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GIS AND REMOTE SENSING BASED ECOTOURISM SUITABILITY ANALYSIS: THE CASE OF WONDO GENET WOREDA, SIDAMA, ETHIOPIA

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNVIRSITY IN PARTIAL FULFILLMENT OF THE REQUIRMENT FOR THE DEGRE OF MASTER OF ARTS IN TOURISM DEVELOPEMNT AND MANAGEMENT

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Dedication

This thesis work is dedicated for those who have lost their lives' because of COVID 19 all over the World! And to those who have committed their lives to bring justice and democracy in Ethiopia!

ACKNOWLEDGEMENT

I would like to express my special gratitude to my advisor, Ermias Teferi (PhD) for the whole hearted cooperation and intellectual advice to me during the course of study and the thesis work. With deep admiration, I express my unforgettable and heartfelt gratitude to the German Academic exchange service (DAAD) for providing me summer school geospatial technology training, which keen my interest to integrate geospatial technology on my thesis and for the valuable suggestions they have provided me throughout the study work. I also render my homage for those who helped me in various possible ways. I take this opportunity to render my sincere gratitude to Ethiopia institute of geospatial technology (EIGT) and National metrology agency (NMA) for their technical, material and professional support. My heartfelt gratitude also goes to my heart friend Demisew Assfaw for his encouragement and motivation to the accomplishment of my study. I also render my gratitude to Professor Tsegaye Bekele for recommending and coordinating my summer school training and making my thesis work a good success. Last but not least, I use this opportunity to thank staffs of WGCF-NR and WGEGA, Wondo Genet culture and tourism office for their hospitality and kindness to share their ideas with and for their commitment to provide primary and secondary data materials. I am also extremely delightful to place profound sense of gratitude to our batch mates for the nice moments we shared together. Finally, I express my deep sense of gratitude to Ministry of Education and DAAD for providing financial and granting me scholarship for pursuance of my study.

Table of Contents

Contents Page

LIST OF TABLES

List of Figures

Acronyms and Abbreviations

AHP: Analytical hierarchy process

ARCCH: Authority for Research and Conservation of Cultural Heritage

CSA: Central Statistics Agency

EGA: Environmental Grant- makers Association

GIS: Geographic Information System

Ha: Hectare

IGT: Institute of geospatial technology

IUCN: International Union for Conservation of Nature

KII: Key Informant Interview

MOCT: Ministry of Culture and Tourism

MCE: Multi Criteria Evaluation

MICE: Meetings, Incentives, Conventions, and Exhibitions

NMA: National Metrology Agency

RS: Remote Sensing

UNESCO: The United Nations Educational, Scientific and Cultural Organization

UNWTO: United Nation World Tourism Organization

WCMC: World Conservation Monitoring Centre

WGARDO: Wondo Genet Agricultural and Rural Development Office

WGCF-NR: Wondo Genet College of Forestry and Natural Resources

WGEGA: Wondo Genet Ecotourism Guide Association

WGWA: Wondo Genet Woreda Administration

WTTC: World Travel & Tourism Council

WWDSE: Water Works Design and Supervision Enterprise

Abstract

The main objective of the study is to identify the potential ecotourism sites in Wondo Genet, Sidama, Ethiopia by using GIS, RS and AHP. Currently, despite the blessing of many ecotourism resources in Wondo Genet Woreda only Shebelle resort is frequented and stagnated by mass tourism activities. In addition, human induced factors are grappling the ecotourism resources in Wondo Genet. Therefore, this thesis is aimed to assess ecotourism resources and its capability based on six factors such as: land use land cover, species diversity, slope, elevation, rainfall and temperature. These factors were selected according to the local ecotourism guides view, professional expert's from WGCF-NR, tourists' opinions and field survey. Firstly, a resource inventory and a list of ecotourism criteria were developed using the AHP to determine the relative importance of all selected factors. Then GIS tools were used to measure the ranking of classes, to identify the highly potential areas based on the set criteria. Finally, the ecotourism *potential suitability map was made-up, using the linear combination of factors with their respective weights. The degree of suitability of each parameter was classified as highly potential, moderately potential, less potential and not suitable for ecotourism. Subsequently, the result showed highly suitable for ecotourism potential area accounts for 10.86% (2438.86 ha), moderately suitable accounts 14.23% (3194.68 ha), less potential areas 68.89 % (15467.45 ha) and 6.02 % (1351.50 ha) no potential area in Wondo Genet province and its vicinity. Generally, as part of ecotourism niche package Wondo Genet has a potential for wildlife tourism, gastronomy tourism, agrotourism, spa and health tourism, cultural and educational tourism. More specifically, Wondo Genet area can provide ecotourism activities like: ballooning, bungee/ bungy jumping, mountain trekking, mountain biking, rafting, camping, photographing and video-graphing, picnicking, birding, fishing, swimming, and cultural tripping and many other venturer activities. The study also revealed some threats that encountered ecotourism development in Wondo Genet like: deforestation, human wildlife conflict and infrastructure and service limitation are some of the hindering factors in the study area. In general, the study was attempted to identify the major ecotourism potentials and its suitability and identify some hindering factors encountered in Wondo Genet province and vicinity for sustainable ecotourism development.*

Key Words: Ecotourism, Agro-Ecotourism, RS & GIS

Chapter One

1. Introduction

1.1 Background Information and Justifications

Tourism accounted for 10.4% of global GDP and 10% of total employment, one in every eleven dollars in the entire economy and one in 12 of all jobs in 2019 (WTTC, 2020b). Likewise, the tourism industry amounted 6.7% of the Ethiopia's GDP that generated US$ 3,604.5 million in 2019 (WTTC, 2020a). The report shows that Ethiopia has higher competitive advantage in terms of diversity of tourism attractions over other African nations.

On recent decades, due to conventional (mass) tourism activities causes: over exploitation, environmental degradation, and socio-cultural problems in many destinations, the paradigm of eco-tourism emerged and has been promoted as an alternative form of sustainable tourism. Since the first time of the term ecotourism is coined in the early 1980s, it has been considered as a potential driving force for host community empowerment and countries economic development (Cobbinah, 2015). The origins of Ecotourism have been variously traced back to *Ceballos-Lascurain* in 1987. It has been defined as:

> "*Environmentally responsible, enlightening travel and visitation to relatively undisturbed natural areas to enjoy and appreciate nature (and any accompanying cultural features both past and present) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations"* (Ceballos-Lascurain, 1987)

Ecotourism in Ethiopia is a recent phenomenon. It is often asserted that there has been an increase in the demand for ecotourism in Ethiopian national parks, sanctuaries and forest preserve areas (Amare, 2015). Likewise, Wondo Genet is mass tourist destination nestled in the eastern sub-catchment of Lake Hawassa Basin frequented by conventional visitors. Hot springs in Wondo Genet has been served as an idyllic place for excursionist and tourists to escape the daily hectic and hustle life for many decades. The area is endowed with many breathtaking ecotourism potential resources like: sizzling hot springs, lush green dense forest and wildlife diversity (Ali, 2007; Italemahu, 2015; Wondirad, 2020). The high diversity coupled with the presence of endemic species, calls for immediate ecotourism development as a conservation

strategy to restore and rehabilitate the remnant forest of Wondo Genet Woreda. Evidently, the activity of developing ecotourism begins with: proper assessment, identification and prioritization of potential resource area and then creating enabling environment for ecotourists. Although ecotourism assessment studies varied in their methodologies, Remote Sensing and Geographic Information System has been used by studies to evaluate ecotourism suitability and to identify ecotourism location sites (Arrowsmith, 2001; Kumari *et al*., 2010; Asmamaw *et al*., 2014; Gigovic *et al.*, 2016).

According to Asmamaw *et al*., (2014) argues that a comprehensive ground surveys, RS and GIS techniques are commonly required in determining the potentials of tourism activities for a given area. To identify ecotourism hotspot areas GIS and RS can play an important role. However, the fundamental and critical thing with decision theory is to derive the relative weights of each criterion. A well-known weight evaluation method is the Analytical Hierarchy Process (AHP) (Bunruamkaew & Murayama, 2011). The incorporation of AHP with GIS and RS support decision methodology with powerful mapping capabilities which in turn facilitates the creation of ecotourism suitability map. It is thus appropriate at this time to assessment and classifies the ecotourism hotspot sites of Wondo Genet for proper development of eco-tourism. Therefore, the main objective of this thesis is to evaluate the ecotourism capability and to identify the existing ecotourism resources of Wondo Genet by integrating GIS, RS and using AHP algorithm.

1.2. Statement of the Problem

To begin with, in spite of the ever-increasing number of visitors to relish the hot springs in Wondo Genet, only Shebelle resort is frequented and stagnated by mass tourism activities and it resulted to be overused and congested while other ecotourism potential attractions of the Woreda are forgotten. There is a predominance of nature-based activities than cultural and historical based travelling (Ali, 2007 & Italemahu 2015).

Secondly, the ecotourism capability of Wondo Genet and its potential ecotourism resources are not yet fully identified, explored, researched and promoted. Similarly, Italemahu (2015) and Wondirad (2020), slightly tries to identify some spot activities of tourists in Wondo Genet. Yet, these findings do not fully address and illustrate the eco-tourism hotspot areas of Wondo Genet

Woreda. And it is hardly possible to consider the studies are in a way of giving complete picture of ecotourism potential resources of the Woreda.

In addition, recent observations also indicate that human induced factors such as; extensive agricultural activities, anthropogenic fire, deforestation, human population pressure accompanied by unplanned land use are highly affecting and treating the ecotourism potential resources of the Woreda. A number of researches also prove that the state of Wondo Genet forest is in peril (Dessie and Kinlund, (2008); Sahilu, (2017); Mellissea *et al.*, 2018) argued that many of the agro-forestry and Afromontane forest ecosystems are currently changing in to a monoculture Khat (*Catha edulis)* based system. Once again, a research study by Wondirad (2020), divulge the anthropogenic factors facing the area.

Even in the face of these pressing factors, the area is still reputed for its diversified resources and a hotspot for many Ecotourism activities. Thus, the plights faced by the area require an urgent action of ecotourism resource inventory and ecotourism suitability analysis, to establish ecotourism as a compromise between the sustenance of ecological conservation and local people livelihood benefit. Conversely to mass tourism, ecotourism, can provide an opportunity to generate income for the local villagers and at the same time continuing to conserve the environment in Wondo Genet.

As the reviewed of different ecotourism suitability studies in Ethiopia by (Suryabhagavan *et al.*, 2015; Asmamaw *et al.*, 2014; Gebregiorgis, 2009; Gebre *et al.*, 2019) study data was compiled based on expert's opinion from the supply side approach only, visitor's opinion or demand side approach were not considered. In addition, in all of the above listed studies the possible type of ecotourism activities was not identified with each land class or criterion developed. And I believed that ecotourism capability studies would not be enough unless it includes the potential Eco-tourists' perspective with their desired ecotourism activities in different land classes of the ecotourism areas. For instance, Dondo and Joppe (2003), performed a research entitled ecotourism suitability and zoning from both tourist's perspective and local expert's opinion. In Gigovi´c *et al.,* (2016) determined ecotourism activities for each land zone. Therefore, here in this thesis the possible kind of ecotourism activities are identified by integrating visitors' opinion

and the local expertise perspective. Therefore, this study is initiated to answer the aforementioned problems through identifying and mapping out the ecotourism site suitability of Wondo Genet via GIS and remote sensing and AHP algorithm.

1.3. Objectives of the Study

1.3.1 General Objective

The overall objective of this study is to assess Ecotourism resource of Wondo Genet Woreda using GIS, RS and AHP algorithm.

1.3.2. Specific Objectives:

- To analyze Wondo Genet Woreda ecotourism capability.
- To identify existing ecotourism potentials in Wondo Genet Woreda.
- To investigate ecotourism linkage with conservation and livelihood in Wondo Genet.
- To identify ecotourism grappling challenges in Wondo Genet?

1.4 Research questions

- Which part of the Wondo Genet Woreda is more suitable for ecotourism activities?
- What are the ecotourism potentials resources of Wondo Genet Woreda?
- What are the prevailing and grappling challenges of ecotourism resources in Wondo Genet?

1.5 Significance of Study

The results of this study would be a useful tool for decision makers in formulating appropriate plans for ecotourism development. It increases the appeal-ability of ecotourism resources, which in turn facilitate eco-tourism investment, eco-lodge and eco-tour operators. More specifically, the study is helpful in introducing Ecotourism resources of Wondo Genet Woreda, to revitalize and to rekindle ecotourism activities in the other potential parts of the Woreda. The study is helpful to prioritize areas that are best suited for ecotourism activities and it shades light on current state and conservation activities need to be done. Therefore, ecotourism products of the Woreda become more diversified, its wealth creating power will boom/entering a new stage of resource and market sharing condition in the Wondo Genet Woreda. In addition, the methods used and the results obtained may also provide an important base for the academic community to conduct

further studies and investigation in the area. Furthermore, the study will also be a bridge to the current research gap in ecotourism planning using GIS and RS.

1.6 Limitation of the Study

Financial and time constraints was limited this thesis study to do it in a big scope. This study was only limited with six major factors (land use land cover, species diversity, temperature, rainfall, elevation, slope) for the selection of a suitable site among many contextual factors. Even those six factors are related to this study site, future studies could be incorporated with many contextual factors like: (soil, community characteristics, accessibility etc.) with regard to the ecotourism development in Wondo Genet province in future research. Due to the COVID 19 pandemic, a time of data collection was on the state of emergency and it made the data collection difficult to incorporate the local people point of view and to use focus group discussion. In addition, the timing of the study was observed as a major constraint of the study. Because during the data collection there was conflict and political instability in Sidama area, I was unable to take coordinates of each study site and their boundaries were not delineated, which made the data collection delayed and unable to timely execute.

1.7 Scope of the Study

The scope of the study was spatially delimited in Wondo Genet Woreda, which covers about 15,145 ha or 151.45 km2. Objectively, this study was limited on assessing the ecotourism potential resources and its suitability of Wondo Genet mainly using: a comprehensive ground surveys, remote sensing and GIS techniques. As a result, the study is in charge of identifying, quantifying, and mapping the spatial distribution of eco-tourism potential spot areas of Wondo Genet. Both qualitative and quantitative methods of data analysis were used. Satellite images, key informant interviews, and an extended field observation were used to supplement the data acquired by other methods. Moreover, materials like: Binocular, satellite image, GIS software (Arc 10.5), and topographic maps were used.

CHAPTER TWO

2. Literature review

2.1. Tourism in the Global Context

According to World Tourism Organization (1995), tourism is defined as the process of people traveling and staying in places outside their usual environment for more than twenty-four (24) hours and not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited. The Travel and Tourism Competitiveness Report, issued by the World Economic Forum reveals that the sector accounted for 10.4% of global GDP and 319 million jobs, or 10% of total employment in 2019 (WEF, 2019). The data supplied by the World Economic Forum shows that the tourism industry in Ethiopia generated US$ 3,604.5 million in 2019, which amounted to 9.4 percent of the Ethiopia's GDP. The industry accounts for one in every eleven dollars in the entire economy and one in 12 of all jobs in 2019 (WEF, 2019; WTTC, 2020b). Even if, Ethiopia's has a good competitiveness in terms of resource diversity. But Ethiopia is still lagging behind other African destinations that have developed a more competitive tourism industry and attract higher numbers of international tourists.

Recent publications released by world Economic Forum on the travel and tourism competitiveness report in 2019, ranked Ethiopia only 122nd out of 140 countries. This indicates that, the Ethiopia's tourism competitiveness is far behind its significance and huge potential; the same report shows Ethiopia: environmental sustainability (ranked 98), ICT infrastructure (ranked 131), safety and security (ranked 101). The drawbacks are also recorded in ground transport infrastructure (ranked 138), prioritization in travel and tourism (ranked 112), air transport infrastructure (ranked 98), etc. (WEF, 2019). But, almost all other countries from Southern and Eastern Africa ranks better. If the tourism competitiveness pillars are examined, Ethiopia presents a relative competitive advantage only with regard to price competitiveness (ranked 60), and Natural and Cultural Resource ranked 68 (WEF, 2019). Today, Ethiopia is home to thirteen natural and cultural World Heritage sites on the representative list of UNESCOs, maintaining its leading position as the African country with the most World Heritage properties. Furthermore, Ethiopia has six potential natural and cultural heritage sites on the tentative lists, which intend to

nominate for future inscription on the UNESCO World Heritage List. This report testifies countries huge potential in terms of both natural and cultural resource potentials. In addition, Ethiopia is comprised of 277 terrestrial mammals, 201reptiles, 150 freshwater fish, 861 birds, 65 species of amphibians, and over 1,225 arthropods with a huge rate of endemism, accounting one-fourth of Africa's wildlife (Birhan & Gebreyes, 2015).

2.2. Ecotourism in the global context

In recent years, the paradigm of ecotourism emerged and becomes the fastest growing segment in the global tourism industry (TIES, 2015). The main driving force for the emerging of ecotourism concept was the growing concerns about the negative environmental and socio-economic effects of mass tourism development (EGA, 2008) and as a result of ecotourism helpful in the protection of environment and sustainable development (Fang, 2017; Mokarram *et al*., 2020). Ecotourism was created to plan and manage tourism activities and is a useful tool for solving the economic and environmental problems of an area (Thomson, 1991; Goodwin, 1996). In addition, (Honey, 2008) stated that ecotourism was developed as an alternative to preservationist approaches to park management that had marginalized local communities and furled conflicts. To minimize the negative impact of tourism on the environment, ecotourism is increasingly considered as conventional tourism antithesis and presented as a new form of sustainable tourism (Cobbinah, 2015).

"The concept of ecotourism emerged in the early 1980s to describe a new type of tourism that preserves and sustains the natural and cultural heritage of the environment" (Mansour *et al.*, 2019: 1). Since the first time of the term ecotourism coined in the early 1980s, it has become a phenomenon and the fastest growing segment in the global tourism industry (TIES, 2015). Accordingly, the sector of ecotourism is growing at a fast pace with an estimated yearly growth rate of 20-34% since the 1990s (TIES, 2006). The number of tourists in regular tourism industry grows 1/3 of the tourists in ecotourism (UNWTO, 2018). Ecotourism is one of the world's economic activities which have grown significantly in recent years (Mokarram *et al*., 2020). Ecotourism is rapidly growing as a commercial activity and is currently considered as one of the world's biggest industries (Das & Chatterjee, 2015). According to Starmer-Smith (2004) estimation, ecotourism will represent 5% of the global holiday market by 2024 and the number of ecotourists is growing approximately three times faster than that of conventional tourists (Das

and Chatterjee, 2015). In several countries, Ecotourism has become an important industry and mushroomed into the largest foreign exchange earner and become an important industry in countries like: Nepal, Kenya, Costa Rica, Mexico, New Zealand, Australia, Brazil, Thailand, Indonesia, Malaysia, China…etc. (Altunel & Bugday, 2019)

2.3. Ecotourism in Developing Nations

Nowadays, third world countries are introducing ecotourism as a development package, involving capital, expertise technology and management systems, and is thus becoming something like green revolution (Bhattacharya & Kumari, 2004). Developing countries, in particular are being encouraged by a set of diverse interest groups to consider ecotourism as a solution to their environmental and economic challenges (Jemal, 2016). Some developing countries such as Cost Rica and Belize are billed as ecotourism destination. Costa Rica is one of a more popular ecotourism destination and hailed as ecotourism's "poster child" (Honey, 1999), it is thereby conserving five percent of the world's biodiversity in just 0.035 percent of the earth's surface (Pigram, 2010).

The relatively unexploited areas of the African countries possess a rich natural diversity and a unique cultural and historical heritage which can provide a solid base for the internationally growing ecotourism activity. Countries in African like Namibia purportedly became the first developing country to include what has been dubbed an "ecotourism plank" in its new constitution, pledging to protect "ecosystems, essential ecological processes and biological diversity, natures…on sustainable bias" (Jemal, 2016: pp 42).

According to Wetlands International (2002) within Africa, there is a contrast between Western and Eastern Africa in the management of ecotourism in national parks. Levels of tourism in Eastern Africa are much higher than the levels in Western Africa, although the latter also has significant natural resources. The reasons for this are: the more visible wildlife concentrations in Eastern Africa, the relative developed national transportation networks, better hotel facilities, better trained tourism staff, stronger marketing, better tourism infrastructure in the parks (Wetlands International, 2002). Recently, it is often asserted that there has been an unprecedented increase in the demand for ecotourism in Africa, surpassing agriculture in countries like Kenya and Tanzania. Kenya and Tanzania have well-documented examples of

ecotourism industries in eastern Africa. In both countries, the tourism industry is closely tied to world-class systems of national parks and game reserves. Kenya has been a successful leader in the development of ecotourism industries based upon a comprehensive structure of national legislation, policy planning and site management (Pigram, 1990). If properly managed and implemented, sustainable Ecotourism can provide for both these objectives, as it depends on intact nature, rich local culture and many services carried out by local people. Ecotourism can offer a win-win-situation for the benefit of the environment and the local economy (Stronza & Gordillo, 2008). Developing ecotourism activities offers large amount of job opportunities for local/rural population (Das & Chatterjee, 2015). To sum up, ecotourism provides clearly a major opportunity for developing countries as an emerging market, which holds a great promise for countries economic development.

2.4. Ecotourism in Ethiopia

Ecotourism in Ethiopia is a recent phenomenon. It is often asserted that there has been an increase in the demand for ecotourism in Ethiopian national parks, sanctuaries and forest preserve areas (Amare, 2015). Ethiopia is a country which is endowed with the vast array of ecotourism resources including: cultural, historical, and archaeological and natural resources which are ideal for the development of sustainable ecotourism ventures. Ethiopia's wildlife is one of the richest and most diversified in Africa with several of its protected areas and wetlands. Out of the total wildlife resources, more than 320 mammals (39 endemic), 918 birds (19 endemic), 240 reptiles (16 endemic), 71 amphibians (30 endemic) and 172 fishes (38 endemic) species are recorded in Ethiopia (Vreugdenhil et al., 2012). Ethiopia is among a few countries in the world that possesses unique fauna and flora treasures with a high level of endemic species (WCMC, 2001).

However, evidence from different literatures suggests that even though, Ethiopia has many ecotourism treasures: due to its relative newness of the concept, incoherent management, a lack of authorized ecotourism planning and policy, the fundamental principles of ecotourism have not been thoroughly understood and implemented. Thus, the desired benefits have not been achieved so far, as compared to other neighbouring countries with successful ecotourism projects like: Kenya, Uganda and Tanzania, whose government regards ecotourism as one model for sustainable tourism development. Moreover, in Ethiopia eco-tourism's contribution to the

national income as a source of revenue and as a means of preserving the natural environment is negligible in the national tourism policy (Asmamaw & Gidey, 2018).

2.5 Operational Definition of Terms

Tourism: an activity of person travelling and staying outside their usual environment for enjoyment, recreation, business and any other reasons (UNWTO, 2018).

Eco-tourism: "Environmentally responsible, enlightening travel and visitation to relatively undisturbed natural areas to enjoy and appreciate nature (and any accompanying cultural features both past and present) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations" (Ceballos-Lascurain, 1987)

GIS: An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information (Bahaire & Elliot, 1999; and Lillesand & Kiefer, 2004)

Remote- Sensing: is the process of sensing the earth attributes from remote, using of the electromagnetic radiation measurements (EMR).

2.6. Evolution of Ecotourism

Ecotourism definitions, standards and principles provide the framework for the development of appropriate policy and practice for hosting ecotourism (Honey, 2002). In addition, it helps with enhancing deep understanding about the subject matter. Since its rise, ecotourism has consistently grown and is now widely considered as the fastest growing sub-component of the world's travel and tourism industry. As a result, a large number of ecotourism definitions can be founded in the literature because of several different experiences. There has been much discussion and debate regarding the definition and the major principles of ecotourism. Even though many professionals have been involved in formulating and developing eco-tourism policies and principles worldwide, but it is still ambiguous and varies across organizations and scholars. As a result, there is no single universally accepted definition of Ecotourism but there are most commonly used and relatively accepted once.

One of the earliest, widely accepted, and most cited definitions of ecotourism variously traced back to the Mexican consultant Hector Ceballos- Lascuráin (1987) who defined ecotourism as involving travel "to relatively undisturbed natural environment with the specific objective of admiring, studying, and enjoying the scenery and its wild fora and faunas, as well as any accompanying cultural features (both past and present) found in the areas" (p. 14). According to Cobbinah (2015), ecotourism does not merely mean "travel to nature" and to visit intact areas but it also attempts to create healthy and equitable relationships between humans, nature, host and guest. Page & Dowling (2002) oft-quoted definition capture two criteria; nature-based attractions and educational or appreciative motivations – that have since become almost universally recognized as two of the three core prerequisites of an ecotourism experience. The third criterion, environmental and sociocultural sustainability, is implicit in most of the definitions that have been subsequently put forward.

According to Wood (1991) defines ecotourism as 'travel to natural habitats to understand the natural history and cultural setting, financially beneficial to local citizens' (p. 200). Fennell (1999) regards ecotourism as 'a sustainable form of natural based tourism that focuses primarily on experiencing and learning about nature and with a low-impact, non-consumptive and locally oriented way' (p. 43). The most widely accepted definition of ecotourism is also postulated by the International Ecotourism Society (TIES) defined as a "responsible travel to natural areas that sustains the environment, improves the well-being of the local people, and comprising educational elements" (TIES, 2015). In addition, Boo (1990) defined Ecotourism as responsible travel to natural environment where the wild animals and plants as well as cultural treasures are the primary drawing factors with the aim of conserving the natural and cultural landscapes and enhances the welfare of local people.

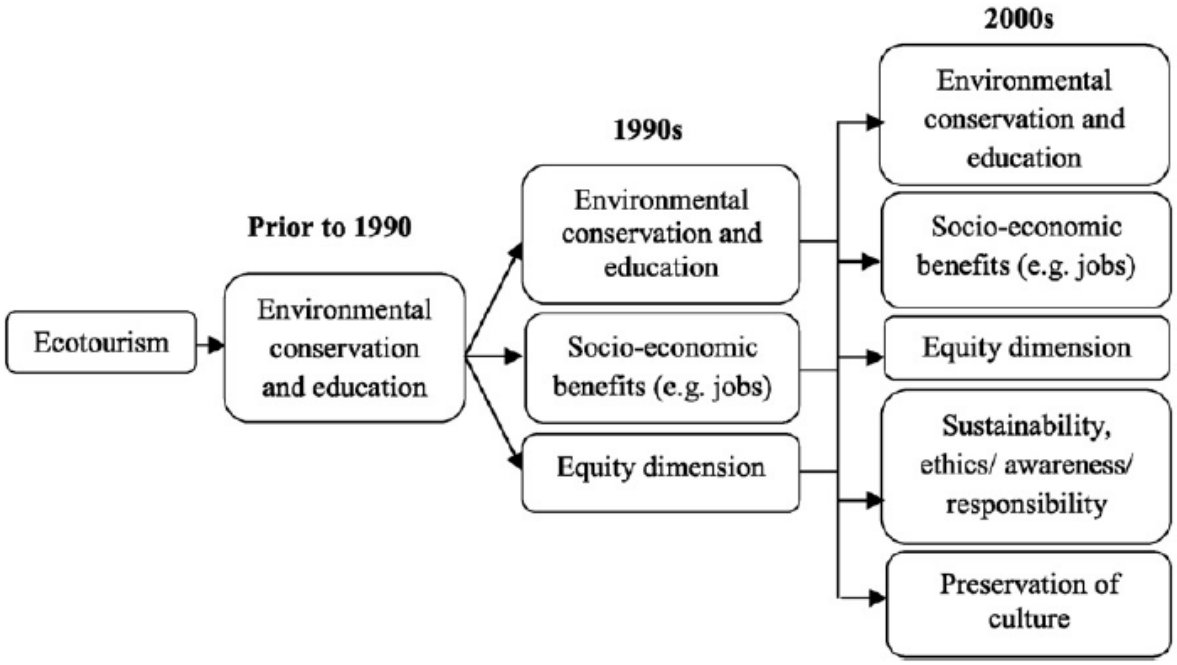


Figure 2.1: Evolution of the meanings Ecotourism adopted from Cobbinah (2015)

2.7. Principles of Ecotourism

It is fundamental that Ecotourism development should takes place in a certain planning framework and principles which relies on ensuring Ecotourism attributes. Accordingly, Hetzer's (1965) outlined four basic principles of ecotourism including:

- Minimum environmental impacts
- Recognizing and esteeming local culture
- Maximizing economic benefits to the local communities and
- Meeting tourists' expectations and satisfaction

According to TIES's (1990), fundamental tents of ecotourism comprise: conservation, community benefit, and sustainable dimension. This indicates ecotourism activities and destinations should implement and adopt the following ecotourism principles:

- Impact minimizing in the host environment in all dimensions.
- Promoting environmental and cultural awareness.
- Offering satisfactory experiences for visitors and host community.
- Offering direct financing for conservation.
- Generate financial benefits for host community and private sector.

- Constructing eco- friendly and less impact infrastructure and facilities.
- Empowering and recognizing host community rights and spiritual beliefs.

Honey (2008) broadened TIES principles by outlining six principles of ecotourism

- Nature travelling;
- Impact Minimization;
- Promoting environmental education;
- Direct funding for conservation;
- Empowering of host community and economic benefits

Evidently, as per the set of established fundamental beliefs and tenets, eco-tourism should be: nature-friendly, ecologically sustainable, environmentally educative and economically beneficial to the local community and giving the desired satisfaction for tourists (TIES, 2015). In summary, the analysis of principles of ecotourism developed and discussed by many of the above scholars and international organizations shows similarities in attributes of ecotourism. As a result, the followings five central components are adopted as noted in figure 2.1 below:

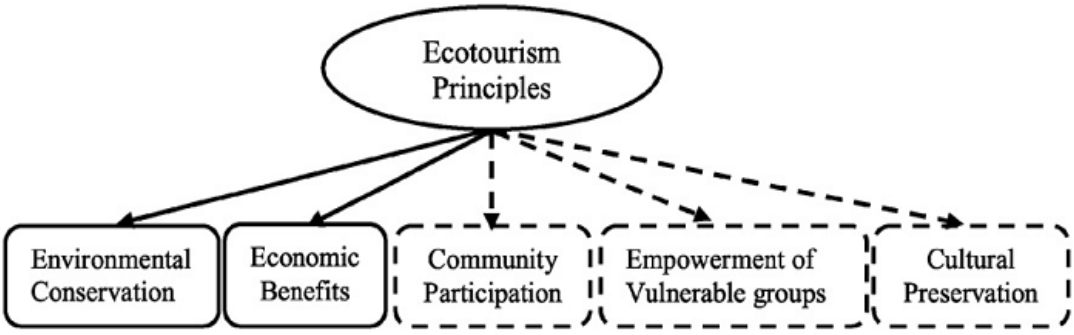


***Figure 2.2: Fundamental principles of Ecotourism adopted from Cobbinah (2015*).**

Generally, ecotourism has a wide variety of benefits, particularly to both the local communities and to the host environment. Among the benefits or objectives commonly associated with ecotourism noted by Das & Chatterjee (2015), presented with the figure 2.3 below:

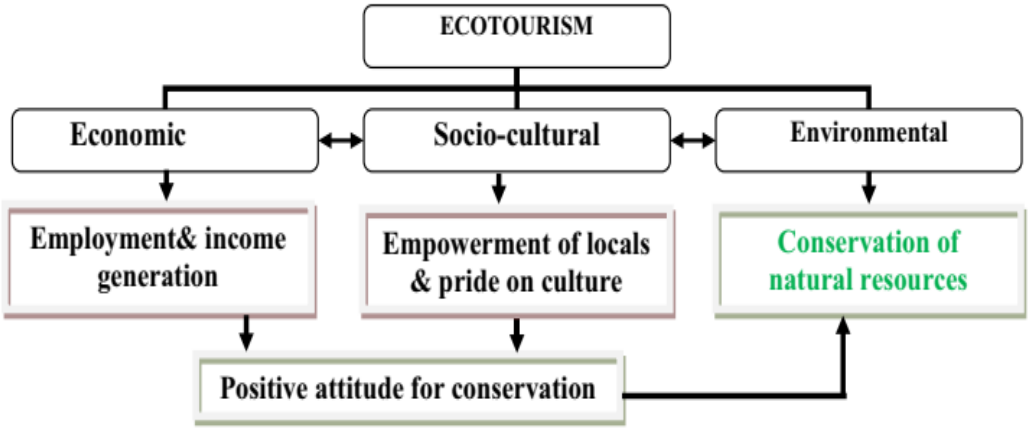


Figure 2.3: Benefits of Ecotourism adopted from (Das & Chatterjee, 2015)

Reviewing of relevant literatures of ecotourism as shown above, ecotourism should be small scale, be low in impact and have an element of interpretation. In addition, it was found that the socio-cultural, economic and environmental dimensions were suggested as the basic indicators of the framework for ecotourism.

2.8. Relationship between Ecotourism and other forms of tourism

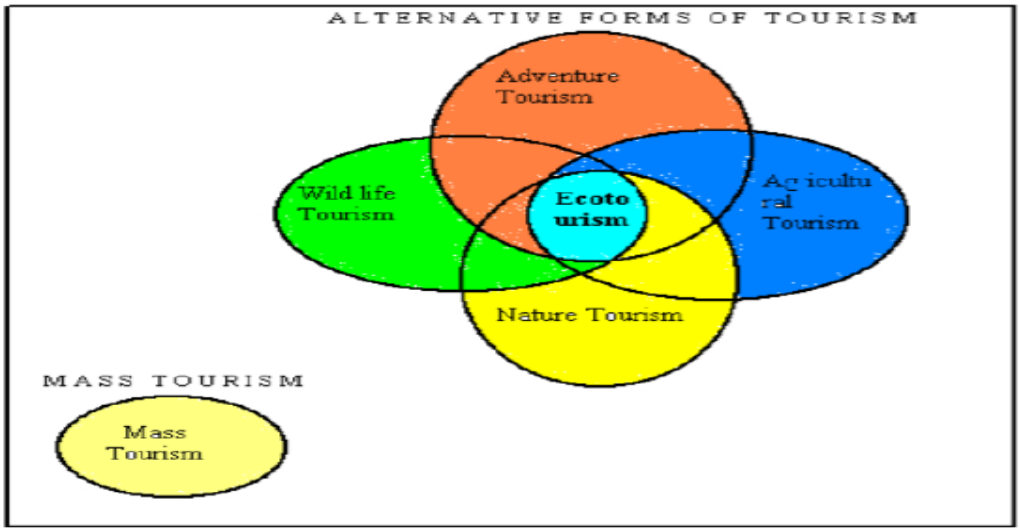


Figure 2.4: Relationship between Ecotourism and other forms of tourism

Source: adapted from http://www.infa.gov.in/surabhi/surabhi.doc as cited in (Gebregiorgis, 2009).

2.9. Application of GIS and Remote Sensing in Eco-tourism

Remote sensing (RS) and geographic information system (GIS) have been used for the identification of potential ecotourism location and its suitable capability based upon environmental indicators such as: ecological fragility, environmental resilience and ecotourism attractiveness (Page & Dowling, 2002). Therefore, using of Remote Sensing and GIS can certainly play an indispensable role for planning and managing ecotourism. More specifically, GIS and RS tools are used in determining, monitoring and mapping out the land use capability of an area for a certain purpose (Page & Dowling, 2002). GIS can be a valuable tool for investigating: location, condition of the area, changes and trends, and patterns associated with ecotourism planning and development (Rahm, 2010). GIS is capable of capturing, analyzing and displaying both spatial and non-spatial (attribute) data related to tourism resources.

Additionally, by analyzing both types of data it is possible to make a prediction for a destination hypothetically and examine its future from the lab before tourism development. Moreover, Arrowsmith (2001) mentioned that the integration GIS for resource inventory can facilitate the identification and monitoring of indicators related to tourism. Such kind of tools plays a sine qua non role in planning, managing and promoting of the tourism industry at a whole and specifically in the context of ecotourism development. The overall conclusion is that, GIS and Remote Sensing are an efficient and effective means of helping the various stakeholders examine the implications of land-use decisions in tourism development (Arrowsmith, 2001).

Table 2.1: **Capabilities of GIS (adopted from Bahaire & Elliot 1999, p.159)**

No	Functional capabilities of GIS	GIS Basic Questions	Tourism Applications
▪	Data entry, storage and manipulation	1. Location, what is it?	Tourism Resource Inventories
▪	Map Production	2. Condition, where is it?	Identify most suitable
	Database Integration and mgt	3. Trend, what has changed?	Measure tourism impacts
▪	Spatial Analysis	4. Routing, which is the best route?	Visitor management/flows
▪	Spatial Modeling	5.Pattern what is the pattern	Analyze relationships associated with resource use
▪	Decision Support	6. Modeling, What if…?	Assess potential impacts of tourism development

The role of remote sensing has been emphasized in quick appraisal of the habitat attributes, identification of new sites for protected areas and the current status of corridors (Kumari *et al.*, 2010). Remote sensing not only provides the spatial data but also allows the comparison of the temporal variations in the habitat features (Lillesand & Kiefer, 2004). The remote sensing and GIS based tourism attractively index, accessibility and environmental resilience were considered for identification of the potential tourism sites in Gramphian National Park, Australia (Arrowsmith, 2001).

2.10. Criteria's selection for Ecotourism Sites and Attractions

Identification and evaluation of ecotourism destinations require setting standards. As a result, determining criteria for selecting certain ecotourism area and checking the ecotourism site suitability should be comprehensive and measurable. Many studies have been using, visitors' preferences, and local point of view framework for presenting ecotourism resources. A common method for tourism resource assessment is a demand approach through conducting visitor surveys and expert knowledge combined with tourists and operators' opinions (Ferrario, 1979). According to Dowling (1993) used tourists and resident's opinion, and expert knowledge to evaluate ecotourism attractions in the Gascoyne Region of Western Australia. Various methods from the supply side of tourism resource assessment existed for resource classification, scenic quality assessment, and landscape evaluation techniques including expert knowledge, visual preferences, field check, and analysis of aerial photos (Litton, 1968).

In addition, GIS and Remote Sensing based ecotourism suitability analysis has been applied including MCE and AHP in many research literatures worldwide. A number of scholars found that Analytical Hierarchy Process can resolve the spatial decision-making processes in a successful way with the support of GIS and Remote sensing tools. Several criteria's, particularly naturalness, wildlife, cultural heritage, landscape, and community, were created to assess suitable ecotourism landscapes within Northern Ontario in Canada (Boyd & Butler, 1996). According to Ullah & Hafiz (2014) argues that to develop and find out suitable ecotourism places evaluation of various spatial variables, including landscape, ecological features, geological structure, climate conditions, soil types, and topographic factors were used. Likewise, Kumari *et al.*, (2010) developed ecotourism indicators for the identification of ecotourism site suitability in West district, Sikkim, using the Analytical hierarchical process AHP in the geospatial

environment. Analytical Hierarchical Process and GIS are key tools used to assess the capability and suitability of landscape for public parks in the City of Larkana (Thapa & Murayama, 2008).

Nevertheless, the applications of such tools in Ethiopia are not mushroomed and little used as compared to other countries and specifically it is rarely discussed in the context of eco-tourism planning and development. In recent years, ecotourism studies have gained attention in the academic community in Ethiopia. However, only few studies attempted to determine ecotourism potential resource in relation to or integrating with GIS and Remote Sensing tools. For instance, GIS and Remote Sensing techniques were utilized to identify potentially suitable sites for ecotourism development in Addis Ababa city and its surrounding mainly based on the natural components of ecotourism by Gebregiorgis (2009). Accordingly, seven parameters were used, such as: land use-land cover, vegetation density, slope, elevation, soil, temperature and rainfall were considered to determine the suitability of an area for ecotourism. The findings of this study pointed out that highly suitable area accounts for 11%, moderately suitable area for 29%, less suitable 33% and very less suitable area 27% (Gebregiorgis, 2009).

Likewise, AHP and GIS techniques were employed to identify potential ecotourism site suitability in case of Hugumburda forest and its surrounding areas in Ethiopia; ecotourism criteria such as land use/land cover, soil, slope, elevation, scenic attractiveness, rainfall and temperature were developed to select suitable ecotourism sites. The result showed highly suitable for ecotourism potential area accounts for 18.92% (9513.65 ha), moderately suitable accounts 17.65% (8871.82ha), less potential areas 25.54% (12841.20 ha) and 37.88% (19044.35 ha) potential area in and around the Hugumburda forest area (Asmamaw & Gidey, 2018).

Additionally, Suryabhagavan *et al.,* (2015) used an integrated approach of multi-criteria techniques in Hawassa city and it's surrounding to generate maps of visibility, land-use/land cover, slope, elevation, proximity to the lake, natural and cultural attraction sites, fauna and flora conservation, rainfall, temperature and proximity to road. Hence, this study concluded that Hawassa town and its surrounding has ecotourism potential development. Likewise, Gebre *et al.,* (2019) used geospatial tools in the selecting ecotourism hotspots in Menz-geramidir district, using three factors such as: topography, landscape and accessibility. And five- parametrical maps were used. Subsequently, by using pair-wise comparison technique, ERDAS, ArcGIS and

supervised classification method was considered for image classifying. Accuracy assessment is also 84% and the overall Kappa coefficient is 0.80 which is acceptable (Gebre *et al.,* 2019). Finally, based on the FAO`s four classes suitability scheme ecotourism hotspot areas were identified as 11% is highly potential, and marginally potential accounts 13.5 % and the not suitable area is 0.06 % (Gebre *et al.,* 2019).

A. Concepts of Multi Criteria Evaluation

The MCE provides a systematic framework for looking at the actual resource of ecotourism and concerned with combining parametrical criteria to form a single index of evaluation. The formula for weight combination is given as follow (Ronald, 2001):

$$S = \sum WiXi$$ where $\boldsymbol{S}$ is suitability $\boldsymbol{W_i}$ is weight of factor, $\boldsymbol{X_i}$ is Criterion

B. The analytical hierarchy process/AHP

Saaty (1980) introduced AHP a kind of MCDM decision support method which is helpful in solving complex decision problems. AHP fundamental scale comprises 9 points. The reciprocal values (1/3, 1/5, 1/7, 1/9) used where the row factor is less significant than the column factor. It offers a structured method to measure eligibility by classifying the suitability analysis problem into hierarchical levels (Saaty, 1980; Byod & Butler, 1996). Byod & Butler (1996) argued that ecotourism potential treasures are calculated using following equation:

$$EP = \{w_{ti}(WDI) + w_{tj}(EVI) + w_{tk}(EAI) + w_{tl}(ERI) + w_{tm}(EDI)\}$$

Table 2.2: **The Fundamental preference scale for pair wise comparison in AHP process**

Scale	Degree of preference	Explanation
1	Equally siginificant	Two activities contribute equally to the objective
3	Moderate significant of one criteria over another	Experience and judgments slightly favor one activity over another
5	Strongly significant	Experience and judgments slightly favor one activity over another
7	Very strong significant	An activity is favored very higly over another
9	Significantly crucial	One activity is favored over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	Opposites	Used for inverse comparison

Source: (adopted from Saaty, 1980)

The AHP uses pair wise comparison to allocate weights to the criteria of each level, measuring their relative importance by using Saaty's (1-to-9) scale, and finally calculates respective weights for elements at the bottom level. According to Saaty (1980) findings the scale of priorities for pair-wise comparisons between two parameters varies from the maximum value 9 to 1/9. The AHP Scale was described as 1- Equal significant, 3- Moderate significant, 5- Strong significant, 7- Strong significant, 9- Extreme significant (2,4,6,8 values in between) as shown in the above. To ensure the acceptancy of the relative importance used, AHP also offers measures to find out the consistency of judgments mathematically. The consistency ratio (CR) can be calculated based on the properties of reciprocal matrices. According to Saaty, (1989) if CR is less than 0.1 then the level of consistency is acceptable in the pair wise comparison. And then if CR > 0.10, then the level of consistency is inacceptable in the pair wise comparison which means there are inconsistencies in the evaluation process, and AHP method may not produce truthful finding.

$$CR = \frac{CI}{RI} \quad \textbf{(1)}$$

Based on the properties of reciprocal matrices, the consistency ratio index (CR) as shown in Equation ***(1)***.

$$S_i = \sum_{i=1}^{n} (Wi\ X\ Ri) \qquad \textbf{(2)}$$

The land suitability map for ecotourism has been created, based on the linear combination of each used factor's suitability score as shown in Equation **(2)**. Where "n" is the number of factors, "Wi" is the multiplication of all associated weights in the hierarchy of "i^{th}" factor and "Ri" is a rating given for the defined class of the "i^{th}" factor found on the assessed land unit (Bunruamkaew & Murayama, 2011).

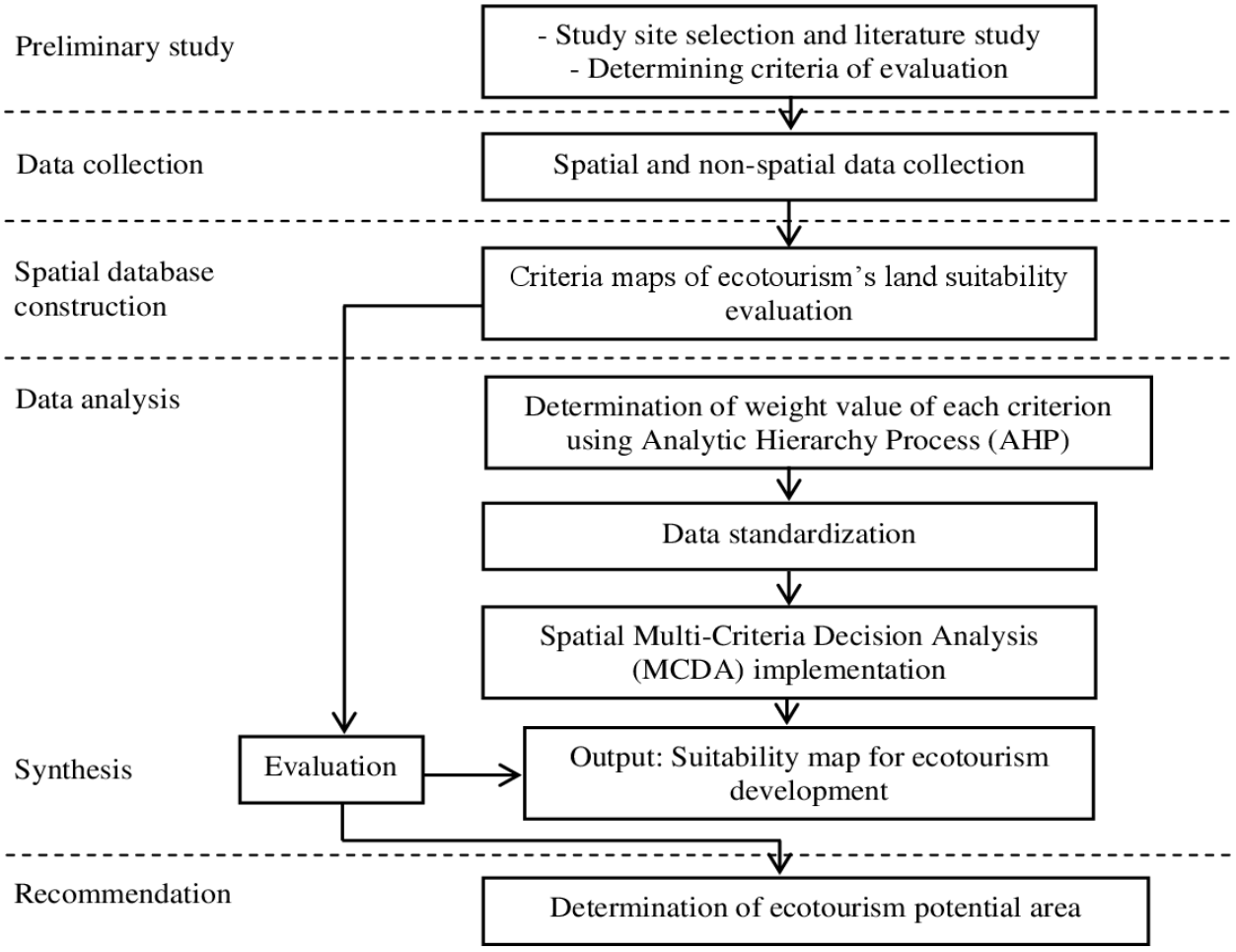


Figure 2.5: Ecotourism site suitability methodology (adopted from Bunruamkaew & Murayama, 2011)

the existing land use land cover dynamics is significantly important in the process of ecotourism hotspot identification. According to (Anderson, 1976 and Morrow, 2010) land cover is referred as the biophysical attributes of the earth's surface and land use refers the aim of which the land is occupied and used. In ecotourism study literatures many types of land use classes are incorporated in ecotourism site selection and suitability analysis. Parametrical factors like: wetland, air, soil, climate, vegetation cover, tourist facilities and amenity are also considered. As shown in Table 2.3 below Gebregiorgis (2009), uses 7 parametrical factors including: land use-land cover, vegetation density, elevation, slope, soil, rainfall and temperature to elect and sort out the ecotourism potential of an area. Depending on the objectives and the study area geographical features, scholars used different parametrical factors including the land use land cover classes.

Table 2.3: land use land cover map classification for ecotourism potential resources

LULC Type	LULC suitability
Dense forest	Highly importance for ecotourism, can serve as major ecotourism attraction, area need to be conserved.
Water body	Can serve as active recreation as boating
Shrub land	Important for ecotourism, area needs to be managed and conserved properly to attract eco-tourist as well as general tourist.
Closed grassland	Is an area of grazing land for some season and an area where local and migratory birds can entertain which are moderately important for ecotourism
Open grassland	Is an area open for grazing throughout the year and where local and migratory birds entertain
Cultivated land	Area under agriculture and farm should not be converted to other schemes.
Built up area	Suitable for eco-tourist infrastructure development

Source: (Gebregiorgis, 2009)

Chapter Three

3. Methodology

3.1. Study Area Description

Wondo Genet is found on the western escarpment of the central rift valley of Ethiopia extending between with a latitude and longitude of 7°1′N 38°35′E and an elevation of 1645-2628 m a.s.l., about 265 km south of the capital Addis Ababa and 24 km east of Hawassa Town. It is one of the 19 Woredas in the Sidama Zone, in SNPPR covering a total geographical area of 15,145 ha or 151.45 km2. Currently the Wereda comprises of 14 kebeles. The topography of the Wereda has mountains and hills are covered 43.5%, flat areas 36.25% and undulating parts covere 20.25% of the wereda.

3.2. Climate

Wondo Genet has a tropical wet- dry high climate, which is characterized by marked seasonal contrast, unreliable precipitation and a dry winter season of two to four months. It has a bimodal rainfall distribution with two rainy seasons, January to April and more extensive in July to September. There is also a characteristic of long dry season in October to February. The annual average rainfall is about 1200mm and the mean temperature throughout the year varies between 17^{o} C and 19^{o}C (Bekele & Kassa, 2008). The minimum and maximum temperature of the study area are 10.2°C and 30.1°C in the months of December and February respectively.The hottest month is February with a maximum temperature of 30.1°C and the coldest month is December with a minimum temperature of 10.2°C. The agroecology of the Wereda has 23% humid and 73% sub-humid tropical climate and receives a mean annual rainfall of 1,163mm per year and showbimodal type of rainy seasons. Short rain season is between March and May accounting for 28% (Belg or Spring) of total rainfall, and long rain season between July and October accounting for more than 50% of the total rainfall (Beyene, 2011).

3.3. Vegetation

Wondo Genet area is still covered with large remnant natural forest and plantation forest. Available documents and oral information indicate that the area had been covered by dense forest about half a century ago. According to Hailegiorgis (2004) the total forestland was estimated to be 10,000 ha in 1940's. Currently, most forest cover is observed in the upper sides

of the mountains and inside the valleys. These consist of open woodlands of medium sized trees above the Juniperus - Podocarpus forest, and of dense tree Aningeria fruginia forests.

At still higher elevations mountain savanna of shrubs, scrubs and grasses come into view. According to Beyene (2011) noted the remnant forest vegetation at Wondo Genet is categorized as dry evergreen Afromontane forests highly disturbed and confined to the mountain slopes. Beyene, (2011) described, trees have been often planted on homesteads, farmlands and farm boundaries and give rise to, what could be described as a 'homestead' and/or 'scattered trees on crop lands '(parkland) type of agroforestry systems. While a variety of fruit trees and shrubs and cash tree crops (Mangifera indica, Coffea arabica, Persea americana, Prunus persica, Rhamnus prinoides, sugar cane, and chat (Catha-edulis), dominate the homesteads, the dominant species in the parklands include Cordia africana, Albizia gummifera, Croton macrostachyus, Ficus species, and Millettia ferruginea. Agricultural crops like: Maize (Zea mays) sometimes followed by teff (Eragrostis tef) is the major grain crop grown on farms, while 'enset' (Ensete ventricosum), along with sugarcane (Saccharum officinarum), various root crops and vegetables (Beyene, 2011).

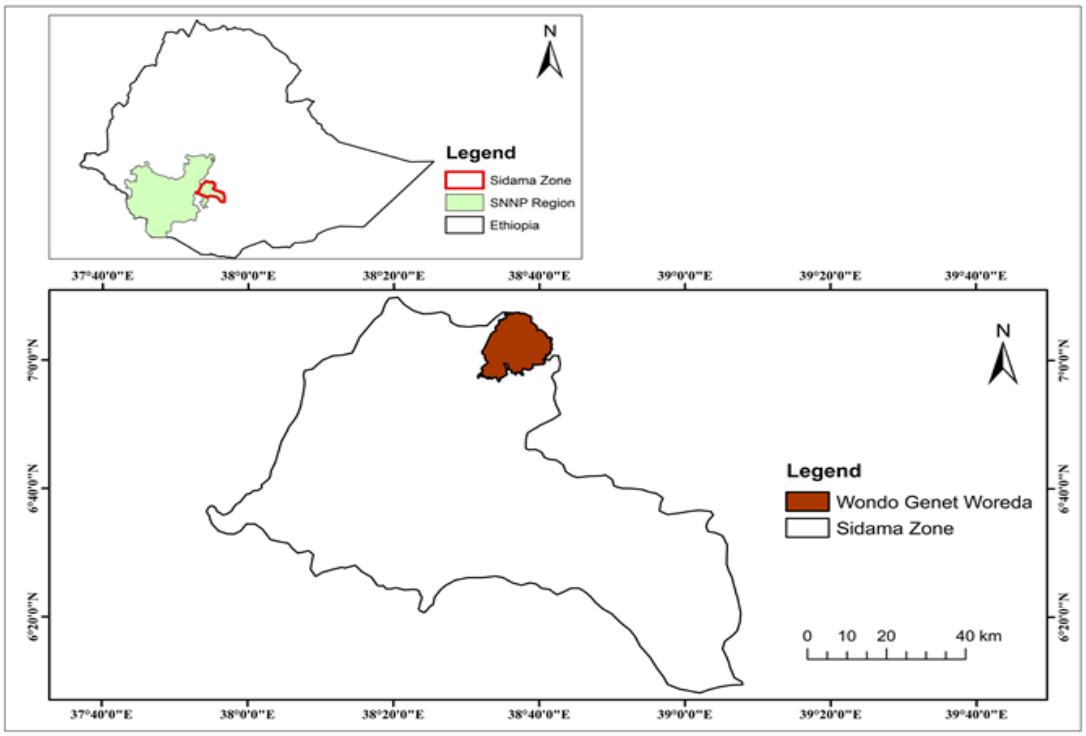


Figure 3.1: ***Geographical Location of Wondo Genet Woreda***

3.4. Geology and Soil

The three dominant soil types in the area are clay soil covering 40%, sandy soil 10% and loam soil 50% respectively (WGARDO, 2008 as cited in Beyene, 2011). According to Hailegiorgis (2004), Wondo Genet comprises escarpments, ridges, plateau, undulating to rolling and dissected plains, depressions and swamps. Most of the bottomlands are flat, but some of the areas at border have deep gullies and degraded lands caused by erosion and deforestation. Due to the variation in landforms, the soil types also show a variation. Though there is variation in color and texture of soil from area to area, the dominant soil, which covers over large area of the Woreda, is sandy loam. Clay loam with reddish color is also found in some parts of the area. Dark brown with loamy-to-loamy sand texture soil is also visually observed in some part of the area. Generally, the soils are fertile with the exception of soils in sloppy lands whose fertility is reduced due to low organic matter. Soil exhaustion due to long continued plugging, soil erosion losses due to deforestation, over grazing and extensive farming are some of the causes of loss of fertility in the area (Hailegiorgis, 2004).

3.5. Research Approach

According to Italemahu (2013) the combination of both qualitative and quantitative research methods brings out a positive outcome to research. In addition, Gedecho (2015) argues that in tourism-related researches, using of qualitative and quantitative research design is recommendable to make the study result finer. As a result, for this thesis study both qualitative and quantitative research methods were adopted and used.

3.6. Method of Data Collection

Data were gathered from both primary and secondary data sources. The primary data were sourced mainly through: 1) Questionnaire Survey, 2) KII, 3) field observation, 4) Remote sensing data. The secondary data were sourced from related literature reviews.

3.6.1. Primary Data Sources

3.6.1.1. Questionnaire Survey

A total of 14 open and close-ended questionnaires were designed, distributed and collected for the Wondo Genet Ecotourism guide association, WGCF-NR ecotourism lecturers and tourist to obtain data on ecotourism suitability criterion. Which is encompasses both demand side (visitors

view) and supply side (local experts) approach. The questionnaire had two parts: primarily setting criteria's and then determining a weight for each factor of suitability. Moreover, the questionnaire survey was administered with visitors to explore their reflections, motivation and their interest towards eco-tourism activities that they want to practice in the area. Hence, incorporating travelers' motive towards the destination selection process were helpful on identifying ecotourism resources which had not been seen from local guides.

3.6.1.2. Key Informant Interview

Informants were purposively selected and interviewed based on their experience on tourism and length of stay in Wondo Genet area from: representatives of local elders, Wondo Genet Woreda tourism officials and resort Managers. As a result, all of the KII were stayed and worked in tourism industry for more than 5 years. Thus, KII were used to identify various parameters of tourist demand, tourist infrastructure facilities, site description, land uses, eco-tourist spots, historical and cultural heritages and their location.

3.6.1.3. Personal Observation

The primary data was also collected through direct field observation to enumerate and record ecotourism potentials: forest resource, wild mammals and birds in Wondo Genet with the help of key-informants and guides. Direct personal observation was also administered as a complementary method to triangulate data collected through questioner and in-depth interviews.

3.6.2. Secondary Data Review

The secondary data were sourced from National metrology agency, geospatial technology institute, and WTTC reports.

3.6.2.1. GIS and Remote sensing data

Preliminary survey was made to select the different ecotourism site selection criterions based upon both demand approach (expert's opinions) and based on supply sides which are tourists. The land use/land cover map produced by applying supervised classification method in ERDAS imagines 2015 software. ArcGIS 10.5 software was used to digitize the land cover obtained from the remotely sensed satellite imagery Spot (1.5m) and Landsat 8(30m) In addition; Arc GIS 10.5

was used to measure the ranking of different sites in accordance with the set criteria and to identify highly suitable classes and the non-suitable ecotourism spots.

3.7. Sampling design

Different sampling techniques were utilized to select participants in the different methods of data collections. For local guides, ecotourism academicians and KIIs purposive sampling were used and visitors were selected based on convenience sampling technique. The desired sample size was also determined based on the existed sample respondent. The sample size (n) for this study was 21 respondents (5 WGCF-NR ecotourism lecturers, 5 Wondo Genet ecotourism guides, 2 Wondo Genet Woreda tourism officials, 2 resort managers, 3 community leaders, and 4 tourists), who fulfilled the designed sampling criteria.

A. Convenience or Accidental Sampling Technique

Since visitors are not residents and stays short period of time their actual number is not known as a result non random sampling technique was used. Italemahu (2015, p.84) argues "Tourist availability at a given time are the main factor for opting accidental sampling".

B. Purposive Sampling Technique

For selecting respondents from: local experts, WGCF-NR lecturers, Woreda tourism officials' and KIIs purposive sampling technique were utilized based on their knowledge of ecotourism and their experience and length of stay in Wondo Genet.

3.8. Demographic Characteristics

In case of the age structure 70 % of the total respondents fall within the age range of 24-33 years. 20% of respondents are between the ages of 34-43 while the remaining 10% are above 44. Whereas from total of respondents' male accounts for 60% and women are 40%.

Table 3.1: Respondents profile

No	Job title	Frequency	Education
1	WGCF-NR Lecturers	5	MA
2	Woreda Tourism expert	2	BA
3	Community elders	3	Write and read
4	Local Guides	5	3 BA & 2 diploma
5	Resort managers	2	BA
6	Tourist	4	4 PhD candidate
	Total	21	

3.9. Data Analysis

The data were mainly analyzed using both quantitative and qualitative data analysis. The non-quantifiable qualitative data has managed manually and analyzed descriptively. Qualitative data obtained from key informant interviews, resource mapping and observational notes was transcribed and described in words. Whereas, for the case of quantitative data simple statistical tools like; frequencies, percentage, figures, tables, graphs, averages, cross tabulation had used. Similarly, suitable photographs taken during field visit were inserted for better illustration. For visualization, some appropriate data was used in GIS (Arc 10.5) to create different layers of the area with the help of computer. After the analysis of the empirical and secondary data, synthesis of the all-data set was made to facilitate recommendation of ecotourism development options in Wondo

3.10. Multi-criteria Evaluation and Selection Process

There were four crucial steps to produce site suitability map for Wondo Genet ecotourism and these are: (1) finding suitable factors to be used in the analysis (2) assigning factor priority, weight and class weight (rating) to the parameters involved (3) generating land suitability map of ecotourism based on FAO`s suitability schemes classes: as highly suitable, moderately suitable, less suitable and not suitable.

3.10.1 Criterions used to identify Potential Ecotourism Sites

The studies of ecotourism suitability analysis mainly begin with the determination of parameters. Since, every destination has unique geographical conditions with its own specialisms, and it needs to adapt favourable measuring parameters. Thus, based on the questionnaire survey, six parametrical factors are identified, within the land ecosystems of Wondo Genet:

Table 3.2: Criteria and factors involved for evaluation of ecotourism suitability

Criteria	Sub-criteria	Unity	Suitability Rating and Score/ layer of classification				References
			Highly suitable	Moderately suitable	Low suitable	Un-suitable	
Land use land cover	Natural forest	class	□				Based on questionnaire field survey, 2020
	Plantation forest		□				
	Wet land		□				
	Shrub land			□			
	Cultivated land				□		
	Rural settlement					□	
Wildlife	Species diversity	%	> 30%	20-30%	5-20 %	< 5%	Bunruamkaew & Murayama (2011)
Topography	Elevation	M	1800-2000	1700-1800	>2000	<1700	Suryabhagavan *et al.*, (2015)
	Slope	%	0-5%	5-25%	25-35%	>35%	
Climate	Temperature	^{0}C	12-15 ^{0}C	15-18 ^{0}C	18-20 ^{0}C	20-22 ^{0}C	Asmamaw et al., (2014)
	Rainfall	mm	770-890mm	700-770mm	630-700	580-630	

Because of the absence of universally agreed parameters that evaluates the suitability for ecotourism, local expert's opinion, tourists view, review of literatures as well as field observation were collated and implemented.

3.10.2 Asigning factor priority, weight and class weight

To obtain the desired relative weight of each parametrical classes, questionnaire matrix was developed, in which the column matrix indicates the value of rank while the raw matrix indicates a list of LULC classes and other class maps. Each criterion has given relative values between 1 and 6 in accordance with their suitability for determining an ecotourism capability. Then the most parametrical suitable classes are given 1st rank, whereas the lower potential sites are given the highest value 6th rank (6=Extremely Important, 5=Very important, 4=Important 3= marginally important, 2=less important, 1=Unimportant). Points given to each class category were then multiplied by the total number of respondents to that class map, and these were aggregated for all lists of ranks. To fix the final value of the rank, the total weight of each attraction was divided by the number of respondents to that attraction category. Details of each processing step are shown below

Table 3.3: **questionaries' matrix**

Attraction Factors	**Rank**						Total weight	Average weight	Class rank	Factor rank
	1st	2nd	3rd	4th	5th	6th				
LULC Map	9	3	2				21	1		**1**
Forest	8	4	2				22	1.05	***1***	
Wet land	7	5	2				23	1.09	***2***	
Shrub land	6	4	4				26	1.24	***3***	
Cultivated land	1	4	5	4			32	1.52	***4***	
Built up	1	4	5	2	2		42	2	***5***	
Sp. diversity Map	5	5	4				27	1.28		**2**
Rainfall Map			5	5	3	1	56	2.67		**6**
T^0 ***Map***		2	5	5	2		47	2.24		**5**
Elevation Map		6	5	3			39	1.85		**3**
Slope Map		4	4	4	2		46	2.19		**4**

(Source: field survey, 2020**)**

Average weight with the less number takes the first rank order and the high average weight takes the last rank. As the above questionnaire' matrix (Table 3.3) shows, weight for each factor maps were assigned based on the questionnaire developed and distributed. Accordingly, the most important criteria with higher influential impacts are land use land cover map and species diversity map, followed by elevation map, slope map, temperature map and rainfall map.

3.10.3 AHP algorithm

The AHP pair wise comparison was used to allocate weights to the criteria of each level, measuring their relative importance by using Saaty's (1-to-9) scale, and calculates respective weights for elements at the bottom level. Finally, parameters are prioritized and potential sites are ranked using the framework of an AHP multi-criteria evaluation approach. Weight and score were given to each of the criterion depending up on their relative importance in suitability.

Table 3.4: **Pair wise comparison matrix for ecotourism potential suitability**

	LULC	Sp. Diversity	Elevation	Slope	Temprature	Rainfall
LULC	1	2	5	5	7	7
Sp. Diversity	1/2	1	5	5	7	7
Elevation	1/5	1/5	1	1	5	5
Slope	1/5	1/5	1	1	3	3
Temprature	1/7	1/7	1/5	1/3	1	3
Rainfall	1/7	1/7	1/5	1/5	1	1
Sum	2.18	3.68	12.4	12.53	23.33	26

As shown from the (table 3.2) land use land cover is appear as a strong determinat factor for ecotourism potential suitability compared to other factors followed by species diversity; elevation is less important than species diversity and land use land cover; slope is less important than elvation, species diversity and land use land cover; temprature is less important than slope, elevation, species diversity and land use land cover; rainfall is less important than all factors.

Table 3.5: **Overall suitability weight and evaluation**

	LULC	Sp. Diversity	Elevation	Slope	Temprature	Rainfall	Mean	Weight
LULC	0.46	0.54	0.40	0.40	0.30	0.30	0.40	40
Sp. Diversity	0.23	0.30	0.40	0.40	0.30	0.30	0.32	32
Elevation	0.09	0.05	0.08	0.08	0.20	0.20	0.11	11
Slope	0.09	0.05	0.08	0.07	0.13	0.10	0.09	9
Temprature	0.06	0.03	0.01	0.02	0.04	0.11	0.04	4
Rainfall	0.06	0.04	0.02	0.02	0.04	0.04	0.04	4

To ensure the acceptability of the relative significance used, AHP provides measures to calculate inconsistency of judgments mathematically. Based upon the properties of reciprocated matrices, the consistency ratio (CR) is calculated which is 0. 051. Similarly, Saaty (1980) argues that if CR is smaller than 0.10, then the degree of consistency is fairly acceptable. Since CR 0.051 < 0.1 shows that level of consistency in the pair wise comparison is acceptable. For the case of this study (Consistency Ratio) CR = 5.1% which is 0.051, which is acceptable. Then the final suitability map of ecotourism development has been obtained by applying Weighted Linear Combination (WLC) and it has been designed in 4 suitability classes as: Highly Suitable (S1), Moderately Suitable (S2), Marginally Suitable (S3), and Not Suitable (N).

3.11. The overall Framework of the study

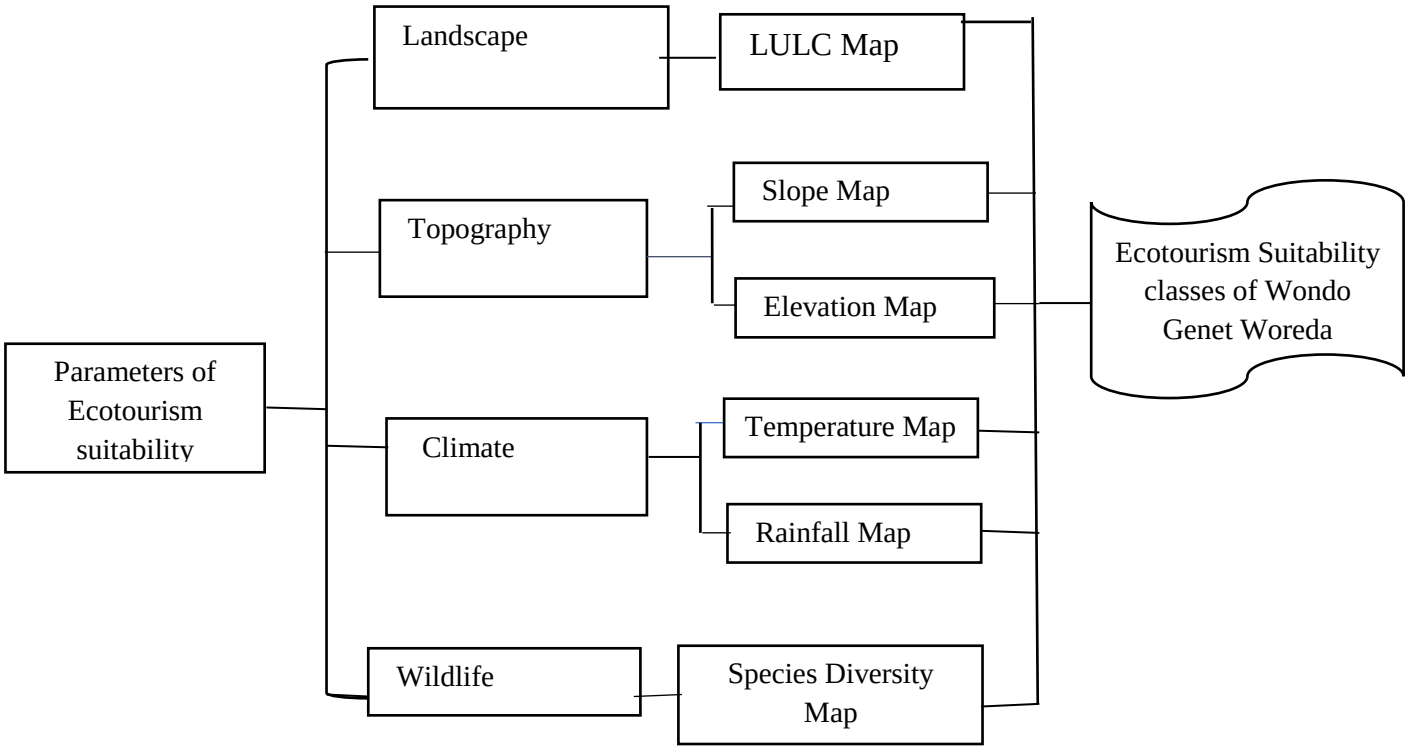


Figure 3.2: The overall framework of the study (Source: field work, 2020)

Chapter Four

4. Result and Discussion

4.1. Criteria's identified for Potential Ecotourism Sites Capability Analysis

The studies of ecotourism suitability analysis mainly begin with the determination of parameters. Because of the absence of universally agreed parameters that evaluates the capability of ecotourism, and every destination has unique geographical conditions with its own specialisms, and it needs to adapt favourable measuring parameters. As a result, based on the acquired information, in the land ecosystem Wondo Genet six parametrical factors are considered: LULC, wildlife, topography (elevation and slope) and climate (temperature and rainfall).

4.1.1 Land Use Land Cover of Wondo Genet

Understanding the existing land use land cover dynamics is significantly important in the process of ecotourism identification and development in Wondo Genet.

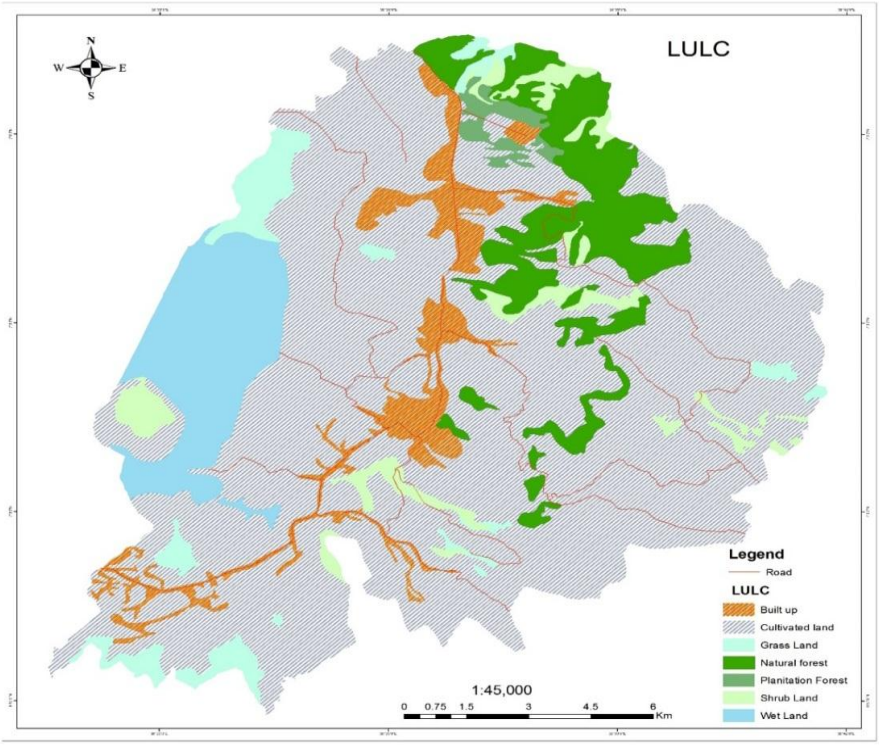


Figure 4.1: Land use Land cover of Wondo Genet computed by field survey, 2020

Based on the analysis of many ecotourism suitability literatures, monitoring land use land cover dynamics is essential to deal with ecotourism (Bunruamkaew & Murayama, 2011; Das, 2017; Fang, 2017). According to Anderson (1976), land cover is referred as the biophysical visible features of the earth's surface and land use simply means use of land features by humans (Morrow, 2010, p: 119). As shown in (fig 4.1) agriculture is the most fundamental form of land use system in the Woreda. It involves mixed agriculture i.e., crop cultivation, agroforestry, and livestock raring. Based on the distributed questionaries', forest and water bodies are presented as highly suitable, grass land is perceived as moderately suitable, agricultural land as less suitable and built-up areas as not suitable. The overall accuracy is presented as follow;

Table 4.2: **Kappa coefficient**

Kappa (K^) Statistics	LULC Class	Plantation forest	Natural forest	Shrub land	Cultivated land	Grass land	Built-up area	Overall Kappa Statistics
	Kappa	0.9041	1	0.8082	0.9041	1	0.9041	= 0.9306

Kappa coefficient is 0.93

Table: 4.3: **Overall Accuracy Classification**

Land Use Land Cover Type	Reference Totals	Classified Totals	Number Correct	Producers Accuracy	Users Accuracy
Plantation forest	11	12	11	100%	91.67%
Natural forest	15	12	12	80%	100%
Shrub land	11	12	10	90.91%	83.33%
Cultivated land	11	12	11	100%	91.67%
Grass land	13	12	12	92.31%	100%
Built-up area	11	12	11	100%	91.67%
Wetland	12	12	12	100.%	100%
Total	84	84	79		

Overall Classification Accuracy = 94.05%

The overall image classification accuracy result is 94.05% and the Kappa coefficient is 0.93. Therefore, the land use land cover classification map is acceptable.

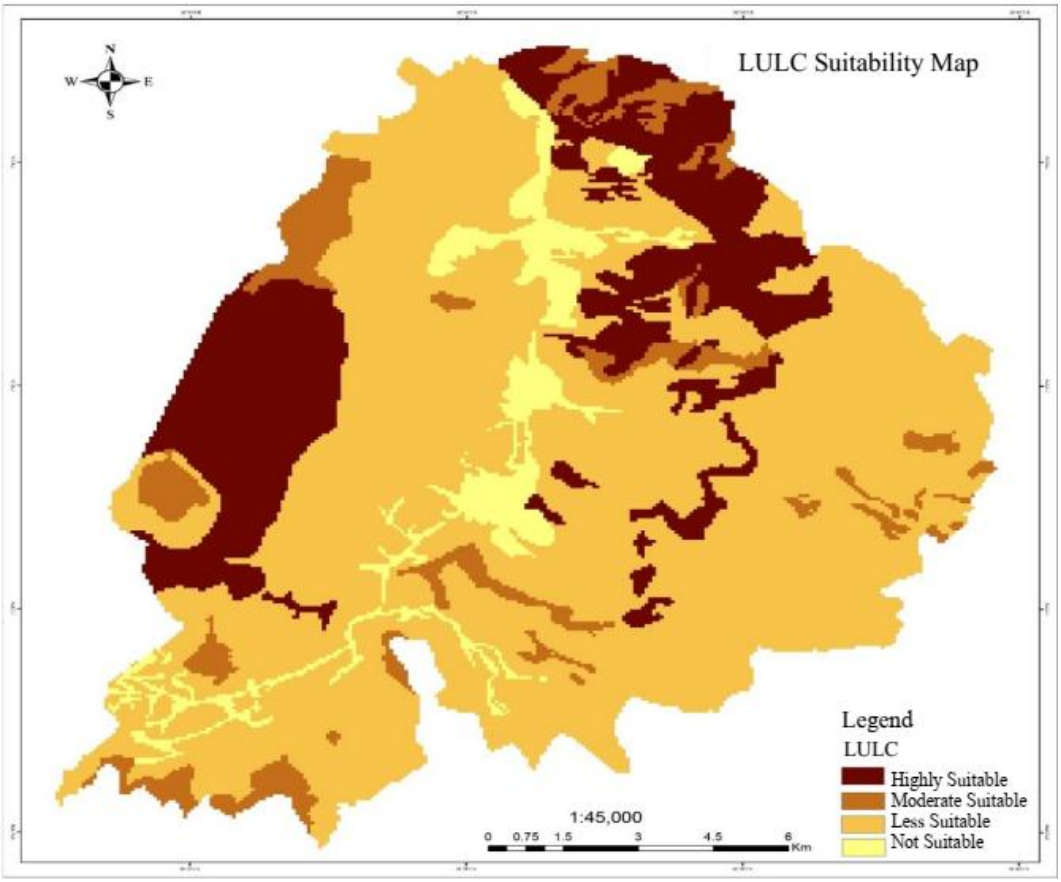


Figure 4.2: LULC Suitability Map of Wondo Genet

Table 4.4: **Area coverage of LULC for ecotourism potential development**

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	4152.40	41.52	18.35
Moderately suitable	1752.10	17.52	7.74
Less Suitable	15271.76	152.72	67.5
Not Suitable	1449.58	14.5	6.41
Total	22625.84	226.26	100

The mapping and classification are done with six major land use and land cover types. As it is shown in (figure 4.2) forest and water areas are more suitable for ecotourism activities than other land uses types. Afromontane forests of Wondo Genet and the wetland area plays a great role on ecological function and contains variety of flora and fauna species which brings more beauty and provides an interesting platform for many kinds of eco-tourists: birdwatchers and wildlife lover. As it is indicated from the table 4.4; 18.35% of the areas were highly suitable, 7.74% of the areas

were moderately suitable, 67.5 less suitable and while 6.41 % of the areas were not suitable for ecotourism potential.

4.1.2. Wildlife Species Diversity

Wildlife is one of the prominent indicators for ecotourism site selection (Bunruamkaew & Murayama, 2011). Accordingly, for the case of Wondo Genet species diversity factor was considered among the seven land classes, based on the local expertise view and direct observation and it also crossly verified with the existed number of recorded flora and fauna species studies. Respondents from WGCF-NR and ecotourism guide association were asked to forward and rank the species diversity (flora and fauna diversity) of Wondo Genet area based on the classified LULU.

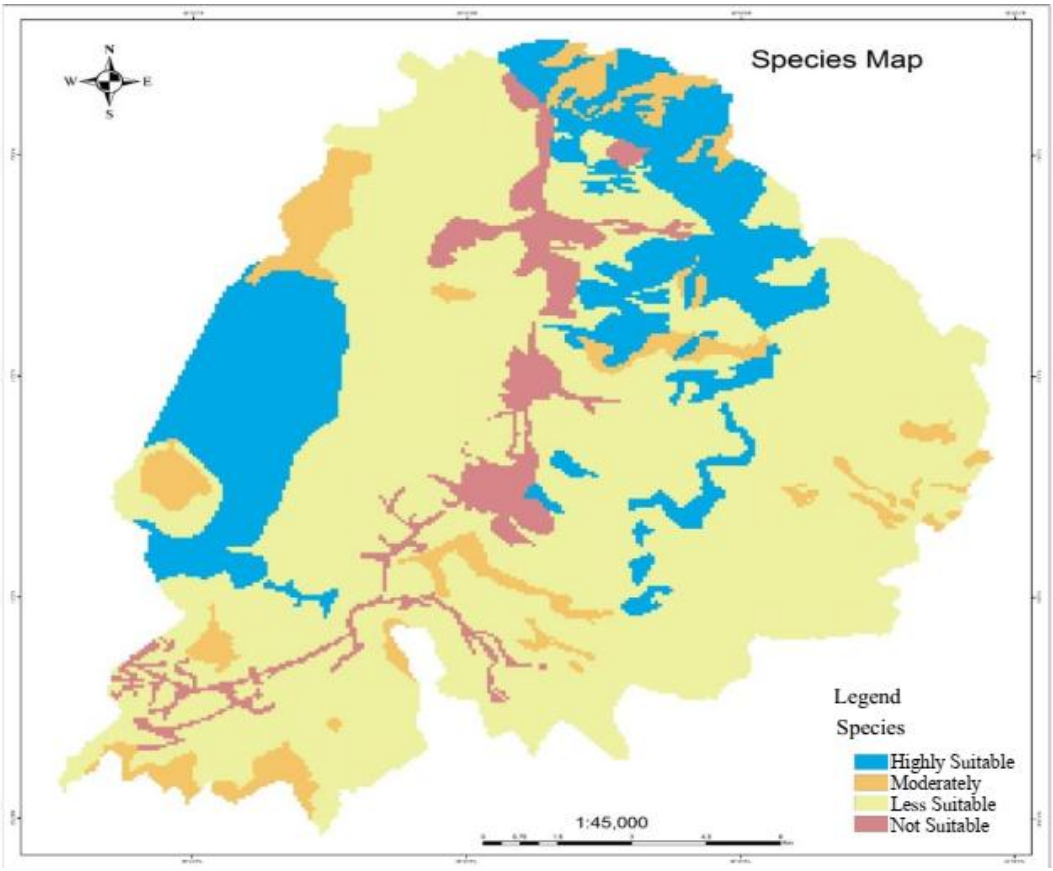


Figure 4.3: Species Suitability Map of Wondo Genet

As a result, Wet land and forest areas ranked as 1st in terms of species diversity, shrub land and grass land ranked 2nd, cultivated land 3rd and built-up areas last. Moreover, field survey also

confirmed that due to the lower catchment of Wondo Genet area is occupied and disturbed by many human settlement patterns and agriculture activity, many of the Afromontane forests and fauna species are confined to the mountain slopes in the upper hill part of Wondo Genet and Cheleleka wetland is also a habitat for diversity of avian species.

Similarly, elevation is one determinant factor on the species diversity and richness of an area, species richness in the case of Wondo Genet tends to increase as elevation increases, up to a certain point, creating a "diversity bulge" at middle elevations. Moreover, beside the respondents view and the direct observation, reviewed studies on big mammal, avian and flora species diversity have taken into consideration. In this regard, species diversity has also crossly verified and determined with the studies of Kebede *et al.,* (2013), Girma *et al.,* (2012) and Girma *et al.,* (2017). Thus, many of the avian, flora and mammal species are found manly in the natural forest and wetland areas.

Table 4.5: **Area coverage of species diversity for ecotourism potential development**

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	4152.40	41.52	18.35
Moderately suitable	1752.10	17.52	7.74
Less Suitable	15271.76	152.72	67.5
Not Suitable	1449.58	14.5	6.41
Total	22625.84	226.26	100

Thus, in this study, the reclassified species map was given from the degree measurement unit for ecotourism requirement as per the established set by Bunruamkaew & Murayama (2011) land types having above 30 % of recorded species are ranked as high; moderate (20-30%); marginal (5-20 %); and less than 5 % of recorded species are ranked as no potential. Therefore, ecotourism & species diversity have a positive relationship: high species diversity is perceived as high suitable. As it can be plainly evidenced from (table 4.5) the area of highly suitable for ecotourism based on species diversity is about 18.35% (4152.4ha). The moderately suitable areas make up about 7.74% (1752.1ha), less suitable areas 67.5% (15271.76ha) and not suitable accounts 6.41% (1449.58ha) in Wondo Genet area.

4.1.3. Topography Dimensions:

Elevation and slope are important topographical factors in evaluating and selecting potential ecotourism site (Kumari *et al.,* 2010; Suryabhagavan *et al.,* 2015; Asmamaw & Gidey, 2018).

4.1.3.1. Elevation

Elevation is an important hypsometrically diverse of relief in the identifications of ecotourism hotspots (Bunruamkaew and Murayama, 2011; Kumari *et al.*, 2010; Fang, 2017). Elevation value of Wondo Genet ranges from 1645 to 2628. The elevation classes are evaluated based on Suryabhagavan *et al.*, (2015) value between 1800-2000m is ranked as high potential, between (1700-1800 m) moderate potential, low potential (>2000), no potential (<1700) for ecotourism significant.

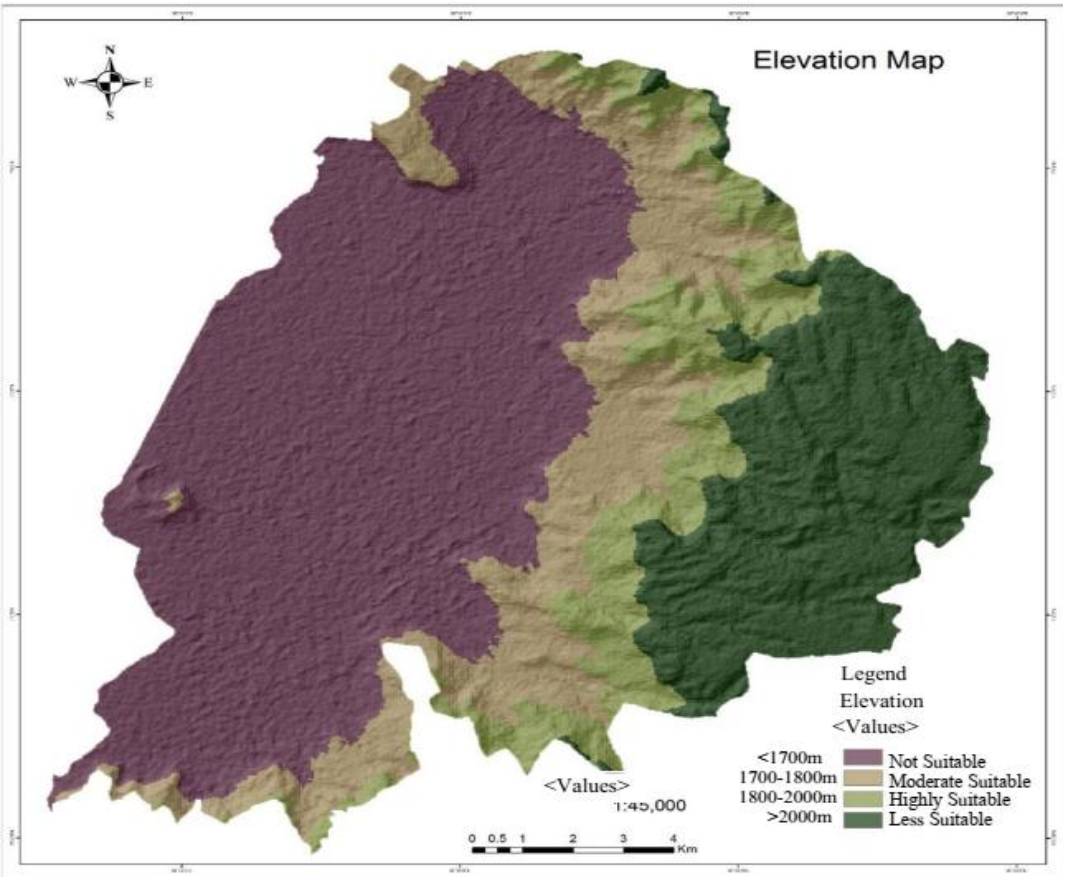


Figure 4.4: Elevation suitability map of Wondo Genet

Table 4.6: Area coverage of elevation for ecotourism suitability

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	4763.1	47.6	21
Moderately suitable	2662.1	26.6	12
Less Suitable	3850.6	38.5	17
Not Suitable	11371	113.7	50
Total	22646.9	226.5	100

Elevation has a direct and indirect effect on ecotourism capability analysis of Wondo Genet Woreda. As it is shown in (fig 4.4), for this study the highest elevation was given for high ecotourism potentials while lowest elevation given no potential for Wondo Genet ecotourism suitability analysis. For many reasons the highest the elevation is preferable for ecotourism: The direct effect is the highest the elevation provides a platform for many kinds of adventurer (allo-centric) eco-tourists. Because adventure tourists, ventured in daring or risky activities and prefer challenges. For example: backpackers and mountain climbers used the highest altitude for hiking, bungee jumping, Para-shot, rock climbing, and mountain biking and eco-trekking activities. In addition, climatic variables such as temperature or atmospheric pressure decrease with increasing elevation, which is favorable for psycho-centric kind of eco-tourists to enjoy. In addition, the lowest elevation class is not suitable for ecotourism because of high temperature.

Secondly, the indirect effect, elevation variation is a very useful predicator variable for biodiversity diversification. Elevation affects the flora and fauna species diversity, which often gives an interesting opportunity for eco-tourists to see and experience different species. Accordingly, in the case of Wondo Genet species richness tends to increase as elevation increases, up to a certain point, creating a "diversity bulge" at middle elevations. The Elevation diversity gradient states that tree and shrub species richness decrease with increasing elevation and conversely, species richness in the herbaceous life form increases with elevation.

4.1.3.2. Slope

The concept of slope is important in ecotourism capability analysis because it is used to determine landform which is easily accessible for ecotourism accommodation development and amenities construction. For the case of Wondo Genet Woreda five slope classes were specified: $(0\text{-}5)^0$, $(5\text{-}25)^0$, $(25\text{-}35)^0$, and $(>35)^0$. Since the flatter the slope is the more appropriate for ecotourism amenities development (Bunruamkaew & Murayama, 2011). As a result, for the case of Wondo Genet Woreda, the steeper the slope tended to have less capability for ecotourism amenity development because of its huge construction cost and inaccessibility. Whereas, the gentle slope of the landform is preferred for ecotourism amenity construction due to its minimum construction cost and minimum risk from natural danger.

In addition, slope is safety indicator, the gentler the slope is the higher the safety (Asmamaw *et al.*, 2014). The steepest slope is not easily accessible and it increases risk of landslide. Therefore, the flatter the slope is the safest.

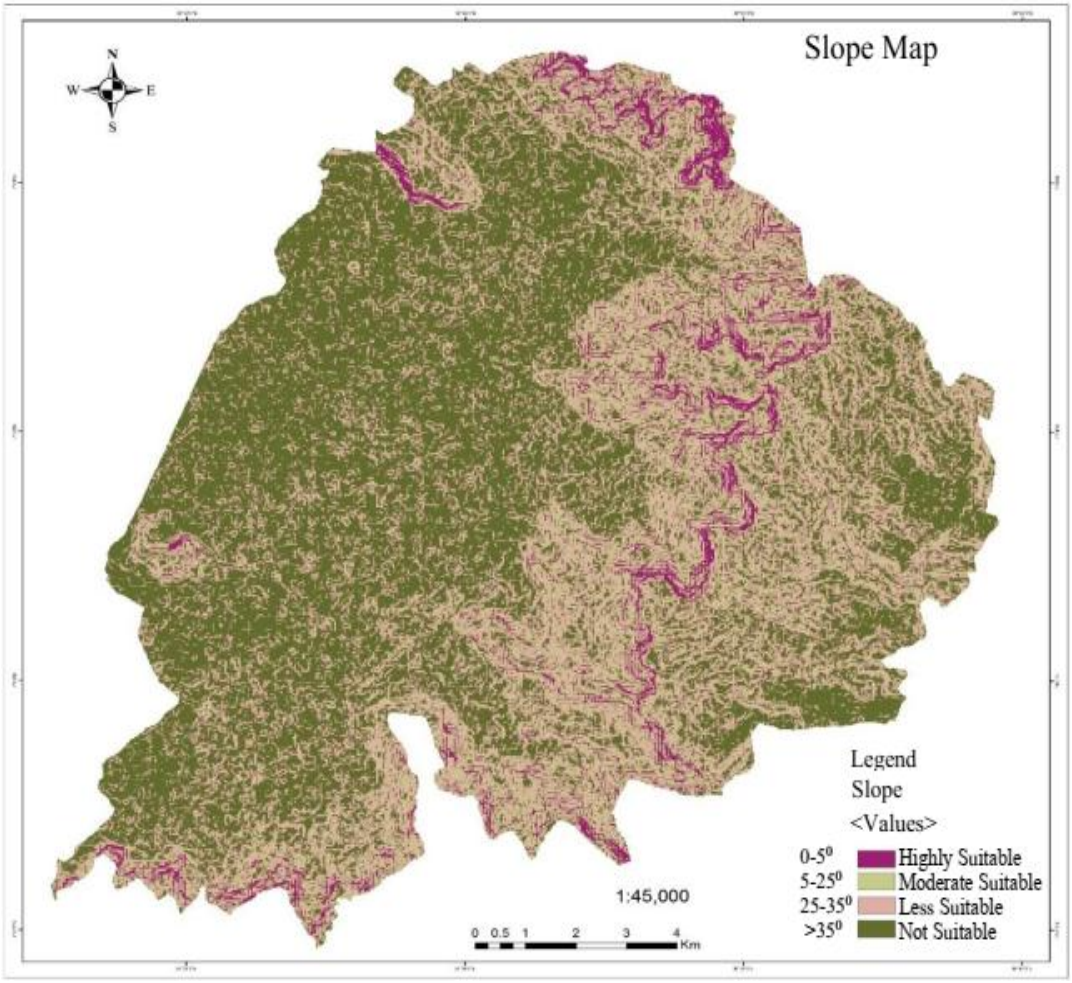


Figure 4.5: **Slope Suitability map of Wondo Genet**

Therefore, in this study, the reclassified slope map was given from the degree measurement unit for ecotourism requirement based on Suryabhagavan et al., (2015) sets: the (0-5) degree is ranked as highly suitable, moderately suitable (5-25 degree), less suitable (25-35 degree), and no potential (above 35 degree). Hence, the gentle or the flatter the landform is considered as the most suitable for ecotourism facility development and it is also preferable for psychocentric ecotourist activities. The lower section of Wondo Genet, provide the necessary platform for outdoor sports such river rafting, swimming, horseback riding, boating, motorcycling, and bicycling and so on.

Table 4.7: **Area coverage of slope for ecotourism potential development**

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	11380.25	113.80	50.26
Moderately suitable	6821.41	68.21	30.12
Less Suitable	3200.83	32.01	14.13
Not Suitable	1241.24	12.41	5.48
Total	22643.73		100

The slope of Wondo Genet Woreda is between $(0\text{-}5)^0$ the lowest slope and the highest slope is 35^0 as it is shown in Figure 4.5 above. As it is clearly evidenced from table 4.7 most parts of the Wondo Genet Woreda are characterized by gentle slope holding 50.26% (11380.25 ha) which is characterized as highly suitable for ecotourism. The moderately suitable areas make up about 30.12% (6821.41ha), less suitable areas 14.13% (3200.83ha) and not suitable accounts 5.48% (1241.24ha) in Wondo Genet area.

4.1.4. Climate

In terms of climate characteristics, Wondo Genet has a great variety of climates.

4.1.4.1. Temperature

Ecotourism potential capability is determined by the temperature of the area. In case of Wondo Genet, area which has lowest temperature is considered as highly suitable for ecotourism & vice versa. Because of Psychocentric ecotourists wants a favorable temperature. Their length of stay also increases on areas with a suitable atmospheric condition.

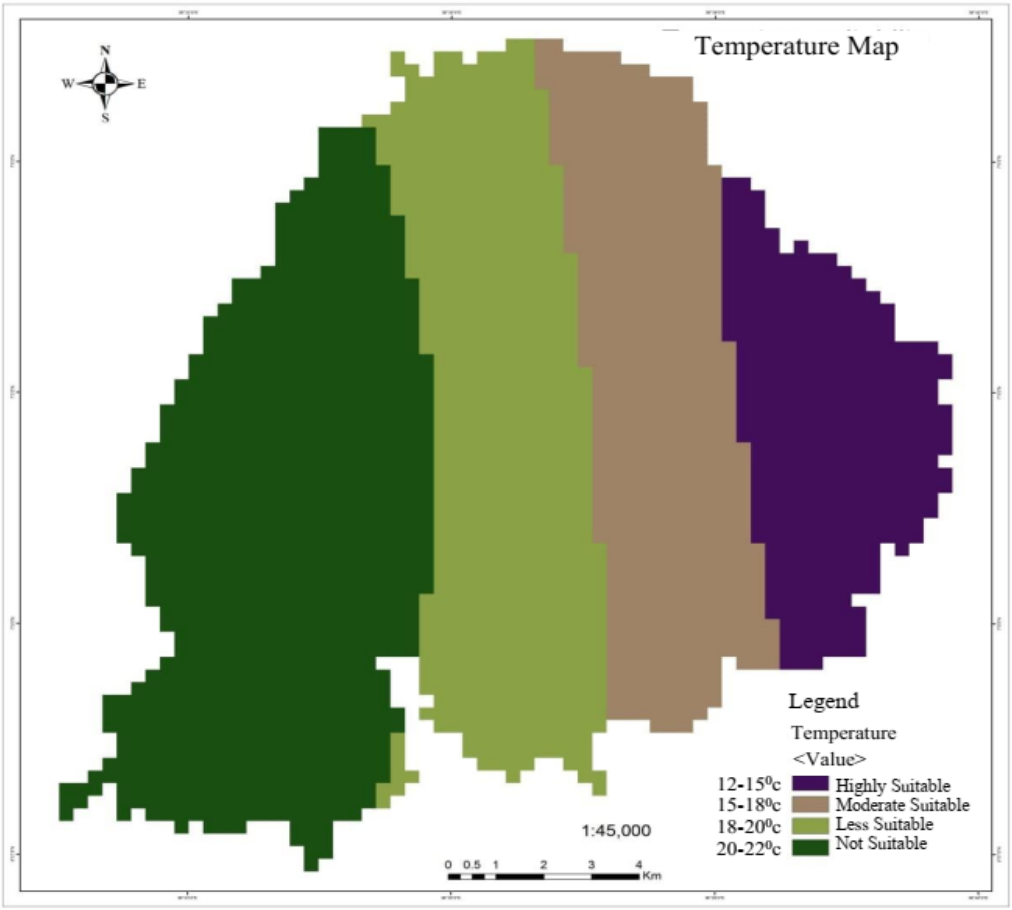


Figure 4.6: **Temperature suitability map of Wondo Genet**

For the case of this study, the state of weather condition in terms of temperature is analysed for different stations (Hawassa, Kofele and Yabello) which are found with in and around Wondo Genet area. The mean annual temperature was interpolated using the Inverse Distance Weighted of ArcGIS Spatial Analyst via the data obtained from the National Metrology Agency services for a period of 2020 year. Therefore, the temperature map was reclassified based on the

ecotourism requirement as per the established set by Asmamaw et al., (2014):12-15 ^{0}C highly suitable, 15-18 ^{0}C moderately suitable, 18-20 ^{0}C less suitable and 20-22 ^{0}C unsuitable.

Table 4.8: Area coverage of temperature for ecotourism potential development

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	3678.699	36.786986	16.21
Moderately suitable	5241.31	52.41	23.10
Less Suitable	5978.06	59.78	26.34
Not Suitable	7793.45	77.93	34.35
Total	22691.51	226.92	100.00

Based upon the temperature suitability map, as it can be plainly evidenced from (table 4.8) the area of highly suitable for ecotourism is about 16.21% (3678.699ha). The moderately suitable areas make up about 23.1% (5241.31ha), less suitable areas 26.34% (5978.06ha) and not suitable accounts 34.35% (7793.45ha) in Wondo Genet area.

4.1.4.2. Rainfall

Rainfall plays a pivotal role in modifying the state of weather condition in a given area.

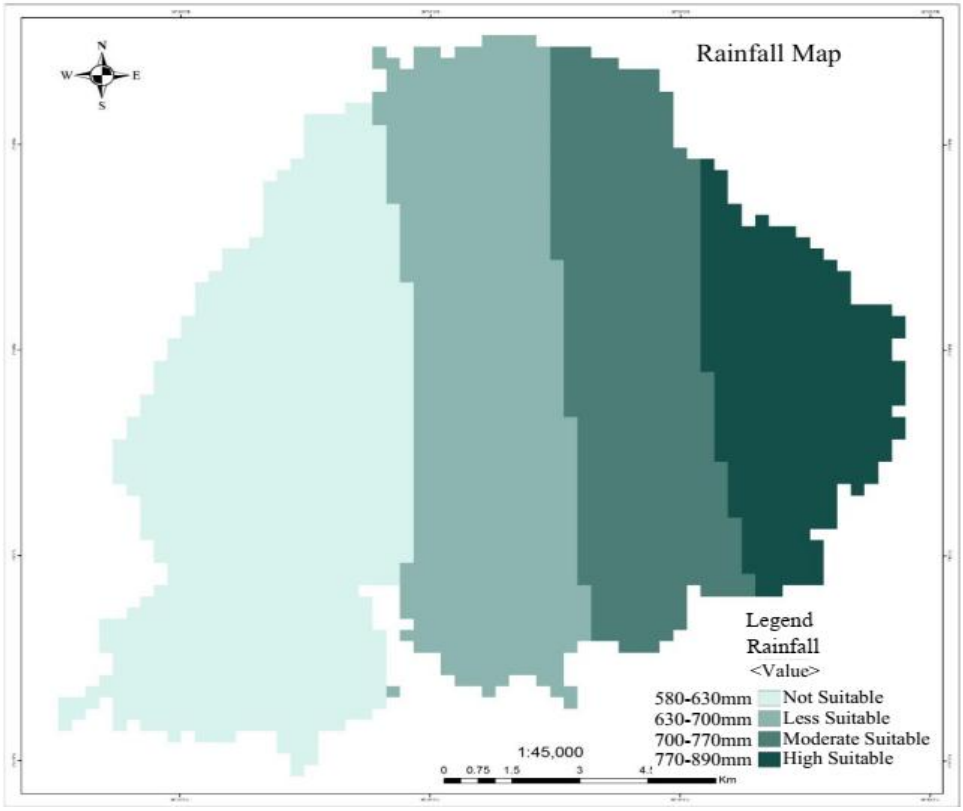


Figure 4.7: Rainfall Suitability Map of Wondo Genet

The rainfall map was reclassified based on the ecotourism requirement as per the established set by Asmamaw *et al.*, (2014), 770-890mm highly suitable, 700-770mm moderately suitable, 630-700 less suitable, 580-630mm unsuitable for ecotourism development. For many reasons area which receives high amount of rainfall is considered as highly suitable for ecotourism compared to areas which receives low amount of rainfall. The first one is allocentric ecotourists are venturers who wants to experience challenges and adventure activities. Therefore, the higher rainfall provides a platform for adventure ecotourists to practice their desired venture.

The second one is rainfall is a very useful predicator variable for species diversity. The higher the rainfall induced the higher the flora species diversity and species richness. Therefore, in case of Wondo Genet the area with a high rainfall correlates with high flora species diversity. Thus, rainfall was analyzed for different three stations (Hawassa, Kofele and Yabello) found with in and around Wondo Genet area. The rainfall data were collected from the National Metrology Agency services for a period of 2020 year.

Table 4.9: **Area coverage of rainfall for ecotourism potential development**

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	8474.07	84.74	37.33
Moderately suitable	6178.76	61.78	27.22
Less Suitable	4832.29	48.32	21.29
Not Suitable	3212.53	32.12	14.15
Total	22697.66	226.97	100

As it can be plainly evidenced from (table 4.9) the area coverage of rainfall, highly suitable is about 37.33% (8474.07ha) and are located in the upper hill part and in the Afromontane forest area. The moderately suitable areas make up about 27.22% (6178.76ha), less potential areas 21.29% (4832.29ha) and 14.15% (3212.53ha) no potential area in and around Wondo Genet area.

4.2. Ecotourism suitability Analysis of Wondo Genet

The six important GIS-based criteria maps were overlaid based on an integrated weighted overlay technique and comprised together for the final suitability map of ecotourism based on their respective weight: the ecotourism Suitability map = 40 (land use-land cover map) +32 (Sp. Diversity map) +11 (elevation map) + 9 (slope map) + 4 (Rainfall map) + 4 (temperature map). The potentiality of ecotourism was categorized into four broad types; highly suitable for

ecotourism development, moderately suitable for ecotourism, less suitable for ecotourism and not suitable for ecotourism potential area. The study attempts to indicate the level of ecotourism suitability at different location of Wondo Genet Woreda as shown in figure 4.8 below.

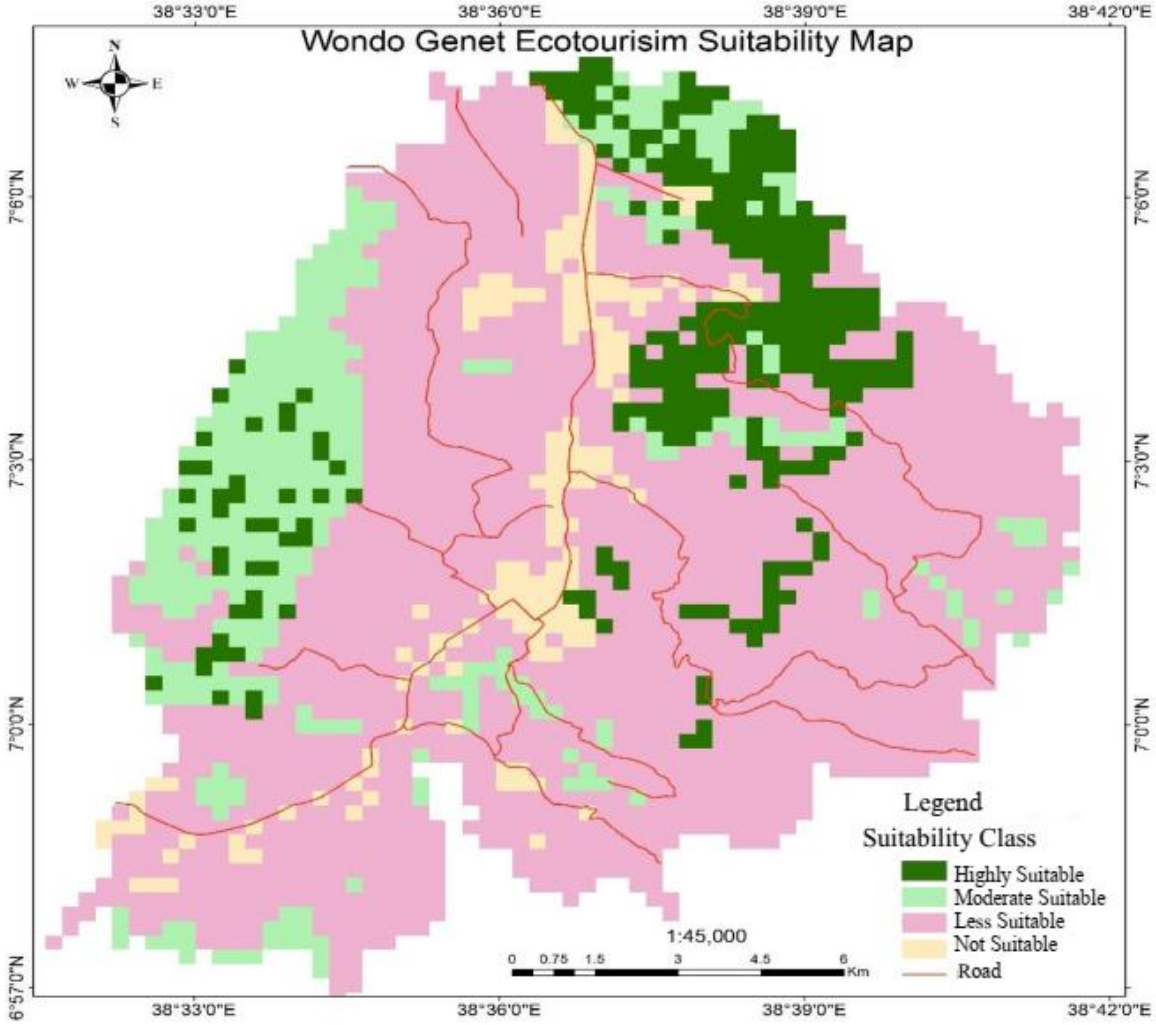


Figure 4.8: Over all Ecotourism Suitability Map of Wondo Genet Woreda

Table 4.10: Overall Ecotourism Suitability

Degree of ecotourism Suitability	Area_ha	Area_km^2	%
Highly Suitable	2438.86	24.39	10.86
Moderately suitable	3194.68	31.95	14.23
Less Suitable	15467.45	154.67	68.89
Not Suitable	1351.50	13.51	6.02
Total	22452.49		100

Based upon the overall suitability map, as it can be plainly evidenced from (table 4.13) the area

of highly suitable for ecotourism is about 10.86% (2438.86ha) and are located in the Afromontane forest area and in the lower part of wetland areas. The moderately suitable areas make up about 14.23% (3194.68ha), less potential areas 68.89% (15467.45ha) and 6.02% (1351.5ha) no potential area in and around Wondo Genet area. To the extent of the suitability degree is concerned, the Afromontane forests ecosystem in the upper hill parts and hot springs, wetland areas, on the lower catchment of the surrounding valleys are home to a variety of flora and fauna, and mammals and avian were identified as the highly suitable valued ecotourism spot as well as the highest-valued motivating factor. Whereas open grassland, agroforestry, and orchard areas are ranked as moderately potential; crop and farm lands are ranked as less/ marginally potential; urban and built-up land, degraded forest, miscellaneous land is ranked as no potential.

Thus, the upper part of the hills is a suitable place for adventure activities. As per the interviewed local guides view the steep slope of mountain chains is suitable for venturer activities like: bungee jumping, parashot, rock climbing, mountain biking and eco-trekking, etc. Generally, Wondo Genet area has the potential to provide ecotourism activities like: rafting, mountain trekking, mountain biking, swimming, camping, photographing and video-graphing, picnicking, ballooning, bird watching, picnicking, and cultural tripping. Whereas, the lower section of Wondo Genet, can also provide the necessary platform for sports such horseback riding, boating, and motorcycling and etc. could be mentioned as some of the interesting opportunities in Wondo Genet Woreda.

4.3. Ecotourism potential attractions of Wondo Genet

Nestling in the eastern sub-catchment of Lake Hawassa Basin, Wondo Genet has many attributes that make it suitable for ecotourism development, especially in relation to experiencing and appreciating the natural environment and local people way of life. Based on the KII view Wondo Genet got its name from Emperor Haile Selassie meaning “the land of paradise”, in reference to the panorama natural landscape of the area. As per the personal observation and experts’ interview, Wondo Genet and its surrounding areas comprise imposing attractions of both natural and cultural settings that are the foremost sources of ecotourism potentials development. The natural resource endowment of the area is both natural and plantation forest dominate the upper hill and the down landscape together with agroforestry, Cheleleka wetland, lake Dabash,

endemic and eye-catching colorful birds, mammals, suitable weather condition, hot springs at the valley of the forest and abundant wildlife diversity.

Its breath-taking scenery and natural beauty are ascribable to mountain massifs, terrains, peaks, river gorges, natural moist Afromontane forests and magnificent various water bodies. As per the data obtained from local guides view the jungle remnant natural forest and streams are one of the prominent sub-watersheds of Lake Hawassa, which serve as abode and main migratory route for variety of bird species and wild animals between the Bale and Arsi mountains. This has significant opportunity for nature-based tourism. In addition, personal observation also prevailed that the area is blessed with rich cultural heritages including Sidama people dressing styles, cultural dances, local handicrafts, folklore/indigenous knowledge and religious sites (mosques and churches) for tourism.

Table 4.11: Ecotourism potential attractions of Wondo Genet

Ecotourism attractions	**Sub- category**	**Frequency**	%
Natural attractions	Hot spring	4	19.05
	Avian Species diversity	4	19.05
	Natural and Plantation Forests (agroforestry)	3	14.3
	Topographical landform massifs, terrains, gorges	3	14.3
	River streams and wetland Ecosystem	3	14.3
	Wild Animals	2	9.5
	Atmospheric Conditions	2	9.5
	Total		
Cultural attractions	Religious Sites, churches, monasteries & mosques	3	14.3
	Folklore/indigenous knowledge, customs	4	19.05
	Museum collections at WGCF-NR	2	9.5
	Traditional music, dancing and traditional dresses	3	14.3
	Diverse cuisines: cultural foods and drinks	4	19.05
	local markets	2	9.5
	Wedding ceremonies	1	4.8
	Unique traditional house construction style	2	9.5
	Total		

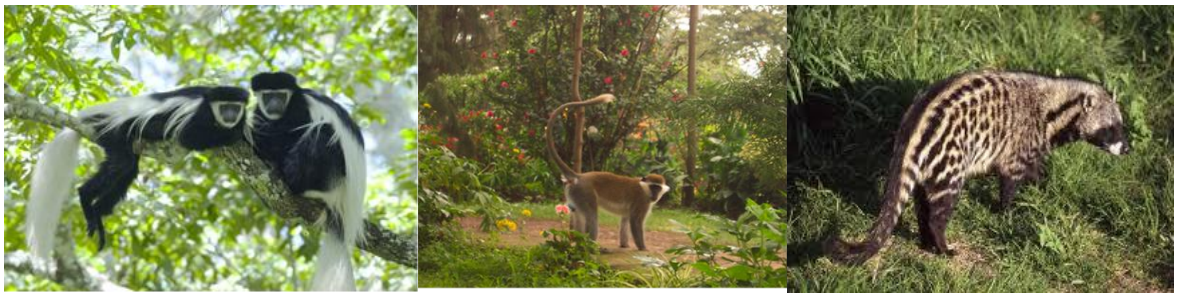
4.3.1. Flora and Fauna of Wondo Genet

Wondo Genet area and it environ are identified with abundant flora and fauna species composition, richness and diversity. The high species richness and species diversity of flora and fauna in Wondo Genet is probably due to the diverse physiographic nature, with its mountain slopes, valleys and fluvial landforms, in addition to this, springs/rivers flowing from the foot of

the mountains, made the area unusually diverse. As a result, Wondo Genet has a national significance regarding conservation of biodiversity and endemic species. It is vivid that the presence of species diversity is perceived as a more suitable criterion for ecotourism development. Because of flora and fauna are being the main attractions for ecotourism (Honey, 1999).

4.3.1.1. Fauna

The forest serves as habitat for many mammals, birds and insects (Cross 2003; Sim 1979). A total of 27 mammal species were identified in Wondo Genet and its surrounding, including the endemic mountain nyala and menelik bush buck (Girma *et al.,* 2012). The jungle forests and streams served as the abode and main migratory route for variety bird species and wild animals between the Bale and Arsi mountains. According to the data obtained from local ecotourism guides and based on the field observation mammal species like wild pig, vervet monkey, warthog, civet cat, colobus monkey and baboon can be found easily around hot-spring areas and inside WGCF-NR. The following are identified during the field survey:



Colobus monkey Vervet monkey Civet Cat

Warthog Spotted Hyena

Figure 4.9: **Big mammals of Wondo Genet (Source: own survey, 2020 and www.tripadvisor)**

During the time of data collection some mammal species were identified as follow.

Table 4.12: **Big mammals identified during the field survey, 2020**

Bushbuck (*Tragelaphus scriptus*),	Baboon (*Papio anabus*)
Dik-dik *(Madoqua kirkii),*	Colobus Monkey (*Colobus guereza*),
Warthog (*Phacochoerus africanus*),	Vervet monkey (*Chlorocebusmitis*)
Civet cat (*Civettictis civetta*),	Aardvark (*Orycteropis afer*)
Serval cat (*felis serval*),	White-tailed mongoose *(Ichneumia albicauda)*

(Source: field survey, 2020)

Quite surprisingly Cross, (2003) identified 137 species of butterflies in Wondo Genet area.

Figure 4.10**: Butterflies of Wondo Genet (cross, 2003)**

Owning to the presence of many kinds of butterfly species, a butterfly garden can be developed as an ecotourism product which gives an interesting flavor and opportunity for nature lovers in Wondo Genet. Thus, this also shows that Wondo Genet Woreda is gifted with not only big mammals but also small mammals, insects and other tremendous biodiversity, which endued an important opportunity for all kind of tourist's interests.

4.3.1.1.1. Birds of Wondo Genet

Wondo Genet is a true bird paradise. The area has been identified among the 73 important bird areas (IBAs) of Ethiopia (Mengistu, 2003). A number of bird researches were made in Wondo Genet in different time interval. Earlier, Sim (1979) recorded 118 species of birds in Wondo Genet area, out of which seven are endemic to the country, three inter-African migrant and six inter- continental migrant species could be observed. Burger &_Sturtevant (2014) identified more than 50 species of birds in Wondo Genet in 2013. A total of 33 migratory bird species in Wondo Genet and its surrounding were also recorded as the findings of (Girma *et al.*, 2017). More recently, a total of 137 species of birds in to 47 families and 14 orders were identified inside

WGCF-NR within the four habitats such as: natural forest, agroforestry, grassland and wooded grassland in and around Wondo genet forest catchment (Girma *et al.*, 2017).

Figure 4.11: Bird of Wondo Genet (Source: Bray, 2013; Sim, 1979; Burger & Sturtevant, 2012)

With the help of bird guide from Wondo Genet Ecotourism Association the following species of birds were identified during the field survey using transect line:

Table 4.13*: *List of birds that have been seen and identified during the field work based on the identification book of (Sim, 1979; Burger & Sturtevant, 2012)

Common name (relative value)	**Scientific name**	**No. of Individuals sited**
1- Wattled Ibis (endemic)	*Bostrychia carunculate*	5
2- Sacred Ibis	*Tureskiona aethiopia*	5
3- Hadada Ibis	*Bostrychia olivacea*	8
4- Great white Egret	*Egretta alba*	3
5- Shoebill	*Balaeniceps rex*	1
6- Marabou stork	*Leptoptilos crumeniferus*	6
7- Tick-billed Raven(endemic)	*Corvus rhipidurus*	20
8- Withe-backed Vulture	*Gyps africanus*	20
9- Lappet-faced Vulture	*Aegypius tracheliotus*	10
10- Red-necked Spurfowl	*Francolinus afer*	4
11- Spur-winged Goose	*Plectropterus gambensis*	2
12- White-browed Coucal	*Centropus superciliosus*	1
13- Little bee-eater	*Merops pusillus*	2
14- Silvery-cheeked Hornbills	*Ceratogymna brevis* (*Bycanistes brevis*)	15
15- Collared Flycatcher	*Ficedula albicollis*	1
16- African Paradise Monarch	*Terpsiphone viridis*	1
17- Oriole	*Oriolus* sp.	2
18- Pied Crow	*Corvus albus*	5
19- Red-cheeked Cordon-blue	*Uraeginthus bengalus*	4
20- Bar-tailed Trogon	*Apaloderma vittatum*	2
21- Yellow-fronted Parrot	(Poicephalus flavifrons)	3

No. of Individuals: is the number of individuals of each species of birds that have been seen during the field survey by the help of bird guide from WGCF-NR.

4.3.1.2. Flora

Due to the diverse physiographical nature, fluvial landforms, valleys, with its mountain slopes, and springs/river, made the vegetation unusually diverse in Wondo Genet. The remnant forest of Wondo Genet contains a substantial amount of Afromontane plant species composition, richness and diversity. A total of 240 plant species were found representing 94 families and 210 genera, of which trees constitute 23.8%, herbs 35%, shrubs 25%, lianas 11.3% and ferns 5% and including seven endemic plant species in Wondo Genet area (Kebede *et al.,* 2013).

Several vegetation types and associated tree species still occurs in this forest. Patches of natural forest confined in the upper valley together with some plantation's forest. Species such as: Albizia gummifera, Podocarpus falcatus, Ficus sur, prunus africana, Cordia africana, and eucalyptus species etc. Homestead agro-forestry is commonly practiced in the area. Topographically Wondo Genet area comprises the hills of Abaro (the highest mountain in Wondo Genet), Bachil Gigissa, Gariramo, Kentere and Cheko, as well as the depression surrounded by these hills. The height of land varies between 2,580 m above sea level at Abaro and 1,600 m above sea level around the marshy area (Zewdie, 2002). Some tree plants which were seen during the data collection are registered and presented as follow:

Figure 4.12: Partial view of natural Forest in the upper valley of mount Abaro

(***Source:*** Jorisbens, 2011 at www.wikiloc.com)

Figure 4.13. **Partial view of Wondo Genet plantation forest cathment (own survey, 2020)**

Wondo Genet plantation forest catchment is pre dominated by woody plant species mainly Eucalyptus species, Pinus patula, Grevillea robusta, Cupressus lusitanica species are common as shown in figure 4.13 above.

4.3.1.2.1. Home garden agroforestry of Wondo Genet

Agroforestry has been the major agricultural farming practice in Wondo Genet for centuries, diverse 'home gardens' of trees, shrubs, and vegetables like enset (false banana), and coffee grown in close combination of maintaining food security while benefiting environmental conservation and sustainable rural development (Sahilu, 2017; Mellissea *et al.*, 2018). Based on KII opinion Wondo Genet agroforestry land consisted of; Enset (Enset ventricosum), maize (Zea mays), coffee (Coffea arabica), sugar cane (Saccharum spp). Tree components of these home gardens include; avocado (Persea Americana), Cordia africana, and Mangifera indica etc.

Figure 4.14. **Coffee and Enset based Agro-forestry of Wondo Genet**

Considerable literatures indicated that agroforestry farms are an important system for the maintenance of biodiversity besides increasing and diversifying rural incomes, food security and

nutrition (Sahilu, 2017; Mellissea *et al.*, 2018). Based on the data obtained from local guides view home garden agroforestry of Wondo Genet plays an indispensable role on conserving agro-biodiversity resources beside its economic and recreational values. However, in recent decades, due to the high commercial value of Khat Wondo Genet farmers are diverting and shifting their enset and coffee-based agroforestry home gardens with monoculture Khat (*Catha edulis)* (Dessie and Kinlund, 2008), putting the agro-forestry system in peril. Therefore, to reconcile this conflict, agrotourism can be considered as an alternative economic strategy that can improve levels of economic welfare of the rural and for conservation of agrobiodiversity. In addition to this, since home garden agroforestry of Wondo Genet is managed by women, so developing agroforestry-tourism would empower and increases women participation by providing new sources of income.

4.3.2. Wondo Genet wetland Ecosystem as an ecotourism potential

Wetlands are ecosystems in which water plays a dominant role in regulating the environment; it is "areas of marsh, fen, peat land or water (World Bank, 2013). Owning to their extensive biological diversity and ecosystem features, wetlands are important destinations for recreational and ecotourism opportunities (IWMI, 2006).

In Ethiopia, wetland ecosystems have a great potential in ecotourism and biodiversity conservation activities (Mengesha, 2017). Because of wetlands of Ethiopia support high population of mammals, birds (including transcontinental migratory species), reptiles, amphibians, fishes and invertebrate species. According to the local guides opinion wetlands of Wondo Genet provides a habitat and food for many types of birds, fiches, hippopotamus and mammals. This is an important platform for tourists to spot and see many kinds of fauna species easily other than other land types in Wondo Genet. Ali, (2007) study revealed that Wondo Genet wetland ecosystem and associated forest provides nature-based recreation service to different users from local visitors to international tourists. Moreover, Wondo Genet area is gifted with many water sources: rivers/ streams, hot springs and wetland ecosystems.

4.3.2.1 Cheleleka wetland

The Cheleleka and its associated wetlands are situated in the lower section of Wondo Genet with indispensable habitats for big mammals like hippopotamus and for fishes such as barbs (Barbus

intermedius), the African catfish. It has a surface area of 14.5 km^2 and a 63 km^2 area of swamp surrounding it. It is slightly acidic (humic acid) due to the large biomass degrading in the standing water (Desta, 2003). Cheleleka wetland is affluent with nine tribute rivers namely: Wesha, Werka, Hallo, Bele-Lango, Shenkora, Abosa, Gomesho, Wedesa, and Gelchacha. According to Abraha (2007) postulated that urbanization, change of shrub by woodland and bush land in to cultivated land, are the major causes for the conversion of Cheleleka in to swamp and shallow. Moreover, the vegetation of this wetland habitat comprises species of Tall papyrus like grasses indicating that the deposition of transported sediment from the uplands has been in a continuous process of filling the natural reservoir of Cheleleka wetland (WWDSE, 2001). Even in the face of these pressing factors, the area is still ideal for many kinds of ecotourism activities.

4.3.2.2 Lake Dabash

The area is filled and surrounded by many hot springs near to cheleleka wetland. And it is known as a birding hotspot with numerous endemic avian species, hippopotamus, fish and other native animals. Beside the spectacular waterfalls, the area is home of several sizzling therapeutic hot springs in the lower part and in the upper valleys.

4.3.2.3 Waterfalls

Wondo Genet watershed affluent with nine rivers namely: Wesha, Werka, Hallo, Bele-Lango, Shenkora, Abosa, Gomesho, Wedesa, and Gelchacha flow and tribute the Cheleleka wetland. The three major picturesque waterfalls are showed as below:

Figure 4.15: **The three major waterfalls in the upper valley area of Wondo Genet**

(Source: www.pinterest.com & www.tripadvisor.com)

4.3.3 Wondo Genet College of Forestry and Natural Resource

Wondo Genet College is one of the naturally gifted mesmerizing campuses owned by Hawassa University. The college campus is rich in biophysical attractions, with many species of flora and fauna holding about 1000 hectares of land, of which natural forests accounts for 650 ha, plantation forests 117.3 ha and the rest are occupied by college campus and human settlements. This can provide an interesting opportunity for many kinds of tourism experiences. According to the staff of WGCF-NR opinion the college has served as a custodian and guardian for many fauna and flora species that are fugitive in the upper and lower valleys of Abaro. It consists of a chain of hills Abaro, Bachil Gigissa, Gairmo, Kentere and Cheko that surround the highly elevated valley. Local guides also conferred that the natural forest and the plantation forest are home to many species of plants and animals.

The natural ecosystem is relatively untouched and unperturbed as compared to other natural habitat types (Girma *et al.*, 2017). The wooded grass land habitat is housing grass intermixed with scattered trees predominantly by Dodonaea viscose, Myrsine Africana, Erica arborea and so on (Kebede *et al.*, 2013). In general, the flora of the college includes indigenous plants species such as Large-leaved cordial *(Cordia africana),* Podo *(Podocarpus falcatus), A*frican wild olive *(Olea africana)* and exotic species Mexican cypress (*Cupres suslusitanica),* Weeping pine *(Pinus patula),* Silky oak *Grevillea robusta),* Eucalyptus species (Hjelm, 2001).

4.3.3.1 Museum collections at WGCF-NR

Currently Wondo Genet College of forestry is under establishing of the so-called museum, containing animal fossils and sculls, which provides an additional experience for visitors. As per the WGCF-NR ecotourism lecturers view the museum collections are being visited by those who came for MICE purposes inside the college.

Figure 4.16: Partial museum collections in WGCF-NR (Source: own survey, 2020)

4.3.3.2 Arboretum of the Wondo Genet College

The College maintains a good arboretum with a large number of species which is indigenous and exotic plants. It is established in 1978, covering an area of 4 ha. There are about 300 plots of 10 m x 10 m for research and conservation purposes. Overall, nowadays there are about 95 different tree and shrub species represented in the arboretum, predominantly consisting of exotic species.

4.3.3.3 MICE Tourism in Wondo Genet College

Wondo Gent College possess Sida hall, auditorium and newly built graduation hall which has been serving as a conference and meeting centre for a while. Therefore, this is an additional opportunity to develop Meetings, Incentives, Conventions and Exhibitions based tourism in Wondo Genet district. According to the WGCF-NR respondents view people who came for MICE tourism are also interested to visit the natural landscape of Wondo Genet College and hot spring areas.

4.3.4 Wondo Genet Agricultural Research Centre

Wondo Genet Agricultural Research centre was established in 2009 to conduct agricultural research mainly on Aromatic, medicinal and bio-fuel plants under the Ethiopian Institute of

Agricultural Research (http://www.eiar.gov.et/wondogenet/). The center holding: 113.5 ha, that is, forest 54.3 ha, open woodland 19 ha, field site trial: 31.9 ha, field genetic bank 3.1 ha, built up area, 4.6 ha, road 4.6 ha. Thus, both domestic and international researchers set their foot in the research center; for research, training and education purposes, as a result of this, the center is an important educational tourism centre.

Figure 4.17: Some features of the research centre Source: WGRC

As shown in figure (4.17) the center also hosts a mesmerizing botanical garden and agricultural field, therefore, in conjunction with the purpose for which it was founded as a research institute, the centre could also provide an immense opportunity for tourists who wants to experience medicinal and aromatic plants.

4.3.5 Agrotourism *as part of Ecotourism Package in Wondo Genet*

Evidently, nature-based or ecological attractions are the primary focus of ecotourism but it could also encompass components of agrotourism/ rural tourism. In Wondo genet this can be an alternative ecotourist attraction which is synergizes agricultural land and agroforestry system of the area. According to the local guides view, tourists who came to visit ecotourism spot of Wondo Genet are also interested on visiting the accompanied rural life. Even though agritourism is not flourished in Wondo Genet Woreda, the multiplicity of agroforestry home gardens system gives a unique and additional experience for visitors who came to enjoy the sizzling hot springs. According to Catalino & Lizardo (2004) tourists interested in agrotourism are also highly motivated to practice ecotourism, to explore local cultures and to practice sports tourism. Therefore, agrotourism can be a variant of ecotourism and it consolidates agroforestry system of Wondo Genet and agrobiodiversity conservation, which is also an increasingly valuable capital in the effort of developing agro- ecotourism. Similarly, Wondirad (2020, p.11) also shared his observation on the competitive advantage of developing and promoting ecotourism, agrotourism

and health-related tourism in Wondo Genet. According to the local guides view today's tourism activities in Wondo Genet create only a limited job opportunity for locals at the whole and specifically women participation is very low as compared to men. For instance, in Wondo Genet Guide association there is a disproportionate gender balance, in which men takes the highest number. As a result, community based agrotourism is proposed as a preponderant opportunity and a unique means of income for the farmers especially for women.

Figure 4.18: Agriculture of Wondo Genet (Source: own survey, 2020 and Wondirad, 2020).

As per the data obtained from KII home garden agroforestry of Wondo Genet is managed manly by women, so developing agrotourism would empower and increases women participation in tourism by providing new sources of income. In general, the Wondo Genet agrotourism attractions offered begins to walk around the agricultural farming and the demonstrated agroforestry system while introducing different types of plants (cultivation and harvesting), post-harvest some crops, testing some products, and buying of fruits. On this type of agrotourism, tourists can also do trekking inside the plantation area to watch the farming land, picking organic coffee beans, sugarcane, avocado, banana and other agricultural products that are demonstrated in the farming land of Wondo Genet. As a result of the emergence of agrotourism in Wondo Genet, farmers could sell a variety of agricultural products and fruits for visitors to support their livelihood. Agrotourism philosophy aim is to increase of farmers' incomes and to improve the quality of life of rural society. Likewise, the fundamental tent of ecotourism is to benefit the host community (TIES, 2015). Therefore, in this regard, agro-ecotourism can provide unusual way of income and can play an indispensable role in supporting agrobiodiversity conservation.

4.3.5.1 *Coffee Tourism*

Sidama Coffee is one of the most famous coffees in Ethiopia with highest quality ranking and complex flavors. Coffee in Sidama is harvested from homestead garden, plantation and forest settings of different woredas. Likewise, Wondo Genet woreda is known with coffee plantations, which would be an important site for coffee tourism. Thus, coffee plantations could be utilized as an agrotourism package in Wondo Genet as a means of ecotourism niche market and product diversification. An interview with the local guides has also indicated that around Wabishebelle Resort locals provides coffee service and ceremonies visitors.

Figure 4.19: Coffee process; Photo: Reko Koba

4.3.5.2 Civet Coffee Tourism

Civets are nocturnal and an omnivore wild animal; eats fruit, carrion, rodents, insects, eggs, reptiles, birds and vegetation and are native to Africa and Asia. Civet cat farming is an ancient practice in Ethiopia and the Queen of Sheba allegedly presented civet musk to King Solomon as gift and even today civet musk is an important export commodity (Abebe, 2003). According to the KII view and based on my field observation, Wondo Genet woreda has civet cat populations in the wild. The Civet cat is known for its production of civet coffee that gives a special flavor for the coffee industry.

Figure 4.20: Civet coffee process (Vega, 2008)

This coffee is called civet coffee or luwak civet coffee, variously marketed as cat-poo coffee. Civet coffee is an exclusive coffee and is one of the most expensive and luxury types on the market (Vega, 2008). The distinctive-tasting coffee can cost up to $100 for a single cup and is already popular across the USA and Europe. As shown in figure 4.20 it is interesting to connote that the coffee beans first digested by the civet cat, while they digest the cherry certain enzymes in the palm civet's digestive tract alter the way the coffee tastes, then the feces of the civet are collected and cleaned, and finally the beans are roasted like any other coffee.

It is also interesting to note that Civet is the best animal coffee picker in the world, chooses the best coffee beans from same coffee tree. According to Carder et al., (2016) in countries like Indonesia civet coffee tourist industry, is rapidly expanding and flourishing in a very recent year. Civet coffee has benefits like: reduced symptoms of memory loss and stomach ache, improved blood pressure and symptoms of diabetes, and aphrodisiac properties (Carder et al., 2016). Thus, following these facts, there is untouched opportunity of the distinctive- civet coffee tasting experience for tourists as part of agrotourism practice in Wondo Genet. Having all this in mind, many literatures revealed the decline of civet population in Wondo Genet therefore, agrotourism/rural tourism development would also be a promise for the improvement of civet population as well, beside its opportunity for a mean of income.

4.3.6 *Agro-ecotourism in Wondo Genet*

A study at the technological institute of Santo Domingo defined agro-ecotourism as "a set of rural activities, encompasses participating in farming activities; exploring local culture; enjoying the landscape and agrobiodiversity; observing organic and conventional agricultural practices;

and sampling tropical fruits and vegetables" (Catalino & Lizardo, 2004). This definition highlights agro-ecotourism as a combination of agritourism and ecotourism, as ecotourism is nature-based and agrotourism is agriculture-based. In the case of Wondo Genet agro-ecotourism is an amalgam of agroforestry, rural settlement, agricultural land, cultural landscape, Afromontane forest and other natural resources. This combination of two strong industries could offers incredible potential to better the lives of small-scale farmers in Wondo Genet. Therefore, as it is postulated in other countries experience, Wondo Genet has higher competitive advantage in terms of agro-ecotourism development. The aim of Agro-ecotourism development in Wondo Genet is to create alternative income generating and to reduce the pressure on the remnant Afromontane forest ecosystem and other natural resources of the Woreda.

4.3.7 Spa and health tourism in Wondo Genet

Because of the geographical position of Wondo Genet is in the Great Rift Valley, there are countless thermal hot springs with highly concentrated mineral water that emanates naturally from the underground. According to the local guides view, the sizzling hot springs are the main drawing factor for visitors to come to Wondo Genet. Beside the recreational values, the area has paramount importance and potential for spa and medical tourism development. The local people and tourists use Wondo Genet hot springs not only for its cleanliness and cosmetic properties but also for the healing purpose. According to the key informants view the hot spring water's properties gave them better health, greater power and personal balance and more especially healing skin diseases and for relieving muscular and joint pain. In addition, it is believed that the thermal spring is bacteriologically clean and hypothermic. As a result, tremendous tourists have drawn to the area for health and recreation purposes. These could be a kind of popular products in the ecotourism market development for Wondo Genet. Thus, it is recommendable that spa center has to be developed for the more spa and health tourist flow in Wondo Genet area. Some of the astonishing hot spring features are presented as follow;

Figure 4.21: Some of Hot springs feature of Wondo Genet (*Source:* Own Survey, 2020)

4.3.8 Some of the cultural tourism resources of Wondo Genet

Like many parts of sidama, Wondo Genet has various ethnic groups co-reside in the area, with tremendous varieties of tangible and intangible heritages across the woreda. Wondo Genet is favored with wondrous cultural amenities and historical treasures; however, the main drawing factor is still limited to the natural asset specifically water-based activities (Ali, 2007; Reba, 2011; Italemahu, 2015). According to the local guides view cultural and historical resources are not promoted and marketed equally with the nature-based activities. Since, many ecotourism definitions, including that of Ceballos-Lascuráin (1987) recognize the role of associated cultural influences as secondary ecotourism attractions.

The incorporation of the cultural element more broadly also implies that ecotourism venues are not restricted to 'relatively undisturbed' settings as argued by Ceballos-Lascuráin but can potentially be located within substantially modified environments as well. In addition, according to Boo (1990), ecotourists are more likely to appreciate local tradition, customs and cuisine than other market segments. This category of resources includes: traditional music and dancing, cultural foods and drinks, traditional dresses and unique traditional house construction style. Wondo Genet rural areas have traditional values, social customs, festivals (Fichee Chambala) and diverse cuisines, eating habits; numerous colorful local markets, wedding ceremonies, churches, monasteries and mosques are also part of cultural tourism attractions in the Wondo Genet that could draw visitors.

Figure 4.22: **Sidama People during Fichee Chambalala (ARCCH, 2014)**

Figure 4.23: **Traditional hut and Enset brushing (Source: www.tripadvisor.com)**

Moreover, Sidama people has dishes like: Bulla, Bursame, Chukame and Omolcho, which are products of enset/false banana and Shametta (local drink), which provides a significant platform for gastronomy/culinary-tourism development. Because there are tourists with the interest of consuming testing local food and beverage called gastronomist. Italemahu (2015) also revealed the interest of visitors to test and experience traditional foods and ways of preparations. According to the local guides view, villages particularly around hot spring areas are influential in attracting this kind of tourism. Therefore, the unique cultural assets of local communities are also among the core elements to develop a more inclusive ecotourism product in the case of Wondo Genet Woreda.

4.3.9 Educational Tourism as part of Ecotourism package in Wondo Genet

Wondo Genet College of Forestry and Natural Resources is one of the mesmerizing campus owned by Hawassa University. It was established over four decades ago to train forest technicians with Swedish assistance. According to the WGCF-NR lecturers view the college is serving as a center of excellence for education, training and research. It has already laid a good foundation in educational programs on eco-tourism and wildlife management, climate change, environmental science, biodiversity and forestry management programs in BSc, MSc and PhD.

As a result, considerable number of students, researchers and instructors from both international and domestics set their footprint in Wondo Genet College and its vicinity every year for education, training and research purposes. More specifically, regarding the educational aim to acquire knowledge, traveling, exploration and experiencing of new place is a great motivation for students when it comes on choosing universities in Ethiopia. According to Pitman et al., (2011) revealed the role of higher education institutions in educational tourism, recognizing that educational tours are an interesting site of study, because they are explicitly about learning. Moreover, Lindberg (1991) provides hard-core ecotourists which are scientific researchers or members of tours specifically designed for education, environmental restoration, or similar purposes. Additionally, ecotourism development must promote educational development and create awareness in people of the need to jointly maintain the ecosystem of the area. Therefore, these is a showcase and vitrine how Wondo Genet College of Forestry is an important place for educational tourism and how higher educational institutions in Ethiopia could foster educational tourism.

4.3.10 Proposed Ecotourism activities in Wondo Genet

Straddling in Sidama regional state, Wondo Genet is blessed with an abundance of cultural and natural assets of high tourism value. This opens an interesting opportunity for many kinds of tourism activities. As per the interviewed visitors, local guides and based on personal observation, Wondo Genet has the potential to accompanied tourist with many kinds of interests and activities. The upper hill parts of Wondo Genet are a suitable place for many ecotourism and adventure activities. The steep slope of Abaro Mountain is suitable for activities like: bungee jumping, parashot, rock climbing, mountain biking and eco-trekking, etc.

As per local guides interview, there are some adventurers who came to Wondo Genet with the aim of having adventurer activities like: bungee jumping and parashot, but because of the underdeveloped ecotourism infrastructure, tourists are unable to practice and enjoy in the area. Local guides also said that the parashot have been practicing in the steep of Abaro mountain by Ethiopian National defense forces so far. Generally, the highly suitable section of Wondo Genet area has the potential to provide ecotourism activities like: forest walking, backpacking, mountain trekking, biking, camping, photographing and video-graphing, ballooning, bird

watching, picnicking and cultural tripping. Moreover, the lower section of Wondo Genet, can also provide the necessary platform for outdoor sports such river rafting, swimming, horseback riding, boating, motorcycling, and bicycling and so on.

4.3.10.1 Sample of mountain view point hike

According to local guides view, this track is a hike starting out at Wondo Genet college of forestry, which is a relatively known a long strenuous hike with several steep and rocky sections. It's a hike that takes to at least 3 viewpoints that are constructed by the college which gives a wonderful opportunity for visitors to see the lower plate of Wondo Gent, hot springs that supply water to the resort pool, wetland areas and Hawassa city from distance. Moreover, there are numerous visits along the trail including, walk along the Wosha river, opportunities to see a variety of bird species. The view of this part has also a potential of high cultural value for tourists to learn about the local culture and of the surrounding area during the viewpoint hike.

Figure 4.24: Hiking trail at WGCF-NR & Visitors at Wosha valley (Source: www.wikiloc.com)

In general, for Wondo Genet Woreda six strategic niche components of ecotourism are identified based on the existing scene of historical, cultural and natural feature. Therefore, Ecotourism is regarded as the six major types of spots as:

(1) Wildlife tourism: Diversity of flora and fauna species

(2) Spa and health tourism: Hot springs together with eco-lodges and resorts

(3) Agrotourism: An agriculture land and Agroforestry system

(4) Educational tourism: Wondo Genet College and Wondo Genet Research center

(5) Cultural tourism: The intangible and tangible cultural elements of Wondo Genet

(6) Gastronomy tourism: local food and beverage: Bulla, chukamee, Bursame & Omolicho

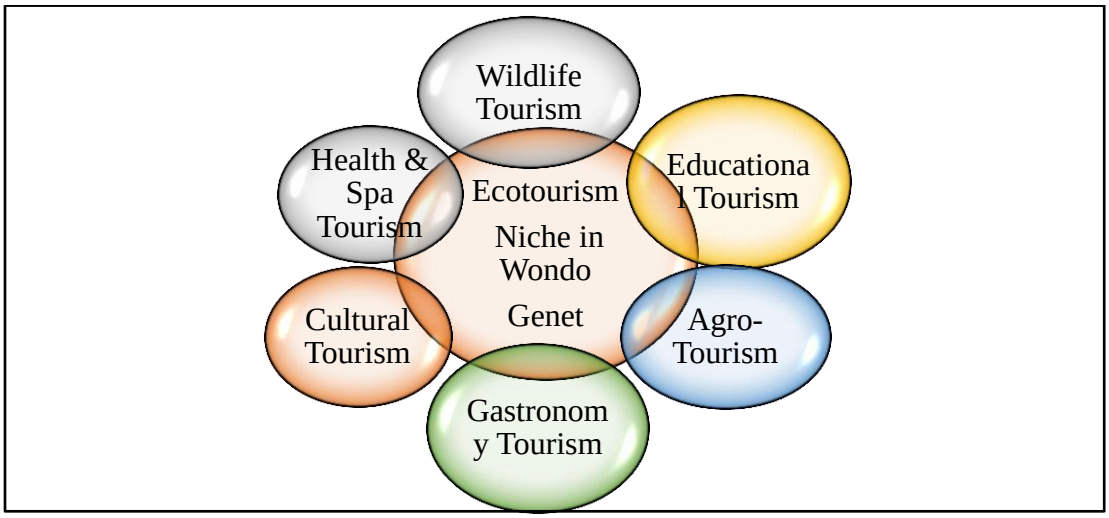


Figure 4.25: Wondo Genet Ecotourism Niche Market: Source (Own Survey, 2020)

4.3.12. Major threats for Wondo Genet Ecotourism resources

Even though, Wondo Genet Woreda has tremendous potential for ecotourism, which can boost the local economy development and provide employment opportunity. However, many different factors are highly affecting, hampering and treating the ecotourism potential resources of the Wondo Genet Woreda. The information obtained from both questioner and KII survey conferred the existed hindering factors such as: deforestation, human wildlife conflict, human induced fire and infrastructure and service limitation.

Table 4.14: Respondents opinion on factors affecting potential ecotourism resources

Threats	***Respondents' opinion***	
	Frequency	%
Deforestation	7	33.3
Human wildlife conflict	4	19.05
Anthropogenic Fire	4	19.05
Infrastructure and service limitations	6	28.6
Total	21	100

4.3.12.1. Deforestation:

Deforestation is the replacement of forest cover by other land use types. It is continuedly reported that there is deforestation of the remnant forest catchment for fuel, construction, and charcoal making purposes, in the upper hill part of Wondo Genet. As the information obtained from the field survey about 33.3% of the respondents agreed that there is a serious clear cutting of trees in Wondo Genet forest catchment. Based on the KII view many of the forest cover are being deforested at a fast rate mainly for agriculture, charcoal production, fuel and settlement.

According to Zewdie (2002) in 1977, 13% of the Wondo Genet Catchment was under natural forest but in 2000 it was reduced to 2 %. Owning to Wondo Genet is one of the most productive agricultural lands; land once covered by natural forest is now converted into agriculture and settlement (Gemechu & Bewket, 2007). A research studies by (Dessie & Kinlund, 2008; Reba, 2011; Sahilu, 2017; and Mellissea *et al.*, 2018) remarked the considerable transformation of natural forest ecosystem into other land uses mainly to agricultural farming, settlement and other land uses. In addition, Italemahu (2015, p. 162) conferred the mass destruction of forests results disappearing of avian species which also consequences tourists decline whose primary motive is nature. Correspondingly, personal observation also prevailed even today there is exploitation of plantation forest for timber production by WGCF-NR itself, which is being affecting recreational values and decreasing tourist attractiveness power of the college. As a result of these, the area has hosted major land use land cover change over the past years. Therefore, the exploitation of forest resource is one of the most and critical challenges facing the ecotourism resources of Wondo Genet Woreda.

4.3.12.2. Major Anthropogenic Fire

The upper hill valleys of mount Abaro and its chain has experienced human induced fire for the past decades, mainly due to the long-standing ethnic-based administrative boundary conflicts (Gemechu and Bewket, 2007), which causes many damages in the wooded grassland habitat and many fauna and flora species (Girma *et al.*, 2012). Even today the recurrent occurrences of fire in the upper hill part of Wondo Genet cause many damages and destructions in the upper hill valley habitats. According to the key informants view anthropogenic fire has occurred in the area for more than tree- four decades because of mount Abaro is a territorial boundary of Sidama and

Oromia regional state demand from each side causes conflicts. As a result, ecotourism potential resources are in peril.

4.3.12.3. Human wildlife conflict

As it is clearly shown in table (4.14), 19.05% of the respondents conferred human wildlife conflict as one major prevailing factor facing in Wondo Genet area. A research by Fenta (2014) remarked the existing human wildlife conflict in Wondo Genet, causing many damages and altering wild animals' behaviour. As a result of this, respondents from ecotourism guide association said that animals became aggressive while tourists try to approach the wild animals for photographing and filming. This affects tourist's experience and limits their desired activities. Similarly, Jemal, (2016) argues human wildlife conflict is one major challenging in developing ecotourism in developing countries.

4.3.12.4. Infrastructure and service limitations

With regard to accommodation facilities, personal observation and interview results indicated that there is an absence of true ecotourism facilities, camping sites and public toilet. 28.6% of the total respondents postulated the existing infrastructure and service limitation as a prevailing threat in Wondo Genet Woreda. Tourists also strongly pointed out the gap in room service provision, food and beverage. Wondirad, (2020) has also remarked the presence of inadequate infrastructure and amenity development in Wondo Genet area as a key challenging factor for ecotourism development. At the moment, the lack of ecotourism facilities and infrastructure, absence of health service and absence of souvenir shops, are the main constraints for the expansion of the ecotourism demand in Wondo Genet.

CHAPTER FIVE

5. SUMMARY AND RECOMMENDATION

5.1. Summary

To identify the potentials ecotourism sites multi criteria evaluation parameters such as: land use land cover, species diversity; slope, elevation, rainfall and temperature factors were used. These important factors were determining which areas are best suited for ecotourism development in Wondo Genet Woreda. Based on the result of the analysis, the areas of highly suitable for ecotourism are mostly located at the mountainous/Afromontane forest ecosystem and at the wetland part of Wondo Genet, which covers 10.86% (2438.86 ha) of the whole woreda. Besides, the areas 14.23% (3194.68 ha) were moderately suitable for ecotourism, 68.89 % (15467.45 ha) less suitable and 6.02 % (1351.50 ha) are not suitable for ecotourism site development. The Abaro mountain chain areas enable visitors for various activities like: mountain trekking, mountain biking, ballooning, bungee/ bungy jumping, video-graphing and other activities. The lower section of Cheleleka wetland is suitable for activities like: fishing, rafting, swimming, bird viewing, camping, picnicking, photographing and other activities.

In addition, Wondo Genet has a potential for many ecotourism niche market like: gastronomy tourism, agrotourism/ rural tourism, spa and health tourism, cultural tourism and educational tourism. The study also revealed some prevailing and grappling challenges for ecotourism development in Wondo Genet such as: deforestation, human wildlife conflict, anthropogenic fire and infrastructure and service limitation are some of them in the study area. Even though tourism is present in the area for a relatively long time and when it was measured according to the fundamental ecotourism tenets, the current activity does not fall in the definition of ecotourism, due to the mass tourism activities. In general, it can be concluded that the true ecotourism practice is not yet implemented in the Wondo Genet woreda. According to Stone & Wall (2003) it is a challenge to have ecotourism activities truthfully to its meaning. To be an effective option as a development strategy, ecotourism planners and managers have to consider unique aspects of the definition of ecotourism to ensure its sustainability. The principles of ecotourism imply optimal use of natural resources, environmental protection, and respect for the socio-cultural aspects of host communities, long-term economic viability of the tourism businesses, and the fair

distribution of socio-economic benefits to all stakeholders. But there is a room of applying ecologically feasible, economically sustainable and socio-culturally viable ecotourism in Wondo Genet, if and only if the true meaning of ecotourism is implemented.

5.2. Recommendation

- Ecotourism strategies development plan for Wondo Genet area should be developed with the close participation of all stakeholder such as tour operators, tour guides, travel agency and other sectors to adopt the true principles of ecotourism.
- An inclusive ecotourism marketing strategy has to be developed by accompanying ecotourism packages such us; (MICE, agro-tourism, and cultural features) in the tour packages or made part of the tour transits of visitors who would like to go to other nearby sites. As a result, Woreda and regional culture and tourism office has to work in close coordination with so as to provide a form of advertisement for these packages.
- It's therefore crucial to think about urgent conservation measure of ecotourism, before the further depletion of potential ecotourism resources.
- Consumptive uses and other mass tourism activities beside ecotourism has to be limited and forbidden on the highly and moderately suitable areas of Wondo Genet.
- Ecological compatible ecotourism infrastructures, health facilities and quality of services has to be offered so as to increase tourist's length of stay. It is important to encourage the hotel, lodge and resorts enterprise to be more subsequent with the real concept of ecotourism.
- In Wondo Genet massive forested areas are distracted, today few forested patches are presenting in some rugged slopes valleys and inside WGCF-NR compound. Therefore, major environment rehabilitation and restoration has to be made to rejuvenate the previous natural feature of Wondo Genet landscape matrix.

Reference

Abebe, Y.D. (2003), Sustainable Utilization of the African Civet (Civettictis civetta) in Ethiopia. Second Pan-African symposium on the sustainable use of natural resources in Africa.

Abraha, L. (2007), Assessing the Impact of Land Use and Land Cover Change on Groundwater Recharge Using Rs and GIS: A Case of Awassa Catchment, Southern Ethiopia. Global Change Biol 11:1577-93

Ali, M. (2007), Recreation Use Value of Wondo-Genet Wet Land Ecosystem, Ethiopia. MA Thesis, Department of Forest Resource Management at SLU: Umea

Altunel, T. A. and Bugday, S. E. (2019), Revenues from Ecotourism Activities in the World Kastamonu University, Faculty of Forestry, Forestry Economics.

Amare, A., (2015), Wildlife Resources of Ethiopia: Opportunities, Challenges and Future Directions: From Ecotourism Perspective: A Review Paper. Natural Resources, 6, 405-422. http://dx.doi.org/10.4236/nr.2015.66039

Anderson, J. R. (1976), A land use and land cover classification system for use with remote sensor data, vol 964., Washington, DC.

Arrowsmith, C. (2001), Modeling potential for nature-based tourism. Paper presented at the Australian Academy of Science Fenner Conference on Nature Tourism and Environment, Canberra, Canberra, Australia.

Asmamaw, D., Gidey, E., Zenebe, A. and Girma, A. (2014), Identification of Potential Eco-Tourism Sites for Sustainable Natural Resource Management Using Remote Sensing and GIS, A Case of Hugumburda Forest and Its Surrounding Areas. Mekelle, Ethiopia.

Asmamaw, D., and Gidey, E. (2018), Identification of Potential Eco-tourism Site Suitability Using AHP and GIS, A Case of Hugumburda Forest and its Surrounding Areas, Ethiopia.

Bahaire, T. & Elliott-White, M. (1999), The application of Geographical Information Systems (GIS) in sustainable tourism planning: A review. International Journal of Sustainable Tourism, 7 (2), 159-174.

Balcombe, C. K., Anderson, J. T., Fortney, R. H., Kordek, W. S. (2005), Wildlife use of mitigation and reference wetlands in West Virginia. Ecol Eng 25:85-99.

Bekele, A. and Kassa, D. (2008), Species Composition, Abundance, Distribution and Habitat Association of Rodents of Wondo Genet, Ethiopia, Faculty of Science, Addis Ababa University, Ethiop. J. Sci., 31(2):141–146

Beyene, S. T. (2011), "An Ethno-Botanical Study of Medicinal Plants in Wondo-Genet Natural Forest and Adjacent Kebeles, Sidama Zone, SNNP Region, Ethiopia." MSc Thesis,

Department of Biology, Addis Ababa University, Ethiopia. Addis Ababa University Libraries copyright © 2018

Bhattacharya, P., and Kumari, S. (2004), Application of Criteria and Indicator for Sustainable Ecotourism: Scenario Under Globalization.

Birhan, M. and Gebreyes, G. (2015), Review on Problems, Prospects and Economic Contribution of Wildlife Management and Ecotourism in Ethiopia. Journal of Veterinary Science and Technology 06(05) doi:10.4172/2157-7579.1000257

Boo, E. (1990), Ecotourism- The Potentials and Pitfalls (Vol. 1). Lancaster: Wickersham

Printing Company.

Boyd, S. and Butler, R. (1996), Managing ecotourism: an opportunity spectrum approach, Tourism Management, 17 (8), 557-566.

Bray, N. (2013), Staffordshire, United Kingdom. at https://zootherabirding.blogspot.com/

Bunruamkaew, K. & Murayam, Y. (2011), Site suitability evaluation for ecotourism using GIS & AHP: A case study of Surat Thani Province, Thailand. Procedia-Social and Behavioral Sciences, 21, 269–278

Burger, D. and Sturtevant, B. (2012), A photographic Guide to the common Birds of Wondo Genet Ethiopia.

Carder, G., Proctor, H. J., Schmidt-Burbach, and Cruze, N. D. (2016), The animal welfare implications of civet coffee tourism in Bali. Universities Federation for Animal Welfare the Old School, UK. www.ufaw.org.uk. DOI: 10.7120/09627286.25.2.199

Catalino, A. H. and Lizardo, M. (2004), Agriculture, Environmental Services and Agro-Tourism in the Dominican Republic. electronic Journal of Agricultural and Development Economics, 1(1): 87-116

Ceballos-Lascurain, H. (1987), The future of ecotourism, Mexico Journal.

Cobbinah, P. B. (2015), Contextualizing the meaning of ecotourism. School of Environmental Sciences, Institute for Land Water and Society, Charles Sturt University, Australia. Tourism Management Perspectives 16 (2015) 179- 189

Cross, P. (2003), The Butterflies of Wondo Genet: An Introduction to the Butterflies of Ethiopia. Addis Ababa.

Das, M. and Chatterjee, B. (2015), Ecotourism: A panacea or a predicament? Tourism management Perspectives 14. pp 4-14.

Desta, Z. (2003), Challenges and opportunities of Ethiopian wetlands: the case of Lake Awassa and its feeders. Wetlands of Ethiopia:67-75

Dessie, G. and Kinlund, P. (2008), Khat expansion and forest decline in wondo genet, ethiopia. Geografiska Annaler: Series B, Human Geography, 90(2), 187–203. doi:10.1111/j.1468-0467.2008.00286.x

Dodds, R. and Joppe, M. (2003), The application of ecotourism to urban environments. Tourism, 51, 157–64.

Dowling, R. (1993), An Environmentally-based Planning Model for Regional Tourism Development. Journal of Sustainable Tourism, 1(1), 17-35.

EGA, (2008), Ecotourism as a conservation strategy for funders a background briefing. New York, USA.

Elena, M. and Thomas, B. (2018), Ecotourism as a learning tool for sustainable development. The case of Monviso transboundary biosphere reserve, Italy. J. Ecotourism 18 (2), 107–121.

Fang, Y. (2017), Site Selection of Ecotourism: A case study of Zhejiang Province. Institute of geography and Environmental Science, Zhejiang Normal University, Jinhua, 321004, China. International Journal of Innovative Science, Engineering & Technology, Vol. 4 Issue 3, ISSN (Online) 2348 – 7968 | Impact Factor (2016) – 5.264

Fennell, D. (1999), Ecotourism: An Introduction. Routledge.

Fenta, M. M. (2014), Human-Wildlife Conflicts: Case Study in Wondo Genet District, Southern Ethiopia. Agriculture, Forestry and Fisheries. Vol. 3, No. 5, 2014, pp. 352-362. doi: 10.11648/j.aff.20140305.14

Ferrario, F. F., (1979), The evaluation of tourist resources: an applied methodology. Journal of Travel Research, 17(3), 18–22.

Gebre, S. L., Taye, B., Gemeda, D.O. and Getahun, K. (2019), Using Geospatial Techniques in the Selection of Potential Ecotourism Sites in Menz geramidir District, Ethiopia. Ghana Journal of Geography Vol. 11(1), 2019 DOI: https://dx.doi.org/10.4314/gjg.v11i1.12

Gebregiorgis, D. C. (2009), Application of Remote Sensing and GIS for Potential Ecotourism site selection in Addis Ababa and its surrounding.

Gedecho, E. K. (2015), Urban Tourism Potential of Hawassa City, Ethiopia American Journal of Tourism Research: Vol. 4, No. 1, 25-36 DOI: 10.11634/216837861504647

Gemechu, T. and Bewket, W. (2007), Challenges and Prospects for Sustainable Forest Management in Wondo Genet Area, Southern Ethiopia. Ethiopian Journal of Development Research Vol. 29, No.2,. DOI: 10.4314/ejdr.v29i2.42709.

Gemeda, D. O., Ambech, A. B. and Melka, G. A. (2020), Ecotourism site suitability evaluation using geospatial technologies: a case of Andiracha district, Ethiopia

Gigovi´c, L., Pamuˇcar, D., Luki´c, D. and Markovi´c, S. (2016), GIS-Fuzzy DEMATEL MCDA model for the evaluation of the sites forecotourism development: A case study of "Dunavski kljuˇc" region, Serbia

Girma, Z., Mamo, Y. and Ersado, M. (2012), Species Composition, Distribution and Relative Abundance of Large Mammals in Wondo Genet Forest Patch, Southern Ethiopia. Asian Journal of applied Sciences, ISSN 1996-3343 / DOI: 10.3923/ajaps, 2012.

Girma, Z., Mamo, Y., Mengesha, G., Verma, A. and Asfaw, T. (2017), Seasonal abundance and habitat use of bird species in and around Wondo Genet Forest, south- central Ethiopia. Ecol Evol;7: 3397–3405. https://doi.org/10.1002/ece3.2926

Girma, Z., Mengesha, G. and Asfaw, T. (2017), Research Article on Diversity, Relative Abundance and Distribution of Avian Fauna in and Around Wondo Genet Forest, South-central Ethiopia.

Goodwin, H. (1996), In pursuit of ecotourism. Biodivers. Conserv. 5, 277–291.

Hailegiorgis, A. B. (2004), Multi-Agent Simulation for Landscape Management A Case Around Wondo Genet: Ethiopia. Thesis submitted in the partial fulfilment of the degree of Master of Science in Geo-information Science at the Wageningen University and Research Center. Centre for Geo-Information. Thesis Report GIRS-2004-12

Hetzer, W. (1965), Environment, Tourism and Culture. Washington D.C.: Island Press.

Hjelm, B. (2001), Manual of Forest Management and Plantations. Wondo Genet College of Forestry and Natural Resources. Wondo Genet, Ethiopia. Pp. 17.

Honey, M. (1999), Ecotourism and Sustainable Development: Who Owns Paradise? Washington, DC: Island Press.

Honey, M. (2002), Ecotourism and Certification: Setting Standards in Practice. Washington: Island Press.

Honey, M. (2008), Ecotourism and Sustainable development: Who owns paradise? (2nd ed.). Washington, D.C.: Island Press.

Hossain, M., Chowdhury, S.R., Das, N.G. and Rahaman, M. M. (2007), Multi-criteria evaluation approach to GIS-based land suitability classification for tilapia farming in Bangladesh. Aquaculture International, 15: 425-443.

International water management institute (IWMI), (2006), Working Wetlands. A new approach to balancing agricultural development with environmental protection. Water Policy Briefing. pp.1-6

Italemahu, T. Z. (2015), Interaction, institutions and impacts of tourism on the Bishoftu-modjo-hawassa route, central Ethiopia. Ph.D. Dissertation, Department of Sociology, Addis Ababa University, Ethiopia.

IUCN, (1996), World conservation, Special issue on collaborative management, NO-2.

Jemal, S. (2016), Potentials and challenges of Ecotourism in Improving Nature Conservation in Developing countries.

Kebede, M., Yirdaw, E., Luukkanen, O. and Lemenih, M. (2013), Plant community analysis and effect of environmental factors on the diversity of woody species in the moist Afromontane forest of Wondo Genet, South Central Ethiopia.

Kumari, S., Behera, M.D. and Tewari, H.R. (2010), Identification of potential eco-tourism sites in West District, Sikkim using geospatial tools. Tropical Ecology 51(1): 75-85.

Lee, P.Y. and Rotenberry, J.T. (2005), Relationships between bird species and tree species assemblages in forested habitats of eastern North America. J Biogeogr 32:1139-50.

Lillesand, R.M. and Kiefer, R.W. (2004), Remote Sensing and Image Interpretation (5th edn.), John Wiley & Sons Inc., New York.

Lindberg, K. (1991), Policies for Maximizing Nature Tourism's Ecological and Economic Benefits. Washington, DC: World Resources Institute.

Litton, J. B. (1968), Forest landscape description and inventories basis for land planning and design. US Dep Agric. Forest Service Research Paper, Berkeley, Calif, 64.

Mansour, S., Al-Awhadi, T. and Ali-Hatrushi, S. (2019), Geospatial based multi-criteria analysis for ecotourism land suitability using GIS & AHP: a case study of Masirah Island, Oman, Journal of Ecotourism, DOI: 10.1080/14724049.2019.1663202

Mellissea, B. T., Descheemaeker, K., Giller, K. E., Abebe, T., Gerrie, W.J. and van de Vena (2018), Are traditional home gardens in southern Ethiopia heading for extinction? Implications for productivity, plant species richness and food security. Journal of Agriculture, Ecosystems and Environment: 252 (2018) 1–13

Mengesha, T. A. (2017), Review on the natural conditions and anthropogenic threats of Wetlands in Ethiopian. Global Journal of Ecology 2(1):006-014.

Mengistu, W. (2003), Wetlands, Birds and Important Bird Area in Ethiopia. In: Wetlands of Ethiopia. International Union for conservation of nature and natural resources, Gland Switzerland.

Mokarram, M., Ronizi, A. R. S. and Negahban, S. (2020), Utilizing multi-criteria decision to determine the best location for the ecotourism in the east and central of Fars province, Iran. Land Use Policy 99 :105095

Morrow, J. L. (2010), ecotourism's role in positive land-use and land-cover change in a costa Rican tropical montane cloud forest. The Pennsylvania State University, the Graduate School College of Earth and Mineral Sciences.

Page, S. and Dowling, R. (2002), Ecotourism. Harlow, Essex: Pearson Education Limited

Pigram, J. J. (1990), Sustainable Tourism - Policy Considerations. The Journal of Tourism Studies 1 (2): 2-9.

Pitman, T., Broomhall, S. and Majocha, E. (2011), Teaching Ethics beyond the Academy: Educational Tourism, Lifelong Learning and Phronesis. Stud. Educ. Adults 2011, 43, 4–17.

Rahm, A. (2010), Application of GIS in ecotourism development: a case study in Sundarbans, Bangladesh. A Master's Thesis, Master of Arts, Human Geography Focusing on Tourism, Mid-Sweden University.

Reba, M. (2011), An Assessment of Recreational Resource Management Practices in Wondo Genet Hot Spring: An Evaluation Study. BA Thesis, Wondo-Genet Forestry College, Wondo-Genet.

Ronald, J. (2001), Idrisii 32 Release 2: Guide to GIS And Image Processing. Volume 2. USA: Clark Labs.

Saaty, T. L. (1980), The analytic hierarchy processes. New York: McGraw-Hill.

Sahilu, M. G. (2017), Agroforestry home gardens in Ethiopia. Diss.,1652-6880;2017:58ISBN978-91-7760-006-0e ISBN978-91-7760-007-7Doctoral thesis

Sim, L. (1979), Birds of Wondo Genet. Stockholm, Sweden.

Starmer-Smith, C. (2004), Ecofriendly tourism on the rise. Daily Telegraph Travel, 6, November 6, 2004.

Stone, M. and Wall, G. (2003), Ecotourism and Community Development: Case Studies from Hainan, China. Environmental Management. 33 (1): 12–24.

Stronza, A. and Gordillo, J. (2008), Community Views Of Ecotourism, 35(2), 448–468. http://doi.org/10.1016/j.annals.2008.01.002

Suryabhagavan, K.V., Tamirat, H. and Balakrishinan, M. (2015), Multi-criteria evaluation in identification of potential ecotourism sites in Hawassa town and its surroundings, Ethiopia, Journal of Geomatics, Vol. 9 No. 1, pp. 86-92.

Thapa, R. B. and Murayama, Y. (2008), Land evaluation for peri-urban agriculture using analytical hierarchical process and geographic information system techniques: A case study of Hanoi. Land use policy: 25, 225-239.

The International ecotourism society (TIES). (1990), Retrieved from https://ecotourism.org/what-is-ecotourism/

The international Ecotourism society (TIES). (2006), Fact Sheet: Global Ecotourism. Retrieved from http://www.box.net/shared/static/eaukonjc0a.pdf [accessed: 15 January 2020].

The International ecotourism society (TIES). (2015), Retrieved from www.ecotourism.org

Thomson, K. (1991), Agenda 21 'Building blocks' preliminary submissions from UK non-governmental organizations for the third preparatory committee of UNCED. An Interim Report from the UNEP-UK National Committee Draft II. UNEP-UK, London.

Ullah, K. M. and Hafz, R. (2014), Finding suitable locations for ecotourism development in Cox's Bazar using geographical information system and analytical hierarchy process. Geocarto International, 29(3), 256–267

United Nation World Tourism Organization, (1995), "Technical Manual on Collection of Tourism Expenditure Statistics.

UNWTO. (2018), United Nations World Tourism Organization. Retrieved from http://www2.unwto.org/content/why-tourism (accessed 15/10/2020)

Vega, F. E. (2008), The rise of coffee. American Scientist 96(2): 138. http://dx.doi.org/10.1511/2008.70.3640

Vreugdenhil, D., Vreugdenhil, A.M., Tilahun, T., Shimelis, A. and Tefera, Z. (2012), Gap Analysis of the Protected Areas System of Ethiopia, World Institute for Conservation and Environment, USA.

Water Works Design and Supervision Enterprise (WWDSE). (2001), The study of Lake Hawassa level, lake Hawassa study and design project.

Wetlands International. (2002), Guidelines on the development of ecotourism at wetlands. AEWA Conservation Guidelines pp. 1-39.

Wondirad, A. (2020), Ecotourism development challenges and opportunities in Wondo Genet and its environs, southern Ethiopia. Journal of Place Management and Development.

Wondo Genet Agricultural and Rural Development Office Report, (2008).

Wondo-Genet Ecotourism Guide Association. (2013), "A Brochure: Tourism Resources Wondo Genet." Wondo-Genet

Wood, E. M. (1991), Global solutions: an ecotourism society. In Nature Tourism: Managing for the Environment (T. Whelan, ed.) pp. 200–6, Island Press.

World Bank. (2013), Wetland Management: Integrated Planning for Kabar Taal Restoration and Building Capacity for Wetland Management in Bihar. Wetlands International South Asia, New Delhi pp. 1-39.

World Conservation Monitoring Center/ WCMC. (2001), Biodiversity Guide to Ethiopia. A report for the Commission of the European community, Cambridge.

World Economic Forum. (2019), “the travel and tourism competitiveness report”, Travel and Tourism at a Tipping Point. Geneva, available at http://reports.weforum.org/ttcr.

WTTC., (2020a), Ethiopia, Annual Research: Key Highlights. Available at https://wttc.org/Research/Economic-Impact

World Travel and Tourism Council. (2020b), “travel and tourism - global economic impacts and trends”, Retrived from www.wttc.org

Zewdie, B. (2002), Perceptions of Forest Resource Changes in and around Wondo Genet Catchment and Its near Future Impacts. MSc Thesis, Wondo Genet College of Forestry.

Appendix 1

- Questionnaire

I: Instruction

For the close ended questions, please put a tick mark (✓) in the space provided.

- Which of the following criteria's do you think has to be included for ecotourism site suitability determinants in Wondo Genet Woreda?

  A. Land use/ Land cover ☐ D. Slope ☐

  B. Vegetation cover ☐ E. If others _____

  C. Elevation ☐

- Do you think that Wondo Genet Woreda is suitable for ecotourism activities?

  A. Yes B. No

If your answer is yes, Please, write the possible kind of ecotourism activities?

- What are the existing ecotourism resources of Wondo Gent? _____
- List out and rank the criteria's used to identify a certain tourist destination as an ecotourism site? _____,_____,_____
- Describe the major land use land cover of the Wondo Genet Woreda? _____,_____,_____
- What kinds of wildlife's (large mammals and birds) are found in the Woreda and its surrounding? _____,_____,_____
- How many species of floras found in Wondo Genet Woreda? _____,_____,_____
- What is the main reason/driving forces that impedes/drives you to come & to visit Wondo Gent? _____,_____,_____
- What are the major prevailing factors that the Wondo Genet Woreda potential ecoturism resources are facing? _____,_____,_____

Appendix 2.

- Map showing the overall watershed of Hawassa and Wondo Genet Woreda and its environs