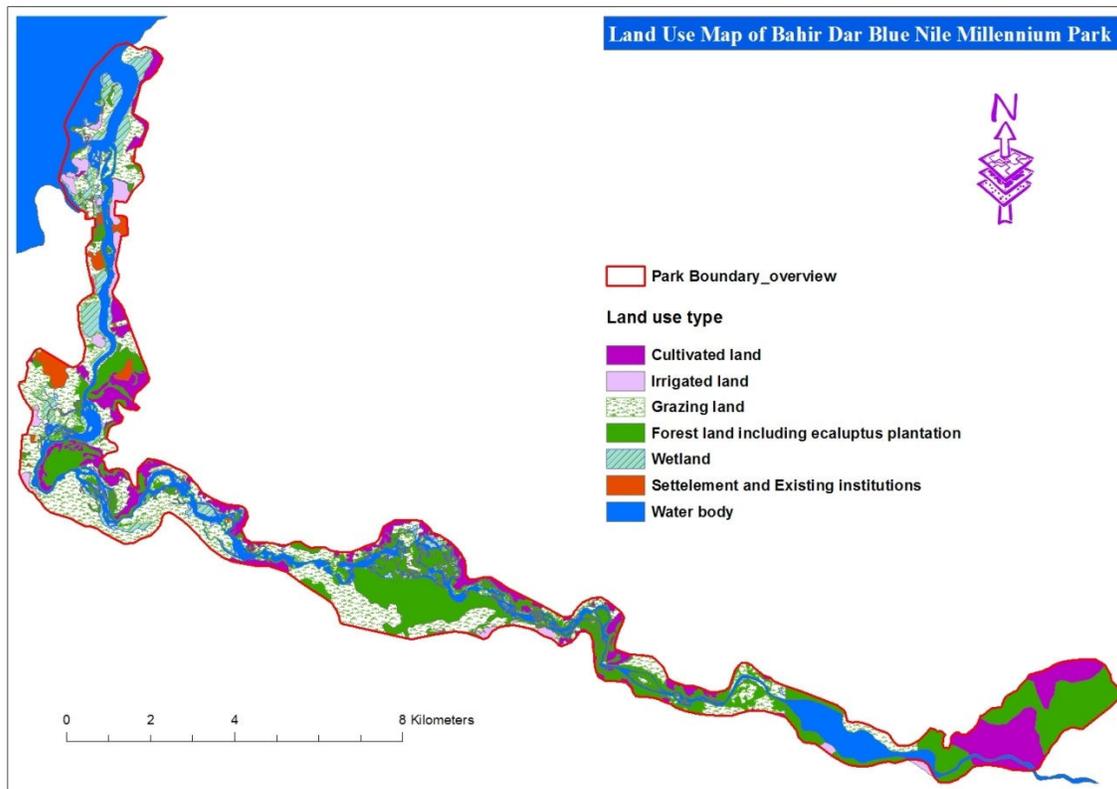
Figure 1: Land use type map of Bahir Dar Blue Nile Millennium Park

4- CONCLUSION

Amhara National Regional state (ANRS) is one of the largest administrative regions endowed with divers Natural resources together with the amazing landscapes and cultural heritage sites. Even though the region has a huge natural resource potential, there are no any recognized resource conservation activities, the region is still experiencing severe land degradation and loss in biodiversity which seeks immediate solutions and genuine participation of stakeholders.

To overcome these problems and develop mechanism for conservation and sustainable use of natural resources strategies like establishment of parks, protected areas and wetland management in general are taking critically important in the region.

The regional government is committed to develop a land use plan for the newly established Bahir Dar Blue Nile Millennium Park. Hence, in order to develop a sound land use plan the current land use status of the park have been studied based on seven main land use classes named as *grazing land, cultivated land, irrigated land, forest land (Including eucalyptus plantation), wetland, settlement and existing institutions, and water body*. As a result the study has shown that a significant amount of the park is used by Forest land (Including eucalyptus plantation), grazing land, cultivated land and water body. A considerable area of the park is also used by Wetland, Irrigated land and settlements and other institutions. Hence, the defined land use type and the area it covers can give valuable information for the planner to design the appropriate land use plan of the park. The major traits on the conservation and development activities of the park are settlement, water pollution, agriculture (Both rain feed and Irrigation) and grazing.

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