GIS based ecotourism potential assessment in Munessa Shashemene Concession Forest and its surrounding area, Ethiopia

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Abstract

This study aims to understand GIS based ecotourism potential of Munessa Shashemene Concession Forest and its surrounding area in Ethiopia. Landsat images from 2009/2010 and 2013 were used to drive baseline data including land cover, land use, stream and road. Elevation based agro-ecology and slope map were derived from SRTM DEM. Rapid wild animals survey, identifying the location of known historical, cultural and unique features were carried out in the field with the help of key-informants. A suitability model was designed in GIS environment to assess the suitability of an area for tourism considering suitability factors such as land cover types, wild animal zone, unique features, topography and distance to a road. The result showed areas which are highly suitable, moderately suitable, marginally suitable, or unsuitable for tourism. The old giant, Podocarpus (Podocarpus falcatus) trees that serve as habitat of the endangered and endemic mountain nyala (Tragelaphus buxtoni), were identified as very high suitable areas for tourists. The highly suitable areas include forest area along the lake which is seasonally visited by mountain nyala and areas of plantation forest that are found adjacent to natural forest. These areas follow remnants of the natural forest and found along boundary between the mid-highland and the highland agro-ecologies. The agricultural land use types consisting of maize/haricot-bean and wheat/barley were evaluated as marginally suitable, nevertheless these could be considered as potential for agri-tourism. The study revealed that the concession area is found to be a suitable area with its huge potential for ecotourism development.

1. Introduction

Ecotourism includes activities historically classified as 'non-consumptive', such as viewing, photographing, as well as those that involve killing or capturing wild animals, particularly hunting and recreational fishing. A considerable growth in tourists' understanding of importance of places, environments and cultures they visit in recent years has contributed to ecotourism development (Crouch & McCabe, 2003). According to McLaren (1988) ecotourism is a multifaceted concept which includes a number of different forms of tourism such as nature travel, adventure travel, birding, camping, skiing, whale watching, archeological digs, and so on. In this regard, we applied the term ecotourism in the landscape dominated by water, forest spectacular wild animals and agricultural land cover. Such ecotourism practices contribute to income generation, conservation of protected areas, creation of employment opportunities for local communities and offers environmental education. One of the significant aspects of ecotourism is sustainability (Diamantis, 2004), because ecotourism is generally nature-based, and careful to an environment. Furthermore it conserves nature and there by contribute to the sustainability of tourism reliant on wildlife and other natural resources (Tisdell, 2011). Sustainable ecotourism development concerns not only developing new environmentally friendly products, but also those aspects of the industry that make all stakeholders more resource conscious.

Ecological degradation and associated problems such as poor productivity of the resource base (land) are challenges that world communities are facing. Since human population is rapidly increasing in Ethiopia, the country is facing the same challenges.
As a result, it has drafted a number of policies that aimed to address the root causes of food insecurity that arise due to ecological and environmental degradations. Currently, such problems are exacerbated by high population growth demanding more natural resources (Girma, Afweork, Gail, & Yosef, 2014). Consequently, environmentally friendly approaches such as ecotourism are increasingly becoming popular and feasible in tackling problems that related with nature degradation and could easily be adopted by the rural communities which are the main stakeholder of the area. Other stakeholders include, government, private sectors, non-governmental organizations, donors, tourists and local communities (Fennell & Dowling, 2003).

Although Ethiopia has immense potential with regards to wildlife, agriculture and biophysical features for development of ecotourism, such practices are at infancy stage as compared to many African nations. Africa nations, such as South Africa and Kenya extensively rely on ecotourism to promote economic growth, job creation and reductions in high levels of poverty. Human-wildlife conflict in Ethiopia is more linked to negative attitude held by local communities towards crop damage by wild animals on farms adjacent to protected areas (Hillman, 1993; Hundessa, 1977). Presumably, sources of resentments among local people and protection experts could lie in multitude of causes than mere crop damage. A predominant cause of conflicts is exclusion of local people from benefits generated from conservation areas (Tedla, 1995). Hence, the same scenario might holds true in Munessa concession forest since many of the local communities were evicted from the area with no compensation. Conversely, forest manager considers the local communities as sources of threat to forest and wildlife. The concession forest delineated its boundary with the hope of conserving and sustainably uses the forest and wildlife resources, however the local communities rarely respect such demarcation since their livelihood is partly dependent on forest resources extracted and farm land in the forest. Such use including, fuel wood and construction materials is hardly controlled and regulated. The long term negative impact of such resource extraction on in the area would be unavoidable. Based on these assertion, the co-existence of these two main stakeholders side by side seems to be conflicting in terms of achieving sustainability of the resource base inside and outside on local communities’ land. Sustainable use of resources within protected area (Concession forest) could decrease conflicts and nurture positive attitudes of the local people towards nature conservation in such area (Kruger, 2005; Primack (1993) also stated, in some countries where people do not hesitate to farm, log, mine and fish in protected areas. Thus, ecotourism is one of the conservation systems that integrate people with nature. Moreover it was highlighted that ecotourism is important as a means of generating much needed foreign currency, locally and nationally (Kruger, 2005; Nepal, 2002). Hence, this study is expected to deliver base line data that could help the initiation of ecotourism (smokeless industry) in the study area since the area is significant with its peculiar biophysical features such as breathtaking waterfalls, streams, diverse flora and fauna including endemic mountain nyala (Tragelaphus buxtoni) (Mamo Dubale & Bekele, 2013), Menelik’s bush buck (Tragelaphus scriptus meneliki) and beautiful agricultural landscape.

The practice of tourist attraction sites evaluation and selection lacks integration of various spatial factors in a GIS environment. Therefore, the aim of this study was to assess the potentials of wildlife and other attractive features of Munessa Shashemene concession Forest and its surroundings for ecotourism development through the application of remote sensing and GIS.

2. Material and methods

2.1. Study area

The Munessa-Shashemene forest (MSF) is demarcated as one of National Forest Priority Areas in Ethiopia. It is found in west Arsi Zone of Oromia Regional State at 240 km south of Addis Ababa, the capital city of Ethiopia and located along the eastern escarpment of the central rift valley. The total concession area of the enterprise was estimated to be 21,384 ha in 2010 consisting of plantation forest (6230 ha) and the natural forest (15,154 ha). The entire forest area is divided into three forest districts, namely Munessa, Gambo and Shashemene. The Munessa forest district (MFD) encompassed 48% of the total area, of which the plantation forest comprised about 2575 ha and natural forest about 8537 ha in 2010. This study was carried out in MFD and the surrounding areas (Fig. 1). The altitude of the study site covered by forest ranges from 2100 m to 2450 m a.s.l. The study area has a bimodal rainfall: the main rainy season is from the end of June to September, and short rainy season is from February to April.

The area is among the Arsi-Bale mountains ridge, which is known for its rich wildlife resources. Accordingly, there are many wild animals found in the area including endemic ones. It is also frequent to see several bird species of different habitats (forest and water bodies). The major wild animals of the forest are Mountain Nyala (Tragelaphus buxtoni), Leopard (Panthera pardus), Menelik’s Bushbuck (Tragelaphus scriptus meneliki), warthog, hyena, and different monkeys.

According to the natural forest inventory (Chaffey, 1979), the natural forest vegetation consists “Broad leaved/Podocarpus forest” with/without bamboo under story, Minusops forest, bamboo thicket, bamboo, and low woodland. During the 1960’s and subsequently planting has been conducted on large scale mainly with Cupressus lusitanica, several Eucalyptus spp. and very few indigenous species. At present, the main plantation species of the enterprise are exotics such as C. lusitanica, Pinus patula, Eucalyptus globulus, E. saligna, E. grandis and E. viminalis. In recent years, more efforts are being made to further encourage planting of the major indigenous species that include Juniperus procera, Olea africana and Podocarpus falcatus.

2.2. Methods for data collection

2.2.1. Baseline data collection

Preliminary land cover and land use (LCLU) was required for field work. It was created through visual interpretation of 2009 and 2010 Landsat 7 image composite. The final LCLU was created through visual interpretation of pan sharpened 2013 Landsat 8 image composite. The final LULC production was supported by ground control points collected through Google image interpretation and ground observation of 2011 and 2015 field work. Interpretation of the forest cover was supported by the 1972 forest inventory map and 2005 plantation forest maps Ethiopia. Road and stream vector layers were digitized using pan sharpened 2013 Landsat 8 image composite and topographic maps. The road layer contains asphalt and gravel roads only. The stream layer includes both perennial and seasonal rivers. Elevation based agro-ecology and slope map were derived from SRTM DEM.

Areas that have potential attractions for tourist were searched in the natural forest area of the enterprise and in landscapes that are settled by the local people bordering the study area. These areas were identified through field surveys, using topographic maps of the area and the preliminary LULC map. Data collection on unique features considered wildlife diversity, beautiful scenery and landscape, cultural, historical and heritage sites, waterfalls, geological
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