

**Determinants of Green Areas Management under  
Urban Landscape Dynamics in Bahir Dar City,  
Ethiopia**

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This is to certify that the thesis prepared by Bizuayehu Telelew, entitled: Determinants of Green area Management under Urban Landscape Dynamics in Bahir Dar City, Ethiopia and submitted in partial fulfilment of the requirement for the degree of Masters of Art (Environment and Sustainable Development) complies with the regulation of the University and meet the accepted standards with respect to the originality and quality.

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## **ABSTRACT**

*Urbanization causes land use change and as a result of urban environmental conditions disturb natural surfaces and replace them by urbanization due to this, the thesis was aimed to investigate the impact of urbanization to green areas development and management. A multi stage systematic random sampling was employed to draw 138 samples households from three sub-cities of Bahir Dar City. The study employed both qualitative and quantitative research methods. Moreover, satellite images have also been used to investigate the trends of green areas in Bahir Dar. The land use pattern of the city indicated that coverage of built up area is increasing radically from 1986-2016 whereas that of crop land, plantation and grassland was decreased from time to time. From 1986-2016, plantation land use class decreased from 5453.5 ha (25.1%) to 2501.8ha (11.5%). The study also tried to assess the perception of community towards benefit of green areas to wellbeing of the society. Descriptive statistics applied to look their perception in environmental, socio economical and health categories, based on this majority of respondents' perceived benefit of green areas. The statistical model namely binary logit were employed to establish the factors affecting green areas management. The result of binary logit model directed that age of household head, average income of household, sufficient number of green areas available, sufficiency of budget allocated to green area management and hour to reach the nearest green area from resident are significant factors that affect green area management negatively while marital status of household head, participation in tree planting campaign and stakeholders collaboration are significant factors that affect green areas management positively. The study recommended that development of green areas should emphasize new settlement areas to make more accessible beside this existing communal green areas management should be more participatory.*

**Key words:** *Green areas, Green areas management, Urbanization*

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## **LIST OF ACRONYMS**

ANRS	Amhara National Regional State
BDCAO	Bahir Dar City Administration Office
CSA	Central Statistical Agency
ETB	Ethiopia Birr
GIS	Geographical Information System
HH	House Hold
KII	Key Informant Interview
LULC	Land Use Land Cover
SPSS	Statistical package for social science software
UN	United Nations
UNDP	United Nations Development
UNESCO	United Nations Educational, Scientific and Cultural Organization

# CHAPTER 1: INTRODUCTION

## 1.1. Background

Urbanization refers to expansion of urbanized areas and growing of large cities through progressive economic activities (Xizhe et al., 2012). Demographical redistribution of population which sources from rural areas accelerates the process of urbanization. However urbanization is different in the context of countries, urban areas characterized by densely settled population that need to access employment and better living conditions (Tim et al., 2017). In 2008, half of the world's population lived in urban areas, especially in developing countries, cities are growing fast and within this annual urban growth rate and it has been predicted as 66% of the people will live in urban by 2030 (UN, 2016).

Urban land expansion that is the process of creating the built up environment to house urban population's and their activities which is one of the fundamental aspects of urbanization force out habitats, hydrology, land cover and surface energy balance (Creutzig et al., 2015). According to Christopher et al. (2016), urbanization causes land use change and as a result of urban environmental conditions disturb natural surfaces and replace them by infrastructures. High density of population causes crowded transportation system, slum settlement and expansion of infrastructure and with unique characteristics of economic activities in urban areas including wastes from industry, damaged infrastructure and changing environmental conditions exacerbate the impact of environmental degradation (Rebecca et al., 2011). The impact expressed by increment in temperature than the surrounding environment Moreover, urbanization bounced the change in absorption and reflection of solar radiation due to many factors including materials used for urban infrastructural development (Luber & Mcgeehin, 2008).

In many developing countries economic growth is experiencing through urban physical infrastructural development (Tim et al., 2017). Ibrahim et al., (2017) illustrates that 60 percent of Africa's urban population lives in low quality living conditions, inadequate access to water and sanitation and crowded living condition with low capital and degraded environmental conditions. As land is main base for

economic growth both for urban and rural areas, urban growth is altering the land use and land cover. Urbanization in sub-Saharan countries is changing the land use due to infrastructure development and related studies agreed upon land use change has direct impact on urban environmental condition, ecosystem and energy balance (Wuy & Shen, 2011).

Ethiopia is among developing countries characterized by high migration from rural areas to urban areas for searching employment and better living conditions and expansion of industries, rapid population growth and environmental degradation (UNDP, 2016). Even though Ethiopia is the second most populated country in Africa, urbanization is growing at 19% with an average of 3.8 annual growth of urban population. It has been estimated to increase from 15.2 Million to 42.3 Million during 2012 to 2037. According to Tsegaye, (2010) and Emily & Mekamu (2010), this will bring challenges in Ethiopian context as high demand for housing conditions force urban development policy focuses to housing development program, provide extended infrastructure development and development of small urban based enterprise and fasten economic growth in the country. The problem becomes worse by high environmental degradation and increases its vulnerability to climate change and Change in climate directly affects the environmental conditions including warming as a result of urban heat island effect, reduced water availability loss in biodiversity and local resources (Rebecca *et al.*, 2011).

Urban greening is drawn up as answer for the disordered urban environment furthermore, vegetation uptake carbon dioxide and stabilize the heat of urban areas and contribute to reduce the impact of climate change beside its ascetic and economical values (Creutzig, 2016). Street trees and urban green areas have significant value in temperature regulation, cooling effect, biodiversity conservation and creating favorable environment in urban areas beside their aesthetic values (Bayram & Ercan, 2012). A multi-functional benefit of urban green areas which provide for the wellbeing of urban dwellers. The aim of this study was to investigate the urbanization on green area development and management in the face of land use/land cover change of Bahir Dar City, beside this, specifically the study assessed community's perception to green areas benefit and determinants of management of communal green areas.

## **1.2. Statement of the Problem**

Ethiopia is being challenged with over population, environmental degradation, food insecurity, unemployment in urban areas (UNDP, 2016). Employment opportunities and access to infrastructure in cities attract people to migrate from rural areas towards urban areas and highest urban growth increase urban and peri-urban areas than the former cities (Tsegaye, 2010). Demographic change pressure the urban development to focus on building of houses, market, transportation stations and other infrastructures than environmental issues of the urban areas (Minwuyelet, 2005). The establishment and management of urban green areas across the urban centres have not been uniform and there is a great deal of variation among the urban centres. Some of them have established some of the green areas components. Furthermore, the establishment and management of green areas across the urban centers in the country have not been standardized and the urban dwelling communities in the country have not been receiving the goods and services that well-planned and well-developed green areas are supposed to provide (Manual for Recreational Parks Development and Management, 2015).

Even though the impact of urbanization is high in the capital city, other large cities like Bahir Dar are facing such problems of rapid urbanization (Appelhans, 2017). Greater population density in urban areas increase demand for green areas but the city is facing diminishing of green areas. Urban green areas have seen as merely the left over spaces, which have not yet been developed with in an urban area. And that function as improving image of the city than ensuring quality of life of the public.

Many studies have been done earlier regarding to the problems and constraints of urbanization in Bahir Dar city. Samson (2012) studied sustainable city fabric for urban slum areas in Bahir Dar, Appelhans (2017) done on urban planning and everyday urbanization: a case study on Bahir Dar, Helen (2017) has also studied the impact of urbanization on livelihood of the community, Atalel (2014) raised urbanization and land use land cover change in Bahir Dar, but these studies are from urbanization perspective. This study emphasized on green areas management and development under urban landscape dynamics by assessing the nature and dynamics of green areas, perception of community towards benefit of green areas to wellbeing of the people and determinants of communal green area management.

### **1.3. Objectives of the study**

#### **1.3.1 General Objective**

The principal objective of the study was to investigate the trends and patterns of urbanization and the management and development of green areas in Bahir Dar City.

#### **1.3.2 Specific Objectives**

Specifically the study attempted to;

- Assess the nature, accessibility and dynamics of green areas in the context of urbanization in Bahir Dar.
- Examine the perception of community towards the benefit of green areas to the wellbeing of the people in Bahir Dar.
- Assess the determinants of green areas development and management in Bahir Dar.

### **1.4. Research Questions**

The research question of the study was;

- How do the trends of urbanization of Bahir Dar City affect the green areas development and management?
- What is the perception of community toward the benefits of green areas to their wellbeing?
- Why do different determining factors affect the green area development and management differently?

### **1.5. Significance of the study**

This study established an understanding on the impact of urbanization to green area development and management in Bahir Dar and this understanding help stakeholders to focus on urban green areas beside urban constructions and related economic activities. Thus it contributes to the policy makers in making a sound decision on

urban green area development. Moreover, this study is helpful as a reference to conduct further research on impact of urbanization and also role of green areas to the urban environment.

### **1.6. Scope of the study**

The main focus of this study was to assess urbanization and green areas management on green area of the city and it was undertaken in Bahir Dar City. The assessment includes urban green status and dynamics of the city's open spaces such as public parks, allocated open space land uses, public squares, public play lots, public play grounds, public play fields, forest lands.

### **1.7. Limitation of the study**

In order to show the extent of change in land use land cover in study, the study employed Landsat. However, Spot is a high resolution image and could have been better to use. But it is very expensive and cost is thus the main limitation.

## CHAPTER 2: LITERATURE REVIEW

### 2.1. Concepts and Definitions

Jennifer *et al.*, (2014 ) defined green infrastructure as parts of urban areas with a mix of street trees, parks, cultivated land, wetlands, lakes and streams, this definition is synonymous with the definition of urban forests. In which, urban forest is defined as trees, forests, green spaces, and related biotic, abiotic and cultural components in and around cities (Per & Sven, 1999). Therefore, green infrastructure and urban forest are regarded as being similar land use types. Hence, in this paper, the terms green infrastructure, green areas and urban forest are used interchangeably.

**Urban green areas** refers to spaces that are located in the urban web which include urban forest, river buffer vegetation, recreational parks, avenues of trees and other garden area (Fratini & Marone, 2011).

**Formal green areas** are proportion of open space that is retained in a mostly undisturbed vegetative state. It can be partly or completely covered with grass, trees, shrubs, or other vegetation (Ethiopia National Urban Green Infrastructure Standard, 2015).

**Informal green areas** are vacant lots street or railway verges, fields and power line corridors that are not intentionally designed for parks and recreational spaces (Christoph & Jason, 2017).

**Communal green areas** are shared spaces and communally used and managed by residents that live around the green areas. They are not a public park, a private backyard or a community garden however they can function as all (Fratini & Marone, 2011).

**Urbanization** is the process of physical expansion of already existing urban centres and the growth in the proportion of a population living in urban areas due to economic growth and development, rural-urban migration, technological change and rapid population growth (Pay & Stefan, 2010).

**Green area development and management** regarded as the activities performed by a management organization in order to maintain develop urban green spaces. Management includes institutions and actors. Management is not only concerned with

activities on the operational level of work, but it also includes the technical, biological and human relation aspects, especially collaboration and communication.

**Well-being** is defined as access to basic materials to maintain freedom of choice, freedom of action, health, good social relations and safety (Weldon & Bailey, 2007).

## **2.2. Trends and Patterns of urbanization**

Although demographic growth is slowing down in the whole world, the fact that it has taken the ever shortest time to add one extra billion signals a major shift in both the place and scale of global demographics, the world population reached the seven billion mark. This historic event took place 12 years after the six billion mark. It took 123 years to double from one to two billion but ‘only’ 33 years to cross the three-billion thresholds (UN Habitat, 2012). The total population in Delhi has witnessed steep rise from 1.74 million in 1951, which was 0.48% of total population of India, to 16.75 million in 2011 (Directorate of Census Operations, 2013). The density of population was 4,194 in 1981 and rose to 11,297 in 2011 (Directorate of Census Operations, 2011 as cited in Diana et.al, 2010), the urban population was 82.4% in 1951 and 97.5% in 2011. The number of villages reduced from 300 in 1961 to 165 in 2001. Area wise, the rural areas have shrunk from 797.66 km<sup>2</sup> in 1991 to 369.35 km<sup>2</sup> in 2001. In 1991 rural-urban share was 53.79%-46.21%, which in 2011.

African cities are crowded in that they are packed with people who live in unplanned, informal downtown dwellings to be near jobs, the immediate reason is that the urbanization of people is not accompanied by an urbanization of capital. Housing, infrastructures, and other capital investments are lacking. Across the region, housing investment lags urbanization by nine years (PAGE, 2016). An underlying cause of this crowding is that African cities are not economically dense or efficient enough to promote scale economies and attract capital investment. In principle, cities should benefit businesses and people through increased economic density, firms clustered in cities should be able to access a wider market of inputs and buyers, with reduced production costs thanks to scale economies (Ibrahim *et al.*, 2017).

The physical growth of urban areas can be explained demographically and functionally. While demographic definition of urbanization is restricted to factors such as population size and density, the economic functional definition refers to the

territorial concentration of productive activities, industries and service rather than population (Tsegaye, 2010).

According to Louis (1969), the analytical contours of urbanism with reference to a classic triad of sociological properties large population size, high population density, and high levels of demographic heterogeneity. For Wirth, the spatial coexistence of these properties within urban areas distinguished such zones from all other settlement types and justified the deployment of specific research strategies, the tools of a distinct field of urban sociology, to investigate them. By contrast, in the early twenty-first century, the urban appears to have become a quintessential floating signifier: devoid of any clear definitional parameters, morphological coherence, or cartographic fixity, it is used to reference a seemingly boundless range of contemporary socio-spatial conditions, processes, transformations, trajectories, and potentials.

Ash and Nigel (2002), describe that state of the city is everywhere and in everything. The urbanized world now is a chain of metropolitan areas connected by places/corridors of communication (airports and airways, stations and railways, parking lots and motorways, teleports and information highways). The footprints of the city are all over these places, in the form of city commuters, tourists, teleworking, the media, and the urbanization of lifestyles. The traditional divide between the city and the countryside has been perforated.

Development of the urban sphere, especially in developed countries context, one very important key strategic aspect has to do with sustainability considerations, i.e. the systemic interplay between environmental/ecological, economic and socio-cultural as it referred to as green factors in the sustainability context (Helmut *et al.*, 2016). Within this context, there are challenges dealing with climate change, water availability and natural resource lows, including waste streams and their uses (Xizhe *et al.*, 2012). According to the same study, when it discusses green issues in connection with urban challenges, a starting point is the sustainability challenges connected with the urban space itself.

However, also finding of highly relevant considerations dealing with what the urban development implies for other activities distributed in geographical space as mirrored like by the urban-rural connections in the form of the connection between urban space and its natural resources supporting (Creutzig *et al.*, 2015). Thus the impacts of the urban activities on the surrounding world is here at risk in all its different ecological

dimensions, such as water quality and quantity, biodiversity erosion, implications of the chemical impact on the ecological systems of the hinterland - and in terms of the competition over land use among different functions including most emerging issues are climate changes, freshwater scarcity, deforestation, and fresh water pollution and population growth, these problems are very complex and their interactions are wide. Jenefer *et al.* (2014) agreed on this idea and explain urban green space as provision of a wide range of ecosystem services that could help combat many urban ills and improve life for city dwellers especially their health. Such green space is diverse, varying in size, vegetation cover, species richness environmental quality, proximity to public transport, facilities, and services.

A large and rising population results in greater anthropogenic activity for sustenance and improved living standards. In a river basin, population growth ultimately leads to increasing demands and competition for scarce freshwater resources, and expanding degradation of watersheds (Madalina, 2012). Good water resources management must therefore deal with the population poverty–environment nexus, and consider the broader implications of population growth on the sustainable management and development of freshwater resource in State Of The River Nile Basin Report, 2012. History and experience demonstrate that urbanization is closely linked to economic growth and the transformation of economies towards productive sectors, namely industry and services. Available evidence suggests that urban and industrial development in Africa is disconnected, resulting in lost opportunities for job creation and improved well-being. It is also not surprising that Africa’s cities are crippled by severe infrastructure and service gaps (Economic Report on Africa, 2017).

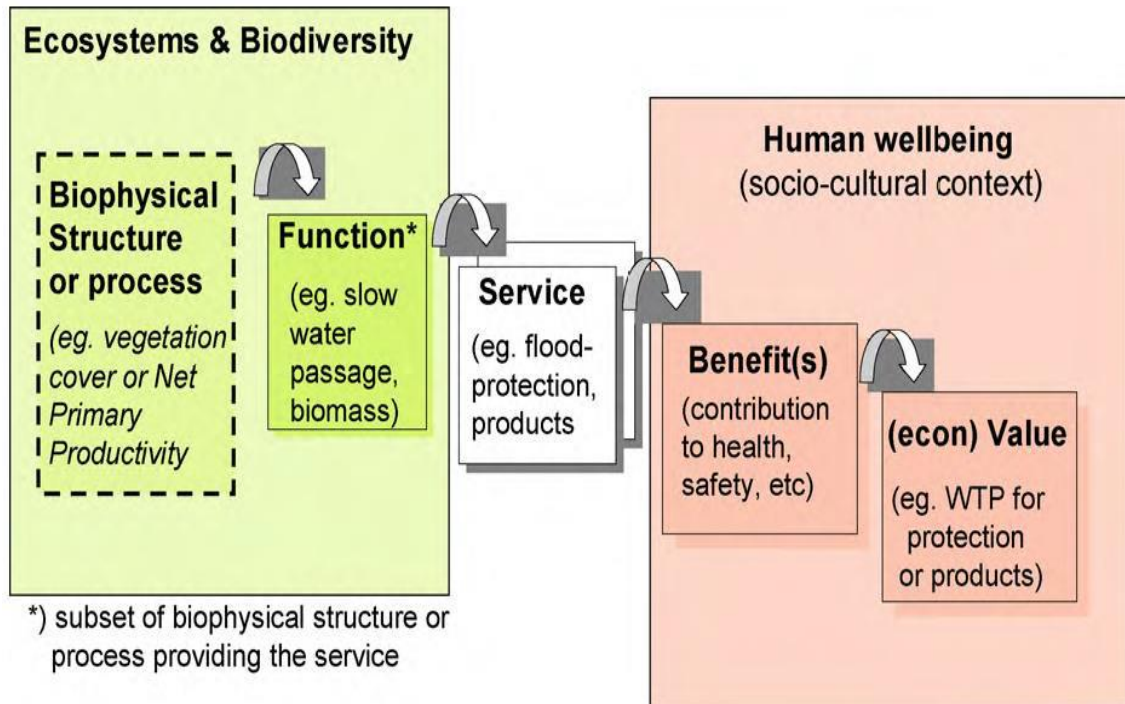
Studies explain urbanization largely by rural-urban migration in response to an urban-rural wage or utility gap and this utility gap could be the result of a rural push or an urban pull. There are various rural push factors, if the country experiences a Green Revolution, the rise in food productivity releases labor for the modern sector and people migrate to the cities (Bayram & Ercan, 2012). Rural poverty due to land pressure or natural disasters causes rural migrants to flock to cities. The United Nations classifies Ethiopia as 14.9% urban, while the World Bank reports a 10.9% urbanization rate. In an effort to provide standardized measures of Ethiopian urbanization over time, we use the WDR agglomeration index methodology which incorporates a series of GIS data and analyses including: travel time raster’s,

population density raster's and other nationally collected biophysical and infrastructure variables (Lall *et.al*, 2017).

In the same way as global situation and developing countries, the urbanization phenomenon in Ethiopia has been associated with environmental problems in most cities, including Addis Ababa. Among the problems are urban sprawl, solid and liquid waste management; water, air, and noise pollution; illegal settlements and the degradation of open green areas. Open green areas in particular and open spaces in general have been placed under extreme pressure, thus threatening their ability to maintain basic ecological, social and economic functions (Samson, 2010). Bahir Dar city, the capital of Amhara National Regional State in Ethiopia, is the same to the country condition. There are environmental problems induced by industries, motorized vehicles, household wastes, urban sprawl and other climatic effects.

### **2.3. Benefits of Green Areas to well Being**

Well planned and maintained recreation parks serve urban communities in many ways. As a concept, ecosystem services are anthropogenic and nature's intrinsic value is not considered and the main focus lay on the connection between ecosystems and the well-being of humans. Well-being is defined in MA (2003) and Common International Classification of Ecosystem Services (CICES) (Haines *et al.*, 2011) as access to basic materials to maintain freedom of choice, freedom of action, health, good social relations and safety. A certain level of material prosperity is connected to the well-being of humans (UN development goals).



**Figure 1:** The Cascade model which illustrates how the ecosystems and the biodiversity create services which generates human well-being

**Source:** Adopted from Johan, (2013).

### **Ecological benefits of green spaces**

In addition to the many benefits that amenity green spaces provide for individuals or communities, these green spaces, if designed and managed appropriately, can contribute to the green infrastructure of a city and the ecosystem services it can support. For instance, trees and shrubs can absorb carbon dioxide contribute to the mitigation of the impacts climate change. Green spaces should offer something for everyone, be robust and give people a sense of place. According to Ethiopian national urban green infrastructure standard (2015), a well-designed place has the following qualities (Per & Sven, 1999):

- Sustainability
- Definition and enclosure
- Adaptability and robustness
- Biodiversity
- Character and distinctiveness
- Connectivity and accessibility
- Inclusiveness

Studies showed that, the very presence of plants in a city improves the visual appearance of the urban environment, contributes towards climate change prevention, creates lower densities of development and reduces levels of activity in an area (Thomas, 2013). There is big variation comparing with rural areas, in solar input, rainfall pattern and temperature is usual in urban areas, hence solar radiation, air temperature, wind speed and relative humidity vary significantly due to the built environment in cities (Bayram *et al.*, 2012). In UK Neighbourhoods, Cities and Regions Analysis Division (NCRA) analysis indicated that, the ecosystem is finely tuned with plant and animal species highly interdependent on each other for survival. Green infrastructure can have a positive impact on air quality. Vegetation is capable of removing ammonia (NH<sub>3</sub>), carbon dioxide (CO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), ozone (O<sub>3</sub>), particulate matter (PM; dust) and sulphur dioxide (SO<sub>2</sub>) from the air (Nowak *et al.*, 2006 and Powe *et al.*, 2004). The ability of trees to intercept pollution varies between species, throughout the age of the tree, and with the planting design (Martin, 2013). A case study carried out in West Midlands on urban forest reported that some species of tree have a greater potential to improve air quality (O<sub>3</sub>, NO<sub>2</sub>, HNO<sub>3</sub>, NO and PAN) while others could have a detrimental impact (Nowak *et al.*, 2006). Green Infrastructure alleviates the impacts of climate change, such as flooding and the heat-island effect and provides effective ecosystem services that are expensive and difficult to replace with man-made solutions (SDC, 2010). Urban areas have warmer air and surface temperatures compared with non-urban areas. Buildings, roads and paved surfaces store heat during the day which is then released in the evening and night resulting in increased temperatures (RICS, 2011). The urban heat island effect can be reduced by increasing albedo (the reflection of incoming radiation away from a surface) or by increasing vegetation cover with sufficient soil moisture for evapotranspiration.

### **Socio-Economic Benefit of Urban Green Infrastructure**

In this section of the review assess the social benefit of green infrastructure and demonstrate the practical value of green infrastructure/space from the developed countries perspective. Various literatures confirmed that there are many potential social benefits that good quality, accessible green space and infrastructure can provide, but the most significant of these can be grouped into three broad categories improvements in levels of physical activity and health promotion of psychological

health and mental well-being and facilitation social interaction inclusion and community cohesion (Forest Research, 2010).

Recreation parks support the stabilization of faltering relationships between dwellers of urban centers and provide a landmark element and point of pride in urban communities. When working in connection with other issues such as reducing crime, eliminating graffiti, or managing traffic, recreation park development and improvement offer quick and tangible actions that help redefine and improve lifestyles in urban centers. They revitalize responsible and friendly interactions of individuals and communities that live in and around cities and towns (Forest Research, 2010)

According to Forest Research (2010), social capital refers to the relationship people create when they interact with one another and build integrated community from a social perspective. Recreation parks provide a place to meet, to interact in a shared environment, to celebrate differences and to enjoy the company of family and friends. In other words, they provide a place for social capital to grow. Recreation parks' development is one of the quickest and most effective ways to build a sense of community and improve quality of urban life, this is especially important in Ethiopia as we are a more culturally and socially diverse community.

### **Health and Well-Being benefit of green areas**

Socially, benefits from urban greenery can accrue to urban communities through access to urban green spaces, healthy living and education. Many public green areas provide the local community and visitors with opportunities for physical recreation and relaxation, as well as for social interaction (Wodarczyk, 2007). According to Forest Research, there is a strong body of evidence which demonstrates the restorative value of green space showing that more passive forms of usage, or even just access to views of green space, can have a beneficial impact on mental well-being and cognitive function (Forest Research, 2010 and RICS, 2011). Studies found that, quality green spaces have positive benefits for people living in deprived urban communities. Similarly, access to green space is an important predictor of increased physical activity and reduced risk of obesity (John, 2011). This was already found by Bayram et al. (2012), people who were exposed to natural environment, the level of stress decreased rapidly as compared to people who were exposed to non-environment. Various research evidences, shows that they can have a beneficial

impact on mental well-being and cognitive function. At their best, green spaces can also help facilitate social interaction, integration and the development of community cohesion (Forest Research, 2010).

On the other hand, different case studies showed that reduced access to the natural environment can result in social isolation, obesity and chronic stress (Institute of Public Health, 2006). Human contact with nature is recognized as valuable for our mental health (SDC, 2010). The positive effects increased with the length of stay and with the level of physical activity undertaken. A study illustrated by Frank (2003) found that students under exam stress had increased positive feelings and reduced fear and anger when they had a view of plants. The study also found that more trees in urban neighbourhoods correlate with a lower incidence of asthma. It was found that when plants were present in the interior

Evidences show that with growing urbanization, rates of chronic diseases such as diabetes and heart diseases tend to increase at alarming rate. Improper diet, a sedentary lifestyle and lack of exercise are some of the major factors that contribute to these problems. However, presence of accessible and diverse recreation parks plays a significant role in encouraging people to become more active. They serve urban community to breathe healthier life. Recreation parks provide open spaces for playing, trails for running and walking, as well as for riding bikes. These are just few examples of how recreation parks provide active living opportunities. Accordingly, green areas are vital in contributing to the country's leading health strategy, which mainly focuses on prevention. Therefore, recreation parks, together with creative design and management of other urban green infrastructure, can make a difference and contribute to healthier citizens. Stress refers to the biological, behavioural, and psychological responses a body produces when affected by a stressor. A stressor can be anything that destabilizes the body and mind from their regular state of being. It can be short-term or chronic, resulting from a single stressing event or an accumulation of many stressors (Gutman & Nemeroff, 2011).

Urban environments in particular contain many stressful stimuli, such as unpredictable loud noises. The majority of the research in this field has viewed the relationship between green space and mental health from an overarching, urban green space may offer an opportunity for urbanites to retreat from stressful stimuli and engage with a natural environment in a beneficial way.

## **2.4. Challenges of green areas development and management**

The urban land use has increased tremendously with 4.17 km<sup>2</sup> till 2003 and further 66.33 km<sup>2</sup> added from 2003 to 2011 at the cost of fallow land, agricultural area; shallow water bodies and scrub land, the built up area increased by about 17% from 1997 to 2008 (Uttara *et.al*, 2012). Extended human activities in urban areas cause emission of greenhouse gases to the atmosphere carbon dioxide which is the major gas sourced from burning, industrial wastes and crowded transportation in urban areas. The accumulation of this gas in the atmosphere increase temperature as it trap the radiation from land to pass through the atmosphere. Especially in urban areas the problem is severe because of factories, extended infrastructure and high population density (Creutzig *et.al*, 2016).

Both in developed and developing countries, high population growth and density of the population constrained urban areas that are characterized by rapid growth in transportation, concrete buildings, settlement areas and overall intensive infrastructure development (Dorina & Dominic, 2015). Urbanization process increased through industrialization with many environmental problems including noise, heating , water pollution and through changing the land use to build up areas (Ibrahim *et.al*, 2017).According to Uttara *et.al* (2012), materials used to build the urban environment like concrete, asphalt, brick and others absorb and reflect energy than vegetation and soil. Because of this urban areas are warmer than the surrounding rural areas moreover, it exacerbate environmental problems by increasing erosion and sedimentation to river channels , in addition to this, rapid urbanization with mass concrete results very small proportion of green areas compared with other parts of urban areas (Bayram & Ercan, 2012).

It is observed that politicians, industrial houses, especially in developing country try to grab these green open spaces for creation of concrete jungle. Scientific understandings of how urban forests, river buffer vegetation, recreational parks and street trees benefits people is generally lacking in majority of developing countries. This happens because non-market benefits of such areas are not correctly valued. There is evidence that open space with in town and cities might be more effective in helping adaptation, as it can provide shade, flood storage, improve infiltration rate and reduce run-off. This clearly has implications for policies to encourage infill development (Emily & Mekamu, 2009). The use of land as open space, however, is

no less important than other uses. So, that the protection of open space is particularly important in urban areas where competing development pressures are greatest. Indeed, its retention and enhancement is now all the more important in support of the drive for urban renaissance (Helmut *et.al*, 2016).

Urban green spaces provide many functions in urban context that benefits people's quality of life. There is therefore a wide consensus about the importance and value of urban green spaces in cities towards planning and constructing sustainable or eco-cities of 21st century. Steadily growing traffic and urban heat, especially in the developing countries is not only damaging the environment but also incur social and economic costs. The ecological benefits bestowed in green spaces which range from protecting and maintaining the biodiversity to helping in the mitigation of change cannot be overlooked in today's sustainable planning. Inner-city green spaces are especially important for improving air quality through uptake of pollutant gases and particulates which are responsible for respiratory infections. Urban Green spaces refer to those land uses and land cover that are covered with natural or man-made vegetation in the city and planning areas. It has been long argued about the definition of green space system. Different disciplines have used various definitions from their own professional concept, such as Horticultural Greenland System, Urban Greenland System, Ecological Greenland System, and Urban Green Space and Green Open Space.

## **2.5. Empirical Studies**

Finding of various empirical studies agreed up on the impact of urbanization on urban environment that experienced as air, noise and water pollutions. In order to improve environmental quality of cities, urban areas come up with answer that has to be incorporate to urban planning policies as well as other urban structures. This review aimed to assess how previous studies link urbanization and green areas.

The result of study on remote sensing and urbanization on environmental impacts revealed that expansion of urban areas in Jing-Jin-ji, the Pearl River Delta and the Yangtze River delta including large cities Beijing and Shanghai had high urbanization trend with large environmental damage. In contrast Stockholm's urban extent was minimum for past 25 years, urbanization undertook on the expense of agricultural areas, forests and wetlands. In large construction projects such as 2008 Olympic

Games in Beijing and 2010 World Exhibition in Shanghai cause negative effect replace green infrastructures with urban features with modern complexes build up areas (Jan Haas, 2016)

The study in Santa Cruz and Bolivia (Heather, 2011) assessed the impact of urbanization and land use change in availability and accessibility of green areas and water features. In interdisciplinary approach of methodologies used for better explanation of urban green areas for improving urban quality of life. In peri-urban areas the loss of green areas created conditions conducive to sand storms, which are common during winter. The quality of life in cities reduced as flooding increased and impacts long term ground water and disturb the environment. The output of water balance model indicated decrease in available water and evaporation with rapid growth. The land use change in rapid growth decrease green space and decrease actual evapotranspiration and ground water recharge.

The research conducted in Tampere of Finland and Stuttgart of Germany determined the factors influencing green area planning. The result showed that land use plan and local development plan were not applicable and it recommended legalizing green areas in local development plan and Federal Building code (Sari, 2010). Beside this the distribution of green areas of UK has shown uneven distribution with lower density residential areas containing many more trees and much higher tree than areas of higher density housing (Justine, 2010).

Mccormack *et al*, (2010) defined green areas as an inter-connected network of water ways, wetlands, woodlands, wild life habitats and other natural areas: greenways, parks and other conservation lands, working farms, ranches and forests; and wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources and contribute to the health and quality of life for communities and people.

The vegetation cover is imperative for balanced atmospheric temperature and sustenance of life. As per the reports of Forests Survey of India (2011), total area of forest and tree cover was 40 and 111 km<sup>2</sup> respectively in 2001 that increased to 120 and 176.2 km<sup>2</sup> in 2011. Total vegetative cover doubled in a decade from 10% to 19.97% on account of substantial increase in tree cover under the Green Action Plan of Delhi Government. Open forests have coverage share of 119.96 km<sup>2</sup> and dense forests are merely 6 km<sup>2</sup>.

According to (Jim & Wendy, 2006), rapid urbanization in Guangzhou city of china caused wide expansion and land use change of cities. The study assessed people's perception to ecosystem services of urban green areas, attitude toward site condition and management of green areas and expectation of land scape design. The result showed that people are aware about benefits of green areas to ameliorate urban microclimate and environmental quality and wildlife habitat, biodiversity conservation and ecosystem services have limited concern. Beside economic benefits of urban green areas has low attention than recreational values. The study concludes as residents reflect difference in understanding of inherent benefits of green areas.

In Africa's context similar studies also explore the unplanned urbanization process and its impact on urban green areas. Spatio-temporal change, composition, extent and distributional inequalities of urban green areas in Kumasi, Ghana have been conducted. According to (Bertrand, 2017), Kumasi urban green area coverage currently 33% green cover but green coverage decrease in recent years than previous. Coverage of green areas decreased by 25.6% over the 28 years in Kumasi from 58.2% of total area in 1986 to 32.6% in 2014. The absolute percentage of vegetation cover decline in years 2009-2014, at 16.8% was about 4 times greater than the change between 1986 and 2000. Non vegetation area increased by 61% while vegetation cover decreased by 44% with time interval of 1986 to 2014. Dominancy of home gardens and vegetation on institutional compounds showed importance of privatizing urban green areas.

Study conduct in Uganda revealed factors affecting green areas management such as limited financial resources, institutional capacity and lack of commitment. Although there were willing stakeholders that involve in green areas management, poor implementation of policies affected the land use plan (Akola, 2017).

Cities in the developing countries have also faced unprecedented rate of urbanization and increasing poverty. According to the world urban population estimation made by United Nations (2014), the urban population of the world will increasing from 3.9 billion in 2014 to 6.4 billion in 2050, where 94% of the growth will be absorbed by the urban areas of the less developed regions. This estimation indicates that, the urban development challenges will be increasingly concentrated in cities, particularly in the lower and middle income countries where the pace of urbanization is very fastest (UN, 2014).

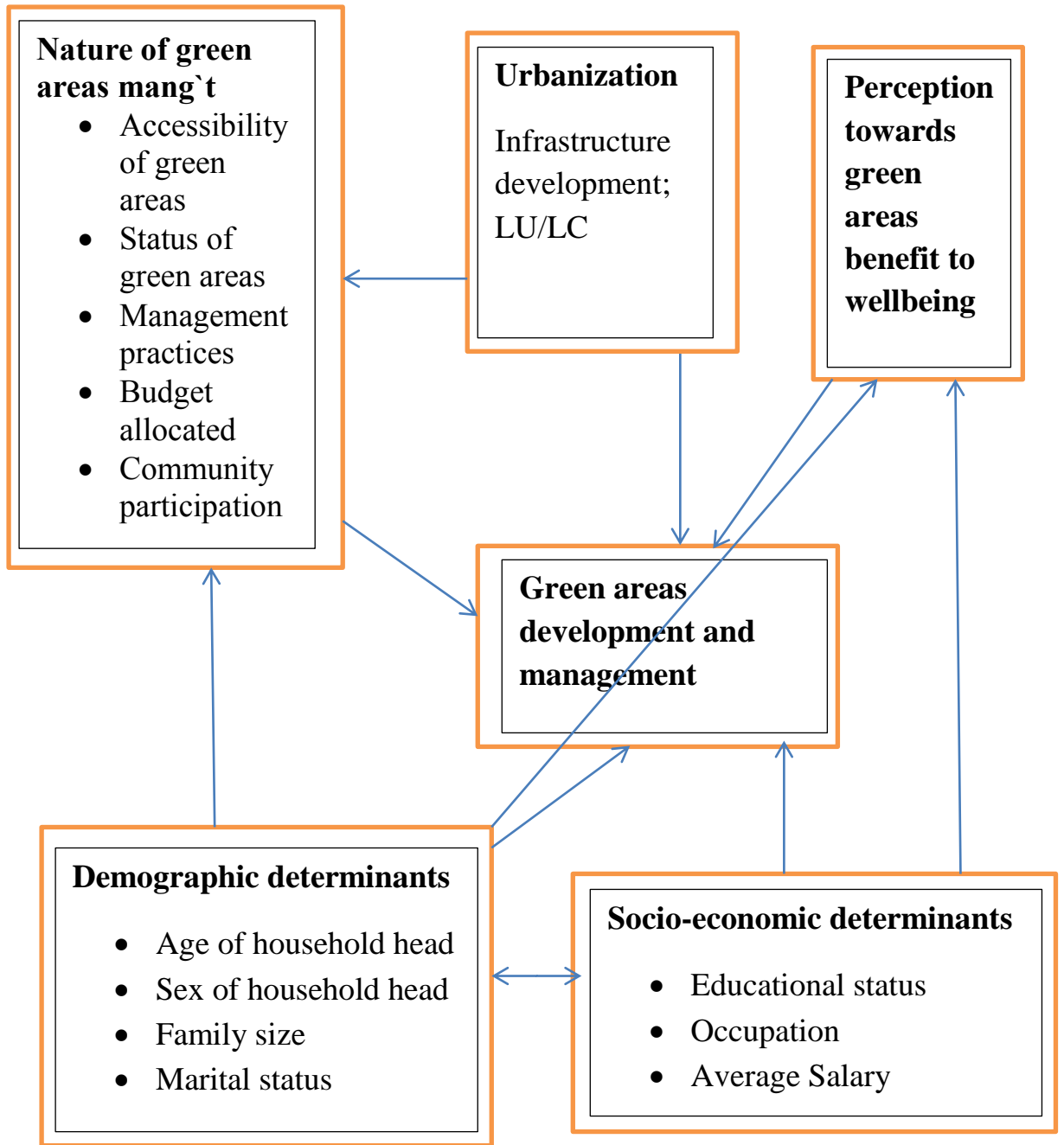
In the context of Ethiopia, in Addis Ababa which is the largest city of the country, 22,000 ha planned to cover with green areas and with total was found to be 30% as only 7% of land is covered from total area of the city (54,000 ha) (Gezahegne, 2014). Green areas management lacked action oriented awareness to enhance community's participation and minimum budget allocation and this limit sustainability of green areas.

Gebeyehu (2014) performed a study as Addis Ababa has experiencing rapid expansion, due to rapid rate of urban growth and dominant urban population in the country, the urbanization process undertaken by deteriorating the urban environment (However rapid population growth in urban areas needs infrastructure development corresponding housing and streets, the situation also figure corresponding well planned green areas to minimize the impact of the changing climate. Due to this fact assessing the contribution of urban green areas to climate change mitigation is crucial mainly in fast growing urban centers like Addis Ababa is important while new constructions taking place including around Rivers.

Similar study done in Bahir Dar (Atalel, 2014), showed an increase expansion of built up areas in the last 25 years from 1.5% in 1986 to 4.1% in 2001 and 9.4% in 2010 at the expense of other land use classes like agricultural land and plantation.

## **2.6. Conceptual Framework**

As shown in the figure 2, the conceptual framework of this study present the relationship between development and management of green areas to nature of management of green areas, urbanization, perception of the community to towards benefit of green areas to wellbeing of the community and beside determinants that affect management of green areas including demographic and socio-economic determinants. The process of urban expansion results from urban development that expressed through industry plantation, and economic growth through infrastructure development causes land cover change. Moreover, nature of management practices of green areas affects development and management of green areas. Perception of the community towards benefit of green areas to wellbeing of the community determine by their demographic and socio-economic status also link with nature of management of green areas and overall development and management of green areas.

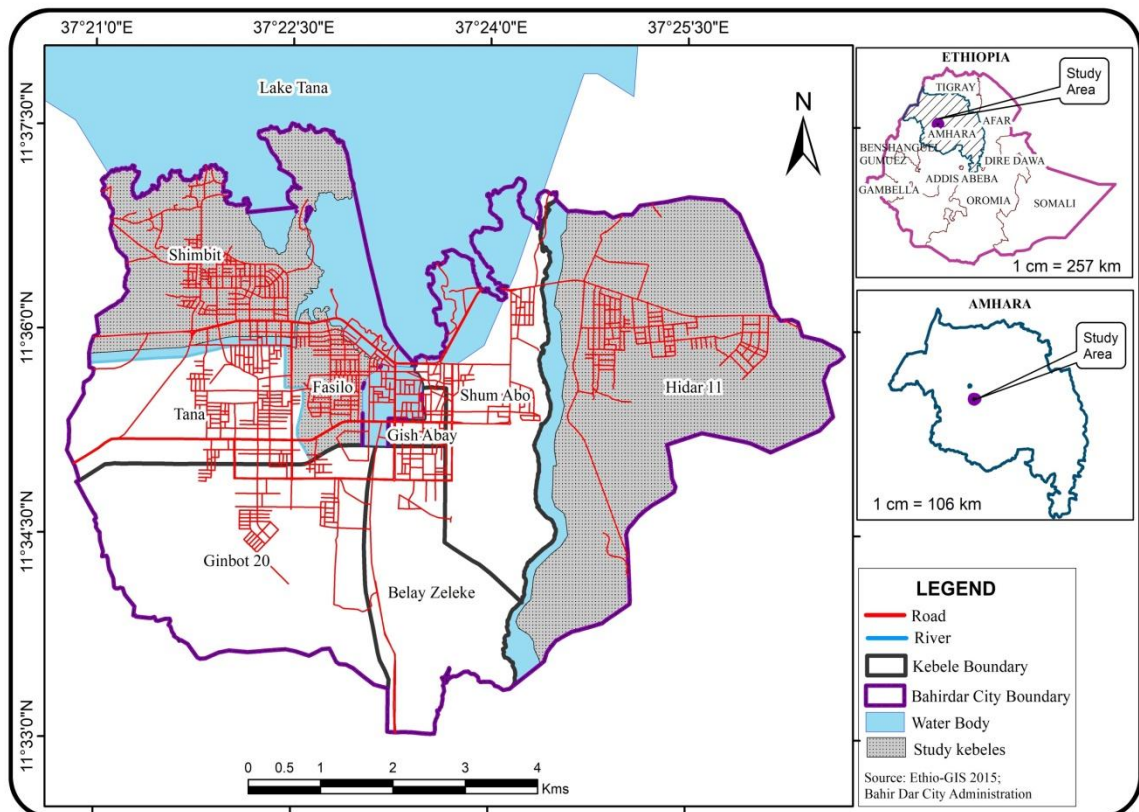


**Figure 2:** Conceptual Framework of the study

## CHAPTER 3: RESEARCH METHOD

### 3.1. Description of the study area

The study was conducted in Bahir Dar City which is located in the Northwestern part of Ethiopia. It is located at 565km from Addis Ababa, the capital city of Ethiopia. The city is situated on southern shore of Lake Tana, source of Blue Nile River. In its astronomical location, Bahr Dar is located at  $11^{\circ}34'27''$  north latitude and  $37^{\circ}21'41''$  east longitude, with the altitudinal range of 1,500m to 1,800m above mean sea level. Bahir Dar is the capital of Amhara National Regional State. It was awarded the UNESCO peace price for addressing challenges of rapid urbanization in 2002 (Abel, 2012).



**Figure 3:** Location Map of the Study Area

Bahir Dar has a subtropical highland climate that expressed as very warm afternoon temperature and cool temperature at the morning. The average maximum temperature ranges between  $25^{\circ}\text{C}$  to  $32^{\circ}\text{C}$  and the average minimum temperature varies between  $8^{\circ}\text{C}$  and  $13^{\circ}\text{C}$ . The mean monthly maximum temperature in the study area is  $32^{\circ}\text{C}$  in April and May. Similarly, the mean monthly minimum temperature is  $11.3^{\circ}\text{C}$  while

the mean maximum temperature is 28.8°C. The annual mean temperature of Bahr Dar City is 20.05°C. Additionally, mean monthly precipitation also varies from 2mm in January and February to 396mm in July. The average rainfall is 1,416mm per year, with the major rainy season occurring between June and September (BDCAO).

According to the data from CSA (2013) population projection, the population of Bahir Dar City was 362,297 in July 2017, of which about 50.04% were male and the remaining 49.96% was female population. Of the total population in Bahr Dar, about 48,300 (13.33%) were found to be living in rural kebeles around the city in July 2017.

### **Rational for selecting the study area**

Urban green areas refers to spaces that are located in the urban web which include urban forest, river buffer vegetation, recreational parks, avenues of trees and other garden area. The researcher personal observation also discovered that urban green areas have problems associated with their planning, development and management within Bahir Dar City. Bahir Dar that is tourist city and capital of Amhara Regional state categorized under second larger cities of Ethiopia, which has rapid urbanization rate. Moreover, the city has image of green nature of palm trees. Thus, urban green area management is an important planning issue that needs to be researched in order to assess the nature and dynamics of status and factors for the development and management of this area.

### **3.2. Research design and approach**

The study employed retrospective-cross-sectional research design. This is because retrospectively, the research was looking into the spatiotemporal land-use/land-cover (LULC) changes quantitatively to investigate the impact of urbanization on green areas for the last 31 years. In this case, the satellite images of three periods (1986, 2000 and 2016) was taken and analyzed by using GIS and RS techniques. On the other hand, the data related to determinants of communal green areas management and perception of respondents towards green areas benefit to community in Bahr Dar was taken only during the survey time which is said to be cross-sectional design.

### 3.3. Data types and sources

Both primary and secondary data used in order to collect the important data to meet the objectives of the study. Primary data obtained through key informant interview, focus group discussion, household survey and field observation. This study carried out with an integrated approach using RS and GIS techniques together with KII-based qualitative data in order to look into historical dynamics urban of green areas in Bahr Dar City and nature of management practices of urban green areas. In addition to this perception of households towards benefit of green areas and factors affecting households decision to green areas management assessed based on data obtained from household survey.

Three series of land sat images (1986, 2000, and 2016) of Bahir Dar City obtained from Earth Explorer (<http://earthexplorer.usgs.gov>) Landsat imageries Landsat 8 of TM and OLI was employed and acquired in the same season and the same level of resolution for the periods 1986, 2000 and 2016. The aim of using three series image is to show the level and intensity of LULC changes of urban green areas owing to urban expansion and conversion of urban green areas in to other land uses such as settlement areas, road, transport stations, recreation areas and other urban buildup areas.

**Household Survey:** To collect data from the respondents this study used survey questionnaire. Both closed and open ended types of survey questionnaire used to investigate the study. The reason for using such survey questionnaires is easy to administer, less expensive, help to get firsthand information from the respondents. The researcher developed the questionnaire in English and translated into Amharic language. Prior to data collection, three enumerators who have trained on the administration of the questionnaire and recruited. The household survey questionnaire characterized with themes of demographic and socio-economic characteristics of respondents, nature and accessibility of green areas, perception towards green areas benefit and factors affecting green areas development and management. Basic information was gathered and quantitative data which used for computing statistical model was obtained from this instrument.

**Interview of Key Informants:** This employed to make sure how far it is reliable the study conducted in depth key informant. The key informants were the heads of urban

planning office, city sanitation beautification and green area development land development and management office, of Bahir Dar city administrative and three key informants were interviewed during data collection period. The interviews made with the key informants was more valuable and provides numerous data about the green areas management at general level, and about the specific issues stated on the semi structured interview format. The checklist prepared includes issues like status and nature of development and management of green areas.

**Focus group discussion:** The aim of group discussions held in this research was to distinguish informants or participant's attitudes and experiences about the urban green areas development and management to generate general understanding. The two group discussion was including participants who have been visiting green areas and participating in green areas management by considering different age and sex group (to maintain age and gender balance). A checklist was used to guide the focus group discussions. The researcher's role here was to facilitate the discussion and to motivate the participants to express their ideas, perceptions and experiences freely regarding the issues under study. Participants explained nature of green areas in the study areas and factors that affect green areas management.

**Field observation:** observation that conducted by the researcher in order to characterize and understand the physical or spatial condition of the study area and crosscheck and add to the data obtained through other methods of data collection. This method applied to observe the various impacts of urban expansion especially, its impact on green areas development and management in the study area.

The secondary data collected from different resources like published and unpublished materials, books, journals, articles, reports from City Sanitation Beautification and Green Areas Development and Management office at different time, and e-resources. Documents from Bahir Dar Urban Development Housing and Construction Office, Central Statistical Agency (CSA), National Metrological Agency (NMA) and Environmental Protection Agency reviewed.

### **3.4. Sampling Technique**

Bahir Dar city Administrative Office data indicated that Bahir Dar city expand in all direction except the northern part due to the presence of Lake Tana. In order to understand determinants of green area management in dynamics of urbanization of

the city, three sub-cities that means Hidar 11, Fasilo and Shimbt selected using simple random sampling method from the total of 9 sub cities. Finally using the calculated sample size, all randomly selected sub-cities were included in the study with their total number of households. The total number of sample size for each sub-city were calculated using probability proportional to their size According to CSA, (2007), Hidar 11 Sub-City has a population of and 16,221 households, 19,000 in Fasilo and 18,973 in Shimbt sub-city respectively.

For populations that are large, Cochran (1977) developed the equation. Based on this to determine sample size the researcher used formulas as following. The study conducted at household's level:

$$n_0 = \frac{z^2 pq}{d^2} \rightarrow n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where;  $n_0$  is the sample size,  $Z^2$  is the abscissa of the normal curve that cuts off an area at the tails ( $1 - \alpha$  equals the desired confidence level, 95%) 1.96.,  $p$  is the estimated proportion of an attribute that is present in the population, and is 0.1 (proportion of the population to be included in the sample i.e. 10%)  $q$  is  $1-p$ .  $1-0.1$  i.e. (0.9),  $N$  is total number of population and  $d$  is the desired level of precision (0.05). To estimate the sample size

$$n_0 = \frac{(1.96)^2 \times 0.1 \times 0.9}{(0.05)^2}$$

$$n_0 = 138.298$$

$$n = \frac{138.298}{1 + \frac{138.2976 - 1}{54,194}}$$

$$n = 138$$

Accordingly 138 respondents selected by using scientific statistical method. According to the formula the sample size is determined with some degree of precision for general population. Respondents selected for all three sub cities by using proportional to size consequently, 41 households are selected from Hidar 11, 49 from

Fasilo and 48 Shimbt. In order to selecting household, systematic random sampling technique employed to make population free of bias.

### **3.5. Data analysis**

Data analysis made to put together and fit the data collected from different sources, using various data collection techniques to the need of research objectives

#### **Land-use /cover analysis and classification of Bahir Dar city**

In order to achieve one of the main objectives of the study which is to assess land use change, Landsat Thematic Mapper image of 1986, Enhanced Thematic Mapper plus (ETM+) image of 1986, 2000 and 2016 processed by using Arc GIS software. Prior to the main data analysis, pre-processing applied to correct image data for distortion or degradation and also to increase image`s readability.

#### **Survey Data Analysis**

Primary data obtained from survey questionnaires, key informant interview and assessment of the researcher used to explain issues related to the status and challenges of urban green areas. Qualitative data analysis exploited to explain qualitative data in word data that collect from, observation and interview. The perception of community to green areas development and management analysed qualitatively.

Quantitative data analysed by descriptive statistics and inferential statistics. Descriptive statistics, such as mean, minimum, maximum, standard deviation, table, frequency, and percentage. Inferential statistics such as regression employed to analyse the factors affecting green areas development and management. Binary regression model is used to estimate the relationship between factors affecting green areas development and management. Quantitative data obtained through survey questionnaire were edited, coded, cleaned and entered into computer for analysis using SPSS statistical software. Then, the data were imported into STATA 13. Analysis was done using STATA 13. The analysis part was conducted using both descriptive and econometric analysis. Binary logit, were employed using STATA 13. Moreover, secondary data obtained from various data sources organized and analysed to complement the survey results.

### 3.6. Model Specification

For the third objective which is about factors affecting households decision to green area management were under seen by binary logit model. Binary logistic regression model were employed and the dependent variable is dichotomous with two values, 1 for if the household manage green areas and 0 for not engaged in green area management. According to Gujarati (2004), binary logistic regression model to analyse the decision to manage communal green areas can be explained as following;

$$p_i = E\left(Y = \frac{1}{x_i}\right) = \frac{1}{1+e^{-(\beta_1+\beta_2 X_i)}} \quad (1)$$

Where equation 1 is logistic distribution equation

Let consider,  $Z_i = \beta_1 + \beta_2 x_i$  or replaced by  $Z_i$  in the first equation, then we obtained equation,

$$p_i = \frac{1}{1+e^{-z_i}} = \frac{e^{z_i}}{1+e^{z_i}} \quad (2)$$

$Z_i$  is between  $-\infty$  and  $+\infty$ , and  $p_i$  is between 1 and 0. Where  $P_i$  shows the probability that household manage green areas,  $X_i$  is the explanatory variables,  $i$  is the possibility of green area management and household that did not manage green areas. (where  $p_i$  equal to one the probability that households green area management and  $1-P_i$  the probability that household did not manage green areas.

$1 - P_i$  Then, the possibility of management of green areas can be explained as in equation 3 as follows:

$$1 - P_i = \frac{1}{1+e^{z_i}} \quad (3)$$

Equation 4 is obtained by dividing by probability of decision to green area management

$$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i} \quad (4)$$

When the natural logarithm of both sides of the equation is written, equation 5 is obtained:

$$Li = \ln\left(\frac{p_i}{1-p_i}\right) = Z_i = \beta_1 + \beta_2 x_i \quad (5)$$

Thus, non-linear logistic regression model is liberalized based on both its parameters and variables. “L” is called “logit” and this model is called logit model.

When there are more than one independent variable,  $(x_1, x_2 \dots x_k)$ , the equation becomes:

$$P_i = \epsilon \left( Y = \frac{1}{x_i} = \frac{1}{1 + e^{-(\beta_1 + \beta_2 x_1 + \beta_3 x_2 + \dots + \beta_k x_k)}} \right) \quad (6)$$

If the disturbance term  $U_i$  is considered the general logit model becomes

$$Z_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_n x_n + U_i \quad (7)$$

Where  $\beta_0$  an intercept,  $\beta_1$  are coefficients for the independent variables,  $x_i$ s are socioeconomic characteristics and  $U_i$  is error term

Whereby; decision of households engaged in green areas management is represented as follow:

$$Y(x) = [1 \text{ if } \textit{participate in green area management}, 0 \text{ other wise}]$$

If the error term ( $U_i$ ) is brought in, the Logit model becomes:

$$Z_i = \beta_0 + \beta_1 \text{age} + \beta_2 \text{marital status} + \beta_3 \text{houshold average income} + \beta_4 \text{sufficiency of number of green areas} + \beta_5 \text{accessibility of green areas} + \beta_6 \text{participation in tree planting campaign} + \beta_7 \text{sufficiency of budget allocated to green areas management} + \beta_8 \text{hours to reach the nearest green area from resident} \quad (8)$$

### Selected Explanatory Variables

Based on the available literature, the following independent variables are hypothesized to influence the green area development and management.

**Table 1 :** Expected Sign of Explanatory Variables Hypothesized Variables

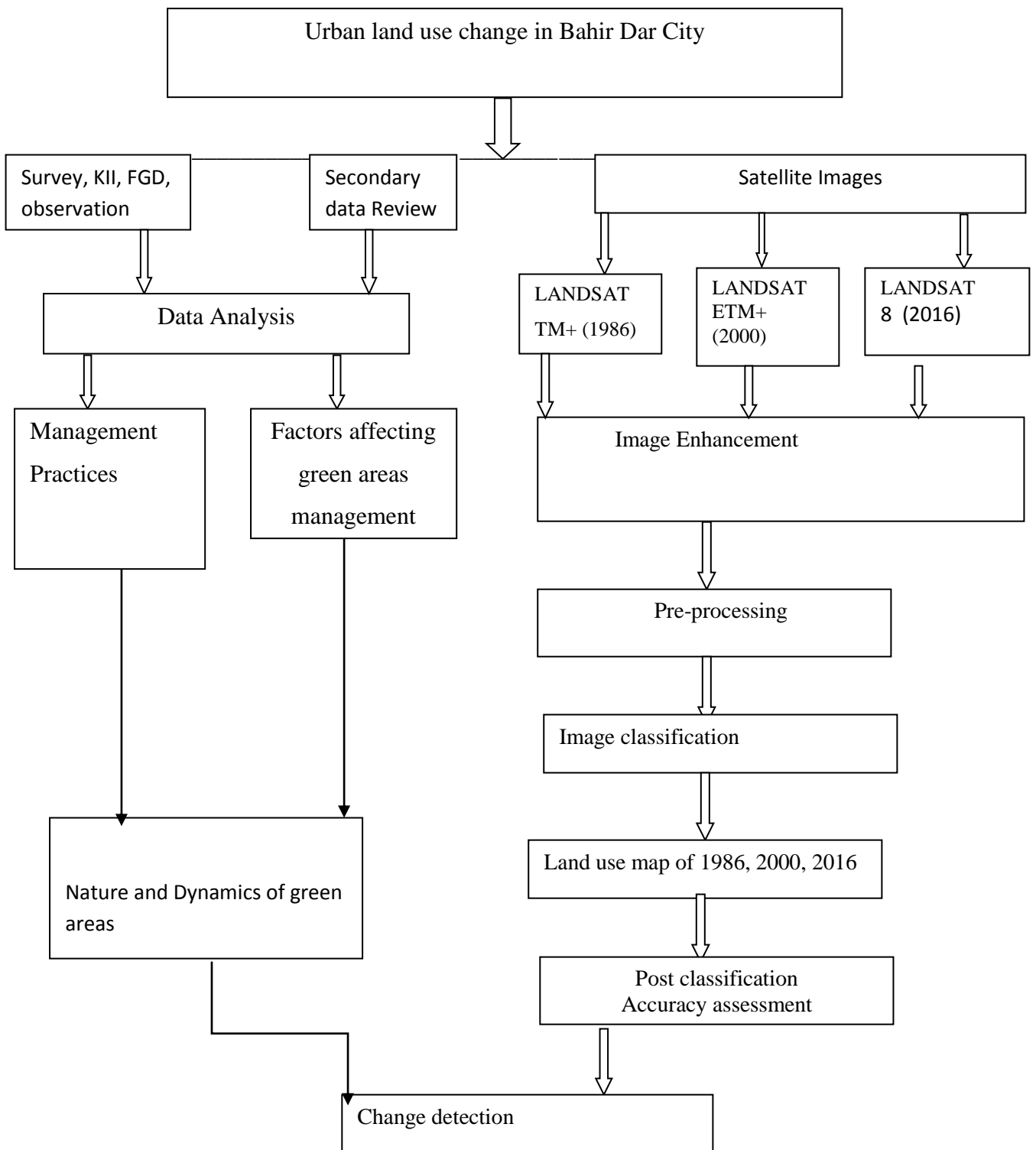
Explanatory variables	Nature of Variable	Expected Effect	Literature
Age of the household Head (Year)	Continuous	-	Aziz, (2012) and Akdeniz & Celik, (2017)
Marital Status	Categorical	-	Aziz, (2012)
Average income	Continuous	-	Aziz, (2012)
Educational status	Categorical	+	Rajib et al, (2015)
Occupation status	Categorical	-	Yeshewazerf, (2017)
Family size (Number)	Contentious	-	Aziz, (2012) and Waweru, (2014)
Sufficient no of green areas	Dummy	+	Annika, (2011)
Accessibility of green	Dummy	+	Somajita & Harini, (2017) and Annika, (2011)
Hour to reach the	Dummy	-	Aziz, (2012), Sari, (2009)

nearest green area Responsibility to manage green areas	Dummy	+	and Annika, (2011) Yeshewazerf, (2017)
Participation in tree planting campaign	Dummy	+	Ali, (2007)
Status of population Policy	Dummy	-	Justine, (2010)
implementation	Dummy	+	Ali, (2007)
Budget allocated	Dummy	+	Akola (2007) and Ketsela, (2016)
Workers motivation	Dummy	+	Ketsela, (2016) and Yeshewazerf, (2017)
Awareness	Dummy	+	Ketsela, (2016)
Stakeholders collaboration	Dummy	+	Azadi et al., (2017) and Kristin, (2014)

**Table 2:** General description of research methodology

General description of research methodology

Objectives	Type of Data	Source of data	Data analysis
Nature and dynamics of green areas	Both Qualitative and Quantitative	Geo-Spatial Field observation	Arc GIS
Perception of the Community to benefit of green areas to well-being	Qualitative	Questioner KII	Qualitative description of
Determinants of green areas development and management	Both Qualitative and Quantitative	House hold survey, KII Field Observation	Inferential statistical method such as Regression



**Figure 4:** General methodology flow of the study

## CHAPTER 4: RESULT AND DISCUSSION

The result and discussion part of the study displayed in this chapter in the descriptive and econometric analysis. Spatio-temporal data interpreted to show the extent of change of land use classes. Perception of respondents analysed descriptively. Binary logit model employed to identify the factors affecting green area management in the study area.

### 4.1. Demographic characteristics of respondents

From the collected sample data, household characteristics, namely sex, age, marital status, family size, educational status and income level were believed to influence the issues related to green area development and management. These household characteristics were assessed and the result was presented in Table 2 and Table 3. Accordingly, the majority of the respondents were male, 87.68 % and 12.32 %. And, 88.41 % of the respondents were married. The mean of age of respondents is 45.522 with minimum of 26 and maximum of 78. The average family size was 5.62 while the minimum and the maximum household size were 2 and 12 respectively.

**Table 3:** Demographic Characteristic of Respondents

<b>Sex of respondents</b>		Frequency	Percent		
Male		121	87.68		
Female		17	12.32		
Total		138	100.00		
<b>Marital status of respondents</b>					
Married		122	88.41		
Divorced		13	9.42		
Widowed		3	2.17		
Total		138	100		
Variable	Observation	Mean	Standard deviation	Minimum	Maximum
<b>Age of respondents</b>	138	45.522	11.051	26	78
<b>Family size</b>	138	5.616	2.216	2	12

Source: Own survey, 2018

Similarly, Table 3 shows that 44.20 % of the respondents in the selected sub cities were Degree holders and above. And from a total of 138 observations 28.89% of the respondents were self-employed. Besides, the mean of average salary of respondents is 5330.21 Birr/month.

**Table 4:** Socio-economic characteristics of respondents

<b>Educational status of respondents</b>	Sub city of respondents			Total	percent
	Fasilo	Hidar 11	Shimbt		
Illiterate	1	3	0	4	2.89
Read and write	0	1	1	2	1.44
Primary education	4	1	3	8	5.79
Secondary education	9	6	12	27	19.56
College diploma	11	15	10	36	26.08
Degree and above	24	15	22	61	44.20
<b>Total</b>	<b>49</b>	<b>41</b>	<b>48</b>	<b>138</b>	<b>100</b>

<b>Occupational status of respondents</b>	Fasilo	Hidar 11	Shimbt	Total	percent
Part time employed	2	1	1	4	2.89
Full time employed	8	9	12	29	21.01
Self employed	13	13	14	40	28.98
Government employed	15	10	8	33	23.91
Non-government employed	0	0	1	1	0.72
Family business	7	4	5	16	11.59
House wife	4	4	4	14	10.14
Remittance		0	1	1	0.72
<b>Total</b>	<b>49</b>	<b>41</b>	<b>48</b>	<b>138</b>	<b>100</b>

Variable	Observations	Mean	Standard deviation	Minimum	maximum
Average salary of respondents	138	53	30.21	900	15000
		34	18.16		

Source: Own survey 2018

The following table indicates the frequency and percentage of respondent's independent variable which is management of communal green areas. Regarding to this 41.30% of respondents manages communal green areas and the remaining 58.70% of respondents don't manage communal green areas.

**T/able 5:** Respondents response to communal green area management

Do you manage communal green areas?	Frequency	Percent
Yes	57	41.30
No	81	58.70
Total	138	100.00

Source: Own survey 2018

#### **4.2. Nature of green areas in Bahir Dar city**

Green areas development and management in Bahir Dar was assessed by considering the nature of green areas. Participants in focus group discussion raise issues that express the nature of green areas in Bahir Dar. Availability of green areas, status of green areas and hours to reach the nearest green area mentioned as indicators to show accessibility of green areas and accessibility of green areas may have association to green areas management. The response of sample respondents indicated that majority of respondents, 91.30%, answered no for sufficiency of number of green areas in their sub-city. Regarding to distribution of green areas focus group discussion participants said that, the city administrators perceived benefit of green areas as a way to emphasize Bahir Dar as a tourist city than its benefit to the local community and based on this distribution of green areas focused on middle part of city and development of green areas in other side have less focus.

Most visitors of green areas interviewed for the purpose of this study said that, green areas are concentrated on the lake Tana side and this shows that green areas serve as source of income for the city and other part of the city may not have sufficient number as the middle one. Green areas are not justly distributed and stratified based on socio economy of urbanities, socio political factors and geographical factors. Uneven distribution of urban green areas among the community regarded as environmental injustice (Wolch, Byrne and Newell 2014).

**Table 6:** Sufficiency of number of green areas

Sub-city of respondents	Do you think that the number of green areas is sufficient in quantity?		
	Frequency Yes	Frequency No	Total
Fasilo	7	42	49
Hidar 11	3	38	41
Shimbt	2	46	48
Total	12	126	138
Percent	8.69	91.30	100.00

Source: Own survey 2018

For the overall status of green areas that categorized as good status, medium status and not good status, majority of respondents 46.37% answered that green areas have medium status while 45.65% of respondents said that green areas are not in good status. Issues raised during focus group discussion support this result, communal green areas located on Hidar 11 and Shimbt Sub-city are not well managed, emphasis given for only planting trees than other form of green spaces and in some green areas around the lake, street children are living and also drug addicted youth spend their time in green areas and this is challenging the status of green areas.

**Table 7:** The Status of green areas

Sub-city of respondents	How do you evaluate the status of green areas in the sub-city			
	Good	Medium	Not good	Total
Fasilo	7	23	19	49
Hidar 11	2	18	21	41
Shimbt	2	23	23	48
Total	11	64	63	138
Percent	7.97	46.37	45.65	100.00

Source: Own survey 2018

Majority of respondents which is about 38.41% takes less than quarter hour to reach their nearest green area on their foot. Studies explain that accessibly to green areas

may be measured by distance to walk to reach the nearest green area from ones resident. Shorter distance from a resident to green areas assumed to increase accessibility of people to green areas as European Environmental Agency (EEA) recommends 15 minute of hour to reach to the nearest green areas on foot and this has an association to management of green areas (Peschardt and Stigsdotter, 2013 as cited by Lidia, 2016).

**Table 8:** Hours to reach the nearest green area

Hours take to reach the nearest green area	Frequency	Percent
Less than quarter hour	53	38.41
Between quarter an hour and half hour	34	24.64
Half hour	33	23.91
More than half hour	18	13.04
Total	138	100.00

Source: Own survey 2018

Majority of respondents which is 45.7% visit green areas weekly (Table 9) and responses in focus group discussion indicated that people are more likely to be frequent visitors if their travel time to green area is less. Moreover the interview with visitors indicated that most people visit green areas occasionally when they have an appointment with someone.

**Table 9:** Frequency of visiting green areas

Frequency of Visiting	Frequency	Percent
No visiting green areas	32	23.2
Weekly	63	45.7
Monthly	18	13.0
Once in three months	11	8.0
Once in six months	8	5.8
Annually	5	3.6
Occasionally	1	0.7
Total	138	100

Source: Own survey 2018

As table 10 shows shortage of time was mentioned as a reason not to visit green areas frequently by the majority of respondents which is 44.9% and 25.4% of respondents agreed up on green areas are not in good condition to visit. In contrast with this idea discussion with focus groups listed some factors that limit the frequency of people to visit green areas. Green areas that are located in villages are not well managed to visit as they are compounded for the purpose of symbol and in most cases solid wastes are dumping inside. Other well managed green areas are located in middle part and somehow they are far from people residents. So, people have a chance to visit those well managed green areas occasionally because it needs both transportation fee and enough time.

**Table 10:** Reasons for not frequently visiting green areas

Reasons not frequently visiting green areas	Frequency	Percent
Shortage of time	62	44.9
Fee for visiting	6	4.3
Transportation cost	17	12.3
Green areas are not in good condition to visit	35	25.4
Cultural barrier	3	2.2
Green areas don't have good management	15	10.9
Total	138	100.0

Source: Own survey 2018

### **4.3. Urbanization and green areas Management**

Now a day's urban areas are expanded because of rapid growth and development. Ethiopia is among developing countries that experience unplanned urbanization that affect different components of urban structure .This enable the country to have several emerging secondary cities with the potential to become the primary one. The study

tried to assess the status of green areas in the context of urbanization of Bahir Dar. Based on this, 56.52% of respondents answered that green area coverage decreased in the context of urbanization of the city.

**Table 11:** green areas coverage in the context of urbanization

Sub-city of respondents	How do you evaluate green areas coverage in the context of urbanization			
	Increased	Decreased	The same	Total
Fasilo	10	27	12	49
Hidar 11	4	22	15	41
Shimbt	6	29	13	48
Total	20	78	40	138
Percent	14.49	56.52	28.98	100.00

Source: Own survey 2018

#### **4.3.1. Patterns and Trends of Green Areas in Bahir Dar**

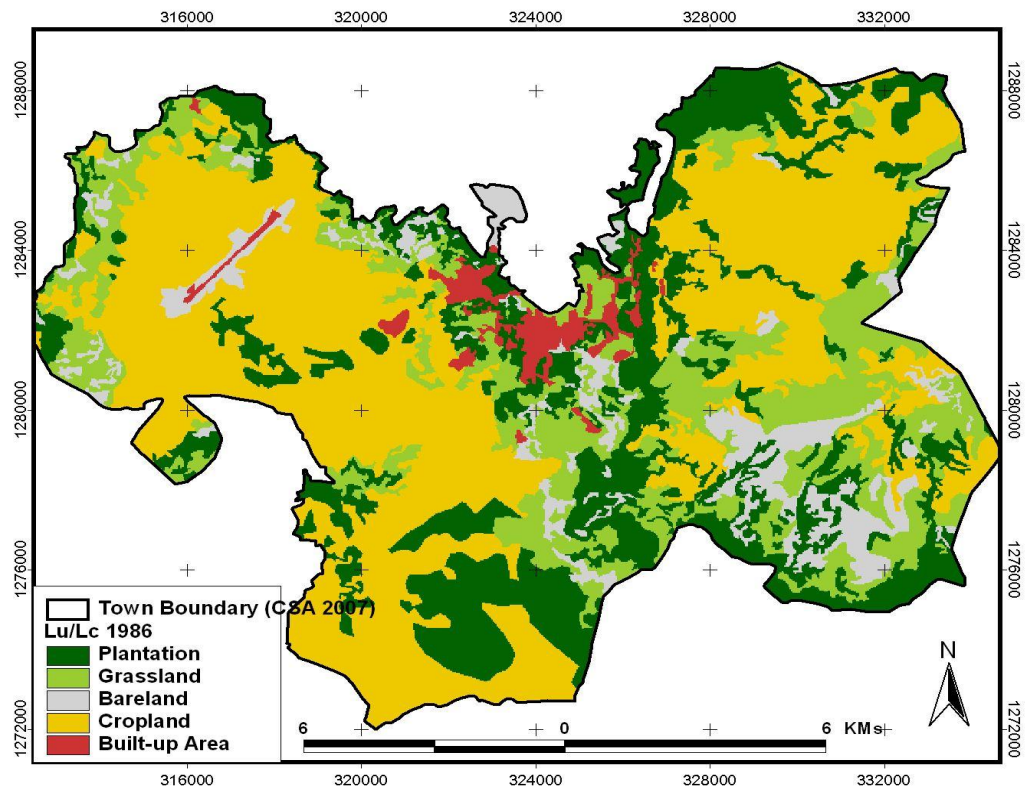
In this section each land use classes including plantation, bare land, crop land, grass land and build up areas summarized to reveal the alteration of land uses with the time of 1986 to 2016 in spatial and temporal pattern.

##### **Spatio- temporal Distribution of Land use/cover**

Each land cover classes generated for the 1986, 2000 and 2016 Landsat images present the distribution of each land use classes in three maps of land use/cover that shows the spatial and temporal distribution. The figure (6) shows built- up area have been covering majority of the study area within the time frame of 1986 to 2016. This implies that other land use classes have been transformed to build up areas through urbanization. Plantation is collected around the river and lake side rather than other edges of the study area.

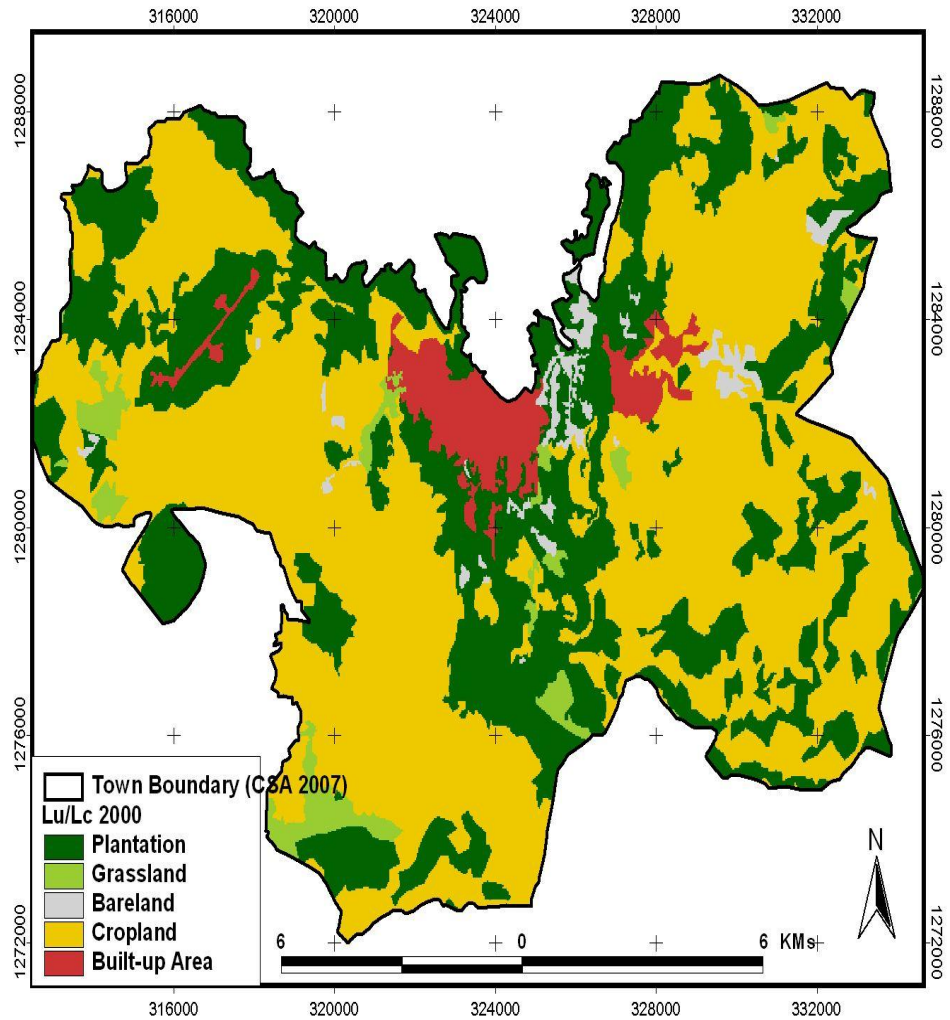
Table 12: Description of Land use/Land cover classes identified in the study area

Land use/cover	Description
Plantation	Areas that covered with dense trees and trees of good ornamental values planted and grown along major roads, institution compounds and hotels
Grass land	All areas covered with natural grass and small shrubs dominated by grass
Crop land	Areas of land prepared for growing agricultural crops and also areas currently under crop and land under preparation
Bare land	Open spaces with little or no vegetation
Built up Areas	Consists construction sites including commercial and transportation infrastructures



**Figure 4:** Land use/Land cover Map of Bahir Dar in 1986 Source: 1986 GLCF for the imaginary land use mapping and analysis (expert assistance).

As the land use/cover map of 1986 and 2000 satellite image is shown in Figure 4 and 5. The area coverage of each land use classes summarized in Table 13 that shows bare land as major land use (45.8%). Moreover the percentage cover of build-up area was 22.3 in 1986 and 2000. The minimal land use was cropland which was about 2.5%.



**Figure 5:** Land use/ cover map of Bahir Dar in 2000

Source: 2000 GLCF for the imaginary, land use mapping and analysis (expert assistance)

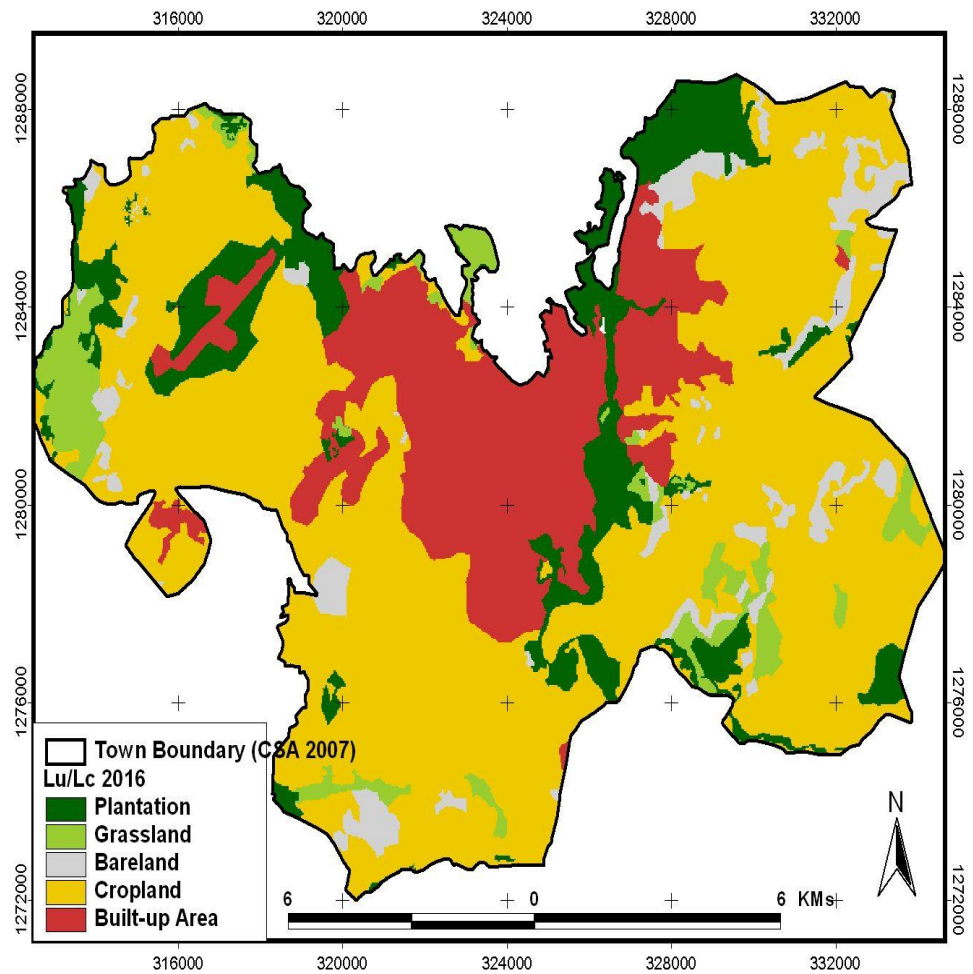


Figure 6: Land use/land cover map of Bahir Dar in 2016

Source: 2016 GLCF for imaginary, land use mapping and analysis (expert assistance).

**Table 13:** Percentage of Land use/Land cover in Bahir Dar during the period of 1986-2016

LU/LC Type	1986		2000		2016	
	ha	%	ha	%	ha	%
Plantation	5453.5	25.1	7417.6	34.2	2501.8	11.5
Grass land	4122.8	19.0	628.5	2.9	1100.9	5.1
Crop land	1682.4	7.8	381.4	1.8	1130.0	5.2
Bare land	9907.0	45.7	12326.4	56.8	12888.9	59.4
Built up areas	530.6	2.4	942.4	4.3	4071.8	18.8
Total	21696	100.0	21696	100.0	21693	100.0

Plantation land cover type has been declining in the time frames of 2000 to 2016 (Table 12). In 1986, 5453.5 ha (25.1%) of the study area was covered by plantation and it increases to 7417.6 ha (34.2%) in 2000. This emphasizes the land use change as because of afforestation programs change other land use classes but during 2016 only 2501.8 ha 11.5% of land is covered with plantation. Beside this, the distribution of plantation concentrated on river bank and along the Lake Tana side.

#### 4.3.2. Expansion of built up areas over Green areas

On account of rapid expansion of urbanization, among the five land use classes, the built up area expands over other land use systems and the change shown in the following tables and graphs.

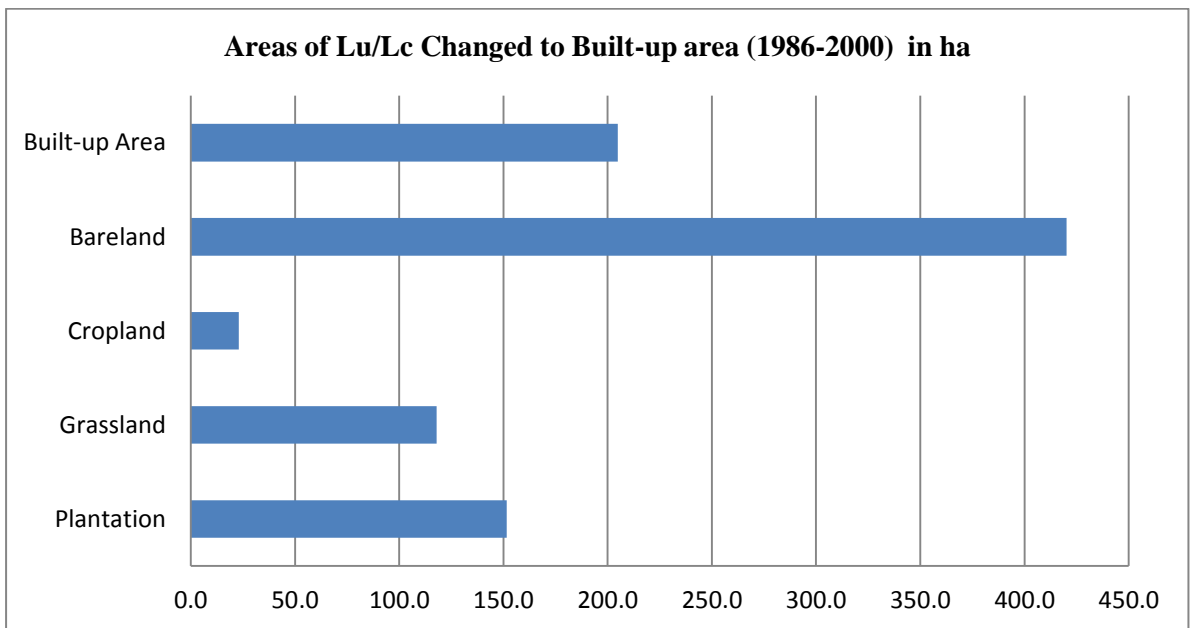
**Table 14:** Percentages of Land use/Land cover change in Bahir Dar during the period 1986- 2016

Lu/Lc Type	Change 1986 -2000		Change 2000 -2015		Change 1986 -2016	
	ha	%	ha	%	ha	%
Plantation	1964.2	36.0	-4915.8	-66.3	-2951.64	-54.1
Grass land	-3494.3	-84.8	472.41	75.2	-3021.93	-73.3
Crop land	-1301.0	-77.3	748.53	196.2	-552.42	-32.8
Bare land	2419.4	24.4	562.5	4.6	2981.88	30.1
Built- up	411.8	77.6	3129.39	332.1	3541.14	667.3
Total 1986	0.0	0.0	-2.97	0.0	-2.97	0.0

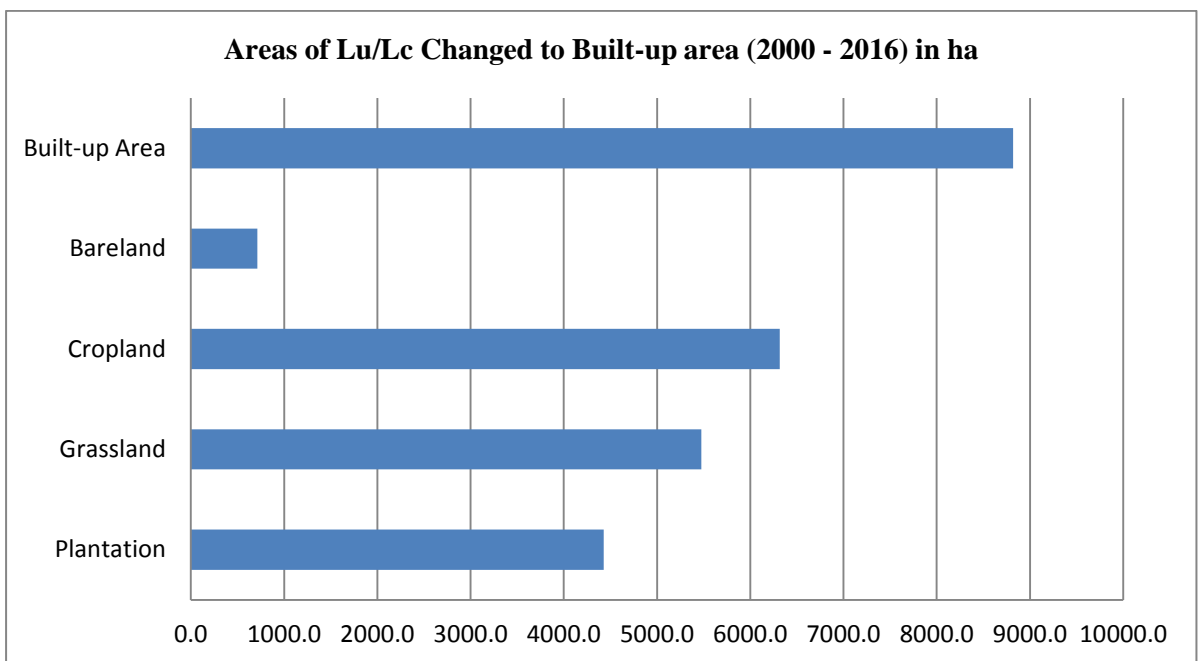
The Percentages of Land use/Land cover change in Bahir Dar during the period 1986, 2000 and 2016 shows negative values that indicates transformation of land use systems to other land use systems, mostly to Built-up areas and bare lands. In comparison with other land use systems, Built-up area and bare land are the land use systems which showed a positive net overall change in the entire three time intervals. This positive net change reveals that there is transformation of other land use systems to bare land and built-up area.

As Table 14 explains, in 1986 Built-up area was smallest land cover which was 530.6 Ha (2.4%); plantation was the next largest land use system next to bare land that covers 4122.8 ha (19.0%). But in 2016 Built-up areas covered the largest land use system with a change of 3541.14 ha (667.3%) than other land uses. Perhaps, grass land use class has a decline trend from 1986 to 2016 and transformed to other land use

class as it was 4122.8 ha (19.0%) in 1986 and while in time interval from 1986 to 2016, a change of -73.3% (-3021.93) was predicted and this land use system has changed to other land use through urbanization process.



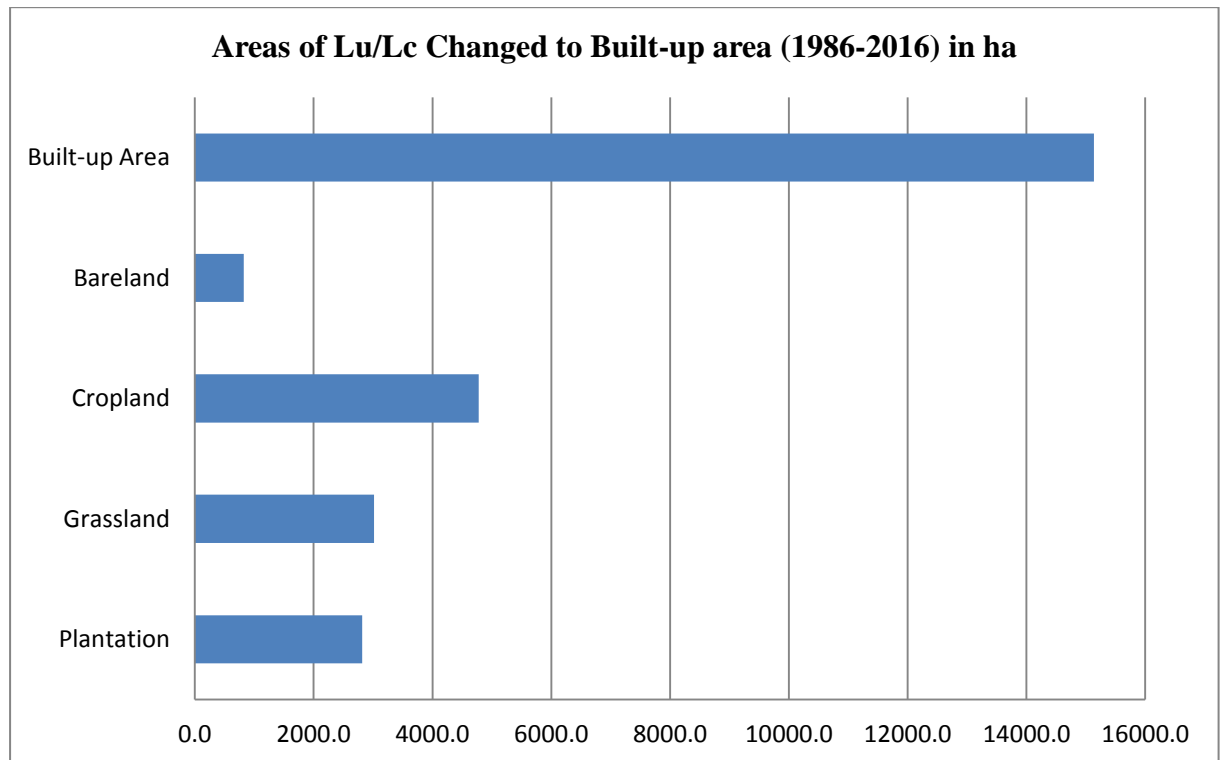
**Figure 7:** Land Use Categories Changed to Built-up Areas (1986-2000)



**Figure 8:** Land Use Categories changed To Built-up Area (2000-2016).

In summary, the land use transformation from all other land use type to built-up areas over the time intervals 1986-2000, 2000-2016, and 1986- 2016 were made. The loss

of area from bare land and built-up area is small in each time interval as compared with losses in other land use classes.



**Figure 9:** Land Use categories Changed to Built-Up Area (1986-2016).

#### **4.4 Benefits of Green Areas to wellbeing as perceived by Sample Respondents**

Green areas in Bahir Dar contribute for wellbeing of the society beside their use for beautification and recreation in the city. Public green areas provide the local community and visitors with opportunities for physical recreation and relaxation, as well as for social interaction. Moreover green areas can have a beneficial impact on mental wellbeing and cognitive function (Wodarczyk, 2007). The study explored how respondents perceive the socio-economic and environmental benefits of green areas. The result of the study shows that majority of respondents perceived as green areas are beneficial for physical and spiritual health (Table 15). Majority of respondents perceived that green areas are beneficial for urban environment.

**Table 15:** Green areas benefit to health as perceived by respondents

Green areas benefit	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Physical health	3.6	3.6	1	13.8	78	100
Spiritual satisfaction	1	2	0	7	90	100
Refreshment	1	2	1	6.5	89.5	100

Source: Own survey 2018

As discussed in the above section, rapid urbanization is altering land use system and this result in distortion of environmental system of urban environment including climate, ecosystem and the whole biodiversity. The results of thesis done by Justine, (2010) have shown that all respondents to the survey were very positive about urban trees, regardless of the type of street they lived on and any socioeconomic variables. Small variations existed between streets, but this was only in the strength of agreement or disagreement. Respondents in the UK rated benefits more highly and problems less highly than respondents in the USA, but overall there were little differences in the responses.

**Table 16:** Green areas benefit to environment as perceived by respondents

Green areas benefit	Strongly disagree	Partially disagree	neutral	Partially agree	Strongly agree	Total
Climate change mitigation	1	2	1	10	86	100
Protect ecosystem	3.6	2.2	1.4	8.7	84.1	100
Protect biodiversity	2.9	0	3.6	16.7	76.8	100

Source: Own survey 2018

Socio economic benefits of green areas have been seen more on public parks that are found around Lake Tana and Abay River. Green areas that are owned by the

community and found in surrounding settlement areas are not characterised as employment opportunity. Majority of respondents' perceived benefit of green areas for wellbeing of the society and ideas raised in focus group interview indicated that all type of green areas should incorporate socio benefits in addition to recreational uses.

**Table 17:** Green areas benefit to socio economy as perceived by respondents

Benefit of green areas	Strongly disagree	Partially disagree	neutral	Partially agree	Strongly agree
Social interaction	1.4	0	2.9	21.7	73.9
Employment opportunity	3.6	6.5	3.6	20.3	65.9
Educational purpose	3.6	5.1	3.6	25.4	62.3

Source: Own survey 2018

The results indicated widespread recognition of environmental benefit of urban green areas and negative response were weakly expressed. Climate change mitigation and environmental benefit were emphasized. Environmental functions focus respondents attention as majority of respondents agreed up on green areas benefit to climate change mitigation, protecting ecosystem and protecting biodiversity.

Respondents are aware about benefits of green areas to the environment including conservation of habitat, species conservation, other natural ecosystem and contribution to mitigate climate change impacts whereas; respondents had limited concern about economical services of green areas. Communal urban green areas did not structured with infrastructures that create job opportunities to earn income. Urban areas support the stabilization of faltering relationships between urban residents and provide a landmark element and point of pride in urban communities. Respondents argue on administrators plan to develop green area to improve the image and character of the city than assuring socio-economic benefit of green areas.

When working in connection with other social benefit issues such as reducing crime, green areas development and improvement offer quick and tangible actions that help redefine and improve lifestyles in urban centers. They revitalize responsible and

friendly interactions of individuals and communities that live in and around cities and towns and especially for youth this helps to refresh and control other evil activities.

#### 4.5. Determinants of Communal Green Areas Management

The study employed binary logistic model to estimate the effect of each hypothesized variables on green areas management.

##### Model Diagnosis Test Results

The validity of regression model have been assessed by the model specification tests for the overall model fit (model goodness of fit), multicollinearity problem and tests for model specification error tests. Multicollinearity were employed before running logistic regression while model goodness of fit and model specification error test (link test) were employed after running logistic regression.

**Table 18:** Model diagnostic test

Tests	Tests name	Factors of green management
Gof	Pearson (chi2)	0.0790
Pwcorr	Multicollinearity	Min= -0.2932 Max= 0.6068
Linktest	Hat sq.	0.362

Source: Computed form own survey (2018)

While running regressions on multiple explanatory variables, there often is the problem of two variables having the same effects on the dependent variable. Multicollinearity occurs when two or more predictors in the model are correlated and provide redundant information about the response. The pair wise correlation tests were employed to test if there is correlation between independent variables. Multicollinearity is a problem when the correlation result is above 0.8 and below - 0.8 (Stock and Watson, 2007). Based on this the coefficient of all variables were found to be above -0.2932 and below 0.6068 (see appendix). Whether the data follow any pattern, or fit a specified or assumed probability distribution. More precisely, we ask: Is there any evidence against the (null) hypothesis that the data are a random sample from a particular distribution. The model goodness of fit tests of the two logistic

equations justified the fact that the models are enough to explain the dependent variables. This is evidenced by the fact that the Pseudo R<sup>2</sup>- statistics of the first model is 0.5022 which lies between 0 and 1 (appendix 4). The result checked that the explanatory variables of the model could explain the dependent variable and these results confirmed that the model was well fitted. Besides, the model goodness fit was tested using prob > chi<sup>2</sup> which found to be 0.0790 which is greater than 0.05 (see appendix 3) which indicates the model was good.

Link test was run to test the model specification error. The null hypothesis is that there is no specification error. If the p-value of hatsq is not significant then we fail to reject the null hypothesis and conclude that our model is correctly specified. So, the value of hatsq in the model was found to be insignificant with p-value of 0.362. This test result confirms that there is no specification error in the model that the study used.

### **Binary Logistic Model Estimation Result**

From variables that was assumed as factors that affect communal green area management, the result of Logistic regression model estimates variables that are significant factor to management of communal green areas in Bahir Dar City, these include age of household head, average salary of household, marital status, sufficiency of green areas, and accessibility of green areas, participation in plantation campaign, sufficiency of budget, stakeholders collaboration and hour to reach the nearest green area.

**Table 19:** Logistic Regression Estimation Result

Management of green areas (yes)	Odds Ratio	Robust Std. Err.	Z	P>z	Marginal effect dy/dx
Age	.9063014	.0303562	-3.27	0.001***	-.0089574
Average income	.9997511	.0001516	-1.68	0.094*	-.0000227
Marital 3=divorce	1.645809	3.075236	0.26	0.795	.0458
Marital 4= widowed	9.030341	9.731482	2.00	0.045**	.2197979
Educational status 2=read and write	.3777899	.4122421	-0.88	0.377	-.0891794
Educational status 3=primary education	.8976544	1.158883	-0.08	0.934	-.0103752
Educational status 4=secondary education	1.079615	1.249638	0.07	0.947	.0074146
Educational status 5=college level	.8468104	1.21584	-0.11	0.909	-.0159391
Occupation 3=full employed	.7099398	.6705288	-0.37	0.715	-.0314076
Occupation 4=self employed	.42117	.3652059	-1.05	0.294	-.0783296
Occupation 7=family business	.3138313	.3810835	-0.97	0.332	-.1040618
Family size	1.269025	.3006231	1.00	0.317	.0216916
Sufficient no. green areas(yes)	.1951637	.2037378	-1.80	0.071*	-.1419194

Accessibility of green areas(yes)	.5529052	.4977793	-0.68	0.495	-.0531852
City administrators responsible (yes)	11.93951	18.86836	1.42	0.157	.2473638
Participation in tree Planting campaign(yes)	43.02647	38.93955	6.40	0.000***	.4506295
Population pressure on green areas(yes)	1.172362	.9875674	0.19	0.850	.0144724
Low policy implementation green(yes)	.669777	.6267088	-0.42	0.678	-.0371838
Sufficient budget allocation(yes)	.3018599	.2091898	-1.86	0.063*	-.1016482
Workers motivated(yes)	.4334082	.311518	-1.27	0.206	-.0737055
Awareness creation by administrative(yes)	.7163019	.5681469	-0.43	0.666	-.0300263
Good management of green areas (yes)	5.117681	4.96574	1.59	0.112	.1627085
Stakeholders collaboration (yes)	.1911	.1885777	-1.83	0.067*	.1385436
Low awareness on green area mgmt.(yes)	.7142909	.4387716	-0.56	0.575	-.0305414
Low community awareness on green area mgmt.(yes)	.6722785	.6085566	-0.44	0.661	-.036679
Hour to reach the nearest green area ( 2= <1/2 hour)	.9534578	.9233745	-0.05	0.961	-.0044495
Hour to reach the nearest green area ( 3=1/2 hour)	.1989178	.161611	-1.89	0.059*	-.1399655
Hour to reach the nearest green area (4=>1/2 hour)	.7855415	.744804	-0.26	0.799	-.0223972
cons	18.9926	48.4836	1.15	0.249	

NB: \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

Computed form own survey (2018) (\*\*) dy/dx is for discrete change of dummy variable from 0 to 1 Source: computed from own survey (2017)

**Age of Household head:** The marginal effect shows that there is a negative relationship between age of household head and likelihood of management of communal green areas in Bahir Dar. This indicates that when the age of household head increased by one year, the probability of the decision of the household to green areas management decreased by 0.895%. In addition to this the odds ratio result explains the probability of green area management decrease with 0.906 times in negative significant association with age of household head. When people become younger, they have more chance to move the house and visiting and managing communal green areas than older household heads. The result is inconsistent with a research conducted by Aziz, (2012), logistic regression modelling indicated significant differences in probabilities of using and managing communal green areas in terms of age groups.

**Income:** For average income of household, marginal effect value of average income of household shows the negative relationship of decision to communal green areas management and household`s average income. In keeping other factors constant, the

probability of decision to communal green areas management decrease at 0.0022% when average income of household increase by one additional birr. Households with high annual income found to decide more to manage communal green areas than those households with lower average monthly income. This has an implication that people become busy to administer their own business when they have more income than others. The odds ratio value also explains the probability of green area management that decrease with 0.999 times in high average income of household. Previous study conducted by Ali (2007), revealed similar result that participation in environmental concerns like tree plantation was factor for green management system.

**Marital status:** The relationship between marital status of household head and decision to communal green area management has become positive and significant at 5% level of significance with odds ratio value of 9.030. The odds ratio indicates that the probability of communal green areas management increases by 9.030 times. Marginal effect with value of 0.219 implies that, keeping other factors constant, as the marital status of household head becoming unmarried increased by one additional unit increase the decision to communal green areas management at 21.9%. This might be due to unmarried household heads decide by themselves than married ones as they decide without any influence and take responsibilities to their households. This result is in harmony with finding of Aziz (2012) which found marital status was important factor in green area management.

**Sufficiency of number of green areas available:** The relation between sufficiency's of number of green areas available has shown a significant and negative relationship with the decision to communal green areas management with the odds ratio and p-value of 0.195 and 0.071 respectively. The odds ratio indicates that the likelihood of decision to communal green areas management decreases by 0.195 times for one green area increment in green areas. The marginal effect of sufficiency of green areas on the decision to communal green area management with a value of 0.1419 indicates that, keeping other factors constant, as number of green areas increases by one the likelihood to manage green areas decrease by 14.19%. This is because as the number of green areas increases and people perceive as this number is sufficient they give less attention to management of communal green areas, so with large number of green areas in the sub-city households don't tend to manage green areas. Previous study

done by Annika (2011) indicated similar result as available number of green area determines management of communal green areas.

**Participation in tree plantation campaign:** The household's participation in tree plantation campaign were found to be a positive and statistically significant factor that determines decision to management of communal green areas. This variable has p-value, odd ratio and marginal effect of 0.000, 43.023 and 0.4506 respectively. The odd ratio of 43.023 shows that, the probability of decision to management of communal green area increased by 43.023 times for additional participation. The marginal effect of 0.4506 also indicates that the probability of decision to green areas management increases by 45.06% relatively as one more participation in tree planting campaign. This is for the reason that, households that participate in tree plantation campaign aware more about benefit of managing communal green areas and have more motivation to manage green areas than those who do not participate in tree plantation campaign in the sub-city. The result is harmony with Ali (2007), concern to environment determine green area management.

**Sufficiency of budget allocated:** Budget allocated to communal green areas management was found a significant factor in determining household's decision to green areas management with p-value of 0.063 at 10% significant level and odds ratio of 0.3019. The odds ratio of 0.3019 indicates that the probability of decision to communal green area management decreases by 0.3019 times for one additional unit of budget allocate to green areas management. The marginal effect of 0.1016 reveals that keeping other factors constant, the probability of decision to communal green areas management decreases by 10.16% for one increment in the allocation of budget for communal green areas management. As people observing the budget allocate for green area management is sufficient, households might have less inspection to management of communal green areas, and starts to wait administrative to implement budget allocation. This finding is in consistent with previous study by Akola, (2007) and Ketsela, (2016) that found budget allocation was determinant to communal green area management.

**Stakeholder's collaboration:** The collaboration of stakeholders was positively and significantly related with management of communal green area with p-value of 0.067 at 10% significant level and odds ratio of 0.191. The odds ratio result indicates that the likelihood of managing green areas for households that insight good stakeholders

collaboration increased by 0.191 times than others. The marginal effect of this variable is 0.1389 implying that the probability of managing communal green area increased by 13.89% as compared to those with an insight of stakeholders collaboration. This is because influential role of the City Sanitation Beautification and Green Area Management Office and society should also be considered since most of green space projects are non-profit oriented. The state influences urban green space development and management by providing a legal framework, empowering people, coordinating their various interests, and controlling over project implementation and management. In addition, society involvement contributes to a positive cognitive image and ends up with the establishment of a belonging sense which is important in creating and monitoring.

Similar study by Azadi et al., (2017) and Kristin, (2014) indicates that the main indicators which significantly influence urban green space performance are state, society, implementation, and regulation. The study concluded that the state plays a critical role in the urban green area development and management though it is not the only actor.

**Hour to reach the nearest green area:** The relationship between household's decision to communal green area management and hour to reach the nearest green area from their resident found that statistically significant at and negative relationship. The result shows, p-value 0.059 at 10% significant level, odds ratio and marginal effect of 0.198 and 0.1399 respectively. The marginal effect indicates that the probability to decision for management of communal green area decrease by 13.99%. And also the odds ratio shows the probability of decision to management of green area decrease by 0.198 times than households which have green area that is near to their resident. Previous study by Aziz, (2012) and Sari, (2009) and Annika, (2011) indicates similar finding, distance from resident is an important factor that explain management of communal green areas.

#### **4.6. Green Area Development and management Practices in Bahir Dar**

The study found that, green area management in the study area was divided in to urban green area development and management and Abay millennium park management. Based on new urban planning policy of Ministry of Urban Development, Housing and Construction, from total area of the city 40% for build-up

area, 30% for green area and 30% set for infrastructure from total area of the city (Manual for Recreational Parks Development and Development and Management, 2015). Bahir Dar is covering 26% of total area of the city with green areas and green area management includes four types of green areas, Public Park, community parks, road side green areas and green areas in institutions and around residential areas.

- 31 Km median
- 47 Km road side green areas
- 39 ha 39000 m<sup>2</sup> green areas in each sub-city managed by community participation 273,000m<sup>2</sup>
- 7public recreational parks and 12 public green areas managed by individuals

Public green areas managed by city sanitation and green area development and management office with budget allocated from other stakeholders. The office took responsibility to manage those 14 public green areas and some NGOs participated by financial support. Communal green areas are green areas located in villages, which is about 92 and individuals took agreement to manage. Some respondents have argued on management of communal parks as the agreement is exposed for corruption as communal parks had poor management than other green areas. Institutions manage green areas around institution`s compound by allocating budget and workers.

**Table 20:** Green areas managed by community

No_	Site name	Area in Ha	Sub-city
1	Chimbl River	1.5	Hidar 11
2	Habitat sefer	2.45	Ginbot 20
3	D Zone	0.2	Hidar 11
4	Lake Tana Side Alma	1.5	Shum Abo
5	D Zone	0.6	Hidar 11
6	D 2 Zone 8 <sup>th</sup> block	4.3	Hidar 11
7	Meserete krstos church	0.5	Ginbot 20
8	Around150s	1.2	Ginbot 20
9	Gnd Wenz	0.8	Hidar 11
Total		13.05 ha	

(Source: Bahir Dar City Sanitation, Green Areas Development and Management Office)

City Sanitation, green area office structured in zone with two parts as city Beautification and green area office and Abay Millennium park management and it is responsible to manage green areas that locate in river buffer and around Lake Tana. The office organized with 280 workers in all level of city administration sub-city and kebeles.

Communal green areas were being as waste disposal site and open spaces left still open without any management activities and planted trees and shrubs left without proper tending operations like weeding. Planation undertook without considering species suitability and structures including walkways and driveways neglected. Moreover communal spaces were being eroded by run off. Some residents shift fence of green areas to privatize space and used for slaughtering and waste disposal site. The limited role of the wider community in the development and management of urban recreational parks; the highly limited opportunity by the wider community to access these facilities; and the very traditional approach towards development of urban centers have had contributed to the complex problems that halted the progress of recreation parks and other green spaces in the centres.

## **CHAPTER 5: CONCLUSION AND RECOMMENDATIONS**

### **5.1. Conclusion**

The main objective of this study was to assess urbanization and green areas development and management in Bahir Dar. Specifically the research included three objectives which were to assess the nature and dynamics of green areas in the context of urbanization, to examine the perception of community towards green areas benefit to wellbeing of the society and identifying the factors affecting household's decision to green area management.

The study summarizes that green areas in Bahir Dar have different nature and characteristics. Each land cover classes generated for the 1986, 2000 and 2016 Landsat images present the distribution of each land use classes in three maps of land use/cover that shows the spatial and temporal distribution. Built- up area have been covering majority of the study area within the time frame of 1986 to 2016. In 2016 built-up areas covered the largest land use system with a change of 3541.14 ha (667.3%) than other land uses. This implies that other land use classes have been transformed to build up areas through urbanization.

Plantation was concentrated around the river and lake side rather than other edges of the study area. Plantation land cover type has been declining in the time frames of 2000 to 2016. In 1986, 5453.5 ha (25.1%) of the study area was covered by plantation and it increases to 7417.6 ha (34.2%) in 2000. This emphasizes the land use change as because of afforestation programs change other land use classes but during 2016 only 2501.8 ha 11.5% of land is covered with plantation. In summary, the land use transformation from all other land use type to built-up areas over the time intervals 1986-2000, 2000-2016, and 1986- 2016 were made. The loss of area from bare land and built-up area was small in each time interval as compared with losses in other land use classes.

The study tried to assess perception of community towards benefit of green areas to wellbeing of the society descriptively. The result showed that respondents are aware about benefits of green areas to the environment including conservation of habitat, species conservation, other natural ecosystem and contribution to mitigate climate change impacts whereas; respondents had limited concern about economical services

of green areas. Communal urban green areas did not structured with infrastructures that create job opportunities.

The result of Logistic regression model estimates variables that were significant factor to management of communal green areas in Bahir Dar, these include age of household head, average salary of household, marital status, sufficiency of green areas, and participation in plantation campaign, sufficiency of budget, stakeholders collaboration and hour to reach the nearest green area. The model directed that age of household head, average income of household, sufficient number of green areas available, sufficiency of budget allocated to green area management and hour to reach the nearest green area from resident are significant factors that affect green area management negatively while marital status of household head, participation in tree planting campaign and stakeholders collaboration are significant factors that affect green areas management positively.

## **5.2. Recommendations**

Based on the findings of the study the following general recommendations were drawn to enable optimal utilization urban green areas management as improved management of green areas helps to capitalize on the benefit of green areas.

In order to create ownership among the community members and other stakeholders, the City Sanitation, Beautification and Green Area Management Office should develop more participatory system; this can be done through local institutions with sufficient budget allocation. Active community involvement in green area development and management also enhance administrators` motivation to work more on green areas management.

Development of green areas should emphasize new settlement areas like as areas around the Lake side to make more accessible. Further to this existing communal green areas management should structure with infrastructures that create job opportunity. Improving the nature of attractiveness of those communal green areas, by mixing tree species, fencing green areas, building walk ways and also proper management including weeding frequently and cleaning the surrounding able to magnify the benefit of communal green areas.

Generally, the City Sanitation Beautification and Green Areas Development and Management Office should strength it's collaboration with other stakeholders including educational institutions, local institutions, NGOs, private sectors, community and other governmental offices. Multidisciplinary way of stakeholder involvement is essential elements of successful urban sustainable. Responsibility of each respected stakeholder needs to be studied with further research to come up with more effective and efficient green area development and management.

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## APPENDIXES

### Appendix 1: Household Survey Questionnaire

Addis Ababa University

College of Development Studies

Centre of Environment and Sustainable Development

#### *A Questionnaire for Sample Household Survey*

Dear respondent, I'm studying my MA in Environment and Sustainable Development in Addis Ababa University. Now I am working my thesis and the purpose of the research is to assess urbanization and green areas development and management in Bahir Dar City. Participation and giving your answer without any hesitation is a precondition for this research to attain its goal. It is only based up on your own consent to respond the questions. Therefore, please feel free to respond to the questions to the best of your knowledge.

Thank you in advance for your collaboration!

**Date of interview** \_\_\_\_\_.

#### **I. Personal details of Respondent**

1. Code \_\_\_\_\_

2. Zone \_\_\_\_\_

3. Kebele \_\_\_\_\_

4. Sub city \_\_\_\_\_

5. Age \_\_\_\_\_

6. Sex:                      1. Male                      2. Female

7. Marital status:

1. Single              2. Married              3. Divorced              4. Widowed              5. if any specify

8. Religion:              1. Orthodox              2. Protestant              3. Catholic

4. Muslim              3. Johbaitness              4. Other specify \_\_\_\_\_

9. Occupation              1. Unemployed              2. Part time              3. Full time              4. Self-employment

5. GO              6. NGO              7. Family business              8. House Wife              9. Remittance

10. Other (Specify) \_\_\_\_\_

10. Average monthly income

---

11. Level of education:

1. Illiterate    2. Read and write    3. Primary (GRADE1-8)  
4. Secondary (Grade 9-12)    5. College diploma    6. Degree and above

12. Total number of the family in your household -----

## **II. Questions on Green Areas Development and Management**

1. Is there a green area in your Kebele?

1. Yes    2.No

2. If yes how many green areas are there?

- 1.1    2.2    3.3    4. Others specify\_\_\_\_\_

3. Area of green areas

1. Narrow    2.Medium    3.Wide

4. Are you satisfied with the current availability of green areas in the sub city?

1. Yes    2.No

5. Do you think that available green areas are enough in number?

1. Yes    2. No

6. How do you evaluate the nature of green areas in Bahir Dar city?

1. Good    2.Moderate    3. Not good

7. In your opinion are green areas accessible to the people in the sub city?

1. Yes    2.No

8. If no why?

1. Few green areas    2.green areas are not in good condition    3.not beneficial  
4. Other specify

9. How many minutes you spent to reach at the nearest park on foot?

1. Less than quarter hour    2. Less than Half hour    3. Half hour    4.more than one hour

10. Have you ever visit green areas?
1. Yes                      2, No
11. If yes please circle (multiple responses possible)
1. Weekly    2. Monthly            3. Once in 3 months
  4. Once in 6 months            5. Annually            6. Not at all
12. What was the reason/factor not to recreate in the park?
1. Shortage of time,            2. Fee amount,            3. Distance and transport cost
  4. Poor facility of parks            5. Cultural barriers            6. Not well managed
  7. Others please specify
13. Who frequently visit green areas in Bahir Dar?
1. Females    2. Males
14. Which age range frequently visits green areas in Bahir Dar?
1. Youth males    2. Youth females    3. Adult males    4. Adult females    5. children
15. How do you evaluate green areas coverage to the rate of urbanization of the city?
1. Increased            2. Decreased            3. The same
16. There is annual decline in green areas coverage
1. Strongly disagree    2. Disagree            3. Neutral
  4. Agree                      5. Strongly agree
17. Condominium developments have been taking Bahir Dar's green areas
1. Strongly disagree    2. Disagree            3. Neutral
  4. Agree                      5. Strongly agree
18. Industry/factory developments have been taking big part for the reduction of green areas in Bahir Dar
1. Strongly disagree    2. Disagree            3. Neutral
  4. Agree                      5. Strongly agree
19. In your understanding is the spatial urban expansion has been decreasing the available green areas in the last 30 years.
1. Strongly disagree    2. Disagree            3. Neutral
  4. Agree                      5. Strongly agree

II. Benefits of green areas

1. Green areas have benefit for the wellbeing of the community

1. Strongly disagree      2. Disagree      3. Neutral  
 4. Agree      5. Strongly agree

2. Benefits of green areas

No	Benefits of green areas	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	For beautification and recreation					
2	Psychological satisfaction					
3	Health					
4	Carrying out different ceremony					
5	Combating climate change					
6	Ecological balance					
7	Biodiversity conservation					
8	Create job opportunity					
9	Education					

3. Who is responsible in management of green areas?

1. Residents around green areas    2. Community      3. Village leaders  
 4. Kebele administration    5. City administration    6. Other specify \_\_\_\_\_

4. Are you willing to participate in green area management and development?

1. Yes      2. No

5. If your answer is no, why? -----

6. What is your responsibility in management of green areas?

1. Financial support    2. In kind support    3. Participating in community discussion  
 4. Other specify

7. Are the city administrative official's play important role in the green area management?

1. Yes                      2. No

8. Do you manage green areas?

1. Yes              2. No

9. If Yes:    1. Contribution in kind (For example water)    2. Contribution in cash

---

3. Participate in meetings    4. If any other specify

10. Do you ever participate in planting campaign in your village?

1. Yes    2.No

11. If No, why?              1. Lack information    2. No interest    3. It is others responsibilities    4. Negligence                      5.If any other specify\_\_\_\_\_

12. How do you evaluate community participation in green areas management of the city?

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1. In your opinion is the population growth cause for the losses of green area in the city?

1. Yes              2. No

---

2. Poor implementation of government policy was making it difficult for Bahir Dar to have well managed green areas

1. Yes    2.No

3. Is planned budget sufficient for green area development in Bahir Dar?

1. Yes    2.No

4. Are workers motivated in development of green area in the city?

1. Yes    2.No

5. Is the office working to increase awareness of the community to management of green areas in the city?

1. Yes    2.No

6. In your view necessarily expert consultancy services require for green area management in the city?

1. Yes 2.No

7. In your opinion is there good coordination with the aliened bodies in green area management in the city?

1. Yes 2. No

8. In your opinion is there low awareness to green area management in the city?

1. Yes 2. No

9. Do you think that low awareness of community to green areas management affect green area?

1. Yes 2. No

10 .Low priorities have been given to green areas in the city of Bahir Dar.

1. Yes 2. No

11. If yes, why? \_\_\_\_\_

12. If no, why? \_\_\_\_\_

13. Good attention given to green areas management

1. Yes 2. No

14. If yes, why? \_\_\_\_\_

15. If no, why? \_\_\_\_\_

16. What are other factors on green areas management in Bahir Dar?

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II. የከተማ መስፋፋትና አረንጓዴ ልማት ይዘት ጥያቄዎች

3. በቀበሌዎ ውስጥ አረንጓዴ ቦታ አለ?

- 1.አዎ 2.የለም

4. መልስዎ አዎ ከሆነ ስንት አረንጓዴ ቦታዎች አሉ?

- 1. 1 2. 2 3.3 4.ሌላ \_\_\_\_\_

2.1. ስፋታቸውስ በሜትር

- 1. ----- (ሰፊ) 2.----- (መካከለኛ) 3.----- (ጠባብ)

3. አሁን በክፍለ ከተማው የሚገኙ የአረንጓዴ ቦታዎች በቂ ነው ብለህ/ሽ ታስባለህ/ሽ?

- 1. አዎ 2. አይደለም

4.የአረንጓዴ ቦታዎችን ሁኔታ/ይዘታ እንዴት ትገመግመዋለህ/ሽ?

- 1.ጥሩ ሁኔታ ላይ ነው 2.መካከለኛ ሁኔታ ላይ ነው 3.ጥሩ ሁኔታ ላይ አይደለም

5. እንደ አንተ/ች አመለካከት በክፍለ ከተማው ያሉ የአረንጓዴ ቦታዎች ለህብረተሰቡ ተገቢውን ጥቅም እየሰጡ ነው ብለህ/ሽ ታስባለህ/ሽ

- 1.አዎ 2.አይደለም

6. መልስዎ አይደለም ከሆነ ለምን?

- 1.ቁጥራቸው በቂ አይደለም 2.ጥሩ ይዘታ የላቸውም 3.ተገቢውን ጥቅም እየሰጡ አይደለም 4.ሌሎች ካሉ ዘርዘሩ -----

7. በቅርብህ/ ሽ የሚገኝ የአረንጓዴ ቦታ ለመሄድ ስንት ሰአት ይወስዳል?

- 1. ከሩብ ሰአት በታች 2. ከግማሽ ሰአት በታች 3. ግማሽ ሰአት 4. አንድ ሰአት

8. የአረንጓዴ ቦታዎችን ኅብኝተው ያውቃሉ?

- 1. አዎ 2.አላውቅም

9.መልስዎ አዎ ከሆነ ፣ በየስንት ጊዜው ይጎበኛሉ ?

- 1. በየሳምንቱ 2.በየወሩ 3.በየሶስት ወሩ 4. በየስድስት-ወሩ 5.በየአመቱ

10. የአረንጓዴ ቦታዎችን በተደጋጋሚ ለመጎብኘት ችግሩ ምንድን ነው?

- 1.የጊዜ እጥረት, 2.ክፍያ ስለሚያስከፍሉ, 3.ርቀትና የመጓጓዣ ክፍያ 4. ፓርኮቹ የተመቻቸ ሁኔታ የላቸውም 5. የባህል ገደብ 6.የቦታዎች አያያዝ ጥሩ ስላልሆነ 7. ሌላ ካለ ዘርዘሩ-----

11. የአረንጓዴ ቦታዎችን በብዛት የሚጎበኙት እነማን ናቸው ?

- 1.ሴቶች 2.ወንዶች

12.በየትኛው የእድሜ ክልል ውስጥ ያሉ ሰዎች በብዛት አረንጓዴ ቦታዎችን ይጎበኛሉ?

- 1.ወጣቶች ወንዶች 2.ወጣት ሴቶች 3.ጎልማሳ ወንዶች 4. ጎልማሳ ሴቶች 5. ህፃናት

13. የአረንጓዴ ቦታዎችን ይዞታ ከከተማው መስፋፋት አንጻር እንዴት ትገመግመዋለህ/ሽ?

- 1.ጨምሯል 2.ቀንሷል 3.ተመሳሳይነው

14. የአረንጓዴ ቦታዎቹ ሽፋን በየአመቱ እየቀነሰ ነው ::

- 1. ሙሉ-በሙሉ አልስማማም 2.በከፊል አልስማማም 3.ገለልተኛ 4.በከፊል እስማማለሁ 5.ሙሉ-በሙሉ እስማማለሁ

15.የአረንጓዴ ቦታዎቹ ሽፋን በየአመቱ እየጨመረ ነው ::

- 1. ሙሉ-በሙሉ አልስማማም 2.በከፊል አልስማማም 3.ገለልተኛ 4.በከፊል እስማማለሁ 5.ሙሉ-በሙሉ እስማማለሁ

16. የኮንዲሚንየሎች ግንባታ የአረንጓዴ ቦታዎች ላይ ተፅዕኖ አለው

- 1. ሙሉ-በሙሉ አልስማማም 2.በከፊል አልስማማም 3.ገለልተኛ 4.በከፊል እስማማለሁ 5.ሙሉ-በሙሉ እስማማለሁ

17. የኢንዱስትሪዎች ግንባታ ለአረንጓዴ ቦታዎች መቀነስ ትልቁን ድርሻ ይወስዳል

- 1. ሙሉ-በሙሉ አልስማማም 2.በከፊል አልስማማም 3.ገለልተኛ 4.በከፊል እስማማለሁ 5.ሙሉ-በሙሉ እስማማለሁ

18. በእርስዎ አስተያየት ላለፉት 30 አመታት ያለው የከተማው መስፋፋት በከተማው ውስጥ ያሉ

አረንጓዴ ቦታዎችን ቀንሷል ብለው ያስባሉ ::

- 1. ሙሉ-በሙሉ አልስማማም 2.በከፊል አልስማማም 3.ገለልተኛ 4.በከፊል እስማማለሁ 5.ሙሉ-በሙሉ እስማማለሁ

III. የአረንጓዴ ቦታዎች ጥቅም ላይ ያለው የመረዳት ችሎታ

1. የአረንጓዴ ቦታዎች ለህብረተሰቡ ደህነት አስተዋፅኦ አላቸው ::

1. ሙሉ-በሙሉ አልስማማም    2. በከፊል አልስማማም    3. ገለልተኛ  
 4. በከፊል እስማማለሁ    5. ሙሉ-በሙሉ እስማማለሁ

2. የአረንጓዴ ቦታዎች ለህብረተሰቡ የሚሰጡትን ጥቅሞች

ተ. ቁ.	የአረንጓዴ ቦታዎችን ጥቅሞች	ሙሉ በሙሉ አልስማማም	በከፊል አልስማማም	ገለልተኛ	በከፊል እስማማለሁ	ሙሉ በሙሉ እስማማለሁ
1	ለመዝናኛነት					
2	መንፈስን ለማደስ					
3	ለአካላዊ ጤንነት					
4	የተለያዩ ዝግጅቶችን ለማካሄድ/ ማህበራዊ መስተጋብርን ለማዳበር					
5	የአየር ለውጥን ለመከላከል					
6	ሥነ-ምህዳርን ለማስተካከል					
7	ለብዙሀ ህይወት ጥበቃ					
8	ለስራ ፈጠራ/ የገቢ ምንጭ					
9	ለትምህርት					

3. የአረንጓዴ ቦታዎችን ማስተዳደር የማን ሃላፊነት ነው?

1. በአረንጓዴ ቦታዎች አካባቢ የሚኖሩ ሰዎች    2. ሕብረተሰቡ    3. የአካባቢው ማህበራት/እድር

4. የቀበሌው አስተዳደር    5. የከተማው አስተዳደር    6. ሁሉም

4. በአረንጓዴ ቦታዎች ልማት ላይ ለመሳተፍ ፍቃደኛ ነዎት?

- 1. አዎ
- 2. አይደለም

5. መልስዎ አይደለም ከሆነ ለምን -----

6. በአረንጓዴ ቦታዎች ላይ የእርስዎ ሃላፊነት ምንድን ነው ብለው ያስባሉ?

- 1. የገንዘብ እርዳታ
- 2. የቁሳቁስ ድጋፍ
- 3. በአካባቢ ውስጥ የሚደረጉ ስብሰባዎች ላይ መሳተፍ
- 4. ሌላ ካለ-----

7. የከተማ አስተዳደሩ የሚጠበቅበትን ሃላፊነት ተወጥቷል ብለው ያስባሉ?

- 1. አዎ
- 2. አይደለም

8. በአረንጓዴ ቦታዎች ልማት ተሳትፈው ያውቃሉ?

- 1. አዎ
- 2. አላውቅም

9. መልስዎ አዎ ከሆነ ተሳትፎዎ በምን ነበር:

- 1. የቁሳስ ድጋፍ በማድረግ
- 2. በገንዘብ
- 3. ስብሰባዎች ላይ በመሳተፍ
- 4. የጉልበት በማገዝ
- 5. ሌሎች ካሉ ዘርዘሩ -----

10. በዛፍ ተከላ ዘመቻ ውስጥ ተሳትፈው ያውቃሉ?

- 1. አዎ
- 2. አልተሳተፍኩም

11. መልስዎ አይደለም ከሆነ ለምን?

- 1. በመረጃ እጥረት
- 2. ፍላጎት የለኝም
- 3. የሌሎች ሀላፊነት ነው
- 4. ቸልተኝነት ነው
- 5. ሌሎች ካሉ -----

12. በአረንጓዴ ቦታዎች ልማት ላይ የህብረተሰቡን ተሳትፎ እንዴት ይገልፁታል

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**IV. በአረንጓዴ ቦታዎች ልማት ላይ ያሉ ተፅዕኖዎች**

1. የህዝብ ብዛት በአረንጓዴ ቦታዎች ይዞታ ላይ ተፅዕኖ አለው ብለው ያስባሉ?

- 1. አዎ
- 2. አይደለም

2. የፖሊሲዎች አፈፃፀም ዝቅተኛ መሆን ለአረንጓዴ ቦታዎች ልማት ተፅዕኖ አለው

- 1. አዎ
- 2. አይደለም

3. ለአረንጓዴ ቦታዎች የሚመደበው በጀት በቂ ነው ብለው ያስባሉ

- 1. አዎ            2. አይደለም

4. በአረንጓዴ ቦታዎች ልማት ላይ የሚሰሩ ሰራተኞች ጥሩ የስራ መነሳሳት አላቸው ብለው ያስባሉ?

- 1. አዎ            2. አይደለም

5. በእርስዎ አስተሳሰብ የከተማ ፅዳትና የአረንጓዴ ልማት ፅ/ቤት ለህብረተሰቡ ግንዛቤ ለማዳበር ይሰራል

- 1. አዎ            2. አይደለም

6. ለአረንጓዴ ቦታዎች የሚገባውን ያህል የባለሙያዎች ክትትልና ድጋፍ ይደረጋል ብለው ያስባሉ?

- 1. አዎ            2. አይደለም

7. የአረንጓዴ ቦታዎች ልማት የሚመለከታቸው አካላት ጥሩ ቅንጅት አላቸው ብለው ያስባሉ?

- 1. አዎ            2. አይደለም

8. በባህር ዳር ከተማ ለሚገኙ አረንጓዴ ቦታዎች ልማት ላይ የህብረተሰቡ የግንዛቤ እጥረት አለ ብለው ያስባሉ

- 1. አዎ            2. አይደለም

9. በባህርዳር ለሚገኙ አረንጓዴ ቦታዎች ልማት ላይ የህብረተሰቡ ተሳትፎ ዝቅተኛ መሆኑ ተፅዕኖ አለው ብለው ያስባሉ

- 1. አዎ            2. አይደለም

10. ለአረንጓዴ ቦታዎች ልማት የሚሰጠው ትኩረት ዝቅተኛ ነው ብለው ያስባሉ

- 1. አዎ            2. አይደለም

11. አዎ ካሉ ለምን.....

12. አይደለም ካሉ ለምን-----

13. ለአረንጓዴ ቦታዎች ልማት የሚሰጠው ትኩረት ከፍተኛ ነው ብለው ያስባሉ

- 1. አዎ            2. አይደለም

14.አዎ ካሉ ለምን-----

15.አይደለም ካሉ ለምን-----

16. ሌሎች በባህር ዳር ከተማ የአረንጓዴ ቦታዎች ላይ ያሉ ተፅዕኖዎችን ዘርዝሩ

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## **Appendix 2 : A SEMI STRUCTURED INTERVIEW FOR KEY INFORMANTS**

Addis Ababa University

College of Development Studies

Centre of Environment and Sustainable Development

I'm studying my Master's in Addis Ababa University. Now I am working my thesis and the purpose of the research is to assess urbanization and green areas development and management in Bahir Dar City. Participation and giving your answer without any hesitation is a precondition for this research to attain its goal. It is only based up on your own consent to respond the questions. Therefore, please feel free to respond to the questions to the best of your knowledge.

Thank you in advance for your collaboration!

Office \_\_\_\_\_

Position \_\_\_\_\_

1. How do you evaluate the trend of green areas in the context of urbanization in Bahir Dar?
2. What are the main functions and benefits of green spaces in Bahir Dar?
3. Which government organization is responsible for planning and management of green areas in Bahir Dar?
4. What is the role of sub city administration in green area development and management?
5. How the green area department is structured?
6. How many experts are there in the sub city concerning green areas?
7. How often does green areas are maintained?
8. How much budget is allocated for last year for green areas development and management?
9. What are local regulations exist in the sub city regarding to green areas development and management?
10. Can you describe present planning and management of green areas development and management in Bahir Dar?
11. What are the challenges and opportunities of green area development and management in Bahir Dar?

12. How do you describe the factors affecting green areas development and management of Bahir Dar?
  13. What do you think about the benefits of green areas regarding to the urban environment?
  14. Who do you think is the main responsible to management of green areas?
-

## Appendix 3 : BINARY LOGIT RESULT

### Multicollinearity Test

```
. pwcorr Age Average_salary Marital Edu_status Occupation Family_size Sufficen_no_green Accessiblity_green City_adminis_resp Planting
> _campaign III_Popln_green low_policy_green suffic_budget workers_motivated Awareness_creation Good_management_green Stakeholders_co
> labration low_awareness_gm low_comm_awerness_gmnt hour_to_go_green_co
```

	Age	Average_salary	Marital	Edu_status	Occupation	Family_size	Sufficen	Accessiblity	City_adminis	resp	Planting									
Age	1.0000																			
Average_salary	-0.1176	1.0000																		
Marital	0.1749	-0.1302	1.0000																	
Edu_status	-0.1928	-0.0261	-0.1054	1.0000																
Occupation	0.0054	-0.1187	-0.0607	0.0100	1.0000															
Family_size	0.4573	-0.1222	0.0944	-0.0040	-0.0154	1.0000														
Sufficen_n	-0.0154	0.0576	0.0794	0.0942	0.0023	-0.0734	1.0000													
Accessiblity	-0.1406	-0.0472	-0.0402	-0.0081	-0.0268	-0.1929	0.2691	1.0000												
City_adminis	-0.1257	0.0629	-0.0264	0.0460	-0.0819	0.0835	0.3158		1.0000											
Planting_c	-0.0413	-0.0279	0.1360	-0.0180	0.1588	0.1837	-0.0869			1.0000										
III_Popln	-0.0626	-0.0537	-0.0822	0.0700	-0.0186	-0.2219	0.0152				1.0000									
low_policy	0.0914	-0.0168	-0.1007	-0.1109	-0.0120	-0.0002	0.0302					1.0000								
suffic_bud	0.1372	0.0394	-0.0336	-0.0779	0.0156	0.1206	-0.0591						1.0000							
workers_mo	-0.1175	-0.0814	-0.1095	0.0783	0.0222	-0.0984	0.0147							1.0000						
Awareness	0.0358	0.0124	0.1211	-0.1109	-0.0925	-0.0275	-0.0029								1.0000					
Good_manag	-0.0128	-0.0792	0.1329	-0.0995	-0.1481	0.0406	-0.0055									1.0000				
Stakeholde	-0.0029	-0.0965	0.0913	-0.1168	-0.1922	0.0279	0.0453										1.0000			
low_aware	0.0130	-0.1282	0.1883	0.1095	0.0895	0.1297	-0.0083											1.0000		
low_comm	-0.0360	-0.1205	0.0653	-0.0697	-0.0782	-0.0097	-0.0894												1.0000	
hour_to	0.0547	-0.0962	0.1472	0.0057	-0.1420	-0.0517	-0.1316													1.0000

	Accessiblity	City_adminis	Planting	III_Popln	low_policy	suffic	worker
Accessiblity	1.0000						
City_adminis	0.3379	1.0000					
Planting_c	-0.0439	0.1082	1.0000				
III_Popln	0.1112	-0.0456	0.0099	1.0000			
low_policy	-0.0353	-0.1413	-0.0653	-0.0789	1.0000		
suffic_bud	0.0147	0.0564	-0.0129	0.0651	-0.1043	1.0000	
workers_mo	0.2195	0.1468	-0.0099	0.0652	-0.0766	0.1419	1.0000
Awareness	0.0549	0.1730	0.2100	0.0447	0.0645	0.1285	0.0952
Good_manag	-0.0081	0.1121	0.0889	-0.0359	-0.0786	0.2487	0.1323
Stakeholde	0.1323	0.4560	0.0480	-0.0911	-0.0786	0.0962	0.1791
low_aware	0.0461	-0.1179	-0.0606	0.0836	-0.0188	-0.0843	-0.0588
low_comm	0.1035	-0.0122	-0.0403	-0.0073	0.0699	-0.0427	0.0175
hour_to	-0.2932	-0.2643	0.0139	-0.0549	-0.0001	-0.1827	-0.0107

	Awareness	Good_m	Stakeh	low_aware	low_comm	hour_t
Awareness	1.0000					
Good_manag	0.3037	1.0000				
Stakeholde	0.4004	0.6068	1.0000			
low_aware	-0.1722	-0.0584	-0.2263	1.0000		
low_comm	-0.1403	0.0493	0.1009	0.0995	1.0000	
hour_to	-0.0854	-0.1109	-0.1863	0.0124	-0.1284	1.0000

```
. logistic mngt_GA Age Average_salary i.Marital i. Edu_status i.Occupation Family_size i.Sufficen_no_green i.Accessibility_green i.Cit
> y_adminis_resp i.Planting_campaign i.III_Popln_green i.low_policy_green i.suffic_budget i.workers_motivated i. Awareness_creation i.
> Good_management_green i.Stakeholders_colabration i. low_awareness_gm i.low_comm_awerness_gmnt i. hour_to_go_green_co ,r
```

```
Logistic regression                Number of obs =      138
                                   Wald chi2(28) =      58.96
                                   Prob > chi2 =      0.0006
Log pseudolikelihood = -40.426222  Pseudo R2 =      0.5022
```

mngt_GA	Robust					[95% Conf. Interval]
	Odds Ratio	Std. Err.	z	P> z		
Age	.9063014	.0303562	-2.94	0.003	.8487153	.9677948
Average_salary	.9997511	.0001516	-1.64	0.101	.999454	1.000048
Marital						
3	1.645809	3.075236	0.27	0.790	.0422559	64.10195
4	9.030341	9.731482	2.04	0.041	1.092479	74.64408
Edu_status						
2	.3777899	.4122421	-0.89	0.372	.0445066	3.206833
3	.8976544	1.158883	-0.08	0.933	.0714822	11.27251
4	1.079615	1.249638	0.07	0.947	.1116905	10.4357
5	.8468104	1.21584	-0.12	0.908	.050774	14.12313
Occupation						
3	.7099398	.6705288	-0.36	0.717	.1114995	4.52033
4	.42117	.3652059	-1.00	0.319	.0769771	2.304375
7	.3138313	.3810835	-0.95	0.340	.0290461	3.390823
Family_size	1.269025	.3006231	1.01	0.315	.7976756	2.018895
1.Sufficen_no_green	.1951637	.2037378	-1.57	0.118	.0252233	1.510068
1.Accessibility_green	.5529052	.4977793	-0.66	0.510	.0946926	3.228386
1.City_adminis_resp	11.93951	18.86836	1.57	0.117	.5392716	264.3416
1.Planting_campaign	43.02647	38.93955	4.16	0.000	7.301072	253.5624
1.III_Popln_green	1.172362	.9875674	0.19	0.850	.224922	6.110711
1.low_policy_green	.669777	.6267088	-0.43	0.668	.1070195	4.191771
1.suffic_budget	.3018599	.2091898	-1.73	0.084	.0776105	1.17406
1.workers_motivated	.4334082	.311518	-1.16	0.245	.105946	1.773004
1.Awareness_creation	.7163019	.5681469	-0.42	0.674	.1513391	3.390322
1.Good_management_green	5.117681	4.96574	1.68	0.092	.7640881	34.27702
1.Stakeholders_colabration	.1911	.1885777	-1.68	0.094	.0276245	1.321987
1.low_awareness_gm	.7142909	.4387716	-0.55	0.584	.2142903	2.380935
1.low_comm_awerness_gmnt	.6722785	.6085566	-0.44	0.661	.1140325	3.963416
hour_to_go_green_co						
2	.9534578	.9233745	-0.05	0.961	.1428752	6.362768
3	.1989178	.161611	-1.99	0.047	.0404682	.9777625
4	.7855415	.744804	-0.25	0.799	.1224927	5.037652
_cons	18.9926	48.4836	1.15	0.249	.1275464	2828.137

. margins, dydx(\*)

Average marginal effects                      Number of obs   =        138  
 Model VCE        : Robust

Expression    : Pr(mngt\_GA), predict()

dy/dx w.r.t. : Age Average\_salary 3.Marital 4.Marital 2.Edu\_status 3.Edu\_status 4.Edu\_status 5.Edu\_status 3.Occupation 4.Occupation  
 7.Occupation Family\_size 1.Sufficen\_no\_green 1.Accessibility\_green 1.City\_adminis\_resp 1.Planting\_campaign  
 1.III\_Popln\_green 1.low\_policy\_green 1.suffic\_budget 1.workers\_motivated 1.Awareness\_creation 1.Good\_management\_green  
 1.Stakeholders\_colabration 1.low\_awareness\_gm 1.low\_comm\_awerness\_gmnt 2.hour\_to\_go\_green\_co 3.hour\_to\_go\_green\_co  
 4.hour\_to\_go\_green\_co

	Delta-method					[95% Conf. Interval]
	dy/dx	Std. Err.	z	P> z		
Age	-.0089574	.0027361	-3.27	0.001	-.0143201	-.0035947
Average_salary	-.0000227	.0000135	-1.68	0.094	-.0000492	3.85e-06
Marital						
3	.0458	.1766273	0.26	0.795	-.3003831	.3919832
4	.2197979	.1096862	2.00	0.045	.0048169	.4347789
Edu_status						
2	-.0891794	.1009696	-0.88	0.377	-.2870762	.1087174
3	-.0103752	.1248432	-0.08	0.934	-.2550634	.234313
4	.0074146	.11151	0.07	0.947	-.2111409	.2259701
5	-.0159391	.1387417	-0.11	0.909	-.2878679	.2559897
Occupation						
3	-.0314076	.0859281	-0.37	0.715	-.1998236	.1370085
4	-.0783296	.0746837	-1.05	0.294	-.2247069	.0680478
7	-.1040618	.107252	-0.97	0.332	-.3142719	.1061483
Family_size						
1.Sufficen_no_green	-.1419194	.0787287	-1.80	0.071	-.296225	.0123861
1.Accessibility_green	-.0531852	.0778722	-0.68	0.495	-.2058118	.0994415
1.City_adminis_resp	.2473638	.1746561	1.42	0.157	-.0949558	.5896834
1.Planting_campaign	.4506295	.0704207	6.40	0.000	.3126075	.5886514
1.III_Popln_green	.0144724	.0763311	0.19	0.850	-.1351338	.1640785
1.low_policy_green	-.0371838	.0895827	-0.42	0.678	-.2127626	.138395
1.suffic_budget	-.1016482	.0547558	-1.86	0.063	-.2089675	.0056712
1.workers_motivated	-.0737055	.0582426	-1.27	0.206	-.1878588	.0404478
1.Awareness_creation	-.0300263	.0696161	-0.43	0.666	-.1664714	.1064188
1.Good_management_green	.1627085	.1024037	1.59	0.112	-.037999	.363416
1.Stakeholders_colabration	-.1385436	.0755615	-1.83	0.067	-.2866414	.0095543
1.low_awareness_gm	-.0305414	.0544467	-0.56	0.575	-.137255	.0761723
1.low_comm_awerness_gmnt	-.036679	.0836156	-0.44	0.661	-.2005626	.1272046
hour_to_go_green_co						
2	-.0044495	.0906971	-0.05	0.961	-.1822125	.1733135
3	-.1399655	.0740276	-1.89	0.059	-.285057	.0051259
4	-.0223972	.0878061	-0.26	0.799	-.194494	.1496997

Note: dy/dx for factor levels is the discrete change from the base level.

## Model goodness of fit

```
. estat gof
```

### Logistic model for mngt GA, goodness-of-fit test

```
number of observations =    138
number of covariate patterns =    138
Pearson chi2(109) =    130.45
Prob > chi2 =    0.0790
```

## Linktest (model specification error)

```
. linktest
```

```
Iteration 0: log likelihood = -81.215716
Iteration 1: log likelihood = -42.173336
Iteration 2: log likelihood = -40.164653
Iteration 3: log likelihood = -40.058776
Iteration 4: log likelihood = -40.057136
Iteration 5: log likelihood = -40.057134
```

```
Logistic regression                Number of obs =    138
                                   LR chi2(2)      =    82.32
                                   Prob > chi2     =    0.0000
Log likelihood = -40.057134        Pseudo R2    =    0.5068
```

mngt_GA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_hat	1.136689	.2512644	4.52	0.000	.6442198	1.629158
_hatsq	.0646002	.0709144	0.91	0.362	-.0743894	.2035898
_cons	-.1327898	.3279951	-0.40	0.686	-.7756484	.5100687

**Appendix 4 : Pictures**



**Picture 1:** Green area management (roadside green area fetching)



**Picture2:** Interview