

ADDIS ABABA UNIVERSITY



COLLEGE OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

ASSESSMENT OF URBAN GREEN INFRASTRUCTURE IN ADDIS
ABABA: THE CASE OF BOLE SUB CITY

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF
ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN
GEOGRAPHY AND ENVIRONMENTAL STUDIES SPECIALIZATION IN
LAND RESOURCE MANAGEMENT

By

SAMSON AYNACHEW

JUNE, 2014

ADDIS ABABA

ADDIS ABABA UNIVERSITY



COLLEGE OF SOCIAL SCIENCE

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

**ASSESSMENT OF URBAN GREEN INFRASTRUCTURE IN ADDIS ABABA: THE
CASE OF BOLE SUB CITY**

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF
ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN
GEOGRAPHY AND ENVIRONMENTAL STUDIES SPECIALIZATION IN
LAND RESOURCE MANAGEMENT

By

SAMSON AYNACHEW

GSE/1571/11

ADVISOR: TEGEGNE G/EGZIABHER (Professor)

June, 2014

ADDIS ABABA

COLLEGE OF SOCIAL SCIENCE

This is to certify that the thesis prepared by Samson Aynachew entitled: Assessment of Urban Green Infrastructure in Addis Ababa: The case of bole sub city and submitted in partial fulfillment of the requirements for the Degree of Masters of Arts (in Land Resource Management) complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Advisor: Professor Tegegne G/Egziabher Signature_____ Date_____

Internal Examiner: Dr. Tebarek Lika Signature_____ Date_____

External Examiner: Dr. Messay Mulugeta Signature_____ Date_____

Chairman of Department Graduate Committee

Acknowledgments

I would like to express my deepest gratitude to my advisor Professor Tegegne Gebre-Egzabiher for his comments and advice provided me in the course of writing my thesis. Similarly, my special thanks goes to Semret Abte for her moral and financial support.

Additionally, I address my thanks to my father and mother, Ato Aynachew Weldehana and W/o Yeworkwuha Mamo for their unreserved assistance. Moreover, I would like to extend my gratitude especially to Asegedech Mamo, Eyob Tilahun, Tsion Mamo, Ermias Aynachew and Teferi Getaw for their moral and technical assistance.

Beside these, I like to thank my friends AbiyWogderes, Mulugeta Gadissa and Mekdes Demoze for their material and moral support.

Lastly, I also extend my thanks to Ato Samuel Bekele Beautification, Park, Cemetery, Development and Management Officer of the sub city and his colleague and all those who helped me in the data collection process.

Abstract

The prime objectives of this study were to assess the state, use and challenges of recreational parks and street trees. The study employed both qualitative and quantitative methods and used questionnaires, interview, focus group discussion and observation for data collection and purposive and random sampling techniques were used to select participants. The present status of recreational parks and street trees in the study areas is not enough and lack proper management and development. This is because there is low level of public awareness about the values of recreational parks and street trees, low level of community participation, poor implementation of government policies, lack of budget, lack of skilled man power, illegal settlements and there is also problem of co-ordination among different stakeholders. To solve the above problems the following recommendations are given: awareness creation about the communal nature of recreational parks and street trees, assign qualified professionals, allocate sufficient budget, formulate and enforce rules and regulations, integration among different stakeholders and improving institutional capacities of local agencies are responsible to recreational parks and street trees development and management.

Keywords: *Recreational parks, Street Trees, Green Infrastructure*

<i>Contents</i>	<i>Page</i>
Acknowledgments.....	i
Abstract.....	ii
Table of Contents.....	iii
List of Figures.....	vi
List of Tables.....	vii
List of Appendices.....	vii
Acronyms.....	iix
CHAPTER ONE: INTRODUCTION.....	1
1.1. Background of the Study.....	1
1.2. Statement of the Problem.....	3
1.3. Objectives of the Study.....	4
1.3.1. General Objective.....	4
1.3.2. Specific Objectives.....	4
1.4. Research Questions.....	5
1.5. Significance of the Study.....	5
1.6. Scope of the Study.....	6
1.7. Limitation of the Study.....	6
1.8. Organization of the Thesis.....	6
CHAPTER TWO: REVIEW OF RELATED LITERATURE.....	7
2.1. Definition, Concept and Components of Urban Green Infrastructure.....	7
2.1.1. Definition of Urban Green Infrastructure.....	7
2.1.2. Green Infrastructure- A Green or Grey Concept?.....	8
2.1.3. Components of green infrastructure.....	9
2.1.3.1. Urban Forest in Addis Ababa.....	10
2.1.3.2. River Buffers.....	11
2.1.3.3. Recreation and Road Side Parks.....	12
2.1.3.4. Urban Agriculture.....	14
2.2. Green Infrastructure and their Environmental Benefits.....	16
2.2.1. Green Infrastructure and Heat Amelioration.....	16

2.2.2.Green Infrastructure and Flood Risk Reduction.....	17
2.2.3.Green Infrastructure Improving Water Quality	18
2.2.4.Green Infrastructure Improving Air Quality	18
2.2.5.Green Infrastructure and Carbon dioxide	19
2.2.6.Green Infrastructure and Sound Pollution	20
2.2.7.Green Infrastructure and Biodiversity Conservation.....	20
2.2.7.1.Increasing Habitat Area	21
2.2.7.2.Increasing Species Movement	21
2.3.Green Infrastructure Social Benefits	22
2.4.Green Infrastructure Economic Benefits.....	23
2.5.Green Infrastructure Unemployment Reduction.....	24
2.6.Actor in Urban Green Area Development and Management	24
2.7.Empirical Experience of Urban Green Infrastructure	26
2.7.1.Experience in Developed Countries	26
2.7.2.Experience in Ethiopia.....	26
2.7.3.Experience in Addis Ababa	28
2.8.Conceptual Framework	30
CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND REASEACH METHOD	31
3.1.Study Area.....	31
3.2.Study Approach.....	32
3.3.Source of Data	32
3.4.Method of Data Collection.....	32
3.5.Sample Size and Method Of Sampling	33
3.6.Method of Data Analysis.....	34
CHAPTER FOUR: RESULTS AND DISCUSSION	35
4.1.Socio-Economic Characteristics of the Respondents	35
4.1.1.Age Group	35
4.1.2.Sex Distribution.....	36
4.1.3.Income Level of Respondents	37

4.1.4.Level of Education of the Respondents	37
4.2.Use, State and Challenges of Recreational Parks and Street trees.....	38
4.2.1.The State of Recreational Parks and Street Trees.....	38
4.2.1.1.Recreational parks and street trees developed by the governmental institutions and nongovernmental stakeholders.....	39
4.2.1.2.Green Infrastructures Developed by Private.....	39
4.2.1.2.1.Developed by Embassy of Ukraine.....	39
4.2.1.2.2.Developed by Edna Mall.....	40
4.2.1.2.3.Developed and Managed by City of Refuge Church	41
4.2.1.2.4.Developed and Managed by Public	41
4.2.1.2.5.Developed and Managed by the Municipality	42
4.2.2.The use of recreational parks and street trees.....	43
4.2.2.1For Beautification and Recreation	44
4.2.2.2.For Mental and Psychological Satisfaction.....	44
4.2.2.3.For Carried out Different Festivals and Ceremonies	44
4.2.2.4.Combating Climate Change	44
4.2.2.5.Ecological Balance.....	44
4.2.2.6.Create Job Opportunity	45
4.2.3.Challenges to the development and management of recreational parks and street trees	46
4.2.3.1.Lack of Public Awareness	47
4.2.3.2.Low Level of Community Participation	49
4.2.3.3.Poor Implementation of Government Policies.....	49
4.2.3.4.Lack of Budget.....	50
4.2.3.5.Lack of Skilled Man power.....	50
4.2.3.6.Shortage of Urban Land Areas	51
4.2.3.7.Illegal Settlement	51
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS	53
5.1.Conclusions.....	53
5.2.Recommendations	55
References	
Annexes	

List of Figures

Page

Figure 1: The Green-Grey Continuum.....	9
Figure 2: Various actors &their linkage in urban green infrastructure	
Development management.....	25
Figure 3: Conceptual model.....	30
Figure 4: Geographical location of Bole sub city and the study woredas.....	31
Figure 5: Sex distribution of the respondents.....	36
Figure 6: Photograph of Ukraine Embassy’s green area.....	40
Figure 7: Photograph of green area protected by Edna Mall.....	40
Figure 8: Photograph of street trees which is protected by churches.....	41
Figure 9: Photograph of recreational park managed by public.....	42
Figure 10: Photograph of recreational park protected by the Municipality.....	42
Figure 11: Photograph that shows unprotected green area.....	48
Figure 12: Well protected green area.....	48

List of Tables	Page
Table 2.1: Sub cities, localities & area dominantly covered by forest.....	10
Table 2.2: Some naturally grown plants along the Addis Ababa Rivers.....	11
Table 2.3: Tree and shrubs recorded along the streets of Addis Ababa.....	13
Table 3.1: Composition and number of participants for interview in the study area...	34
Table 3.2: Composition and number of participants for the questionnaire in the Study area.....	34
Table 3.3: Composition and number of participants in focus group discussion in the study area.....	34
Table 4.1: Age structure of the respondents.....	35
Table 4.2: Income level of the respondents.....	37
Table 4.3: Level of education of the respondents.....	38
Table 4.4: Total area covered by green areas by the government institutions.....	39
Table 4.5: Shows the responses of the urban residents regarding the use of recreational parks and street trees.	43
Table 4.6: Perceptions of respondents on constraints & their rank in seriousness....	46
Table 4.7: Respondents preference used for green spaces.....	48
Table 4.8: Budget allocation of the sub city for green infrastructure development..	50

List of Appendices

Annex 1: Questionnaires prepared for sample households

Annex 2: Interview guidelines for Beautification, Park, Cemetery, Development and
Management officer, Non-governmental Organization & Environmental
Protection Authority

Annex 3: Interview guidelines for urban planners & land development
and ownership administration officers

Annex 4: Focus group discussion for residents & business communities

Annex 5: Field observation

Acronyms

BPCDMO:	Beautification, Park & Cemetery Development and Management Officers
CBO:	Community Based Organization
CGAADP:	Clean and Green Addis Ababa Development Plan
CSA:	Central Statistics Authority
EPA:	Environmental Protection Authority
FAO:	Food and Agriculture Organization
FDRE:	Federal Democratic Republic of Ethiopia
MoFA:	Ministry of Federal Affairs
NGO:	Non Governmental Organization
ORAAMP:	Office of the Revised Addis Ababa Master Plan
UHI:	Urban Heat Island
UNPF:	United Nation Population Fund

CHAPTER ONE

1. Introduction

1.1. Background of The Study

For the first time in history, the majority of the world's population lives in urban areas (UNPF, 2007). The 20th century was the century of urbanization. Now a day, it is calculated that over half of the world population lives in urban regions while by 2030 the urban population is expected to be doubled. Urban green infrastructure of fundamental importance for the quality of life on our ever increasingly urbanized societies. Today, the development of green infrastructure is changing the way communities think and making them sustainable in order to improve the quality of life of their current residents and for future generations of residents.

Urban green infrastructure refers to spaces that are located in the urban web which include urban forest, river buffer vegetations, recreational parks, urban agriculture, avenues of trees and other garden area. Green infrastructure is defined in different ways by different authors. Benedict and McMahon (2002) defined green infrastructure 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.

More recently Davies et al (2012) 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 (Carter, 1995). 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 greens have significant amenity and recreational value contributing towards quality of urban life. Green infrastructure provides benefits to people, ecosystems and the

economy. It is a key component for sustainable growth of communities and a critical public investment (Benedict and McMahon, 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 (Josh Foster, 2011).

Addis Ababa is a unique city with land features of mountains and plains. Addis Ababa is the capital city of Ethiopia, located at the eastern part of Africa. It is the seat of African Union and many other regional and international organizations. The city has an area of 540km² with more than 3 million inhabitants. For administration purpose the city is divided into 10 sub cities and 116 woredas (local administration units).The altitude ranges from 2100m above sea level at the south of Akaki area and 3100m above sea level at the north of Entoto Mountain (Mekonnen Biru, 2012)

The places with in the present Addis Ababa city boundary were forested. The mountain chains which are located in the northwest, northeast, and southwest consists of plant species that exist in dry afro-montane vegetation type of Ethiopia. On the other hand, the vegetation at the south part of the city has similarity with the low land vegetation of the rift valley area(Ibid).

Patches of the peri-urban forest, planted trees in parks, riverine vegetations and road side plantations etc are the stuffs that created habitable condition. The trees are also good carbon sink and play important role in mitigating global warming. Above all the peri – urban forest which represents the largest portion of the green areas, play significant role in improving urban environmental conditions. However, because of unplanned development since establishment of the city, the forest genetic resources as well as their habitats have been severely affected.

Few studies were conducted on urban green spaces in Addis Ababa. Gebrye Kefelew (2012) studied Co-operative housing green areas and Street trees in Nifas silk Lafto sub city. He identified this space has problems related to planning, management and safety.

1.2. Statement of the Problem

Green infrastructures are very well known to provide environmental, social and economic benefits to communities (forest research, 2010). And, since green infrastructures are mainly plants, they live many years in perpetuity. They provide the environmental, social and economic benefits not only to the present communities but also, with little management cost to the future generations as well. Therefore, green infrastructure should ensure the sustainability of cities and urban areas.

In an urban environment, parks and public nature reserves are considered as the only means of accessing nature (Maller et al, 2005). Based from this realization, efforts will be made to stress on the importance of parks and open spaces for healthy functioning of urban inhabitants. For instance, health justification was used for provision of parks and other natural areas and for preserving the wildness areas outside of cities for public use (Parsons, 1991; Ulrich, 1993). In the 19th century, parks were designed in strong belief of its possible health advantage gained from these open spaces (Hamilton-Smith and Mercer, 1991; Rohde and Kendle, 1997) which were hoped to reduce disease, crime and social unrest and provide 'green lungs' for city, and areas for recreation (Rohde and Kendle, 1997). Even now, urban spaces are expected to function not as an isolated unit but as a vital part of urban landscape with its own specific set of functions (Urban Task Force, 1999).

A well distributed open space can influence the quality of life of people in a congested urban area. Nonetheless, green infrastructure and open space in Bole sub city and each woreda is not well managed, organized and protected.

Street tree is also an important part of green infrastructure land use components. It is indicated that there are many opportunities to engage with people in streets rather than in parks or plazas.

Therefore, the street is actually the truly representative of public open space, the one which the whole population may be comfortable in using (Ward Thompson, 2002). Thus, it is vital to explore the responses of urban residents through their experience and preferences in using these social spaces. Therefore, to understand green infrastructure networks, the research must not only cover the experiences of using parks and open spaces, but must also include streets and loose-fit places as important parts of green infrastructure components.

However, the green infrastructure of the 128 years old Addis Ababa is not developed, managed and protected very well to fulfill the environmental, social and economic benefits to the community. For example, the urban forest in Addis Ababa has transformed from once dense indigenous forest to degraded eucalyptus plantations (Horest; 2006).

As it is known Addis Ababa is the capital city of Ethiopia and Africa, even it is the home of many international diplomats and a population of more than 3 million and site of many industries. However, it is facing tremendous environmental, social and economic problems associated with lack of appropriate green infrastructure development, management and protection. Beyond this general statement the status and overall challenges faced by the green infrastructure in the city is not clearly known. Thus, this study identified the use, state and challenges for the low level of development of green infrastructure in Bole sub city.

1.3. Objectives of the Study

To achieve the research aim, the following research objectives are formulated.

1.3.1. General Objective

The general objective of the study is to assess state, use and challenges of urban green infrastructure in bole sub-city.

1.3.2. Specific Objectives

The specific objectives of the study are to:

1. assess the past and present status of green infrastructure in the study area;

2. assess the use of recreational parks and street trees in the study area;
3. identify the challenges that hinders the development of green infrastructure in general and recreational parks and street trees in particular in bole sub-city;
4. investigate the level of awareness of the residents towards the functions of green infrastructure in the study area;
5. suggest the future opportunities for green infrastructure development in Bole sub-city;

1.4. Research Questions

Based on the problem statement in the above paragraphs, the findings of this thesis will try to answer the following research questions. These are:

1. What is the present status of green infrastructure in bole-sub city?
2. How is green infrastructure used in the study area?
3. Why is green infrastructure important?
4. What challenges are faced in developing and promoting green infrastructure in general and recreational parks and street trees in particular in the study area?
5. What is the level of awareness of the residents towards the values of green infrastructure in bole sub-city and factors affecting it?

1.5. Significance of the Study

It is hoped that this research will add to the limited knowledge available in the study area regarding the economic, social and environmental benefit from urban green infrastructure. The outcome of the study may also be used for policy considerations, for planning and designing urban green infrastructure .The study also list out the challenges to promote green infrastructure development and management in the study area and create awareness for the residents about the multifunctional values of green areas in the study wordas.

Moreover, the study will be helpful for researcher as a stepping stone to do further research on the issue at hand. Finally, the study will be important source of information for urban planners, policy makers, NGO practitioners and academics working on urban green infrastructure.

1.6. Scope of the Study

As the title of this research indicates, the core intent of the study is to assess urban green infrastructure in Bole sub-city. This study is limited in terms of space since Bole sub city is a vast sub city with an area of 122.8Km² and a population of 336,115(CSA, 2012). The researcher thus, focused on an assessment of urban green infrastructure only on recreational parks and street trees of the selected woredas found in Bole sub city. The study also focuses only on recreational parks and street trees and does not include cultivated land, wet land, forest area etc.

1.7. Limitation of the Study

Some of the participants are not much willing to fill the questionnaires and to give necessary information openly. Unavailability of organized data in Bole sub city as well as in the concerned institutions was also challenging. Moreover, the number of professionals related with the issue being studied was the main challenge. However, the diverse methods and tools used and by looking convenient timing, reliable data was collected.

1.8. Organization of the Thesis

This research paper is organized in to five chapters. The first chapter contains background of the study, statement of the problem, significance of the study etc and chapter two tells us the review of related literature. Chapter three contains research methods, materials and procedures and chapter four contains data presentation and analysis. The last chapter briefly explains summaries, conclusions and recommendations.

CHAPTER TWO

2-Review of related Literature

The review literature part is discussed on definition, concept and components of urban green infrastructure, green infrastructure and their environmental benefit, green infrastructure social benefit, green infrastructure economic benefit, green infrastructure unemployment reduction, actor in urban green area development and management and empirical experiences on urban green areas.

2.1 Definition, Concept and Components of Urban Green Infrastructure

2.1.1 Definition of Urban Green Infrastructure

There are currently as many definitions of green infrastructure as there are authors working on the concept. As in most academic and practitioner research, the definitions used by an organization or an author relate directly to the focus of their own green infrastructure research. Conservationist authors (i.e. Benedict and McMahon,2006)strongly emphasis the ecological and biodiversity components, planners may review the concept in terms of policy implementation(i.e. Ahern,1995;Fabos,1995),while recreational greenways and green infrastructures specialists may focus on the benefits gained through development.

However, although there is an almost ever increasing diversity in the definitions developed for green infrastructures, there are common themes had which underlie each of them. According to Benedict and McMahon, (2002) green infrastructure is defined as an ‘‘interconnected network of waterways, 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.

From the above definition green infrastructure has a diverse range of components which includes river buffer vegetation and basins, parks, street trees, cultivated land and forest area.

For Williamson(2003) green infrastructure mean that our nations natural life support system-an interconnected network of protected land and water that support native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for America's communities and people.

According to his definition green infrastructure is defined very specifically to at the nation level.

More recently Davies (2012) defined green infrastructure as part of urban area with a mix of street trees, parks, cultivated land, wetlands, lakes and streams. From the above definitions presented above, the following elements are seen as being frequently reported as constituting green infrastructure spatial variance, multifunctionality, natural and human benefits, biodiversity sustainability and connectivity. Each of the above definitions notes that green infrastructure is or should be part of wider ecological features. These features range from the specific landscape elements to more general uses of the term green spaces 'Benedict and McMahon and Williamson.

Generally, green infrastructure is the resilient landscapes that support ecological, economic and human interests by maintaining the integrity and promoting landscape connectivity, whilst enhancing the quality of life, place and the environment across different landscape boundaries.

2.1.1. Green Infrastructure- A Green or Grey Concept?

Although there has been a relatively development in green infrastructure research, there are still questions as to what green infrastructure is as a concept and as a landscape delivery mechanism. Both the term 'green' and 'infrastructure' have been discussed and presented elsewhere as offering a range of contrasting and sometimes contradictory meanings. As such, the concept is still fraught with contradictions.

These contrasting definitions raise important questions, such as what constitutes green infrastructure and in which theoretical disciplines should it be located? The term 'green' can be used to reflect the environment, environmentalism, nature or recycling, but can also be viewed as a Marxist or Feminist concept(Dobson,1995;Benedict and

McMahon,2006;Dapolito Dunn and Stoner,2007).Green has strong connotations with the environment, but professor Mark Shuck Smith questioned the green value or emphasis of green infrastructure. In answer to Shuck smith, the work of Williamson(2003) and Ahem(2007) can be presented to support the use of the term ‘green’ in green infrastructure, emphasizing the ecological functions associated with the concept.

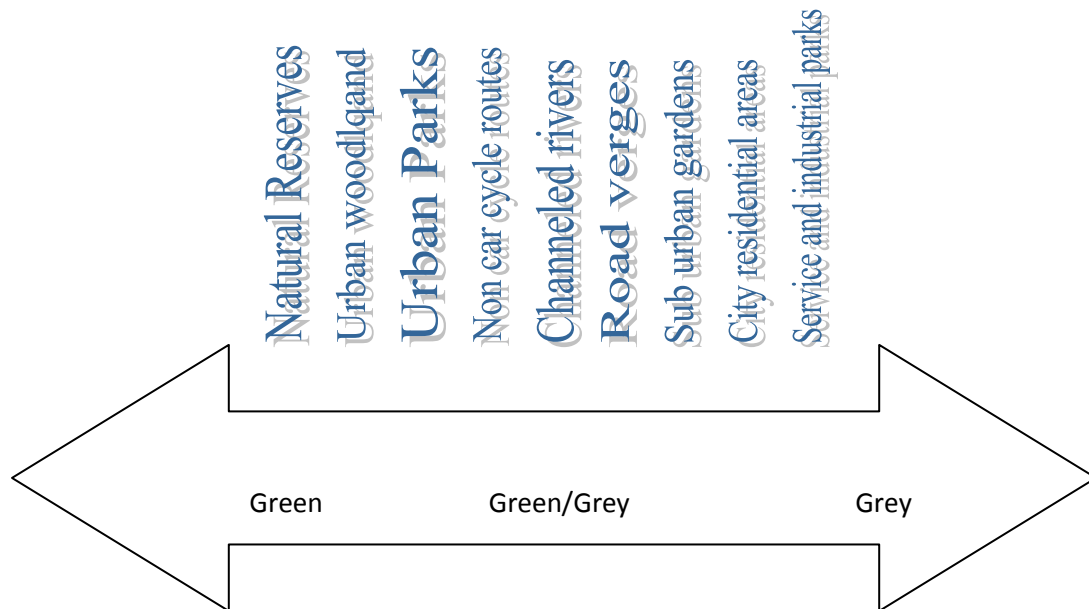


Figure 1: The Green-Grey continuum

Davies et al.(2006)go further and note that the principal functions of green infrastructure should be used to define the concept. The figure above presents the Grey-Green Continuum highlighting where different features can be placed along this movable scale. The continuum, therefore, proposes that there is a relationship b/n the interpretation, function and use of space.

2.1.2. Components of green infrastructure

Green infrastructure is the network of natural environmental components and green and blue spaces that lies within cities, towns and villages which provides multiple social,

economic and environmental benefits. Green infrastructure has its own physical components, including urban forest, parks, rivers, street trees and urban agriculture.

In each of the previous definition that emphasis a diverse range of components that constitute green infrastructure. Among these the following are discussed:

2.1.2.1. Urban Forest in Addis Ababa

According to FAO(2007)forest is defined as land spinning 0.5ha with trees higher than 5 meter and a canopy cover more than 10% or trees able to reach thresh holds in situ with the exception of agricultural and urban land uses. Based on this definition most of the forest patches existing in Addis Ababa cannot be considered as a forest because the existing eucalyptus forest of Addis Ababa is either ex situ origin or it is in urban land use.

However, arbitrarily the urban forest in Addis Ababa can be classified in to peri urban forest and the plantation in recreation parks, road side, riverine vegetation and plantations in private and institutional gardens. It is quite clear that urban forest varies from natural forest in many ways. It is an urban green referring to a re-vegetation by planted trees, shrub or herbs with intended design to improve environmental quality, economic opportunity and aesthetic value. Large amount of forest is found in six sub cities of the city.

Table2.1: Sub cities, Localities and area dominantly covered by forests

No	Sub city	Localities	Areacover(ha)
1	Yeka	Entoto, Ancorcha, Yeka Qersa,Kara	4,327
2	Gullele	Asko, Gojjamber, Raguel, Qussquam	2,803
3	Kolfe-keranyo	Repi, Jemo, Filidoro, Keranyo, Sansusi	1,023
4	NifasSilkLafto	Lebu, Dhertu, Gedowasha, Lafto	228
5	Akakikaliti	Tuludimtu, Salo Giorgis	73
6	Bole	Bole Arebasa, BoleBulbula	42
		Total	8,496

Source: MekonnenBiru, Dec, 2012

Both the peri urban forests and down town forests supply fresh air to the city and they are considered as the breathing organ of the city. It also protects the city from hazards such as flood coming from the surrounding mountains.

In general forest for the city is a base for economic welfare, water supply, improved air quality, stabilized soil, reduced sound pollution, home for wild life, serving as a carbon sink. The urban forest in Addis Ababa like any other cities is making life more comfortable to the residents.

The existing master plan of the city designates about 22,000ha of green area. The green area includes road side trees, recreational parks, and riverine and periurban forest. In the existing master plan of the city 12,342ha of land is allocated for forest and wood land, 4,197ha for river bank, 5129ha for urban agriculture, and 335ha for parks. At present total land covered by peri urban forests is nearly 8,500ha is about 38.6% of the total green area (Table2.1).

2.1.2.2. River Buffers

According to the green frame of the city seven big, six medium sized and 75 small rivers from a network in Addis Ababa. The river banks constitute 4,197ha. The present status of these river banks show local disappearance of the biological resources and the associate wet land ecosystem. Rivers are communal properties. They are expected to accommodate living organisms which are important in maintaining the ecology of the city. Addis Ababa Environmental Protection Authority has attempted to rehabilitate the river banks and to maximize urban forest function.

Table2.2: Some naturally grown plants along the Addis Ababa Rivers.

No	Species Name	Family	Habit
1	Persicaria Senegalensis	Polygonaceae	Herb
2	Buddelagia Polystachia	Logonaceae	Shrub
3	Galinsoga Quadriradiata	Asteraceae	Herb
4	Cythula Uncinulata	Amarantaceae	Herb
5	Amaranthus Caudatus	Amarantaceae	Herb

6	<i>Pychnostachusabyssinica</i>	Lamiaceae	Shrub
7	<i>Vernoniaamagdalina</i>	Asteraceae	Shrub
8	<i>Malva Parviflora</i>	Malvaceae	Shrub
9	<i>Rumexnepalensis</i>	polygonaceae	Herb
10	<i>Arundodonax</i>	poacea	Herb
11	<i>Tagatisminuta</i>	Asteraceae	Herb
12	<i>Guizotiascabra</i>	Asteraceae	Herb
13	<i>Laggerapetrodonata</i>	Asteraceae	Shrub
14	<i>Solanumincanum</i>	Solonaceae	Shrub
15	<i>Commelinadiffusa</i>	Commelineaceae	Herb
16	<i>Parthinumhysterophorus</i>	Asteraceae	Herb
17	<i>Carduspychocephalus</i>	Asteraceae	shrub
18	<i>Fehinopsmacrochaetus</i>	Asteraceae	Shrub
19	<i>Impatiens rothii</i>	Balsaminaceae	Herb
20	<i>Pavoniaurens</i>	Malvaceae	Herb
21	<i>Milletiaferruginea</i>	Fabceae	Tree
22	<i>Phytolacedodecandra</i>	Phytolacaceae	Shrub
23	<i>Justiciaschimperiana</i>	Acanthaceae	Shrub
24	<i>Echinops sp.</i>	Asteraceae	Shrub
25	<i>Ricinuscommunis</i>	Euphorbiceae	Tree

Source: Mekonnen Biru, Dec, 2012

2.1.2.3. Recreation and Road Side Parks

At present there are 16 parks owned by the government with a total area of 122ha. These parks in addition to their economic and aesthetic importance they are playing significant role as urban forest component. Furthermore the city administration designates 342ha of the city's surface area for public recreational parks. Among the proposed 17 public parks in the master plan no one of them were realized in the given time period.

The roadside parks are also play a significant role in urban greening and creating balanced ecosystem. They are important in improving urban environmental conditions

and safeguarding biodiversity. Trees and other vegetation intercept particles and gaseous pollutants. They are important in reduction of noise pollution and dust particles. Moreover, they act as carbon sinks that help mitigate global warming.

Table2.3: Tree and Shrubs recorded along the streets of Addis Ababa

No	Species Name	Family	Habit
1	Acacia abyssinica	Fabaceae	Tree
2	Acacia decurrens	Fabaceae	Tree
3	Acacia melanoxylon	Fabaceae	Tree
4	Araucaria excelsa	Araucariaceae	Tree
5	Callistemon citrinus	Mirtaceae	Shrub
6	Cupressus lusitania	Cupressaceae	Tree
7	Dovyalis abyssinica	Flacoriaceae	Shrub
8	Draacaenasteudneri	Agavaceae	Tree
9	Enseteentricosyum	Musaceae	
10	Erytherinabrucei	Fabaceae	Tree
11	Eucalyptus globulus	Myrtaceae	Tree
12	Euphorbia pulcherima	Euphorbiaceae	Shrub
13	Grevillea robusta	Proteaceae	Tree
14	Jacaranda mimosifolia	Bignoniaceae	Tree
15	Juniperus procera	Cupressaceae	Tree
16	Legusterimulgare	Rosaceae	Shrub
17	Milletia ferruginea	Fabaceae	Tree
18	Nerium oleander	Apocynaceae	Shrub
19	Olea Africana	Oleaceae	Tree
20	Phoenix reclinata	Palmaceae	Tree
21	Pinus pastula	Pinaceae	Tree
22	Pinus radiata	Pinaceae	Tree
23	Podocarpus falcatus	Podocarpaceae	Tree
24	Ricinus communis	Euphorbiaceae	Shrub
25	Rosa recharidi	Rosaceae	Shrub
26	Schinus molle	Anacardiaceae	Tree

Source: Mekonnen Biru, Dec, 2012

2.1.2.4. Urban Agriculture

What is urban agriculture?

Urban agriculture has been perceived and defined from different dimensions by different authors. According to Richtel et al., (1995), it is not the location of urban agriculture which distinguishes it from rural agriculture but the fact that it is embedded in and interacting with urban ecosystem. According to Mougeot (2000), the general definition of urban agriculture is the growing of plants and the raising of animals for food and other uses within cities and periurban areas. It also includes the production and delivery of inputs, and the processing and marketing of products. Renevan (2006) defines urban agriculture as an industry located within or on the fringe of a town, which grows or raises, processes and distributes a diversity of food and non food products, using largely human and material resources, products and services found in and around the urban area.

Urban Agriculture in Addis Ababa

About half of the world population lives in urban areas. It is estimated that by 2020, the developing countries will account for about 75% of all urban dwellers (Bakker et al., 2001). However, while urbanization brings a number of socio-economic benefits, the rapid increase in urban population ushers in a number of challenges. The continued expansion of urban areas into the immediate hinterlands often leads to the conservation of potential agricultural lands into non agricultural land uses.

Some cities have adopted urban agriculture as a strategy to address the increasing urban unemployment, support food security, and nutrition generates income for the urban poor in general and the disadvantaged groups such as women, the disabled.

In Addis Ababa, urban agriculture is one component of these green frames covering an area of 7,309ha of land. It has a significant role in the city's daily economic activity. Wide varieties of plants including fruit trees are cultivated in the urban agriculture sector. In periurban areas there are people engaged in agro-forestry practices. Thus, urban agriculture is sharing the burdens of urban forest by supplying biomass fuel and absorbing CO₂. An agro-forestry development as an extension package is being implemented

both in urban and periurban areas of the city. The agro ecology of Addis Ababa could allow many cereals, vegetables and fruits.

Significance of Urban Agriculture

There is now growing consensus that urban agriculture is not a problem, as previously thought, but an important contributor to sustainable urban growth and development as well as to people's livelihoods. The sector contributes significantly to food supply, employment creation, income generation and environmental management.

Urban agriculture: income generation and Employment creation

As indicated by Thomas (2013), one of the economic benefits of urban agriculture in Addis Ababa has been its capacity to generate income and create employment opportunities. On average three vegetable growing co-operatives gained an annual income of 157,005.31birr, giving an average monthly income of 581.00 birr per each member of the co-operative. According to him in terms of employment, there were about 16,000 people engaged in producing vegetables in Addis Ababa.

Social Benefits of Urban Agriculture

To the above economic benefits, urban agriculture in Addis Ababa was bringing about significant social contributions. It involved some vulnerable groups such as women and the elderly, thereby helping to reduce their dependency on other people. It also served to strengthen social integration of the farmers by organizing them in to cooperatives.

Environmental benefits of urban agriculture

Due to the favorable climatic conditions of Addis Ababa, areas used for urban agriculture were green throughout the year. This contributed towards the creation of a microclimate in some parts of the city, as well as the to the city's aesthetic value. Evergreens also helped to clean the air by reducing dust and protecting the soil from erosion. Some urbanites believed that urban agriculture had protected their areas from being used as sites for the unhygienic dumping of wastes.

2.2. Green Infrastructure and their environmental benefits

Green infrastructure is known to provide quantifiable or measurable environmental benefits. Trees for example, are an important cost effective solution to reducing pollution and improving air quality(Bell and Wheller,2006).This is why Latin American cities: Mexico city and Sao Paolo integrated trees and other vegetations as part of urban environmental improvement programs, policies and measures(Escobedo et al;2008).

2.2.1. Green Infrastructure and Heat Amelioration

Towns and cities are usually a degree or two warmer than surrounding rural areas, as a result of the urban heat island effect (CABE, 2010).The urban heat island is caused by two main factors: the absorption of direct solar radiation by buildings and other man made surfaces and the lack of vegetation in urban areas (Heidt and Neif,2008).

Green infrastructure in urban areas has an important role to play in ameliorating the warming effects of climate change and the urban heat island(UHI).Provision of green infrastructure can reduce higher urban temperatures through evapotranspiration, direct shading and conversion of solar radiation to latent heat(Dimoudi andNikolopoulou,2003).Some research proved that how green infrastructures can facilitate heat amelioration.

Open spaces with higher number or larger area of trees have been found to have lower temperatures than those with few trees. Trees and shrubs provides protection from both heat and UV radiation by direct shading (Potcher, 2006).And similarly according to Gill et al;(2007) suggested that increasing the current area of green infrastructure in Great Manchester by 10%(in areas with little or no vegetation cover) could result in a cooling of up to2.5⁰c under the high emissions scenarios based on the UK Climate Change Impacts (UKCIP020) predictions. As an indicated by Chang et al, (2007) parks of at least 3ha have been shown to be cooler than that of the surrounding urban areas, the temperature in parks of less than 3ha is more variable, and the quality of paved surfaces in a park also causes variation in part temperature.

Several studies of parks in Singapore by Yu and Hien (2006) have shown that the temperature outside the park's boundary gradually increases when moving further away from the green area, suggesting that the parks has a cooling effect and that this extends beyond the boundary. A study conducted by Shashua-Bar and Hoffman (2000) suggested that the cooling effect of trees could be detected up to 80m away.

2.2.2. Green Infrastructure and Flood Risk Reduction

Alterations to the natural environment can affect the movement of water through the hydrological cycle and alter its composition. Urban development retains very little of the original vegetation and landscape, replacing it with buildings, roads, gardens and parks (Whiteford et al;2001), and these changes have a significant impact on the hydrology and also on fresh water ecology and the terrestrial ecosystems that river systems support. Green infrastructure and provide a means through which to restore natural environmental features to the urban environment and can provide hydrological benefits in two key areas: flood alleviation and water quality.

A number of serious flood events in recent years have focused attention on flood prevention and mitigation. Urban development and engineered flood defense have profoundly changed the natural shape of river beds, banks, and shores of estuaries; and these alterations can exacerbate the nature and seriousness of flood and drought events by changing volume, velocity and direction of water flow (Defra, 2008).

Generally, woodland and other vegetation in the urban and per urban environment can contribute to flood alleviation by delaying the downstream passage of flood flows, reducing the volume of runoff through interception and promoting rainfall infiltration in to the soil. Increasing the hydraulic roughness associated with planting native flood plain wood land along a 2.2km grassland reach of the river carry in Somerset could reduce water velocity by 50% and raise the flood and similarly according to Mentens et al;(2006)green roofs contribute significant benefits for urban water management, including storm water management.

2.2.3. Green Infrastructure Improving Water Quality

The provision of high quality water is essential for the health and survival of all forms of life. The quality of water flowing through an urban catchment can be severely impacted due to high speed runoff, pollutants and detritus collected from urban surfaces and reduced infiltration of precipitation (Pompeu and Alves, 2005; Stovin et al 2008; Jacob and Lopez, 2009). Additionally, many urban areas have combined sewerage and storm water collection systems from which over flows, due to high rainfall events adversely affect water quality (Stovin et al; 2008).

A number of studies show green infrastructures can help improve water quality. Stovin et al, (2008) noted that urban trees provide storage and interception of rainfall at source, infiltration of pollutants in the canopy, and infiltration at the root zone along with amenity and ecological benefits. And, similarly, flood plain and riparian woodland can reduce diffuse pollution, primarily by enhancing siltation and sediment retention (Jeffris et al; 2003), nutrient (phosphate and nitrate) removal (Gilliam, 1994) and fixing heavy metals (Gambrell, 1994). A study by Seters et al. (2009) on evaluating the quality of runoff from an extensive green roof on a multi-storey building found that most chemical variables in green roof runoff were lower than from the conventional roof. Therefore, green infrastructure plays very important role in reducing water runoff and protect water quality.

2.2.4. Green Infrastructure Improving Air Quality

The role of vegetation in mitigating the effects of air pollution has been highlighted as one of the potential benefits of urban green space (Tiwary et al: 2009). Trees in urban green space can influence air quality in a number of ways; for example through direct absorption of gaseous pollutants and interception of particles on to leaf surfaces, by lowering air temperatures through transpiration which can reduce the formation of ozone, and through the direct production of oxygen during photosynthesis.

The contribution of green infrastructure for air pollution reduction can be shown from different perspective. Tiwary et al. (2009) showed that trees reduce pollution through the deposition of particulate matter on to leaf surfaces. The structure of large trees and their

rough surfaces cause interception of particulate matter of less than 10 microns in diameter (Pm_{10}) by disrupting the flow of air and trees provide a surface area for capture that can be between 2 and 12 times the area of land they cover. Nowak (1994) showed that trees in the Chicago area were estimated to remove 6190 tones of air pollution per year which equates to an average improvement in air quality of 5-10% can be gained from increased tree cover. A study by broad Meadow and Freer-Smith (1996) found that the proportion of gaseous pollutants such as SO_2 , NO_x and ozone that are absorbed by trees depends on species, stomata conductance, environmental conditions and pollutant concentration in the atmosphere. It was shown that the uptake of SO_2 , NO_x and ozone was higher in broad leaved species than conifers. Lovasi et al. (2008) found that street trees have been associated with a lower prevalence of asthma in children, even after adjustment for potential confounding factors including socio-economic characteristics, population density and proximity of pollution sources. Therefore, green infrastructure plays key role in reducing air pollution.

2.2.5. Green Infrastructure and Carbon dioxide

Forests help remove large amounts of carbon dioxide from the air. Studies suggest that forest stands in urban environments have the potential to sequester and store more carbon than rural stands of the same canopy species composition (McNeil and Vava, 2006). Green houses gases trap the heat of the sun, and as these gases build up, temperature rises. During photosynthesis, trees convert CO_2 into oxygen; carbon is also stored in the body of the tree, in the soil surrounding its roots and in debris that falls to the ground.

Thus, green infrastructure are very important in counteracting anthropogenic CO_2 emissions not only because they store and trap CO_2 in their biomass but also increase the soil surfaces of cities which otherwise would have been a non-permeable surface.

According to a UFORE analysis conducted in Washington (Nowak and Stevens 2006), Barcelona (Chaparro and Terradas, 2009) and Oakville (McNeil and Vava,), it was estimated that 615000t/year, and 118859t/year and 28000t/year of carbon was stored and removed by urban forests of Washington, Barcelona and Oakville respectively.

However, if the amount of carbon stock in the soil was to be added the total carbon stored would be much higher than these figures.

Species and diameter distribution of urban trees are probably the most important parameters in determining stored carbon as tree species have different carbon storage rates and smaller trees have lower carbon storage levels than large trees(Nowak,1993).Large healthy trees(greater than 30 inches in diameter)sequester 90 times more carbon annually than small trees with less than 4 inches in diameter Nowak and Daniel,(2001),Bell and Wheeler,(2006).Large trees store approximately 1000 times more carbon than small trees at maturity(Nowak and Daniel,2001,Bell and Wheeler,2006).

The other way in which trees reduce atmospheric CO₂emission is that by reducing building energy. In urban area where air conditioning is a must and where fossil fuel plants are used, urban trees reduce carbon production by energy conservation (Nowak,1993).It is also known that well managed wood lots replace fossil fuels hence reducing emission.

2.2.6. Green Infrastructure and Sound Pollution

Noise pollution is an environmental problem of developing cities. Using the different barriers between noise source and the receiver, noise can be reduced through reflection, refraction, scattering and absorption effects on noise waves (Herrington,1976; Harris,1979;Yang and Gun,2001 in Miliki et al;2010).These barriers due to conditions can be either physical or biological barriers or a combination of them. The Mounds, hedges and walls are of applicable noise obstructions (Arenas,2008 in Miliki et al,2010).Therefore, urban forests are biological barriers that could notably reduce noise pollution when they are planted with adequate width and density(Miller,1997 in Jim et al;2008).It was estimated that a 4-5 width tree belt with dense vegetation structure could trim sound level by 5dBA(Jim et al,2008).

2.2.7. Green Infrastructure and Biodiversity Conservation

Urban green infrastructure can have influence on urban biodiversity. Green spaces can form a functioning ecosystem in its own right for many species, for example rare or

protected or those that are invasive and require careful management. Just, importantly urban green space contributes to wider ecosystem function for species whose persistence is influenced larger scale process. Green infrastructure can influence biodiversity by increasing habitat area, increasing populations of some protected species and increasing species movement.

The positive impacts that urban green infrastructure can have on air, soil and water quality provide benefits for biodiversity.

2.2.7.1. Increasing Habitat area

The habitats provided in urban green infrastructure can be particularly important for a range of species. As the area available for habitation increases, both the population size of individual species and the total species richness of an area increase. Fernandez-Juricic and Jokimaki (2001) found that habitat area explained much of the bird species richness of any one patch, and that most 10-35 ha parks will contain all the birds' recorded in any urban area of that region. A study conducted by Girma Nigussie (2009) and Fasil Adugna(2010) showed that insects diversity in natural forest patches is much higher than in monoculture forest patches with in urban forest in Addis Ababa.

2.2.7.2. Increasing Species Movement

Urban green infrastructure creates opportunities for longer distance movement for some species. This allows species to move around within and between urban areas. It also increase habitat connectivity therefore, helps species migrate and survive hazards which may be caused by climatic variability. There is evidence that linear' green ways' increase bird species richness in urban parks(Morimoto and Katoh,2005).Some UK species benefit particularly from linear features and wild life underpasses (Eycott et al;2008).Even the trees in back yard provide the benefit of biodiversity conservation networks in urban ecosystems(Hillary et al;2002 in Singh;2010).

Generally, green infrastructure in urban areas can deliver a wide range of environmental benefits such as increased environmental and aesthetic quality, regeneration of previously developed land, improvements in quality of space etc

2.3 Green Infrastructure Social Benefits

Community engagement during the creation of green infrastructure is vital at all stages in the process in order to ensure its success. The involvement of the local community brings social benefits such as community cohesion and inclusion to local people, and provides residents with a sense of ownership and from this a higher level of satisfaction and positive perception of quality. This helps the multifunctional use of the green space system.

Green space offers possibilities in terms of increasing social activity, improving community cohesion, developing local attachment and lower in crime levels, particularly in deprived communities (Bell et al., 2008; Weldon et al., 2007). The mere presence and local availability of green spaces and natural features have been shown to encourage people to use their outside spaces more and, once outside, these green spaces help to promote positive social interactions. A study conducted by Cohen et al. (2008) found there was a positive association between neighborhood features such as parks and the ability of residents to interact positively. Dawson et al., (2006) undertook a national evaluation of the walking the Way to Health Initiative (WHI) which involved surveying 750 people. They found that for many participants the walks were not just about providing physical activity; equally important was the increased opportunity for social interaction and contact.

Sullivan (2005; cited in Davies and Deaville, 2008) undertook a study looking at strength of community, domestic violence and crime on a housing estate. Social ties were found to be stronger the greener the neighborhood, overall reported domestic violence levels were lower in greener areas, and crime levels were significantly lower in residents near natural spaces.

Hitchings (2009) reported that urban green spaces have personal and social significance. If these spaces are more widely available, physically improved and appropriate to practical as well as physiological need then more people could benefit from them. For

example, green space could be aligned to fulfill aspects of daily routine, such as lunching, being a thoroughfare, or for conducting a range of social activities.

Road side trees also reduce traffic accident. This is because the tree's view and heat reduction will calm drivers. Individual driving speeds were significantly reduced in the suburban settings. Faster drivers and slower drivers both drove slower with the presence of trees (Dixon and Wolf, 2007).

2.4 Green Infrastructure Economic Benefits

The more our natural resources are compromised the more we become aware of their ecological and economic significance.

In addition to social and environmental benefits green infrastructure can have an impact on the. The value of good quality accessible green infrastructure to the local economy can be quantified though; inward investment and job creation, land and property values, local economic regeneration.

The more obvious economic benefits of urban forests are fuel wood, food, grazing for livestock, timber and poles, spices, fiber, medicines and other non timber products(Carter,1999).Other benefits(e.g. beautification, privacy, wild life habitats, sense of place, and well being)attributed to urban trees are difficult to price. But the fact that trees reduce buildings energy cost and those environmental services (e.g. reduced pollution and carbon stored) can be valued in money(McPherson et al,2005).

A 2012 study found that 44% of green infrastructure projects reduce costs compared to 31% that increased costs. The study focused on 479 green infrastructure projects from across the USA. Reduced storm water runoff and decreased heating and cooling costs are the most notable cost savings(Wikipedia, the free encyclopedia).

Trees also improve local business activity and increase property values. Shoppers are willing to make more frequent and longer shopping trips to tree-lined commercial districts. Consumers have also been shown to spend up to 12% more when shopping in these districts (Wolf, 2003 in UEI, 2008).

Generally, to estimate the economic values associated with existing and potential green infrastructure differ by geographical scale, from the individual site owner, to the community and broader.

2.5 Green Infrastructure Unemployment Reduction

The implementation of green infrastructure does create an opportunity to hire unskilled and potentially unemployed labors for landscaping and restoration activities. These 'green jobs' can potentially have important social impacts by providing opportunities for the unemployed and impoverished. This could in turn provide further economic benefits to the general public through avoided costs of social services (Raucher, 2009).

In the UK there are many instances of economic growth and investments as a result of the provision of well maintained and managed green space. CESR (2004) the creation of the national forest increased the number of local jobs by 4.1% and local regeneration using green infrastructure attracted \$96 million of investment.

2.6 Actor in Urban Green Area Development and Management

Urban green infrastructure development and management required more integrated approaches and active involvement of public, private and non-governmental actors at individual, community, city and national level (Baycan-Levent and Nijkaml, 2004:2-3 in Gebrye Kefelew; 2012). Urban green infrastructure development and management should therefore involve those whose interests are affected by both green problems and management strategies and action plans; who control relevant instruments for implementing green management strategies, and those who possess relevant information and needed for dealing with a wide spectrum of green issues. For participation and partnership to become sustainable in the development and management of urban green infrastructure and open spaces, collaboration is very important.

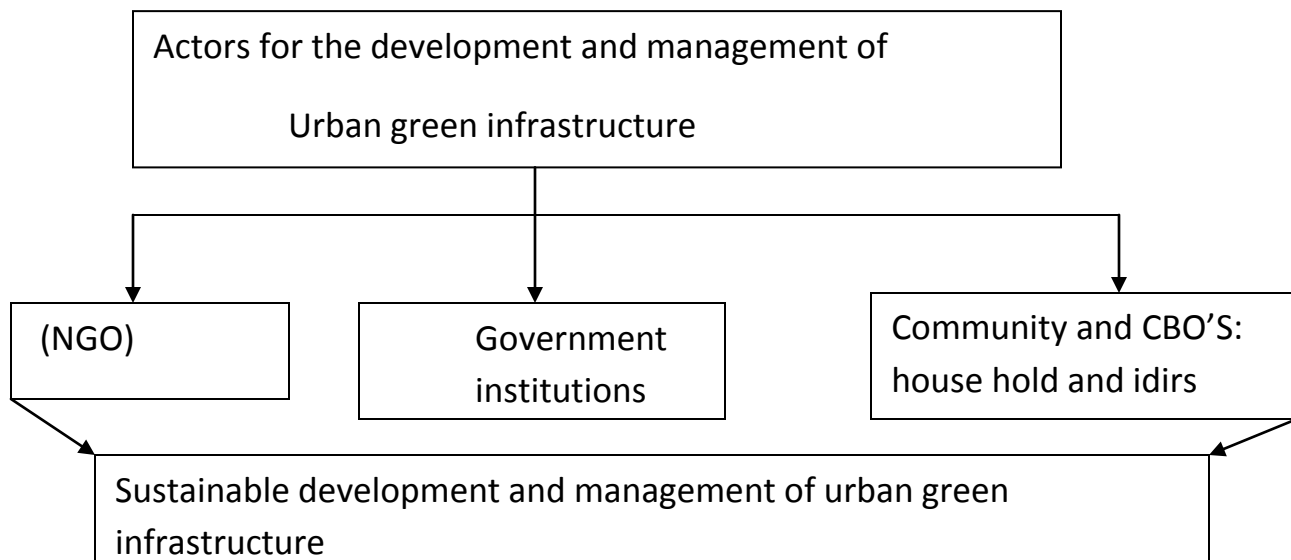
Regarding stakeholders, (Barton et al, 1994:21 in Gebrye Kefelew; 2012) identified the following influential actors which are directly or indirectly involved in the development and management of urban environment in general and urban green infrastructure in particular these are environmental protection agencies whose staffs are responsible for

setting environments regulations and standards for monitoring and enforcement,planning agencies whose staffs are responsible to conduct environmental analysis and used it as inputs for local development planning,concerned residents and community based organizations (CBO’S) whose members and leaders are acutely aware of the impacts of environmental problems at the household and neighborhood level,non-governmental organizations (NGO) that can be effective agents for building local awareness for mobilizing community action and for voicing local concerns,private and informal sector enterprise that generally are concerned about the constraints placed on their business by environmental regulations and the costs such rule incur, particularly when enforcement is lack or inconsistent and the news media whose voice concern for the environment and reporting on those affected by environmental conditions.

As the foregoing paragraph show state,use and challenges for the development and management of urban green infrastructure is determined by the interaction of various government offices, non-governmental organizations and community actors.

In summary, the following figure shows the main actors and their linkages for the development and management of urban green infrastructure.

Figure 2: Various actors and their linkages in urban green infrastructure development and management



Source: Gebrye Kefelew: (2012)

2.7 Empirical Experience of Urban Green Infrastructure

2.7.1 Experience in Developed Countries

Ideas for green urban structures began in the 1870s, with concepts of urban farming and garden allotments. The development of green infrastructure has varied in its focus in the UK, Europe and North America. This diversity has been described as being heavily dependent on the main planning issues in each of these geographical regions. The UK has seen green infrastructures develop through the ideas of Garden Cities and the protected designations of green spaces (Howard, 1985).

In Europe, the development of green infrastructures has been linked with the development of the urban greening agenda and the need to develop integrated green space effectively with in high density landscapes (Beatley; 2000; 2009).

In contrast to the UK and Europe, green infrastructure is a concept originating in the United States in the mid 1990s has its foundations in landscape conservation(Benedict andMcMahon,2006).The term ‘green infrastructure’ is sometimes expanded to ‘multifunctional ‘green infrastructure. Multi-functionality in this context refers to the integration and interaction off different functions or activities on the same piece of land.

2.7.2 Experience in Ethiopia

The consideration of urban greens in urban planning and other social and economic development endeavors of a country has paramount importance for sustainable development. In this regard the urban planning process of Ethiopia has been incorporating the issue of urban planning process exercise since the introduction of modern urban planning (Fetsum2003:106 in Gebrye;2012).He also indicated as this is reflected in the incorporation of green areas and parks in urban plans, considerations of the compatibility of various land use activities, incorporation of generalized environmental objectives and identification of hazardous areas. In spite of this effort, the facilities of urban greens even in the capital city of Ethiopia hardly meet the standards provided by other competitive African cities (ORAAMP, 1996: 32).

In order to respond these problems: the government of Ethiopia is forced to design various supporting guidelines, policies and proclamations. Concerning this, the Ethiopian constitution of 1995, the Ethiopian environmental policy of 1997, the Ethiopian urban development policy of 2006, and urban planning proclamations No 574/2008c can be mentioned.

The Ethiopian constitution provides general principles that urge all peoples the right to live in a clean and healthy environment. The concept of sustainable development and environmental rights are also enshrined in Article 43, 44 and 92 of the constitution of FDRE. As different interventions strategies and proclamations are designed in line with the constitution, Federal, regional and local governments can design and execute supporting proclamation and various intervention strategies and manage urban green infrastructure areas.

Moreover, environmental policy of Ethiopia has recognized the importance of planning and creating green spaces with in urban areas. This opportunity for various stakeholders to develop and manage urban forests, street trees etc as elements of urban green areas.

Besides, the urban development policy, Ethiopia has recognized cities as entities that strive to work towards minimizing serious causes and consequences that endanger the urban environment.

The policy document also declared city government to work towards:

The development and protection of urban greens, designing and developing Environmental friendly development projects, planting and protecting Institutional, parks, residential green areas, street tree and informal green areas, ensuring that an exemplary and leading role as played by the government and ensuring the participation of the private sector in environmental protection selecting and adapting best practices, experiences and technologies sustainable for urban environmental Protection MoFA,2006:21.

Furthermore, urban planning proclamation No574/2008c has made chartered cities and urban administrations one of the institutional areas for environmental protections in Ethiopia. It also prohibits any kind of urban development projects which can not consider its detrimental impacts on urban environment in general and urban greens in particular. All these are very important step in advancing the efforts of urban greens development and management in the country.

2.7.3 Experience in Addis Ababa

Development of urban green areas of Ethiopia was relating with the history of Addis Ababa, which was established in 1886 by Emperor Menelik II. Accordingly, in the early development of Addis Ababa the king divided the location of the residences of his noble men and gave land according to their respective positions. The chiefs in their turn redistribute their land to their immediate followers and create several clusters of residents known as “Sefer” which means camp. The common meeting places for these safer were the “Ghibi” the current grand palace area, the church area and the Arada Market. As Johnson in his PhD paper explained, the city’s evolution was that ‘an increase in population and the coming and going of regional governors and other people, to pay homage to the king promoted the development of commercial services around the ghibbi and it made the Ghibbi an important place of public meeting and gathering. The services of commercial activities make Arada the most popular fabric of the city with its scene of varied life of the people (Johnson, 1976: p: 87)

The Arada area can be considered as the first city’s open public spaces of Addis Ababa. It is unarguable that these open public spaces played a fundamental people’’ role in the early development of Addis Ababa even if their quality was poor and characterized by spontaneous grow and fragmented due to the early tradition between individuals that influence the land occupation and location of houses, absence of the tradition of the city building, gave more emphasis for domestic life than public life.

In general, during the early development of Addis Ababa up to the development of the master plan of the city during the Italian occupation, these open public places served as a place for social gathering, rest, ceremonial gathering and even for recreational purposes.

The development plan of Addis Ababa is being revised now had a proposal that enforces tree planting along the ring roads that are on all new and existing trees, and imposes one-plot-one tree requirements. The existing master plan of the city designates about 22000 ha for green area. The green areas include road side parks, recreational, riverine and periurban forest. In the existing master plan of the city 12342ha of land is allocated for forest and woodland, 4197ha for river bank vegetation, 5129ha of land is allocated for urban agriculture and 335ha for parks. At present total land covered by periurban eucalyptus forest is nearly 8500ha for parks which is about 38% of the total proposed green area, this shows its development and management is poor.

The Clean and Green Addis Ababa Development Plan (CGAADP) was prepared in 2004 by city government of Addis Ababa in partnership with the clean and green Addis Ababa society. The plan is prepared for the period 2004-2005, contains interesting initiatives and ambitious programs about the greening of road side, medians and open spaces. Moreover, initiatives and involvements of the private sectors have been observed in the past years, especially in the development of squares. This effort focuses mostly on beautifying and implemented through concession modality. In this case public authority (the sub city's BPCDMO) is responsible to establish performance standards that the concessions should meet.

2.8. Conceptual Framework

The conceptual model used in this study shows the state, use and challenges of green infrastructure and sustainable city is the result of good management, policy guidelines, community involvement etc

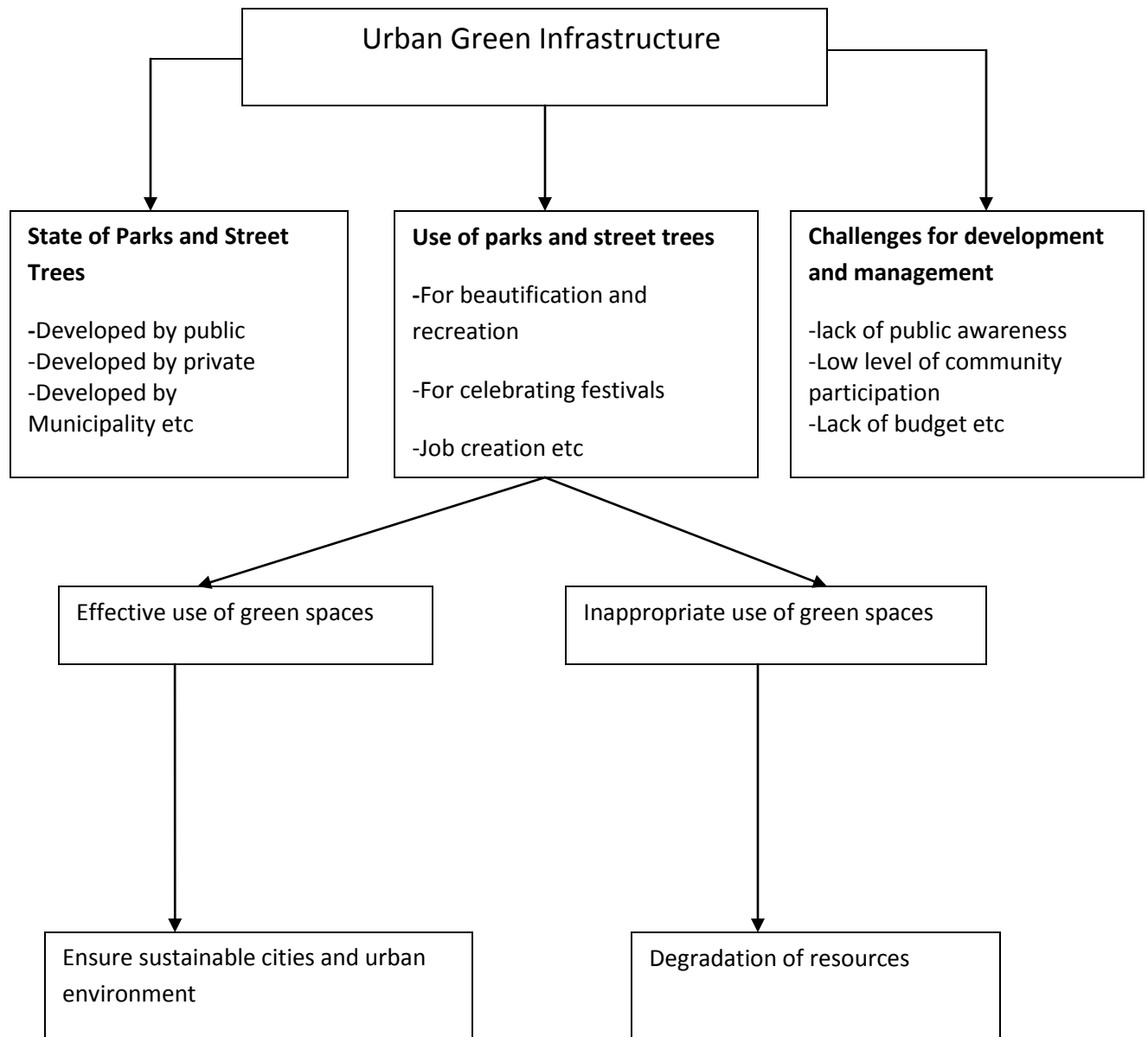


Figure 3: Conceptual Model

CHAPTER THREE

3-Description of the Study Area and the Research Methods

3.1. Study Area

Bole sub city is one of the 10 sub cities in the Addis Ababa city administration. It lies $9^{\circ}1'8''N$ and $38^{\circ}49'29''E$. Geographically; it is situated in the eastern part of the city. It shares boundary with Yeka Sub city in the north, Chirkos and Nifas silk lafto sub cities in the west and Akaki Kaliti sub cities in the south. In the East it also shares boundary with oromiya region. The sub city has 14 woredas and covered an area of $122.8km^2$, from the existing woredas; three woredas were selected for this research work. These are woreda-1, woreda-3, woreda-5. The study woredas will be estimated to be $26.3km^2$ which is more than 21.4% of the total area of the sub city.

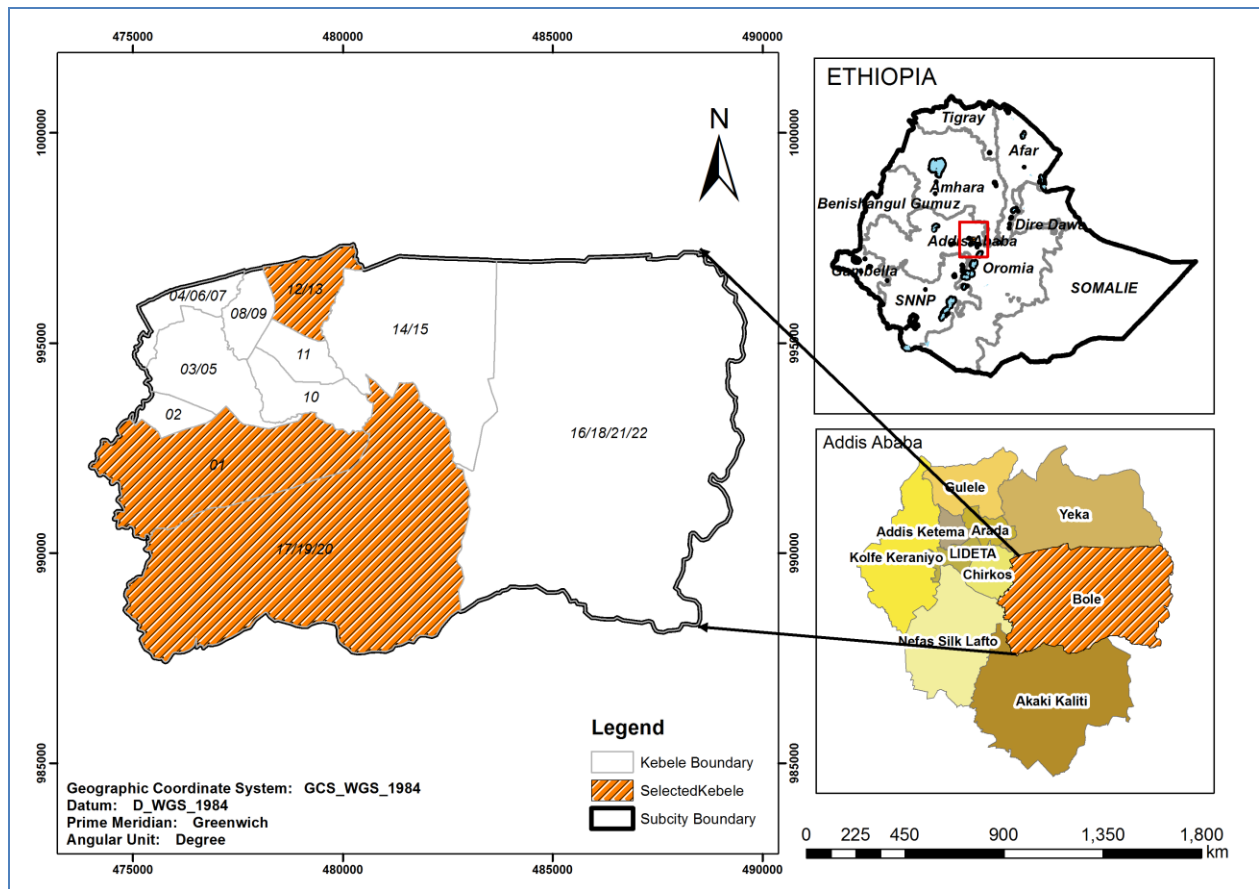


Fig 4: Geographical location of the study area.

Source: CSA (2014)

Why bole sub city?

Urban forest, parks, street trees and river buffer vegetation are breathing, recreation, source of income and interaction spaces for urban centers. However, they are endangered elements of urban green areas in Bole sub-city. The researcher personal observation also discovered that urban green infrastructures have problems associated with their planning, development and management within the sub city. Thus, urban green infrastructure is an important planning issue that needs to be researched in order to identify the state, use and challenges for the development and management of this area.

3.2. Study Approach

The study employed both qualitative and quantitative research methods. Thus, the study used mixed research method. The reason for using this method is to compare the results from two different perspectives as relying on quantitative methods alone can hide important facts obtained from qualitative methods.

3.3. Source of Data

For this study both primary and secondary data sources were collected from various sources. The primary data are obtained from beautification, park and cemetery development and management officer of the sub city and experienced individuals, government officials, residents, NGO practitioner, stakeholders and business communities. Secondary data were obtained from existing maps, published and unpublished materials, internet web sites and photos .

Method of Data Collection

For this study the researcher employed questionnery, interview, observation and focus group discussion in order to get important data on the quality, accessibility, use, challenges, management as well as the community perception on urban green infrastructure.

Questioner: Questioners' were given to randomly selected residents in order to get data on their level of awareness and challenges faced green infrastructure in the study area.

Interview: Interview was conducted to key informants to get data on the values of recreational parks and street trees, budget allocation and challenges for the development and management.

Focus group discussion: Residents and business peoples were also participated in focus group discussion.

3.4. Sample Size and Method Of Sampling

The main purpose of this study is to assess the state, use and challenges of urban green infrastructure in Bole sub city. The study employed purposive sampling technique to select individuals which can provide necessary information about the issue being studied. The researcher purposively identified beautification, park and cemetery development and management officers of the sub city, environmental protection authority officers, urban planners, NGO practitioner, and land development and ownership administration officers for interview in order to get data on the values of recreational parks and street trees, the present status of recreational parks and street trees, budget allocation and challenges for the development and management of green areas in the study area.

To get reliable data the researcher selected 41 representatives from each woreda. Out of these, 10 beautification, park and cemetery development and management officers, 4 NGO practitioners working on the area, 5 environmental protection authority officers, 3 urban planners and 3 land development and ownership administration officers were selected for interview purposively. In addition 1 business people were randomly selected for focus group discussion from each woreda. A total of 45 residents or 15 residents from each woreda were selected randomly. Table list was used as a sampling frame to select residents.

Due to the fact that Bole sub city has 14 woredas, out of these woredas 3 woredas were selected purposively (W1, W3, W5) for this study. The reasons for selecting these

woredas are the presence of recreational parks and street trees that are facing serious problem related with planning, development and management.

The following tables show the number of people selected to participate in different modes of data collections.

For Interview

Table3.1: Composition and number of participants for interview in the study area

Participants	Woreda One	Woreda Three	Woreda Five	Total
BPCDMO	10	10	10	30
EPA	5	5	5	15
Urban planners	3	3	3	9
NGO practitioner	4	4	4	12
Land Administration	3	3	3	9
	Total			75

Source: Own Survey (March, 2014)

For Questionnaire

Table3.2: Composition and number of participants for the questionnaire in the study area.

Participants	Woreda One	Woreda Three	Woreda Five	Total
Residents	15	15	15	45
	Total			45

Source: Own Survey (March, 2014)

Focus group discussion

Table3.3: Composition and no. of participants in focus group discussion in the study area.

Participants	Woreda One	Woreda Three	Woreda Five	Total
Business community	1	1	1	3
Residents	1	1	1	3
	Total			6

Source: Own Survey (March, 2014)

NB:-The residents participated in focus group discussion are those who were participated in filling questionnaires.

3.5. Method of Data Analysis

Data analysis is the process of systematically reaching and arranging the questionery, interview, observation, focus group discussion and other materials that the researcher collected to enrich the study. After the data were collected from various sources, data's and information were organized and analyzed by using different software's like Arc GIS and SPSS. At the end, the data were processed and analyzed.

CHAPTER FOUR

4-Results and Discussion

This chapter analysis and presents the data from questionnaires, interview, focus group discussion and field observation. The analysis and presentation is based on the research objectives and questions with a general socio-economic characteristic of the respondents.

4.1. Socio-Economic Characteristics of the Respondents

The socio-economic characteristic of the respondents had a direct relationship with the development and management of green infrastructures in general and recreational parks and street trees in particular in the study area. Therefore, it is necessary to discuss and analyze these variables which include age, sex, income level and education.

4.1.1. Age Group

Different age groups had different implications for green infrastructure development and management of the study area. Well developed and managed green infrastructure areas contribute more to the social, psychological, cultural and economic development of any age. Green infrastructures are also useful for practical teaching and learning processes of students and for development of interactive life among age mates. For adults, green infrastructures areas create conducive atmosphere for socio-cultural development and social cohesion and for celebration of different ceremonies. For the aged, it provides a place for leisure, rest and information exchange among each other from different sources of media i.e. magazines, journals and news paper.

Table 4.1 Age structure of the respondents

No	Age Group	Frequency	Percentage
1	≤30	25	56
2	31-45	15	33
3	46-60	3	7
4	>60	2	4
	Total	45	100

Source:Own Survey (March 2014)

The age structure shows that most of the respondents are young (<30 years) followed by those in the age group of 31-45 years. Those above 45 years of the age are very few in number.

4.1.2. Sex Distribution

Sex distribution of the respondents had a different interpretation in relation to recreational parks and street trees in the study area. Women use green areas negatively for dumping wastes. Men use the areas negatively for chewing chat and smoking. If the levels of awareness of both sexes are increased the use of green spaces for the intended values should be achieved and helps the management and development of the areas.

Therefore, sex distribution of respondents affect the intention of using recreational parks and street trees especially for those women who are not educated and had low awareness for the benefit of recreational parks and street trees, or had an intention of using green spaces for dumping solid waste. Out of the total 45 respondents 8 of them are women and the remain are male's. Below is sex distribution of the respondents.

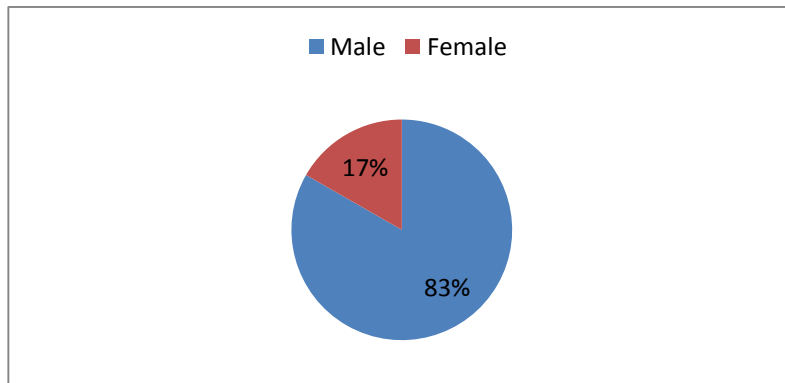


Figure 5: Sex distribution of the respondents

4.1.3. Income level of respondents

Incomes of individuals are closely related to the development and management of recreational parks and street trees in the study woreda. As income of individuals increases, then the tendency of using recreational parks and street tree areas for dumping solid waste and other illegal activities decreases due to their ability to donate money to develop and maintain the green infrastructures and willingness of people to use them. As shown in the table below the income level of the majority of the respondents is less than 1,000 birr per month. This amount could not initiate them to contribute some amount of money for green areas development and small proportion (11%) earn is high, more than 2000 birr.

Table 4.2 Income Level of the Respondents

No	Income Level(in birr)	Frequencies	Percentage
1	<1000	25	56
2	1000-2000	15	33
3	>2000	5	11

Source: Own Survey (March, 2014)

4.1.4. Level of Education of the Respondents

Here education level and awareness of recreational parks and street trees development and management had a direct relation. If the level of education is high and then the awareness about the values and benefits of recreational parks and street trees will be high, which in turn led to increased contribution for development and management of green infrastructures. For an illiterate society, green infrastructures means nothing except simple open spaces for solid waste disposal, while for literate and modern society recreational parks and street trees are a means for leisure and recreation. Therefore, education is an instrument necessary for the creation and development of green infrastructures in the study woredas and even in cities.

Table 4.3 Level of Education of the Respondents

No of Respondents	Level of Education				Total
	Read & Write	12 th completed	Diploma	Degree & above	
Frequencies	7	14	18	6	45
Percentage	16	31	40	13	100

Source: Own Survey (March, 2014)

From the table above, 87% of the respondents had no first degree which had direct impact on awareness and understanding of the values of recreational parks and street trees.

16% of the respondents can read and write, 31% of the respondents had completed 12th grade, 40% of the respondents hold diploma and 13% of the respondents holds first degree and above. This shows that the residents have relatively high education and this may help to create awareness about recreational parks and street trees in the study woredas.

4.2. State, use and challenges of recreational parks and street trees.

4.2.1. The state of recreational parks and street trees

Any development is not a result of one party effort but is a result of integrated effort of actors or communities. The integrated effort of government, non-governmental and community based organizations can help ensure achievements of a goal set to address a particular problem. The same is true for the development; management and maintenance of recreational parks and street trees in the study woredas. In Bole sub-city the development and management of green infrastructure is carried out by different actors including government institutions, individuals and community based organizations for the protection of environment. The activities undertaken by different stakeholders in the study woredas are discussed in the following ways:

4.2.1.1. Recreational parks and street trees developed by the governmental institutions and nongovernmental stakeholders.

There are institutions that developed recreational parks and street trees in their compound and nearby area in the study woredas. For example, among the government institutions beautification, park, cemetery development and management officer took the initiative in the management and development of green infrastructures. Below is the size of plots used by BPCDMO for green area development.

Green infrastructures developed by government institutions

The table below shows that the present state of green infrastructure developed by Beautification, Park, Cemetery Development and Management officer in the study woredas of Bole sub-city.

Table 4.4 Total areas used by green areas by the institution (in M²)

No	Government Institution	Woreda	Total Area	Area covered Green area	Percentage
1	BPCDMO	W1	21,105	3,391	16
2	BPCDMO	W3	15,883	10,449	52
3	BPCDMO	W5	17,192	9,648	56

Source: Own Survey (March, 2014)

4.2.1.2. Green Infrastructures developed by Privates

Under this group, different stakeholders are engaged in the development and management of green areas. These are Embassy of Ukraine, Edna Mall, the Public, the Municipality and you go city churches are some of them.

4.2.1.2.1. Developed by Embassy of Ukraine

Among the foreign embassies found in Bole sub city, the embassy of Ukraine is the one which is involved in the development and management of green areas in the study woredas. As observed in the field survey, it is well developed and serviced as shown in the photo below.



Fig 6: Photograph of Ukraine Embassy's green area

Source: Picture taken by author (March, 2014)

4.2.1.2.2. Developed by Edna Mall

A private institution primarily engaged in the entertainment industry; but side by side they developed and managed green areas in the study woredas. As, shown in the photo below it is an exemplenary green area for other places. It is well developed; managed and continuous follow-up is there as observed in the field survey.



Fig 7: Photograph of green areas on round about which are protected by Edna Mall.

Source: Picture taken by the author (March, 2014)

4.2.1.2.3. Developed and Managed by City of Refuge Church

Churches are places in which religious activities take place. Mostly indigenous forests and aged trees are found in church compound as if churches should take initiative in the development of green infrastructures. City of refugee church is found in Bole sub-city and took initiative in the development and management of street trees in the study woreda as shown in the photo below.



Fig 8: Photograph of street tree which is protected by Church.

Source: Picture taken by the author (March, 2014)

4.2.1.2.4. Developed and Managed by Public

Without community participation the development of green areas will not be achieved. So, community participation is a must for the development, management and protection of green infrastructures in general and recreational parks and street trees in particular. As an example shalla recreational park is developed and managed by the public in the study woreda. As shown in the photo below it is well developed and serviced.



Fig 9: Photograph of recreational park managed by public.

Source: picture taken by the author (March, 2014)

4.2.1.2.5. Developed and Managed by the Municipality

Although the development and management of green areas is the responsibility of the municipal authority, almost none of the green areas proposed on the master plan were developed, except central or peacock park from the study woredas. Peacock Park covers an area of 26.1ha and mostly serves as for celebrating wedding ceremony and recreation. In addition to central park, the municipality had maintained and managed road side green areas.



Fig 10: Photograph of recreational park protected by the municipality.

Source: Picture taken by the author (March, 2014)

In conclusion, different stakeholders have participated in the development and management of green infrastructure in general and recreational parks and street trees in particular in the study areas. The present status of recreational parks and street trees in the study areas however is not enough and lack proper management and development. This is because there is low level of community awareness and there is also problem of co-ordination among different stakeholders.

4.2.2. The use of recreational parks and street trees

Green infrastructures in general and recreational parks and street trees in particular have multifaced functions from which the society benefits. In particular those who are living in urban areas benefit from green infrastructures since green areas have a power to improve the urban environment. Among the uses of recreational parks and street trees the following were observed in the study woredas:

Table 4.5: Responses of the urban residents regarding the use of recreational parks and street trees.

Rank	Uses	Frequencies	Percentage
1	For beautification and recreation	102	100
2	For psychological satisfaction	80	78
3	For carrying out different ceremony	62	61
4	Combating climate change	55	54
5	For ecological balance	52	51
6	Create job opportunity	40	39
7	Conservation of biodiversity	35	34

Source: Own Survey (March, 2014)

4.2.2.1. For Beautification and Recreation

All of the respondents in the study area agree that recreational parks and street trees are used primarily for beautification and recreation. Beautification means to make or become beautiful that give great pleasure or satisfaction to see. Therefore, recreational parks and street trees are eye catching places used as a play ground, recreation and they give shade for the urban settlers. However, the level of development and management in the study woredas are facing problem. Woreda officers should thus give emphasis for such places.

4.2.2.2 For Mental and Psychological Satisfaction

78% of the respondents indicated that they use green space for rest and to get psychological satisfaction. Green spaces bring mental and psychological satisfaction for any age group. Looking, sitting and even playing in areas that is covered by plants brings huge mental and psychological satisfaction for children, youths, women and old age person.

4.2.2.3 For Carrying out Different Festivals and Ceremonies

Out of the total of the respondents, 61% agreed that the green spaces are mostly used for carrying out different festivals and ceremonies. Festivals and ceremonies are any occasion for celebration, especially one which commemorates an anniversary or other significant event i.e. wedding ceremonies, birth day ceremonies and some religious and socio-cultural ceremonies are carried out in such places.

4.2.2.4 Combating Climate Change

Out of the total respondents, 54% said that recreational parks and street trees are the ability to moderate local climate. Green infrastructures provides a range of climate related services that can make both a substantial contribution towards adapting to climate change and limited yet important contribution towards mitigating climate change. Such natural interventions are increasingly being recognized as a desirable 'win-win' approach to combating climate change, as they also help to deliver multiple other social, economic and environmental benefit.

4.2.2.5 Ecological Balance

From the total 51% of the respondents said that recreational parks and street trees used for maintaining the ecological balance of the area. Ecological balance is a state of

dynamic equilibrium with in a community of organisms in which genetic, species and ecosystem diversity remain relatively stable, subject to gradual changes through natural succession. Whatever is taken from the environment must be given to back to it. In fact, phenomena like global warming, acid rain and pollution happen because the elements taken from the environment are used up without replenishing. If the ecological balance is disturbed, there can be drastic consequences, some of which are already happening.

So, developing and managing green areas properly means reduction of air pollution, reducing runoff, reduce rate of carbon dioxide, and solving other urban environmental problems. Therefore, the concerned bodies should consider these values of green spaces and give great emphasis for their protection.

4.2.2.6 Create Job Opportunity

From the total respondents 39% proved that green spaces have a potential to create job opportunity in different posts. The existence of recreational parks and street trees have created job opportunity for citizens, in post such as designing green areas, those who are engaged on preparation of land, guarding of the forests, care of recreational parks and street trees, soil and conservation workers etc. In the study woredas nearly 87peoples are engaged on conservation of green areas.

4.2.2.7 Conservation of Biodiversity

At last 34% of the respondents said that green spaces have an ability to contain different biotic components in the area. The proper uses of biotic components provide maximum benefits for sustainable development and to meet the needs of the present and future generations as well. Conservation in the positive, which includes preservation, maintenance, sustainable, use, restoration and enhance the natural environment. So, developing and managing green spaces properly means conserving variety of plant species and wild animals in the area.

4.2.3 Challenges to the development and management of recreational parks and street trees

In this chapter we focus on factors which contributed for the low level of development and management of recreational parks and street trees in the study woredas:

Table 4.6 Perceptions of respondents on constraints and their rank in seriousness

Rank	Constraints	Frequencies	Percentage
1	Lack of public awareness	115	93
2	Low level of community participation	104	85
3	Poor implementation of government policies	101	82
4	Lack of budget	100	81
5	Lack of skilled man power	95	77
6	Shortage of land in urban areas	85	69
7	Illegal Settlement	80	65
8	Lack of regular follow-up	75	60
9	Problem of pollution from different sources	30	24
10	Lack of coordination from different stake holders	25	20

Source: Own survey (March, 2014)

Therefore, according to the responses from the table above; lack of public awareness, low level of community participation, poor implementation of government policies, lack of budget, lack of skilled man power, shortage of land in urban areas, illegal settlement, problem of regular follow-up, problem of pollution from different sources and lack of cooperation among different stakeholders are the major factors. Some of these problems are discussed briefly below.

4.2.3.1 Lack of Public Awareness

Recreational parks and street trees have different values, both direct and indirect uses. Among the

values of recreational parks and street trees:

- 1) For recreation and leisure
- 2) For economic benefits through job opportunities
- 3) For environmental benefits: reducing run off
- 4) For ecological value: conservation of biodiversity
- 5) For socio-cultural cohesion: green areas have a power of attraction as a center of meeting for different age, culture and sex groups and helps to integrate and discuss about their localities, politics, religion, economy etc
- 6) For practical education of students about nature, environment, flora and fauna and about their interaction and relationship.

In spite of the above uses and other related values, the community, civil servants, the officials and even professionals are not well aware of these values or simply ignored them. Because of these low levels of awareness, the community has the habit of using green spaces for unwanted or illegal purpose like for dumping solid wastes, letting domestic animals in the area, cutting for some other purposes, stealing metal fences and storing and selling construction materials.

Lack of awareness is not only a problem of the people but also that of officials as well. The woreda officers' plants seedlings at the beginning of each summer, but none of the seedlings had developed well because they are not taken care of and maintained regularly. The officers at woreda level should provide environmental education and discuss clearly the values of green spaces to the community as a whole with different social medias. The respondents also pointed out that, they want to use the green spaces for:

- a) Meeting purposes
- b) Dumping solid wastes

- c) Storing and selling construction materials
- d) Building houses not found in the woreda plan.

Table 4.7 Respondents preference for using green spaces

No	Choices of respondents to use green spaces	Frequencies	Percentage
1	For meeting purpose	108	90
2	Dumping solid waste	115	96
3	Storing and Selling Construction materials	73	61
4	Building houses	25	21

Source: Own Survey (March, 2014)



Fig 11: Photograph that shows unprotected green area Fig12: Well fenced and planned green area. Source: Picture taken by the author (March, 2014)

From the responses given in table 4.7 above, one can infer that the awareness of the people about the real and intrinsic benefits is very poor. The non use of green spaces for social gathering or other good purposes lead to weak cultural cohesion and loss of the ecosystem and aggravate environmental degradations. This loss of socio-cultural cohesion brings about total loss of the culture of the society due to lack of transitivity from generation to generation and also create unwanted habits in the society like chewing chat and addiction to other alcoholic drinks.

4.2.3.1.1 Factors Affecting the Level of Public Awareness about the Values of Recreational Parks and Street Trees

Among the factors affecting the awareness of the people about recreational parks and street trees:-

- 1) No attention is given by the officials as well as the community as whole.
- 2) Low level of awareness about environmental function.
- 3) Poverty or low level of living standard.
- 4) Migration from rural areas to urban centers with the mind of peasantry.
- 5) Ignorance about the value of livable and competitive cities.

4.2.3.2 Low level of Community Participation

Community participation is important for public action. The same is true for the case of the development and management of green spaces. Due to the fact that recreational parks and street trees have multifunction and residents are the primary beneficiary, their participation is low.

Though, among the factors affecting the low level of community participation include:

- a) Lack of sense of belongingness
- b) Ignorance of responsibility
- c) Problem of commitment
- d) Problem of participatory rules
- e) Low level of living standard

4.2.3.3 Poor Implementation of Government Policies

Policies refer to rules and regulations formulated for the implementation of the intended objectives. Policies related with the development and management of recreational parks and street trees in the study woredas suffer from implementation problem. Government institutions should therefore enforce rules and regulations for the development and management of green areas in the areas.

4.2.3.4 Lack of Budget

The financial problem for green areas development and management is critical especially for developing countries for maintaining, developing and administering green spaces. The problem is not only for running costs but also expenses for salary for highly qualified multi-disciplinary professional which require heavy investment. The possible causes for budget constraint could be less attention and lack of awareness about the values of green spaces except for beautification, play ground etc

Table 4.8 Budget allocation for green infrastructures of the sub-city (2010-2014)

Year	Allocated budget for green areas	
	Planned	Actual
2010	375,000	375,000 +
2011	500,000	500,000 +
2012	1,120,000	1,120,000 +
2013	1,150,000	1,150,000 +
2014	1,306,330	1,306,330 +

Source: Sub city Finance Office (2014)

From the table above, the five years budget allocation shows a slight increase but does not seem to be enough. For example, the total budget allocated for the sub city for the year 2014 is 375,824,547.48 birr out of this 1,306,330 birr is allocated for the sub-city's beautification, park, cemetery development and management office. This is 0.35% (less than 1%) of the total budget. This could be a reflection of lack of attention for green infrastructure.

4.2.3.5 Lack of Skilled Man power

If cities are livable, clean, suitable and attractive for residents and tourists, will increase its competitiveness. The attractiveness and competitiveness of cities results from qualified and committed officials as well as professionals.

The nature of green infrastructures are multifunctional which requires multidisciplinary professionals like urban planners, land administrator, environmental protection authority officer, BPCDMO etc without qualified and committed professionals, better awareness and sufficient budget development and management of green infrastructures cannot be achieved. Therefore, professionals have irreplaceable role for green spaces development and management. It is observed that BPCDM officers at woreda level are one or two indicating the poor availability of man power.

4.2.3.6 Shortage of Urban Land Areas

Because of the attention given to urban green infrastructure development by government officials, just like other urban issues, is very low and this refrain them to giving the land for the development of green areas. Inappropriate use of land in urban areas, rapid rural-urban migration, street trade, illegal settlement etc contributed a lot for the shortage and inappropriate use of land for green areas in urban environment.

4.2.3.7 Illegal Settlement

Illegal settlement mostly takes place in open spaces which is planned for green areas, riverbanks, and steep slope. These will aggravate environmental degradation. The same is true in the study woredas. The researcher observed that the proposed green areas were occupied by illegal settlers and this was approved by woreda officers but no legal measures were taken.

4.2.3.8 Lack of co-operation among different stakeholders

The integrated effort of government, non-governmental institutions and community based organizations can help ensure achievements of a goal set to address a particular problem. The same is true for green infrastructures development, management and maintenance in the study woreda.

As the level of stakeholder's participation increases, the level of contribution for development and sense of ownership increases. From governmental institutions urban planner, BPCDMO, land administrator, environmental protection officer, water and sewerage authority are some of them and from the nongovernmental and community

based organizations like Idir, Iqub, youth association, environmental club, NGO's and business men and many others had an opportunity to participate in consulting, monitoring and evaluation of development activities. Generally, integration of different stakeholders is making the development and management of green areas too easy.

CHAPTER FIVE

5-Conclusions and Recommendations

5.1. Conclusions

Recreational parks and street trees development and management as well as maintenance require multidisciplinary professionals and high budget allocation. Recreational parks and street trees had a nature of inclusiveness in their development and utilization activities and values. To examine these and other related issues of recreational parks and street trees in the study woredas of Bole-sub city data were collected through different tools and finally analysis was made.

The results obtained from the analysis are summarized as follows: recreational parks and street trees developed by governmental institutions, non-governmental stakeholders, and community based organizations and individuals have many purposes. These were at first developed for beautification and recreation, for shade and for celebrating different festivals.

Due to lack of community participatory and problem of integrating different stake holders the present state of recreational parks and street trees in the study woredas are very poor because of population density, illegal buildings, land use change, unwise use of resources and storing and selling construction materials. Also Public awareness towards developing, managing and using recreational parks and street trees for the intended values are very poor. They prefer to use these places for illegal activities like dumping solid wastes etc. There are various factors which contribute to the low level of awareness of the people about the benefits gained from the well developed recreational parks and street trees. Among the factors negligence, low living standard etc.

The study also identified lack of collaboration and participation among stakeholders as another challenge which affects their co-ordinate efforts and roles to develop and manage recreational parks and street trees. Moreover, underdevelopment of recreational parks and street trees are a result of lack of trained professionals with experience and sufficient budget. The number of trained personnel in the field is very limited in the study woredas.

Problem of regular follow-up, lack of frequent inspection and problem of facilities i.e. Fertilizer, water, soil and fence are great contribution for the low level development of recreational parks and street trees in the study woredas. Problem of pollution from different sources. The road side trees are seriously exposed for smokes coming out from automobiles. Sometimes when we see them their leafs turns from green color to brown or dark; this limits its growth and finally gets dry. Lack off effective and integrated data base system, poor selection of tree species, traffic accidents, street vending and installation of utilities are also identified as hindrances which affect the development and management of street trees.

The findings of the study also revealed that lack of clear enforcement laws, regulations and senses of belongingness of the community to protect street trees as other challenges.

To summarize, the Federal Democratic Republic of Ethiopia Constitution, Environmental Policy of Ethiopia, Urban Development Policy of Ethiopia and urban planning Proclamations No 574/2008c contains general provisions about the development and management of urban environments. Besides, the City Development Plan of Addis Ababa and Clean and Green Addis Ababa Plan of 2004 recognized the importance of urban green areas to urban communities. All these general frameworks should create conducive environment so as to design specific implementation strategies at different administrative levels of the city for the development and management of recreational parks and street trees in the study woredas.

The study found out that the establishment BPCDMO at different administrative levels of the city is a promising condition and should also be equipped with the necessary human and material facilities make great contribution for its development and management.

5.2. Recommendations

The following recommendations are provided to improve the recreational parks and street trees development and management in Bole sub city :

Awareness creation about the communal nature of recreational parks and street trees should be enhanced so as to develop a sense of belongingness. Promoting awareness creating programmes by social Medias like Radio, TV etc. The office also should assign qualified professionals who have good experience in green infrastructure development and management, sufficient budget should allocate for the development and management of recreational parks and street trees. They should also provide water in nearby green areas (it is implemented some part of bole) and watering plants at the appropriate time either the water will evaporate and planting shortage of water resistant plants.

Regular follow up and monitor the achievements of the practiced development and management and strategies need to be assessed so as to check the progress, provide essential supports and to take appropriate measures. The officials should develop one model green space from the study woredas and celebrate different ceremonies to increase the people's awareness about the benefits of recreational parks and street trees.

The administrators should formulate and enforce rules and regulations of green spaces to keep them clean. Moreover government politicians and decision makers should recognize the related problems of recreational parks and street trees as other urban challenges so as to address the problems systematically and consciously.

They should be integration among different stakeholders, residents, business people BPCDMO, urban planner, CBO and many other potential stakeholders in the development and management o recreational parks and street trees. Improving institutional capacities of local agencies which are responsible for urban green infrastructure development and management as well as for planning, implementing and monitoring the development and management strategy of these areas should be of a great concern.

Public sectors, NGO practitioner, business communities and local residents which have significant roles to plan, develop and manage recreational parks and street trees by providing technical assistant to support the local communities and voluntary groups that are involving in the development and management of these spaces.

In order to make the above given key points feasible, co-ordination among stakeholders is a fundamental importance to come up with more sound solutions that considers the interest of all stakeholders, this of course needs further research from the side of all stakeholders.

To develop and manage these green spaces for the intended aims, the good will, co-ordination and efforts of all stakeholders including communities, government authorities and non-governmental bodies are mandatory.

References

- Alamerew B. (2002) Green Frame Development Study, Ministry of Federal Affairs-
AAIDPO Addis Ababa.
- Alan Barber, 2005: *Management of multifunctional urban green apace in England*, the
University of Manchester, England
- Ann Forsyth, 2003: *People and Urban green areas: Perception and Use*, University of
Minnesota, USA.
- Baycan, 2002: *Development and Management of green areas in European cites; a
Comparative analysis*: paper presented at the 38th international planning
congress, Sep: 21-26, 2002, Athence, Greece.
- Bell, R. and Wheeler. (2006). Talking Trees: An Urban Forestry Toolkit for local
Governments. ICLEI (local governments for sustainability)
- Benedict, M.A and McMahon (2002)''*Green Infrastructure Smart Conservation for the
21st Century*
- Center for Neighborhood Technology (CNT) and American Rivers (2010).''The Value of
Green Infrastructure, A Guide to Recognizing its Economic,
Environmental and Social benefits.
- Derese Getachew, 2008: The "Tragedy of the Urban Commons". A case study of 2 public
places in Addis Ababa, Addis Ababa, Ethiopia.
- Dubbale Daniel, Tsutsumi, J., and Benndewald M.J.(2010).Urban Environmental
Challenges in Developing Cities: The Case of Ethiopia Capital Addis Ababa
IV: World Academy of Science, Engineering and Technology (42)397-402pp

Eric J. Walberg, Alcp, 2007, Green Infrastructure in Hampton Roads, Hampton Roads Planning District Commission.

Escobedo, F. J.; Wagner, J. E.; Nowak, D. J.; De la Maza, C.L., Roddriguez, M., and Crane, D.E. (2008). Analyzing the cost effectiveness of Chile's policy of using urban forests to improve air quality. *IN: Journal of Environmental Management* (86)148-157pp

Forest Research (2010). Benefits of green infrastructure. Report by Forest Research.

Forest Research, Farnham. available on line [http://www.forestry.gov.uk/pdf/urgp_benefits_of_green_infrastructure.pdf/\\$FILE/urgp_benefits_of_green_infrastructure.pdf](http://www.forestry.gov.uk/pdf/urgp_benefits_of_green_infrastructure.pdf/$FILE/urgp_benefits_of_green_infrastructure.pdf)

Gabriel Scheer, 2004, Suitable Street Design: An analysis of best practices as seen with in the Seattle context, University of Washington.

Gebrye Kefelew (2012) *An Assessment of Green areas in Addis Ababa: The case of co-operative Housing and street trees in Nifas Silk Lafto Sub city.*

Horst, A. (2006). *Rehabilitation of Urban Forests in Addis Ababa.* *IN: JOURNAL OF THE DRYLANDS* (2); 108-117pp

Johnson Martin Eric, 1974: The evolution of the morphology of Addis Ababa, Los Angeles, university of California Ph.D. Thesis.

Josh Foster and Ashley Lowe, 2011, the value of Green Infrastructure for urban Climate Adaption, the center for clean air policy.

Kumlachew Tesgaye; 2007: critical assessment on the current operation of planned

Public open spaces in Addis Ababa, MA thesis, AAU, Ethiopia.
Mekonnen Biru. (2012). An Overview of Status of the Green Areas, Floristic Composition and Conservation Efforts in Addis Ababa, Ethiopia.

- Ministry of Federal Affairs, 2005: Urban Development Policy of Ethiopia, Addis Ababa, Ethiopia
- Nowak,D.J.(1993).Compensatory value of an urban forest: an application of the Tree-value Formula.*IN: Journal of Arboriculture*19 (3)
- Singh,V.S.,Pandey,D.N.;Chaudhry,P.(2010).Urban forests and open green spaces:lessons For Jaipur,Rajasthan,and India.*IN :RSPCB Occasional Paper No. 1. Rajasthan State Pollution Control Board 4-Jhalana Institutional Area,Jaipur 302017, Rajasthan,India*
- Ulrich,R.S.,Simons,R.F.,Losito,B.D.,Fiorito,E.,Miles,M.A., and Zelson,M.(1991). Stress recovery during exposure to natural and urban environments.*IN:Journal of Environmental Psychology* (1991)11,201-230
- URGE project, 2005: Urban green environment: improving the quality of life in urban regions through urban greening initiatives, research number 000016, Birmingham, England.
- Wieditz,l,and Penny,J.(2007).Climate change adaptation options for Toronto's Urban Forest Clean Air Partnership, Toronto, Canada
- Williamson and Jon Lovell, 2010.Green Infrastructure: connected and multifunctional Landscapes, Land Scape Institute Position Statement, London
- Zelege Gonfa, 2008 examining potentials for protecting and greening urban open spaces in Robe Town, MA thesis, urban management ECSC, Addis Ababa, Ethiopia

Websites

- www.unfpa.org/swp/2007/english/introduction.html
- CAFE Space: www.cafespace.org.UK
- URGE: development of green spaces: www.urge.project.org

Annex 1

Questionnaires Prepared for Sample Households

The questionnaires are prepared for an academic purpose for the fulfillment of MA Degrees in Land Resource Management. The objective of the study is to assess the use, state and challenges of urban green infrastructure in bole subcity. Your response is very important for the success of the study. Writing name will not be necessary.

I would like to thank you for your co-operation

1. Age: less than 30 years
Between 30-45 years
Between 46-60 years
Greater than 60 years
2. Sex: Male Female
3. Occupation: Civil servant Private Sector other specify _____
4. Income: Less than 1000 birr 1000 birr-2000birr > 2000 birr
5. Education: Illiterate Certificate Diploma Degree and above
other specify _____
6. Woreda of residence: _____
7. Are there any recreational parks and street trees in your locality? Yes No
8. If your answer for Q#7 is Yes, what is the use of the existing recreational parks and street trees?

9. By whom recreational parks and street trees was developed and managed now?

10. Is recreational parks and street trees maintained frequently? Yes No

11. Is there a community park developed and managed by the community itself? Yes
No

12. If your answer is Yes for Q#13 explain its current function.

13. What do you think about the values of urban green infrastructure in general and recreational parks and street trees in particular in the urban environment? List the functions:

14. What is expected from you to protect and make sustainable the values of recreational parks and street trees in your locality?

15. Whom do you think is the main responsible body for the development and management of recreational parks and street trees?

16. How do you evaluate bole sub city for developing managing recreational parks and street trees?

17. Had you ever participating in planting and gardening campaign in bole sub city?

Yes No

18. What is the present state of recreational parks and street trees in your locality?

19. What is the attitude of the urban dwellers towards recreational parks and street trees?

20. What are the main challenges facing bole sub city in developing and managing green infrastructures in general and recreational parks and street trees in particular?_____

21. What should be done for Q#20?

Annex 2

Interview guidelines for beautification, park and cemetery development and management officers of the sub city, NGO practitioner and environmental protection authority

Dear respondents

I am conducting a study entitled 'Assessment of urban green infrastructure in bole sub city' and your answers for the interview questions are great help. All your responses will be kept confidential. You don't need to write your name.

Thank you in advance for your co-operation

1. What are the values of recreational parks and street trees in bole sub city?

2. Is green infrastructures part of the plan of the sub city. Yes No If yes; What are the activities under take?

3. Who is responsible for the development, management, maintenance and protection of green infrastructures in general and recreational parks and street trees in particular in bole sub city?

4. What is the main roll of bole sub city's administration in green infrastructures development and Management?

5. How often recreational parks and street trees are maintained?

6. How much budget is allocated for the last 5 years for recreational parks and street trees development and management in bole sub-city?

Year	Capital(in birr)	Remark
2010		
2011		
2012		
2013		
2014		
Total		

7. What is the total budget of the sub-city?

8. Who are the main stakeholders participating and will participate in the future in the development and management of recreational parks and street trees?

No	Major stakeholders	Major role played and achieved	Challenges faced	Remark
1				
2				
3				
4				
5				

9. What mechanisms or approaches follow for the development and management of recreational parks and street trees in bole sub city?

10. What are the main challenges facing bole sub city administration in developing and managing green infrastructure in general and recreational parks and street trees in particular?

11. What do you suggest the solutions for Q # 9? _____

12. What should be done for making Addis Ababa and bole sub city competitive with other sister cities in livability and tourist destinations?

13. How many public parks are there in bole sub city? And list their names.

14. What are the main functions of these public parks? _____

15. Who is responsible for protecting recreational parks and street trees?

16. Is there a nursery site in bole sub city? Yes No

17. If your response is yes for Q #15, what type of seedlings is planted in the site?

18. Do green infrastructures providing values for youth's and others? Yes No

How? _____

Annex 3

Interview guidelines for urban planners and land development and ownership administration officers

1. What are the factors that hinder the development of green infrastructures in general and recreational parks and street trees in particular in your locality?
2. What are the problems that affect the management of green infrastructures in general and recreational parks and street trees in particular in your locality?
3. In what ways are you involving as a stakeholder to plan, develop, and manage recreational parks and street trees in particular in your locality?
4. What local strategic practices are being implemented to develop and manage recreational parks and street trees?
5. In your opinion, what are the opportunities that create conducive environment to develop and manage recreational parks and street trees?

Annex 4

Focus group discussion for residents and business communities

1. What are the factors that hinder the development of green infrastructures in general and recreational parks and street trees in particular in your locality?
2. What are the problems that affect the management of green infrastructures in general and recreational parks and street trees in particular in your locality?
3. In what ways are you involving to plan, develop, and manage recreational parks and street trees in your locality?
4. What local strategic practices are being implemented to develop and manage recreational parks and street trees?
5. In your opinion, what are the opportunities that create conducive environment to develop and manage recreational parks and street trees?

Annex 5

Field observation Check list

No	State of recreational parks and street trees	Response Yes/No	Date of observation	Remark
1	Derelict site			
2	Fenced and planned with trees			
3	Well developed and serviced			
4	Developed and managed by private			
5	Developed and managed by the public			
6	Developed and managed by the municipality			
7	Developed and managed by churches			
8	Changed to other purposes			
9	Used for dump site for solid waste			
10	Used for grazing			
11	Others			
12	Environmental conditions of the site: Erosion:-sheet, rill, gully,			

DECLARATION

I hereby declare that the thesis entitled. *Assessment of urban green infrastructure in Addis Ababa: The case of bole-sub-city* has been carried out by me under the supervision of Pro. Tegegne, Department of Geography and Environmental Studies, Addis Ababa University, Addis Ababa during the year 2014 as a part of Master of Art program in Land Resource Management. I further declare that this work has not been submitted to any other University or Institution for the award of any degree or diploma.

Samson Aynachew Weldehana

Signature: _____

Addis Ababa University

Addis Ababa

Date: June, 2014

CERTIFICATE

This is certified that the thesis entitled *Assessment of Urban Green Infrastructure in Addis Ababa: The Case of Bole Sub-city* is a bonafied work carried out by Samson Aynachew Weldehana under my guidance and supervision. This is the actual work done by Samson Aynachew Wedehana for the partial fulfillment of the award of the Degree of Master of Art in Land Resource Management from Addis Ababa University, Addis Ababa, Ethiopia.

Professor Tegege G/Egziabher

Signature: _____

Department of Geography and Environmental Studies

Addis Ababa University

Date: June, 2014