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THE ROLE OF PUBLIC SECTOR INSTITUTIONS ON SPACE ALLOCATION FOR STREET GREENERY IN ADDIS ABABA

By

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**A thesis submitted to the Graduate Program of EiABC, in partial fulfillment of
the requirement for the Master of Science Degree (MSc) in
Landscape Architecture**

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This thesis is submitted to the graduate Program of *Ethiopian Institute of Architecture, Building Construction and City Development (EiABC)*, in partial fulfillment of the requirements for the Master of Science Degree in Landscape Architecture.

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Declaration

I, the undersigned, declare that this thesis, is my own and is an original work and has not been presented in partial fulfillment for a degree in any other university, and that all sources of material used for the thesis have been duly acknowledged, following the scientific guidelines of the Institute.

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Dedicated To

My father, Ato **Omer Adem**,

A dedicated father and a family person who spent all his working life working for the Ethiopian Ministry of Education and was a strong believer in education as the only way for Ethiopia's bright future.

He passed away on

October 09, 2017

May he rest in peace!

Table of Contents

i

Table of Contents.....	v
List of Tables	viii
List of Pictures.....	viii
List of Text Boxes	x
Abbreviations.....	xi
Acknowledgement	xiii
Abstract.....	xiv
1. Chapter One: Introduction to the Research	1
1.1. Background.....	1
1.2. Problem Statement	2
1.3. Objective of the research.....	4
1.3.1. General Objective.....	4
1.3.2. Specific Objectives.....	4
1.4. Research Questions.....	5
1.5. Scope of the Research	6
1.5.1. Thematic Scope	6
1.5.2. Spatial Scope	6
1.6. Motivation for the Research	7
1.7. Significance of the Research	8
1.8. Limitations to the Research	8
2. Chapter Two: Literature Review	10
2.1. Definitions of key terms and concepts	10
2.2. Benefits of Street Greenery	13
2.2.1. Environmental Benefits.....	14
2.2.2. Social Benefits	17
2.2.3. Economic Benefits	17
2.3. Components of the streetscape for street greenery.....	19
2.3.1. Pedestrian Walkway.....	19
2.3.2. Median.....	24
2.3.3. Triangles and Round About.....	28
2.3.4. Limited-access arterial plantings	30
2.4. Urban Green Infrastructure on streetscapes.....	31
2.5. Overview of International Standards	36

2.6.	Overview of National Policies, Strategies and Standards	39
2.6.1.	Urban Development Policy	40
2.6.2.	Climate Change Resilient Urban Green Development Strategy	43
2.6.3.	Ethiopian National Urban Green Infrastructure Standard	46
2.7.	Literature Review on Method of Analysis and Survey Methods	49
2.7.1.	Thematic Analysis	50
2.7.2.	KAP Survey	52
2.8.	Summary to the Chapter	54
3.	Chapter Three: Contextual Review	56
3.1.	Background information about Addis Ababa	56
3.2.	Overview of challenges in Addis Ababa's street greenery	57
3.2.1.	Space Allocation	57
3.2.2.	Planting Location	60
3.2.3.	Species Diversity	61
3.2.4.	Interaction with other infrastructures	62
3.2.5.	Soil Strata	64
3.2.6.	Air Quality	65
3.2.7.	Maintenance	67
3.3.	Good practices on the city's streets	68
3.3.1.	Space Allocation and Details	68
3.3.2.	Miscellaneous Best Examples	73
3.4.	Summary to the Chapter	76
4.	Chapter Four: Materials and Methods	77
4.1.	Choice of Methods	77
4.2.	Selection of Case Study Street Projects	79
4.3.	Methods of Data Collection	80
4.3.1.	Data Types and Sources	80
4.3.2.	Sampling	80
4.3.3.	Data Collection Techniques	85
4.3.4.	Purpose of Data Collection	85
4.4.	Data Analysis and Survey Methods	85
5.	Chapter Five: Results and Discussion	87
5.1.	Influence of NUGIS on the current professional practice of space allocation for street greenery on street design projects of Addis Ababa	87
5.1.1.	Street design	88

5.1.2.	Root causes for the low compliance of NUGIS	95
5.1.3.	Attitude towards the national standards	99
5.2.	Knowledge, Attitude and Practice among the professional human resource	104
5.3.1.	General Topics	105
5.3.2.	Context Specific Topics	108
5.3.	Level of inter-institutional involvement among the various responsible institutions.	112
5.4.1.	Level of involvement in MUDH	116
5.4.2.	Level of involvement in AACGPC	117
5.4.3.	Level of involvement in AACRA	120
5.4.4.	Level of involvement in AACGRBGADAA	124
6.	Chapter Six: Conclusions and Recommendations.....	127
6.1.	Conclusions.....	127
6.2.	Recommendations	129
7.	References.....	146
8.	Annexes	150
▪	Annex A - List of interview respondents	150
▪	Annex B - The 'Right of way 'section of the NUGIS.....	152
▪	Annex C - Interview Questionnaires	162

List of Tables

Table 1: Brief description of responsibilities of the sample population and theme of the interview..	78
Table 2: Sample population and study units of the research.	81
Table 3: Case study street projects.	84
Table 4: Summary to materials and methods.....	86
Table 5: Summary to street design data analysis	91
Table 6: Summary to median design data analysis.....	93
Table 7: Summary to pedestrian walkway design data analysis.....	94
Table 8: Influence of the standard on the current street development of Addis Ababa	96
Table 9: Knowledge about NUGIS	97
Table 10: Influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa	98
Table 11: Benefit of having one national standard to guide the street greenery development on the city's street design	100
Table 12: Willingness to abide by one national standard that guide the street greenery development of Addis Ababa	103
Table 13: Benefits of street greenery to a city, its inhabitants and its environment	106
Table 14: Tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns	107
Table 15: Addis Ababa's street greenery development.....	108
Table 16: Adequacy of the space allocated for greenery along the streets of Addis Ababa	110
Table 17: Necessity to participate the different relevant stakeholders in the process of preparation and/or revision of a master plan	117
Table 18: Level of involvement during the preparation of street network plan	118
Table 19: Necessity to involve different responsible bodies in the design process of the city's road projects	121
Table 20: level of involvement of utility companies in the design process of Addis Ababa's streets	122
Table 21: Necessity to involve different stalk holders in the development and utilization of urban streets	125

List of Pictures

Picture 1: Zones in the Pedestrian Realm (Source: ADUSDM).....	20
Picture 2: Unplanted curb extension (Source: SDM)	21
Picture 3: Planted curb extension (Source: SDM).....	22
Picture 4: Mid-Block Narrowing. (Source: SDM).....	22
Picture 5: Unplanted Full Side Walk (Source: SDM)	23
Picture 6: Planted Full Side Walk (Source: SDM)	23
Picture 7: Ribbon Side Walk (Source: SDM).....	24

Picture 8: Low plantings at fully planted median tip (Source: SDM)	25
Picture 9: Curb-height median with plantings set back from the curb to allow easier maintenance (Source: SDM)	26
Picture 10: Median with sidewalk (Source: SDM).....	26
Picture 11: Median with tree beds. Select narrow species where there is limited space for canopies (Source: SDM)	27
Picture 12: Planted raised median. (Source: SDM).....	27
Picture 13: A pedestrian mall. (Source: SDM).....	28
Picture 14: Planted triangle with clear paths provides for pedestrians. (Source: SDM)	29
Picture 15: Planted triangles with shorter plants planted along the edge to maintain sightlines. (Source: SDM, Credit: DPR)	29
Picture 16: Planted Round About with public art. (Source: SDM)	30
Picture 17: Unplanted Round About (Source: SDM).....	30
Picture 18: Planting along Limited-access arterial highway (Source: SDM)	31
Picture 19: Street side swale (Source: Abby Hall, US EPA)	33
Picture 20: Rain garden which take runoff from street through trench drain and from sidewalk through curb cuts. (Source Abby Hall, US EPA).....	34
Picture 21: Trees planted at the same time but with different soil volumes. (Source: Casey Trees)..	35
Picture 22: Pervious pavers. (Source Abby Hall, US EPA)	36
Picture 23 : Example of the convergence of failure to allocate appropriate space and sub-standard practice of planting (Source - Author)	58
Picture 24 : Narrow median space provision and planted median space with un-proportionally large tree species. (Source - Author)	58
Picture 25: Large median spaces used for other functions other than street greenery. (Source - Author)	59
Picture 26: A wide street with absolutely no space provision for street greenery and a newly redeveloped area with no street greenery development. (Source - Author).....	59
Picture 27: Physical obstruction due to wrong planting location. (Source - Author)	60
Picture 28: Under-utilized median space by the selection of narrow tree species. (Source - Author)	60
Picture 29: Monoculture in Addis Ababa's street greenery. (Source - Author).....	61
Picture 30: Poisonous plants in Addis Ababa's street greenery. (Source - Author).....	61
Picture 31:High-maintenance plants in Addis Ababa's street greenery. (Source - Author)	62
Picture 32: Trench cut through the main root system of street trees. (Source - Author)	62
Picture 33: Struggle for space. Interaction between overhead power lines and street trees. (Source - Author).....	63
Picture 34: Traffic light obstructed by street tree. (Source - Author).....	63
Picture 35: Serious damage on pavement by the root system of street tree (<i>Grevillea robusta</i>). (Source - Author).....	64
Picture 36: Planting situation for street greenery: Granular and compacted in the making also contested by drainage pipes. (Source - Author)	65
Picture 37: Soot covered street side elements, including street greenery. (Source - Author).....	66
Picture 38: Water trucks watering street greenery. (Source - Author)	67
Picture 39: A half rotten tree trunk let to still stand along a busy street. (Source - Author)	68
Picture 40 : Pedestrian walkway on Taitu Street, along Sheraton Addis Hotel. (Source - Author)	70
Picture 41: Median on Taitu Street, along Sheraton Addis Hotel. (Source - Author)	70

Picture 42: Pedestrian walkway at Bole Road. (Source - Author).....	71
Picture 43: Median at Bole Road. (Source - Author).....	72
Picture 44: A large Mimosa kummel (Ishe) tree in front of Yohannes Church on Arbegnoch Street. (Source - Author).....	73
Picture 45: A large Acacia abyssinica (Bazra Girar) tree on Ethio-China Street (Wollo Sefer). (Source - Author).....	73
Picture 46: Large Spathodea campanulata (Yefim Zaf) trees on General Abebe Damtew Street around stadium area. (Source - Author).....	74
Picture 47: Jacaranda mimosifolia (Yetemja Zaf) trees on Churchill Avenue, Beherawi Area. (Source - Author).....	74
Picture 48: The Taitu Street, one of the best designed and constructed streets in Addis Ababa. (Source - Author).....	75
Picture 49: Zewditu Street -Casa Inchis Area. (Source - Author)	75

List of Text Boxes

Text Box 1: Summarized benefits of UGI on streetscape (Source GSDG).....	32
Text Box 2: Pedestrian walkway standards. (Source: GSDG).....	38

Abbreviations

AABPCDAA	Addis Ababa Beautification, Parks and Cemetery Development and Administration Agency
AACGPC.....	The Addis Ababa City Government Planning Commission
AACGRBGADAA...	The Addis Ababa City Government River Basins and Green Area Development and Administration Agency
AACRA.....	Addis Ababa City Road Authority
AASHTO.....	American Association of State Highway Transportation Officials
ADUPC.....	Abu Dhabi Urban Planning Council
ADUSDM.....	Abu Dhabi Urban Street Design Manual
ATO.....	Amharic language equivalent for Mr.
CRGE.....	Climate Resilient Green Economy
CRUGDS.....	Climate Resilient Urban Green Development Strategy
CSA	Central Statistical Agency
EC.....	Ethiopian Calendar
EDP	Environmental Planning Collaborative
FDRE.....	Federal Democratic Republic of Ethiopia
GDCI.....	Global Designing Street Initiative
GIZ.....	German Corporation for International Cooperation
GSDG.....	Global Street Design Guide
HPR.....	House of Peoples' Representatives
ITDP	Institute of Transportation and Development policies
KAP.....	Knowledge, Attitude and Practice
LRT.....	Light Rail Transit
MFA.....	Ministry of Federal Affairs

MUDHMinistry of Urban Development and Housing

MUDHC.....Ministry of Urban Development, Housing and Construction

NACTO.....National Association of City Transport Officials

NUGIS.....National Urban Green Infrastructure Standards

NYCDOT.....New York City Department of Transportation

ROW.....Right-of-Way

SDM.....Street Design Manual

UDP.....Urban Development Policy

UGI.....Urban Green Infrastructure

UN DESAUnited Nations, Department of Economic and Social Affairs

USEPA.....United States Environmental Protection Agency

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Abstract

The ever increasing human population is creating significant stress on urban centers globally. Simultaneously, urban green infrastructures are becoming integral components of urban centers to relieve them from the ill effects of rapid urbanization. Ethiopia has drafted various policies and strategies, which are in favor of urban green infrastructures, for the proper development of its urban centers. The NUGIS is one of such documents that the country has drafted to implement such policies and strategies in its urban context. On the contrary, Addis Ababa's street greenery development, which is part of the UGI of the city, is found to be unsatisfactory and its space allocation for street greenery is inadequate.

The current practice of space allocation for street greenery in Addis Ababa by the responsible institutions is analyzed from the perspective of regulation, human resource and inter-institutional involvement. To address the research objectives, the study used qualitative and quantitative research approaches. Accordingly 23 streets were investigated and design data were generated. Similarly, to answer the level of knowledge, attitude and practice of the professional staffs and the level of inter-institutional involvement among responsible institutions, an in-depth interview was conducted with 21 professionals from four institutions and results presented.

Findings show that, the NUGIS has no influence on the process of Addis Ababa's space allocation for street greenery. Furthermore, the standard is also found to be unknown by the majority of the officials and professionals in the responsible institutions investigated under this study. On the other hand, the officials and professionals are found to exhibit a high level of positive attitude towards having national standards, such as the NUGIS. They are also highly willing to abide by these national standards, if they are made available.

The research recommends that effort has to be made to enhance the influence of the NUGIS through awareness and ownership creation. Furthermore, guidelines are proposed to enhance the knowledge and practice of professionals and level of inter-institutional involvement among responsible institutions investigated under this study. Finally, a conceptual landscape design is proposed under the design concept of "Linear Park" demonstrating the application of UGI and landscape design principles on actual street project in the city of Addis Ababa.

1. Chapter One: Introduction to the Research

1.1. Background

The planet has gone through a process of rapid urbanization over the past six decades. According to UN-DESA (2014) report, the world is becoming more and more urban and in 2007 the global urban population exceeded the global rural population. The trend will continue in the future, and it is expected that by 2050, two-third (66%) of the world population will live in urban areas. The situation is not different in Addis Ababa. Since its humble beginning in 1887 around the Filwoha hot spring, the present day Addis Ababa is undergoing a rapid increase both in demography and infrastructure. According the Central Statistics Agency (CSA) report, the city population is estimated to be 3.6 million in 2019 and expected to grow by 150% after two decades (CSA, 2013). At the same time, numerous building and infrastructure construction projects are underway to fulfill the demand of the increasing population. This rapid urban development has to be complimented with Urban Green Infrastructure (UGI) in order to cope up with the environmental challenges that the city is and will be facing as a result of its rapid urbanization.

Even though, Addis Ababa's 130 years of age categorizes the city among the camp of young cities, yet it is enough to develop a notable development of street greenery. But an overview of Addis Ababa's streetscape shows otherwise. One can compare that other Ethiopian cities such as Bahir Dar, Dire Dawa and Hawassa exhibit streets with better established street greenery development than that of Addis Ababa.

Generally, the rapid growth of most cities in Ethiopia without properly planned green spaces has generated environmental problems, including: increase in temperature, air and water pollution and greenhouse gas emissions (MUDH, 2015). Properly planned and developed green areas in cities, such as parks and street greeneries, are integral parts of the Urban Green Infrastructure (UGI) which effectively counter balance the adverse effects of urban areas on their environment.

Space allocation for the plant materials is the very first and crucial step to develop street greeneries on urban streetscape. Plants can't grow and establish street greenery without enough provision of planting spaces within the street's hardscape elements. Likewise, it is logical to evaluate the level of determination that a city has to establish street greenery by evaluating the amount of space allocated for street greenery on its streetscape.

Streets are the most abundant form of urban public spaces occupying approximately 20% of the total land area in a typical city (ITDP/EPC, 2011) and in many cities, streets occupy more than 80% of the total public spaces (GDCl & NACTO, 2016). They are so important that the urban life of cities unfolds on them every day.

Urban street greenery (i.e., street trees, shrubs, lawns, and other forms of vegetation) has long been recognized as a critical landscape design element in the urban environments (Lia, et al., 2015). Likewise, street greenery is also an important part of the Urban Green Infrastructure (Zhang & Dong, 2018).

The Urban Green Infrastructure (UGI) is capable of addressing a broad range of urban challenges, such as conserving biodiversity, adapting to climate change, supporting green economy and improving social cohesion (Green Surge, 2017). Due to these facts, currently cities are becoming sensitive about their urban environment by giving special attention to the integration of the principles of UGI elements in their urban development policies and strategies. Similarly, Addis Ababa has various institutions working on its urban greenery and UGI related tasks in the city. For these institutions, the successful completion of their mission is synonymous to the realization of a greener Addis Ababa.

1.2. Problem Statement

Ethiopia has drafted various legal framework documents to improve the quality of life of its citizens in general and the urban environment in particular. The Ethiopian constitution Article 44 affirms that, it is the right of citizens to live in a clean and healthy environment (HPR/FDRE, 1995). The 'Urban Development Policy' document which is issued in 2005 also covers issues of environmental protection in cities as

well as the designation of inner city green areas (MFA, 2005). The 'Climate Change Resilient Urban Green Development Strategy', furthermore gave some directions to street greeneries, specifically mentioning them as "mandatory and integral parts of the country's urban development strategies" (MUDHC, 2014). But the most specific technical document is issued by the Ministry of Urban Development and Housing (MUDH) in November 2015. This document is known as the 'National Urban Green Infrastructure Standards' (NUGIS). This standard is intended to be implemented in all urban centers of the nation and covers 15 different UGI elements. One of the important UGI element in the standard is the 'Right of Way', or in other terms the Street Greenery (MUDH, 2015). Furthermore, 'Public Right of Way Management and Establishment Manual' also published by the MUDH in January 2016 to assist the practical implementation and maintenance of street greeneries (MUDH, 2016).

Addis Ababa is currently investing heavily on its urban street network through the Addis Ababa City Road Authority (ACCRA). Many streets of different hierarchies are being designed and are either presently under construction or completed in the near past. Generally speaking, the present day streets are getting wider to accommodate the ever increasing motorized and pedestrian traffic volume. However, even if the streets are getting wider, the space allocation for street greenery doesn't seem to get enough consideration.

On a typical streetscape, the street greenery are located on specific locations like the pedestrian walkways, medians, roundabouts and traffic islands. But the two vital spaces for street greenery on a typical street are the Pedestrian Walkways and the Medians (MUDH, 2016). On the newer streets of Addis Ababa, Pedestrian Walkways are getting wider which is a good move. But mostly, due to the lack of formally designed or allocated spaces for street greenery, it becomes a norm to see street greenery to come later on as an afterthought on the city's streetscape. Similarly, street medians, which are the safety refuge zones for crossing pedestrians as well as places for street greenery are getting narrower, and at times, omitted altogether..

The neglect of these street green spaces and the general lack of formally designed and allocated spaces for greenery on the streets of Addis Ababa adversely affects the city in terms of aesthetics and lack of potential benefits from the ecosystem services that these street greeneries provide as part of the UGI element. A lot has

been done in the development of policies, strategies and standards as mentioned above to integrate UGI elements in the course of the country's urban development. At federal level and at the level of the city administration of Addis Ababa, specialized institutions are established to work on urban greenery and UGI related tasks. But the materialization of all these efforts, at least in regard to street greenery developments, is not notable and significant on the streetscape of Addis Ababa. And the question is WHY?

Therefore, this particular research is an attempt to address the crucial and fundamental case of space allocation for street greenery on Addis Ababa's streetscape from the perspective of the role played by the responsible public sector institutions. The research is also intended to contribute to the process of filling the existing knowledge gap within the subject matter by putting forward possible remedial measures for the problems.

1.3. Objective of the research

1.3.1. General Objective

The general objective of this research is to assess the current practice of space allocation for street greenery in Addis Ababa by those responsible Public Sector institutions with particular attention given to their compliance to the relevant national standard, the capacity and performance of their professional human resource and the level of inter-institutional involvement among the responsible institutions.

1.3.2. Specific Objectives

Conducting this research under the above generalized objective has the following specific objectives:

- A. To assess the influence of the *National Urban Green Infrastructure Standard* (NUGIS) on the current professional practice of space allocation for street greenery on Addis Ababa's street design projects.
- B. To assess the level of knowledge, attitude and practice among professional staffs of the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape.
- C. To assess the level of inter-institutional involvement among the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape.
- D. To put forward possible recommendations with the overall aim of enhancing the practice in the space allocation for street greenery on Addis Ababa's streetscapes by suggesting remedial measures to the challenges facing the current professional practice.

1.4. Research Questions

In order to achieve its objective, the research is channeled into the quest to answer the following three research questions:

- 1) What is the influence of the '*National Urban Green Infrastructure Standard*' (NUGIS) on the current professional practice of space allocation for street greenery on Addis Ababa's street design projects?
- 2) What is the level of Knowledge, Attitude and Practice among professional staffs of the institutions responsible to the space allocation for street greenery on Addis Ababa's streetscape?
- 3) What is the level of inter-institutional involvement among the institutions responsible to the space allocation for street greenery on Addis Ababa's streetscape?

1.5. Scope of the Research

1.5.1. Thematic Scope

A research in street greenery could have many themes such as various ecosystem services, species selection, maintenance, interaction with utility infrastructure, interaction with traffic and many more. But the thematic scope for this particular study focuses on the fundamental issue of role played by the public sector institutions on the current practice of space allocation for street greenery of the city.

1.5.2. Spatial Scope

The spatial scope of the study has three components:

- a) **Geographically**, the study is bounded to streets within the geographic region of Addis Ababa.
- b) **As Streetscape Elements**, the study focuses on pedestrian walkways and medians. “The two vital spaces for street greenery on a typical street” (MUDH, 2015).
- c) **As Case Study Street Projects**, in line with the thematic scope of the research, which is the city’s current practice of space allocation for street greenery, the study particularly focuses on the recent streets designed under the mandate of AACRA as case study street projects. This is to closely analyze their planning and design concepts and the standards followed in light with the pertinent national standard so that to assess the city’s current practice of space allocation for street greenery. The details to the selection process for these street projects are presented in 4.3 *Selection of Case Study Street Projects* section and the list of the case study street projects are presented in *Table 2: Case Study Street projects*, in this paper.

1.6. Motivation for the Research

Three basic beliefs of the researcher did serve as motivations to get into this particular study and continue to be major driving forces throughout the research process. These are:

- Urban streets are one of the most popular kind of public spaces shared by a vast portion of the urban population from all walks of life. They cover a considerable amount of urban land, have high distribution throughout the city and most important of all, they are interconnected. These characters of urban streets put them as an ideal choice to implement all kinds of developmental works, be it environmental, social, and infrastructural, with significant ability to benefit a large proportion of the urban society equitably and on a daily basis.
- An overview on various research works performed on the subject of street greenery shows that there are lots of researches performed internationally on the subject matter. But nationally, there is much to be done starting from the fundamentals.
- The researcher's academic background, particularly undergraduate study is in Architecture and Urban Planning. And it is the belief of the researcher that, the synergy between Landscape Architecture (which is the overall theme of this research) and Urban Planning could have significant impact in crafting the urban context. The researcher also believes that, this synergy between the two professions has a great potential in creating well designed, environmental friendly, multi-functional and livable urban spaces. And the ideal urban element to create and demonstrate this synergy is none other than the urban streetscape.

1.7. Significance of the Research

The biggest spending of the city government of Addis Ababa is on its street infrastructures. This significant amount for a developing country like Ethiopia is also evidence for the city's determination to develop its urban transportation infrastructure.

It is observable from the city's streetscape that the attention given to street greenery is not significant. Whereas, with minimal effort and financial expenditures, but with big vision, motivation, and dedication of the responsible public sector institutions, it is possible to design the city's streets into social and environmental friendly, well designed green streets which will serve as 'linear parks'. This will have a tremendous environmental, social and aesthetical impact on the city and its inhabitants.

The findings of the research are anticipated to provide an opportunity to reflect on the role played by the responsible public sector institutions on the current practice of space allocation for street greenery in light of international and national standards. Similarly, the recommendations of the research could serve as inputs and contributions to this fast developing city, particularly in one of its current urban development agenda of the successful establishment of the Urban Green Infrastructure. Furthermore, the research is also expected to provide fundamental information for other similar researches and could be used as stepping stone for fellow researchers in their attempts to tackle topics with in the broader category of Addis Ababa's street greenery.

1.8. Limitations to the Research

As discussed above in section 1.5. '*Scope of the Research*', this study generally focuses on fundamental issues. This is done considering the fact that, the study of Landscape Architecture is a new start to the university and in a broader sense to Ethiopia as well. Therefore, the core intention for this study is to contribute its part in the process of laying a foundation for similar academic researches works by focusing

on fundamental subjects influencing the local practice of Landscape Architecture. To this end, some of the fundamental points raised to be studied in this research are found to be broad and has the potential to be a complete paper by themselves. But in this study, as a fulfilment of a Master Degree, the limitation of time and resources made these broad concepts to be studied only at fundamental level. Other researchers could take this as a potential research hint for future research works in the general theme of 'Addis Ababa's street greenery developments'.

While working on this research as the first batch of the newly opened Landscape Architecture program of EIABC, the most significant challenge faced was the lack of advisor for the research. The research was made possible with lots of efforts in seeking advice from many individuals. This process also prolonged the completion time of the study. If it were not for the significant contribution of the three individuals mentioned on the acknowledgment, the completion of the study could be questionable.

2. Chapter Two: Literature Review

The literature reviews presented in this chapter covers and discusses relevant literatures regarding street greeneries in general and their space allocation on streets in particular. The review starts by defining some key terms and concepts on the subject matter and proceed to elaborate the benefits of street greenery. Streets have different components serving different functions. Out of these components of streets, some support street greenery. These different component supporting street greenery are also discussed in the review. Standards play important role in defining the urban fabric. So does the standards for space allocation for street greenery. The different international standards regarding street greenery are discussed to give a general overview of the global practice in space allocation for street greenery followed by the review of local relevant standards and guidelines that are the core theoretical frameworks for this particular research. Finally, the relevant analytical frameworks and survey methods are also discussed.

2.1. Definitions of key terms and concepts

It is proper to start this definition of key terms and concepts by first defining the fundamental term of Street itself.

Street:

Different literatures define street in deferent terms. Most of them commonly agree that streets are the fundamental element of the urban fabric. The global street design guild provide an elaborate definition of street as follows:

“A Street is the basic unit of urban space through which people experience a city. It is often misconceived as the two dimensional surface that vehicles drive on when moving from one place to another. Streets are, in fact, multidimensional spaces consisting of many surfaces and structures. They

stretch from one property line to another, including the building edges, land uses, and setbacks that define each side. They offer space for movement and access and facilitate a variety of uses and activities. Streets are dynamic spaces that adapt over time to support environmental sustainability, public health, economic activity, and cultural significance.

Streets are like outdoor rooms shaped by multiple planes: the ground plane at the bottom, the buildings and the roadbed edges as the side planes, and the canopy plane like the ceiling of the room. Each plane is constructed of many individual elements that are often regulated or created by a range of different policies, codes, guidelines, and building practices. Understanding the various portions of a street as either continuous or interchangeable offers a flexible approach to street design. While sidewalk clear paths, bike lanes, and travel lanes must be continuous and connected in order to function effectively, interchangeable elements such as parking spaces, trees, park lets, and transit stops allow a street to be adapted to serve its context.” (GDCI & NACTO, 2016, p. 4)

Right -of- Way:

Usually, this term which is a very popular term in street design, is defined in simple terms as *“The entire distance from building edge to building edge”*. (GDCI & NACTO, 2016). But a close scrutiny of the term shows significant difference in meaning when it is hyphenated and simply written.

The New York Vehicle and Traffic Law, Title 1, Article 1, Section 139 defines the term **Right of Way** as:

“The right of one vehicle or pedestrian to proceed in a lawful manner in preference to another vehicle or pedestrian approaching under such circumstances of direction, speed, and proximity as to give rise to danger of collision unless one grants precedence to the other.” (NYCDOT, 2015)

Similarly, the hyphenated term, **Right - of- way** is defined by AASHTO as:

A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes. (NYCDOT, 2015)

Green infrastructure:

Green infrastructure is interconnected network of green spaces and water systems mimicking those found in nature to manage storm water and other natural resources to create healthier environment to deliver multiple environmental, economic and social benefits. (GDCI & NACTO, 2016)

Similarly, the USEPA provide a more elaborate and technical definition of the term Green Infrastructure as follows:

“An adaptable term used to describe an array of products, technologies, and practices that use natural systems — or engineered systems that mimic natural processes — to enhance overall environmental quality and provide utility services. As a general principal, green infrastructure techniques use soils and vegetation to infiltrate, evapotranspire, and/or detain stormwater runoff. When used as components of a stormwater management system, green infrastructure practices such as green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition, to effectively retain and infiltrate rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits.”
(NYCDOT, 2015)

Urban green infrastructure:

One of the side effects of urbanization is it distances people from their natural environment. Network of green and blue spaces (green infrastructures) in urban areas are increasingly recognized as having an essential role to play in maintaining the human-nature interaction and in tackling various urban challenges. These are the Urban Green Infrastructures. In addition to provide the above explanation to urban green infrastructure, (Green Surge, 2017) further elaborates the benefits of urban green infrastructure as follows:

“Green spaces inherently provide many benefits in cities, but in recent years the potential of city green and the idea of urban green infrastructure have gathered more interest by researchers, policy makers and citizens alike. In part, this is due to increasing evidence on the cost savings and additional benefits that urban green spaces can provide over conventional ‘grey’ approaches. Green spaces can make substantial contributions to policy objectives for sustainable urban development, such as improving public health, protecting biodiversity, enhancing social cohesion, supporting the economy, providing opportunities for recreation, and helping cities adapt to a changing climate.” (Green Surge, 2017)

Green streets:

The term green streets has deeper meaning than the mere presence of plants on the right-of-way. Rather the definition has a more functional dimensions from the benefits of green infrastructure.

“Roads present many opportunities for green infrastructure application. One principle of green infrastructure involves reducing and treating stormwater close to its source. Urban transportation right-of-ways integrated with green (infrastructure) techniques are often called green streets”. (Lukes & Kloss, 2008)

2.2. Benefits of Street Greenery

Street greenery is part of the urban green infrastructure along the urban streets. It includes all the different hierarchy of plants like trees, shrubs, perennials, and ground covers. Among these different hierarchy of plants, street trees have a dominant significance in their benefits which is relative to their sizes. That is why most of the literatures on the benefits of street greenery are actually results of researches on the benefits of street trees.

Seamans argue that, “The role of the street tree has transitioned from one of beautification and ornamentation to one of environmental service provision over the

course of the last 30 years. Urban trees have always provided environmental benefits to their host cities but the science of assessing ecosystem services “fixed” a new role for city trees and in particular, street trees.” (Seamans, 2013, p. 1). Talking about the Ecosystem Services, street trees have provided a range of ecosystem services to their host cities. Ecosystem services are “the benefits that humans derive from nature” (TEEB, 2011, p. 1). According to TEEB, Ecosystem services (ES) are typically divided into four categories: provisioning, regulating, cultural, and habitat or supporting services (TEEB, 2011) as cited in (Seamans, 2013).

In urban areas, street trees play an important role in their support of healthy communities. This is due to their wide range of benefits both in residential and commercial districts. This make street trees an integral elements of urban life (Mullaney , et al., 2015). The role of street trees in urban areas in the form of ecosystem services such as storm water reduction, energy conservation and improved air quality is becoming the primary purpose for their development (Seamans, 2013). While some benefits span more than one category, the benefits provided by street trees are categorized as environmental, social and economic benefits (Mullaney , et al., 2015). This literature review also follows these categories to discuss the benefits of street trees.

2.2.1. Environmental Benefits

Environmental benefits from street greenery in urban areas are numerous. They help in reducing the urban heat island effect, reducing storm water runoff, enhance biodiversity, habitat and landscape connectivity for urban fauna are some of them. (Burden, 2006); (Rhodes, et al., 2011) cited in (Mullaney , et al., 2015). Furthermore, urban streets are sources of different potential harms like air and noise pollutions. Street greenery play a huge role in fighting air and noise pollution. (Tallis, et al., 2011) cited in (Mullaney , et al., 2015).

For this literature review, brief description for three types of environmental benefits of street greenery are presented. These are Temperature regulation, Stormwater reduction and Improve air quality.

A. Temperature Regulation

It is known that urbanization is the prime culprit for the urban heat island effect. Mohajerani, et al summarized the adverse effects of UHI and it causes as: “The Urban Heat Island (UHI) is a phenomenon that affects many millions of people worldwide. The higher temperatures experienced in urban areas compared to the surrounding countryside has enormous consequences for the health and wellbeing of people living in cities. The increased use of manmade materials and increased anthropogenic heat production are the main causes of the UHI. This has led to the understanding that increased urbanisation [Sic] is the primary cause of the urban heat island” (Mohajerani, et al., 2017).

Vegetation in urban areas, especially in parks and streets generates localized cooling effect on the urban microclimate. “This phenomenon sometimes referred to as the “park cool island”, which stands in contrast to the more commonly discussed “urban heat island” effect.” (Shashua-Bar, et al., 2009). “Appropriate measures may moderate the urban heat island, reduce building energy demand and improve pedestrian comfort” (Steemers, 2003) ; (Grimmond, 2007) cited in (Shashua-Bar, et al., 2009). “Vegetation has the potential to moderate air temperature not only through shading and the reduction of surface temperatures, but also through evaporative cooling.” (McPherson , et al., 1994) cited in (Shashua-Bar, et al., 2009) “Trees intercept not only incoming solar radiation, but also reflect short wave radiation from their surroundings, long wave radiation from the ground, building surfaces and the sky—and in some cases there is significant sensible heat exchange between the warm urban air and the cooler leaves. The dissipation of this heat load by transpiration cooling depends on the water balance, the wind climate and the tree species.” (Oke, 1989) cited in (Shashua-Bar, et al., 2009).

B. Storm water Runoff Reduction

Urbanization significantly change the hydrology of an area by reducing the amount water infiltrated into the soil and increase the speed of the runoff at the surface. This

increase the both the surface runoff and peak discharge rates (Leopold, 1968; Douglas, 1983; Sanders, 1986; Asadian and Weiler, 2009) cited in (Armson, et al., 2013). The usual solution by engineers to these phenomenon is to increase the number and size of sewer and drainage channels.

In the contrary, trees increase the rate of infiltration and reduce surface runoff by intercepting rainfall. “Tree canopies intercept and store water on their leaves and stems during rainfall events and this water is subsequently evaporated. In forested areas, interception loss can be as much as 20–75% of the total evapotranspirational loss (Gash and Stewart, 1977; McNaughton and Jarvis, 1983; Shuttleworth, 1988) cited in (Armson, et al., 2013).

Particularly in urban areas, “Surfaces such as asphalt respond quickly to rainfall and can shed 90% of received rainfall to drain pushing the limits of drainage systems in heavy rainfall events. Many studies have shown that significant amounts of rainwater can be held and evaporated from tree canopies, reducing and delaying the response of an area to rainfall events.... However, the gross interception rate varies greatly with species, tree size, planting density and previous canopy wetness, resulting in a large spread of gross interception values.” (Armson, et al., 2013, p. 283).

C. Improve Air Quality

In urban areas, air quality reduction is becoming a serious global health issue. The primary source of emission for the hazardous particulate matters is urban road traffic. (Tallis, et al., 2011).

“Because of its adverse effect on human health, air pollution is an environmental problem of major concern. Due to the high traffic density, cities often face increased concentrations of air pollutants in comparison with its surroundings. In order to mitigate these air pollutant problems, the use of urban vegetation is often promoted as an effective measure to reduce concentrations. This measure is based on the underlying argument that trees (and vegetation in general) have the capability of cleaning the air by filtering out the pollutants. Vegetation leaves absorb gaseous pollutants through their stomata, while particles are removed from the air by deposition onto the leaves and the branches” (Vos , et al., 2013, p. 113)

“Despite the fact that they effectively remove pollutants from the air, urban trees may under certain circumstances induce a local increase of concentrations. It has been shown that trees in urban street canyons obstruct the wind flow thereby reducing the ventilation leading to higher pollutant concentrations. This potentially negative effect of vegetation on the local air quality is much less known amongst policy makers and the broad public. Based upon the general idea that trees clean the air, there still is the misconception that trees are good for air quality in all cases and under all circumstances. Therefore policy makers and urban planners when faced with a local air pollution hotspot, often intuitively reach for trees to alleviate the problem, thereby potentially aggravating the situation.” (Vos , et al., 2013, p. 113).

2.2.2. Social Benefits

Green spaces in urban environment encourage physical activities and promote interaction between communists. This in turn play a big role in reducing stress and social cohesion. (Van Dille, et al., 2012). In areas with abundance of street trees, reduced crime rates are observed. Crime is a prominent public safety challenge in most urban areas. (Kuo & Sullivan, 2001); (Tarran, 2009). Furthermore, street trees provide safe environment for pedestrians by providing physical barriers between vehicles and pedestrians. They also assist motorists by giving definition of the streets edge to guide their movements and assess their speed. (Tarran, 2009) cited in (Mullaney , et al., 2015)

2.2.3. Economic Benefits

“The economic benefits of street trees is usually under appreciated.” (Moore, 2009) In contrast to conventional forestry and the production of fruit trees, which do have an easily quantifiable economic benefits, street trees cannot be easily quantified as they usually do not have a market value. (Pandit, et al., 2012). However, providing a monetary value to the benefits of street trees by estimating their economic value provide an essential tool to policy and decision makers for their positive actions

towards the development and maintenance of street trees. (McPherson, 2007) cited in (Mullaney , et al., 2015).

“Conservation of energy spent for heating and cooling of buildings is one of the economic benefits of street trees. A 10% increase in tree cover can reduce total heating and cooling energy use by 5–10%. A single tree was found to decrease annual heating costs by 1.3% and cooling costs by 7 %.” (McPherson , et al., 1994) cited in (Mullaney , et al., 2015). As much as 80% of the cooling effect by trees is due to directly to shading by trees on nearby buildings. (Shashua-Bar, et al., 2009).

Street trees contribute to create character and identity to streets. This has a rather direct economic influence when it comes to shopping streets. “Treescaping can increase business income by 20%” (Burden, 2006). “Consumers will sometimes spend an additional 9% on an item in retail developments that include street trees compared with the same item in a non-treescaped retail outlet. This added value results from perceptions of a more-positive atmosphere, increased comfort level and a more favorable environment for visiting and shopping” (Wolf, 2005). Also in the real-estate industry, the presence of treescaped streets significantly influence the customer’s preference for that locality over others. (Zhang & Dong, 2018) cited in (Mullaney , et al., 2015).

And finally, the environmental benefits that were discussed above also have economic dimensions. “Functional benefits of trees such as the removal of air pollution by leaves, and the reduction of stormwater flows through root uptake and canopy interception, increase as tree canopy cover increases. Therefore, the economic benefits of street trees often correlate with physical tree variables such as trunk diameter and leaf surface area.” (Killicoat, et al., 2002) cited in (Mullaney , et al., 2015).

2.3. Components of the streetscape for street greenery

“Streetscapes are important public resources, and collectively they are an essential part of the open space of urban areas. They are a representation of a city’s vitality and livability.” (ADUPC, n.d.)

The aim of this section is to categorize the urban streetscape into parts for closer scrutiny on their ability to support street greenery. The review presented below categorizes the components of the streetscape for street greenery into four parts. These are: Pedestrian Walkway, Median, Triangles and Roundabouts and Limited-access arterial plantings. These four categories mostly covers the entire spaces on the streetscape where there is the possibility of developing street greenery.

2.3.1. Pedestrian Walkway

“Cities are places for people, and they use streets for not only walking, but also resting, sitting, playing, and waiting. This requires making people the highest priority in street design.” (GDCI & NACTO, 2016).

The portion of the street between the curb and the adjacent property line is known as the **Pedestrian Walkway** or simply the **Sidewalk**. This portion of the street, whether paved or unpaved, is the pedestrian realm and it is mainly used for the pedestrian traffic (NYCDOT, 2015) .

“Sidewalks play a vital role in city life. As a conduit for pedestrian movement and access, they enhance connectivity and promote walking. As public spaces, sidewalks serve as the front steps to the city, activating streets socially and economically. Just as roadway expansions and improvements have historically enhanced travel for motorists, superior sidewalk design can encourage walking by making it more attractive.” (GDCI & NACTO, 2016, p. 78).

The pedestrian walk way has different zones referred by different names of classifications which varies among different standards followed by different cities.

But the most popular classification is presented in this review as per its description presented in the Street Design Manual for the city of Abu Dhabi as follows:



Picture 1: Zones in the Pedestrian Realm (Source: ADUSDM)

“There are four primary zones in the pedestrian realm: Frontage, Through, Furnishings, and Edge zones. Because interaction occurs between these zones, development of a cohesive design for the pedestrian realm is important. Design must consider the unique conditions associated with each zone as well as how the pedestrian realm interacts with other elements of the street, such as bicycle and transit facilities and junctions. Maintaining clear sight lines between pedestrians, bicyclists, and motorists in these areas of interaction is critical (ADUPC, n.d.).

The manual also describes the four zones of the pedestrian realm as follows:

“Frontage Zone: *The frontage zone is adjacent to the building or property line. It provides space for door openings, steps, architectural elements, utilities, window hopping, signs, displays, and similar features.*

Through Zone: *The through zone is an obstacle-free space for pedestrian movement. It must remain both horizontally and vertically clear and provide a direct connection along pedestrian desire lines.*

Furnishings Zone: *The furnishings zone is where street furniture, necessary utility equipment, trees, landscaping, transit, stops, and other features such as kiosks, sidewalk cafés, and vendors may be located.*

Edge Zone: *The edge zone is adjacent to on-street parking or motor vehicle lanes. The edge zone provides space to open a car door. It is where pedestrians wait for taxis or buses. This zone is often where street lights, signals, traffic signs, parking meters, electric car recharge stations, and other street-related infrastructure are placed.” (ADUPC, n.d.)*

The pedestrian walkway is not always uniform in width. But occasionally it bulge out to the drive way. This extended section is usually known as **Curb Extension**. The curb extension, could support and provide different services. In addition to maximizing the street greenery area, it serves the purposes of providing space for seats and other street furnitures and enhance the pedestrian safety by reducing crossing distances. Furthermore, two curb extension from either side of the street create a **Mid-Block Narrowing** or if it is at intersections, a **Gateway**. (NYCDOT, 2015).



Picture 2: Unplanted curb extension (Source: SDM)



Picture 3: Planted curb extension (Source: SDM)



Picture 4: Mid-Block Narrowing. (Source: SDM)

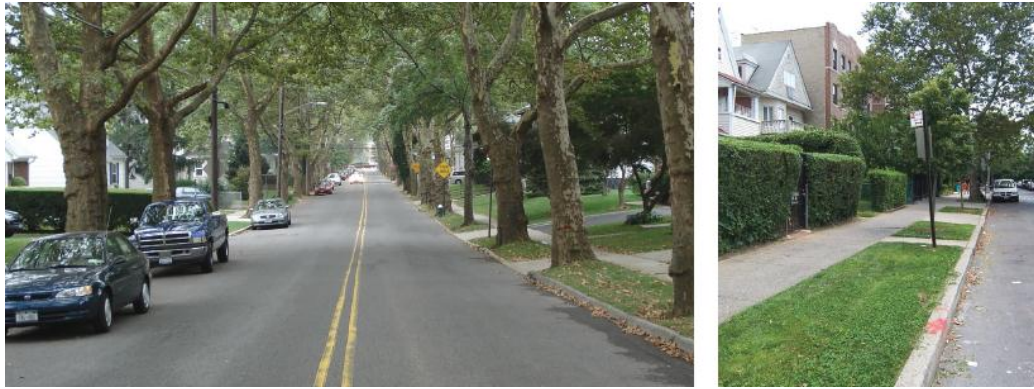
Other ways of categorizing the pedestrian walkway is by the surface area of vegetation it supports on it. In densely populated areas, heavy pedestrian movement is usually expected. In these areas, most of the sidewalk area have to be paved by hard surfaces to support the large pedestrian traffic leaving only limited space for street greenery. This kind of sidewalk is known as a **Full Sidewalk**. In contrast to this, in areas where the pedestrian movement is moderate, a large portion of the sidewalk area is allocated to a continuous zone of unpaved softscape allocated for planting. This continuous kind of sidewalk is categorized as a **Ribbon Sidewalk**. (NYCDOT, 2015).



Picture 5: Unplanted Full Side Walk (Source: SDM)



Picture 6: Planted Full Side Walk (Source: SDM)



Picture 7: Ribbon Side Walk (Source: SDM)

2.3.2. Median

“Medians are the dividing part of the traveled way. They are used to separate traffic flows and control turning movements. They are typically located in the middle of the street, but may be located on the sides (side medians) where there are frontage lanes. Medians benefit pedestrians by providing a protected pedestrian “refuge” in the middle of the street.” (ADUPC, n.d.).

Medians or as they are also known as refuge islands are essential component of the street vital for crossing pedestrians, making it easier and safer to cross multiple lanes of traffic. It is advisable to install median in all streets where pedestrians have to cross three or more traffic lanes or in narrower streets where speeds and vehicular volumes make single-stage crossings prohibitive or unsafe (GDCI & NACTO, 2016).

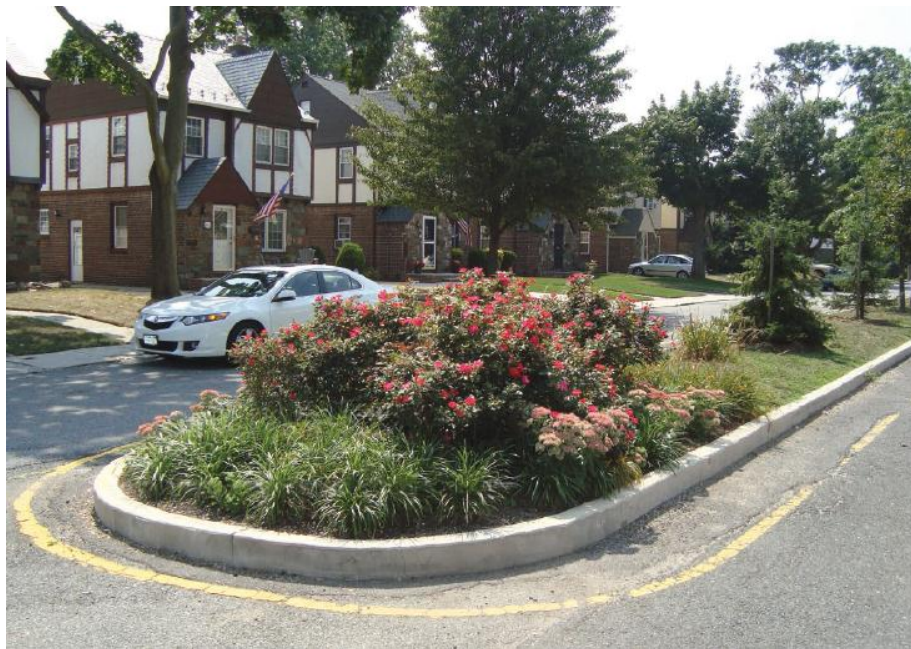
Medians vary a lot in height as well as width. The height usually fall into two categories. That is the 15-18 cm height or the ‘curb height medians’ and the other higher level of 30-60 cm. The width also vary from a narrow raised concrete islands to tree lined avenues and intensively landscaped boulevards. Raised medians provide additional planting space on the street hardscape. Trees are typical, but careful considerations must be given to the sight lines of the pedestrian, motorized and non-motorized traffic. (NYCDOT, 2015).

Medians provide various benefits such as:

- *Reduces risk of left-turn and vehicle head-on collisions*
- *Calms traffic by narrowing roadway*
- *Enhances pedestrian safety and accessibility by reducing crossing distances and providing refuge for pedestrians to cross road in stages*
- *If designed for walking access, can provide additional pedestrian capacity*
- *Greens and beautifies the streetscape if it incorporates trees and/or plantings.*
- *Improves environmental quality and can incorporate storm water source controls (NYCDOT, 2015).*

Planting the medians could be done as:

- Fully planted
- With planting setbacks for maintenance
- With some provision for pedestrian walking.
- In tree beds



Picture 8: Low plantings at fully planted median tip (Source: SDM)



Picture 9: Curb-height median with plantings set back from the curb to allow easier maintenance (Source: SDM)



Picture 10: Median with sidewalk (Source: SDM)

When there is space constraints in the right-of-way, the selection of narrow species is recommended.



Picture 11: Median with tree beds. Select narrow species where there is limited space for canopies (Source: SDM)

Raised medians could be more than curb height. This higher medians, usually 30-60 cm high above the road bed, provide above-ground soil volume for planting. These curb height are generally employed where underground constraints prevent planting at grade and/or along high-speed roadways. Higher medians can encourage higher motor vehicle speeds; therefore, design the median to the minimum height necessary to accommodate appropriate soil depth. Consider visibility in relation to the overall height of mature plantings and the raised median. For perimeter plantings, choose plants that will not protrude beyond the edge of the raised wall; plants that cascade over the edge of the wall may be acceptable (NYCDOT, 2015).



Picture 12: Planted raised median. (Source: SDM)

Finally, it is worth concluding this section of medians by mentioning **Pedestrian Malls**, which are wide medians that allows for pedestrian circulation and safe use in the right of way in addition to plantings. In the pedestrian malls, careful consideration must be followed as to how the planting design will function with other elements, such as seating, lighting, and artwork. Also the consideration of storm water collection is paramount. (NYCDOT, 2015)



Picture 13: A pedestrian mall. (Source: SDM)

2.3.3. Triangles and Round About

Triangles (Traffic Islands) are planted or unplanted areas of any size and shape, not just a triangle, within the public ROW that generally used to separates and/or channelizes traffic. In addition to this purpose, triangles, depending on their sizes and location, could encourage social and recreational activities and support street furnitures like seats. Triangles are also ideal as spaces for street greenery. But careful consideration should be paid to the height and width of shrubs, grasses, and perennials at maturity not to block sight lines of traffic. The simple rule in planting is to keep taller plants towards the interior and use shorter plants along the exterior of

triangle plantings. Also the choice of dwarf species is recommended where visibility is a concern. (NYCDOT, 2015)



Picture 14: Planted triangle with clear paths provides for pedestrians. (Source: SDM)



Picture 15: Planted triangles with shorter plants planted along the edge to maintain sightlines. (Source: SDM, Credit: DPR)

Roundabouts are round traffic islands at intersections with one way vehicular traffic around a central circle in which entering traffic yields to traffic already in the roundabout. Primarily, roundabouts are applicable to lower top vehicular traffic speed at intersections thus reducing the severity of crashes and eliminates head on collision. In addition to their traffic management services, roundabouts are ideal

spaces for street greenery, spaces for stormwater source control and also as place for public art creating interesting focal point. (NYCDOT, 2015)



Picture 16: Planted Round About with public art. (Source: SDM)



Picture 17: Unplanted Round About (Source: SDM)

2.3.4. Limited-access arterial plantings

Limited-access arterial highways are high speed roadways with access ramps and with no intersection or traffic control. These highways usually have large areas for greenery.

Landscapes along limited-access arterial highways feature shade and evergreen trees, understory plantings, and turf grass to provide a green buffer for adjacent communities and enhance the natural environment. These areas are typically much larger and allow for a greater diversity of plants than is possible elsewhere. However, irrigation is rarely provided, and plants must tolerate other urban stresses such as wind and salt. Large-growing shade trees should be spaced to promote maximum growth, typical form, and sturdy structure; interplant large trees with smaller understory trees and/or shrubs to increase the density of plantings. (NYCDOT, 2015)



Picture 18: Planting along Limited-access arterial highway (Source: SDM)

2.4. Urban Green Infrastructure on streetscapes

UGI is a broad term having lots of elements under it. The intention of this part of the literature review is to highlight and discuss major UGI element on urban streets and their benefits.

In most urban centers, streets comprise a significant percentage of publicly owned land. This offers urban streets a unique opportunities to stage many environmentally beneficial projects. (EPA, August 2009).

The Global Street Design Guide summarizes the benefits of green infrastructure by on streets as follows:

Environmental

Habitat and Biodiversity. Green streetscapes enhance urban biodiversity as native species provide habitats for birds, insects, and other species. Native vegetation is better suited to the rainfall of the local area. Enhancement of biodiversity in cities can increase environmental awareness among urban residents.

Water Quality. Green infrastructure improves stormwater quality by reducing the load of sediment, unwanted minerals, and other contaminants that are carried with runoff from impermeable surfaces.

Flow Management. Retaining runoff in landscaped areas and slowing the rate of flow from the catchment area reduces the risk of erosion of the soil bed. Slower flow rates reduce stress on downstream waterways as well.

Natural Hydrology. Where local soils are suitable, rain gardens are used to treat stormwater before it permeates the groundwater.

Passive Irrigation. Directing stormwater to irrigate the planting reduces the need for manual watering and increases soil moisture.

Social

Amenity and Landscape Design. Landscape design contributes to a city's character and identity. Planting complements the built environment, softens appearance of hard surfaces, and provides a visual screen.

Urban Cooling. Trees and green infrastructure provide significant reductions in urban temperatures. Large trees with good soil moisture can reduce local temperatures through shading and evapotranspiration. Trees can reduce air temperatures in parks and green areas by as much as 2–8°C, and they have been linked to the prevention of unnecessary loss of life during heatwaves.¹

Encourage Outdoor Activity. Green cover encourages outdoor activity, including walking, cycling, and other recreation.

Air Quality. Vegetation improves air quality and reduces greenhouse gases. Trees remove carbon dioxide, nitrous oxides, sulphur dioxide, carbon monoxide, and ozone from the atmosphere. The most effective species in trapping pollutants are those with large leaf surface areas and high transpiration rates.

Economic

Energy. By reducing local temperatures and shading building surfaces, green infrastructure reduces the cooling demand of buildings, thus cutting energy needs.

Lifespan of Infrastructure. Green infrastructure complements grey infrastructure such as catch basins and drainage pipes, and lengthens the lifespan of grey infrastructure.

Water Systems. The impacts on drainage systems and the cost of managing erosion in waterways can be significant. Streets with green infrastructure slow the rate of runoff, reducing the pressure on these systems and lowering maintenance costs.

Property Values and Marketability. Street trees and green infrastructure enhance aesthetic qualities and provide a significant neighborhood amenity. Properties on tree-lined streets are valued at up to 30% more than those on streets without trees.²

Text Box 1: Summarized benefits of UGI on streetscape (Source GSDG)

Mostly, urban areas are covered by impervious surfaces. These surfaces could be roofs, roads, sidewalks, parking lots, and the like. They all in common contribute to stormwater runoff. Amongst these, roads and travel surfaces exhibits perhaps the largest urban pollution source and also the greatest opportunity for the use of UGI. (Lukes & Kloss, 2008)

Even though, urban streets are significant sources of runoff, they are also part of the urban infrastructure. Conventionally, they convey stormwater by using networks of buried pipes. (Lukes & Kloss, 2008). Whereas, UGI on urban streets complements the conventional piped stormwater drainage system by using natural means to capture, infiltrate or evaporate stormwater before it enters the conventional piped

system. In doing so, UGI helps to reduce flooding and water pollution by absorbing and filtering stormwater while providing natural relief to the built environment, enhance urban aesthetics and providing social benefits. (GDCI & NACTO, 2016).

The components and process of UGI is vast. But some of the major components are Swales, Rain Gardens, Street Trees and Planting, Permeable Paving and Passive Irrigation.

A. Swales

Swales are long and shallow vegetated depression along side streets with slight slope. (EPA, August 2009). They serve as natural alternative to the conventional piped drainage system where space and grade is available. (GDCI & NACTO, 2016) The three main purposes of swales are to reduce stormwater volume by infiltration, improve water quality through vegetation and soil filtration and reduce the flow velocity of stormwater by increasing channel roughness. (Lukes & Kloss, 2008). When stormwater pass through swale, it slows stormwater down. This allow the water to soak into the soil and taken by the plants or infiltrate further into the ground. Simultaneously, sediment and pollutants from the street surface will also settle out. (EPA, August 2009).



Picture 19: Street side swale (Source: Abby Hall, US EPA)

B. Rain Gardens

Rain Gardens are also known by various names such as bioretention systems, flat bioswales, flow-through planters, or pervious strips. They are configurations of street side plants and soil filtrations systems, equipped with special soil filter media, to remove pollutants from stormwater runoff. Some are designed to allow water to infiltrate underlying soil strata while others are designed to collect the treated water and convey the clean water downstream. (GDCI & NACTO, 2016).

Rain gardens features could be presented as street side garden beds, street tree pits and planter boxes. A number of natural process occur in rain gardens such as infiltration and storage reduces runoff volumes and attenuates peak flows; biological and chemical reactions that occur in the mulch, soil matrix, and root zone; and stormwater is filtered through vegetation and soil. (Lukes & Kloss, 2008)



Picture 20: Rain garden which take runoff from street through trench drain and from sidewalk through curb cuts. (Source Abby Hall, US EPA)

C. Street trees and plantings

Street trees provide a wide range of benefits to the urban environment such as reducing the urban heat island effect, reduce stormwater runoff, improving the air quality. In addition to that, street trees provide various social and economic benefits to urban areas and their inhabitants. Despite their numerous benefits, the mostly street trees are given very little space to grow in often inhospitable environment. The soil around street trees is mostly compacted during construction. This in turn stunt the growth of street trees and shorten their life span. To increase the health of street trees and benefit fully from their matured size, attention must be given to the soil volume, mix and compaction. (Lukes & Kloss, 2008)



Picture 21: Trees planted at the same time but with different soil volumes. (Source: Casey Trees)

D. Permeable paving

Permeable paving is used to allow rainfall to pass through the pavement surface to the underlying soil strata to recharge the water table. Also, to alternate surfaces with permeable pavement also reduce stormwater runoff. Permeable pavements could be made in the form of block pavers with

infiltration gaps in-between pavers or porous material with infiltration gaps within the material. (GDCI & NACTO, 2016)



Picture 22: Pervious pavers. (Source Abby Hall, US EPA)

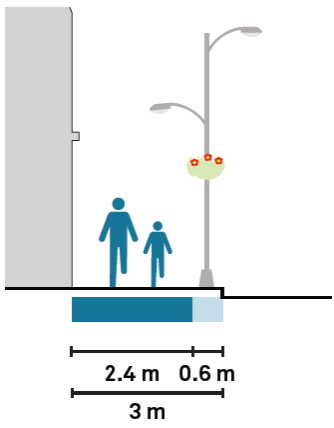
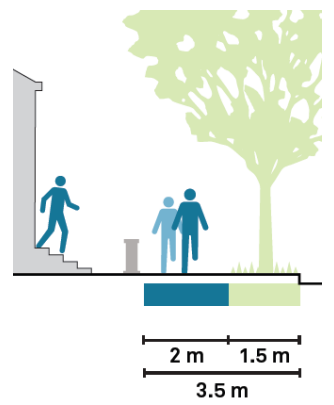
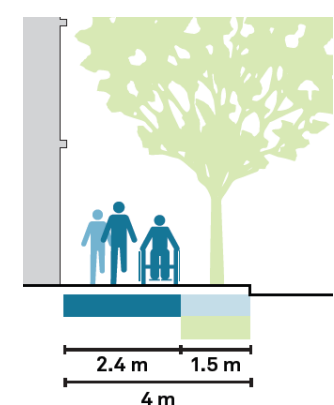
2.5. Overview of International Standards

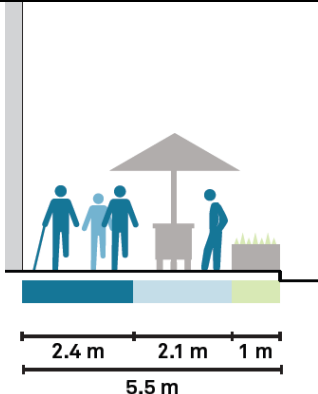
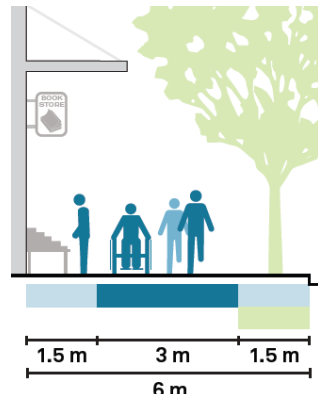
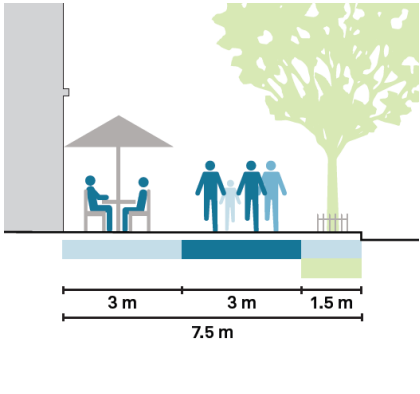
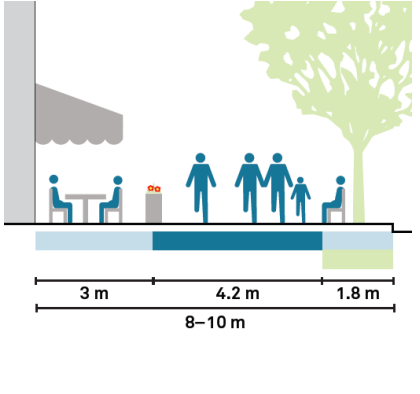
Every city designs its streets and street elements according to its own specific planning and design standards. These standards vary due to their case specific nature. Cities design and construct their streets according to their economic capabilities, standard of living, population size, culture, and climatic conditions to mention the few. This makes the discussion of a certain unified international standard difficult to choose from all the specific local standards.

The Global Street Design Guide (GSDG) was prepared to fill the gap for a unified standard for street design. In its own words, the GSDG “put forward universal principles to create common world class streets” (GDCI & NACTO, 2016)

The pedestrian walkway is one of the primary location for street greenery. At the same time it is a contested space by many functions, socio-economic activities and utility infrastructures.

For this section, spatial standards put forward by the GSDG for pedestrian walkways is presented as part of a representative unifying street standards.

Narrow Sidewalk <i>Quiet streets in low-density contexts might have too narrow sidewalks. A recommended minimum clear path of 2.4 m and an absolute minimum of 1.8 m should be provided. When streets are too narrow for trees, other alternatives to landscaping should be explored. If comfortable sidewalks cannot be provided on both sides of a street, a shared street is preferred. Locate utilities and other obstructions immediately against the curb.</i>	 The diagram illustrates a narrow sidewalk layout. On the left is a grey building. A blue path of 2.4 m is shown with two pedestrian figures. To the right of the path is a light blue utility strip of 0.6 m. A street lamp stands at the edge of the utility strip. The total width of the sidewalk is indicated as 3 m.
Ribbon Sidewalk <i>In low-density streets where the sidewalk sits between a planting strip and a set-back building, provide a minimum width of 2 m. Tree pits should not be less than 1.5 m wide. Locate utility poles in the planting strip.</i>	 The diagram shows a sidewalk between a building and a planting strip. The blue path is 2 m wide, with a pedestrian figure. The adjacent green planting strip is 1.5 m wide and contains a tree and a utility pole. The total width is 3.5 m.
Narrow Sidewalk with Trees <i>Medium-density residential streets should maintain a clear walking path of 2.4 m or more. When space allows, trees should be planted between the clear path and the moving or parking lane. Tree pits should be at least 1.5 m wide.</i>	 The diagram depicts a sidewalk with a tree. The blue path is 2.4 m wide, with three pedestrian figures. A green tree pit of 1.5 m width is located between the path and the street. The total width is 4 m.

Neighborhood Main Street 1 <i>On small retail streets with low but persistent pedestrian traffic, sidewalks should provide a minimum clear path of 2.4 m in addition to space for commercial activities. When there is not enough width to plant trees, provide landscaping strips or planters.</i>	
Neighborhood Main Street 2 <i>Neighborhood main streets should provide a clear path of 2.4 m to allow moderate volumes of people to comfortably pass one another. Space for commercial activity to extend from storefronts should be allocated on the building side. Tree pits, planters, and seating should provide a buffer between pedestrians and moving vehicles or cycles.</i>	
Medium Commercial Sidewalk <i>Commercial corridors should provide a clear path of 3 m or more to allow a continuous flow and enable people to comfortably pass one another. Ground-floor activities from adjacent buildings can be encouraged to activate the sidewalk by providing flexible and dedicated space on the sidewalk adjacent to the clear path.</i>	
Wide Commercial Sidewalk <i>Busy commercial corridors with heavy pedestrian flows and activities should be designed, when possible, with a width of 8–10 m, allowing for commercial activity, street furniture, transit stops and shelters or queuing spaces, landscaping, and green infrastructure. (GDCI & NACTO, 2016, p. 80)</i>	

Text Box 2: Pedestrian walkway standards. (Source: GSDG)

2.6. Overview of National Policies, Strategies and Standards

Street greenery, which is the general theme of the research, is part of the urban street network which in turn is an integral component of any urban area. Street greenery also plays an important role in the urban environment. The aim of this section is to review the various legal and technical documents of Ethiopia at large and that of the city of Addis Ababa in particular with the aim of establishing part of the necessary theoretical framework for the research. Furthermore, this review also covers relevant technical standards that give specific technical recommendations and guidelines to the process of street greenery development.

The Ethiopian constitution, which is the basis for the country's policies and strategies, under *Article 44, Environmental Rights*, declares:

"All persons have the right to a clean and healthy environment."
(HPR/FDRE, 1995, p. 16).

Subsequently, Ethiopia has developed various legal frameworks to materialize this constitutional decree into practice. In the urban context, the 'Urban Development Policy' is among the significant legal frameworks. Based on the concepts from the Urban Development Policy and addressing the critical issue of climate change, the 'Climate Resilient Urban Green Development Strategy' was developed. In the strategy, detailed directions were set towards green developments in urban areas with strong emphasis given to these urban green areas by considering them as part of the urban green infrastructures. The contribution of this standard is significant in defining the term itself and clarifying the component of the then new concept of 'Urban Green Infrastructure'. But, the mere development of the strategy was not adequate to cover the required details. And this was the major reason for the development of the predominantly technical standard, the 'National Urban Green Infrastructure Standard'.

The focus on this section of the literature review will be on the above mentioned three documents. Particularly, the NUGIS is the basis for the first research question.

In addition to the three documents, the ‘Street Design Standard for Urban Ethiopia’ and the AACRA manual are incorporated in this section of the literature review.

2.6.1. Urban Development Policy

The ‘Urban Development Policy’ was first issued by the Ministry of Federal Affairs in 2005. According to the document, the fundamental focus of the policy is stated to be

“...the development of micro and small enterprises, land development and management, housing development, development of urban planning and management, city plans, sanitation and green-ness and urban-to-urban-center and urban-to-rural-center linkages.” (MFA, 2005, p. 25).

The vision of this policy is *“To enable cities guarantee development and fast service to their inhabitants, to make them suitable for living and plan-led so that they can be centers of development and paragons of democracy, to see them link and cooperate with each other so as to prove their international competency and prosper.”* (MFA, 2005, p. 6)

Similarly, the two objectives of the policy are:

- 1. To enable cities become centers of development and impact development at both rural and national levels.*
 - 2. To enable urban dwellers exercise authority and benefit from development so that they can enjoy the standard of living enjoyed by middle income countries.*
- (MFA, 2005, p. 6)

The policy starts by relating the fundamental challenges of Ethiopia’s urban centers to be the same problems facing the country itself. And these challenges are largely summarized as problems concerning development and good governance. And in this paper, the problem of development is given emphasis due to its relation to the theme of the research. On the list of ‘Developmental Problems’, the lack of sufficient urban green areas is listed together with the problem of solid and liquid waste disposal

system. A summary of the 6 points listed under section 1.1.1 Developmental Problems of the policy is presented as below.

Developmental Problems

- 1. Our urban centers lack basic infrastructure, a lot of them lack drinking water, road, electricity and telephone service. Infrastructures are of low coverage and poor quality.*
- 2. Our urban centers did not receive widespread and quality social service. Social service in urban centers is usually of low coverage and poor quality. The service was limited to a few cities only and it focused only on disease treatment and education, instead of prioritizing disease prevention, basic education and vocational training.*
- 3. Our urban centers and their neighborhoods have a significant shortage of housing or dilapidated old houses.*
- 4. The shortage of recreation centers and pollution is another problem in urban centers. Proper solid and liquid waste disposal systems, bounded and well-kept green areas as well as local recreation centers have been lacking for a long time.*
- 5. Our urban centers did not have strong ties with rural centers. Even though our economic policy states that its objective is agriculture-led industrial development, we failed to integrate urban and rural development.*
- 6. The growth of our different urban centers was unbalanced and not complementary. There is a giant gap between the growth of Addis Ababa and other cities as well as cities in different administrative regions. (MFA, 2005)*

The policy sums the challenges of development and good governance and states “... as a sum total of all of these challenges, the lack of democracy and good governance has debilitated cities for a long time. Even now, cities have not achieved a reliable and thorough change. Therefore, it is mandatory to devise a policy that can solve these problems.” (MFA, 2005, p. 4).

The policy also indicates the necessity to come up with a relevant policy by stating, *“It is important to devise a holistic policy that can regulate democracy and good governance to solve the aforementioned problems. Since the lack of such a policy is one of the root problems, a policy that helps solve the problems and states the role of cities in national development and democratization, devises a plan for rapid and just development in cities and points out the must-have characteristics of good governance that can realize these goals must be designed.”* (MFA, 2005, p. 4).

The policy discusses different challenges in urban centers of Ethiopia and provides different direction to tackle them. As the main aim of this review is to assess the policy in light of the theme of the research, it is natural to give a closer look to what it says to the fundamental concepts of the research. This fundamental concepts could be expressed in broader key words like Urban Greenery and Urban Green Infrastructure. In the policy, the concept of Urban Green Infrastructure is not mention at all. While discussing about infrastructures in urban areas, the policy document states in section 4.4 *Infrastructure Provision*, *“...it is important to execute the expansion of infrastructure through the combined effort of the government, the private sector and the public. Above all, the provision of clean drinking water to cities should be prioritized.... The provision of roads is second to the provision of drinking water.... It is important then to distribute telephone service and electricity to all cities in order of their importance....City administrations should also encourage the expansion of transport services”* (MFA, 2005, p. 18). It is clear to see from the above section, while discussing infrastructure provision in cities, the policy didn't specify urban greenery as infrastructure.

Similarly, in the policy, the subject of urban green areas is mentioned at some places. While discussing developmental problems of urban areas it is mentioned that one of the problems of Ethiopia's urban centers is lack of *“proper solid and liquid waste disposal systems, bounded and well-kept green areas as well as local recreation centers have been lacking for a long time”*. (MFA, 2005, p. 2). Lack of urban green areas is presented alongside with sanitation problem rather than an independent issue. Also, in section 4.6.3 *Ensuring Environmental Conservation and Sanitation in Cities*, the policy gives some details in regard to urban green areas. In

this section also, the pattern of association of the issue of urban green areas together with sanitation repeats itself.

The policy generally deals with lots of broad urban issues from different social, economic and environmental perspective. Some of them are significantly elaborated considering the intensity of the problem and the necessity to overcome it. But while discussing urban green areas in particular or the urban environment in general, the policy shows lack of depth and present the general tendency of looking the broad issue of urban environment from the narrow perspective of sanitation and related matters.

2.6.2. Climate Change Resilient Urban Green Development Strategy

The Climate Change Resilient Green Development Strategy was prepared by the Ethiopian Ministry of Urban Development, Housing and Construction (MUDHC) and issued in 2014. The strategy states that, in order to make the transition from poverty and backwardness towards sustainable growth and prosperity, Ethiopia has engaged in rapid and comprehensive development activity. But it also stress on continued attention to be paid to reduce the impact of expansion of industrial development, increase in urban population and climate change on environmental imbalances. The strategy also gives particular emphasis on the struggle to mitigate climate change which is one of the current global agenda. In this regard, the strategy indicates the high level of attention to be given to create conducive situations to cities to expand their green development and by that eliminate the pollutant gases they generate. (MUDHC, 2014).

The strategy elaborates the choice to follow the direction of green economy by the government of Ethiopia, it says:

“Ethiopia is striving to build a green economy and be among middle income countries by 2024/25 (2017 E.C). If our country is to follow conventional growth directions, in addition to other various harms it would have led to rapid greenhouse gas emissions and to wasteful natural resource utilization. On the contrary, our country prepared a strategy and an implementation strategy

which could withstand this situation and is striving towards avoiding these harms and build a green economy” (MUDHC, 2014, p. 3)

The vision of the strategy is stated as: *“ To have cities which give fair development and prompt service to their residents, which are suitable for living and led by plans, which are the area’s development centers and paragons of democracy, which are interlinked with each other and internationally competitive and prosperous”.* (MUDHC, 2014, p. 25)

The main challenge to implement Urban Green Infrastructure is identified in the strategy to be the lack of green development standards. Direction to solve this challenge was indicated to be the prompt preparation of such nation standard to give practical guidance and legal framework to the implementation of UGI in urban centers of Ethiopia. This is the first strategic and practical step to be taken by the Ethiopian government to the later preparation of the NUGIS.

“The main challenge to urban green infrastructure and service provision is the absence of green development standards which support works and enabling. With regard to urban beautification and green development, that there is no specific standard and legal framework for execution meant that a working procedure which ensures transparent service provision in the sector is not setup..... Therefore, to resolve the above detailed problems green infrastructure standards and executive legal framework should be designed which shall be applicable at all administrative levels, starting from the federal level in a manner which is compatible, gives appropriate support and supervision, centers on the satisfaction of beneficiaries and ensures transparency and accountability. Regions and cities should adapt these standards according to particular realities, and implement them.” (MUDHC, 2014, p. 30)

The strategy claims that the majority of the society understood it green infrastructure, as *“land area at city centers or outskirts not put under any construction but is covered with vegetation and is green.”* But on the contrary, the concept of green infrastructure is *“network of green bodies which offer multi-sectorial services.”* In line

to this the following 17 component of urban green infrastructures are listed and elaborated in the strategy:

1. *Parks*
2. *Sporting fields*
3. *Road dividers, roadsides and roundabouts*
4. *Plazas and Festival Areas*
5. *River and Riverside Areas*
6. *Lake and Lakeside Areas*
7. *Watershed areas*
8. *Urban Agriculture Development*
9. *Woodlots and Greenbelts*
10. *Individual's Compound and Surrounding*
11. *Compounds of (governmental and non-governmental) Institutions and its surrounding*
12. *Compounds and Surroundings of Housing Cooperatives and Condominiums*
13. *Compound and Surrounding of Religious Institutions*
14. *Neighborhood Open Spaces*
15. *Cemeteries*
16. *Seedling Nurseries*
17. *Greening Roofs and Walls (MUDHC, 2014)*

For each of the above component of urban green infrastructure, the strategy provides brief explanation supported by local examples. Out of the above 17 UGI components, the component of 'Road dividers, Roadsides and Roundabouts' is close to the theme of this research. For this purpose, information in the strategy regarding this component are summarized and presented as follows:

Road dividers, roadsides and roundabouts

In this section of the strategy, general information about road side vegetation developments is presented starting from why now a days these developments are getting attention. With the worldwide challenge of global warming, street vegetation

got special attention. Street greenery no more are planted merely for beautification but rather they become mandatory element of city development. The diversified benefits of street greenery easily justify the financial expenditure spent on their development and maintenance. The strategy finally states in regard to street greenery development that, in Ethiopian cities, selection, planting and maintenance of street greenery is not practiced having into consideration the immense and diversified benefits of street greenery (MUDHC, 2014).

2.6.3. Ethiopian National Urban Green Infrastructure Standard

Ethiopia has set a goal to join middle income country status by 2025. In doing so, the country has also set a vision to reach this status with net-zero greenhouse gas emission by following its Climate Resilient Green Economy (CRGE). The country's rapid population growth and urbanization is creating demanding societies in the urban settings. The Ministry of urban Development and Housing (MUDH) has prepared the Climate Change Resilient Urban Green Development Strategy (CCRUGDS) as road map to fulfill the urban population's need in the area of UGI service provisions. (MUDH, 2015)

To implement the CCRUGDS, a standard was prepared by MUDH in November 2005. This standard is the National Urban Green Infrastructure Standard (NUGIS).

The scope of the NUGIS in its own description is: *"These National Urban Green Infrastructure Standards (NUGIS) create the framework for municipalities to provide effective and sustainable urban green infrastructure (UGI) for their citizens in order to protect public health and environmental quality. They provide minimum requirements to enable competent authorities to meet their legal responsibilities"* (MUDH, 2015, p. 1)

The minimum standards set in the NUGIS are expected to be implemented across cities and towns of Ethiopia by placing the responsibilities on national, regional and local public authorities or 'Competent Authorities', by providing the basic minimum requirements to be achieved in the design, implementation and operation of UGI. While doing so, there is also a room that competent authorities may exceed the

standards, and implement alternative conforming UGI, so long as the basic minimum goals are achieved. The flexibility of the standard goes up to granting exceptions if more appropriate solutions are achieved. (MUDH, 2015)

Under this section, the acquired basic information about the NUGIS are briefly presented with the intention of drawing a background for the data analysis and its subsequent findings. These basic information about the NUGIS are made to cover the motive for the standard, how it was prepared, how it was publicized and the monitoring mechanism for its implementation. The Ministry of Urban Development and Housing (MUDH) was the right place to search for these basic information. In MUDH, the directorate that prepared the document was the '*Urban Greenery and Beautification Directorate*'. Therefore, the interview data collection specifically targets this directorate. The selection of the respondents was made to be diversified and includes the director, the different professional and the ex-office head. The analyzed interview data reveals the following results regarding the basic information about the NUGIS.

The motive for the standard in broader terms is related to the economic growth of the country. As the economy grows so does its adverse impacts on the environment. The spread of urbanization also comes up with its own new environmental challenges among others on the list. The government of Ethiopia took notice of these global and local challenges and started to draft policy and strategy documents that adapt and mitigate these challenges. The country's economy was also planned accordingly. The '*Climate resilient green economy*' (CRGE) was prepared in 2011 (2003 EC). Similarly, to address the environmental challenges in urban centers, the government drafted the '*Climate resilient urban green development strategy*' (CRUGDS). Therefore, to implement these strategies the need for a standard become mandatory. Hence, the motive to prepare the NUGIS is one means to implement the strategies.

Before the NUGIS, there was no standard to implement UGI in the country and things were done arbitrarily rather than in structured and scientific manner. Therefore based on this need, the standard was developed hoping that all the coming leaderships will have a common platform to implement UGI in the country.

The preparation of the standard was done with a joint collaboration of the MUDH and GIZ. After passing a decision and the preparation of the terms of references was completed, the MUDH asked the assistance of GIZ. GIZ assigned a professional to work full time with the Ministry to provide technical assistance. GIZ also involved professionals from EIABC as consultant. The drafts of the standard was continuously been criticized by the Ministry's professionals till the final document was prepared.

After the preparation of the standard was completed, it was **publicized** in two main processes. These are the launching ceremony and the continuous trainings provided by MUDH. The launching ceremony of the NUGIS was held from March 7-9, 2016 (Yekatit 28 - 30, 2008 EC), in the presence of the then Prime Minister Ato Hailemariam Desalegn in Addis Ababa's Millennium Hall. The document was presented for audience size of about 2300-2400 participants from all over the country. Each governmental, private, religious, civic society and others were represented during the launching ceremony of the standard. After this, there was a move to create awareness creation and implementation in the regions which was overlooked by the regional presidents. In Addis Ababa also, this process of awareness creation was done starting from the Mayor's Office till Woreda level (the lowest level of the city government). This launching ceremony was the first publicity process for the standard. After that, the MUDH keeps on giving short trainings on NUGIS and other supporting manuals. The trainings are given to 30 cities and town every year. At least 2000 different levels of leadership and professionals get the trainings each year.

Parallel to the trainings, **monitoring and evaluation** of the implementation process of the standard was performed. There is a checklist for the monitoring process and one of the item on the checklist is whether or not the urban development is according to the standard. This include also street greenery.

NUGIS includes 15 UGI elements in 15 distinct sub-chapter. These are:

1. *Recreational parks*
2. *Rights of way*
3. *River and canal corridors and lake shores*
4. *Open spaces in residential areas*
5. *Open spaces in administrative and commercial areas*

6. *Open spaces in industrial areas*
7. *Schools and kindergartens*
8. *Cemeteries and religious yards*
9. *Outdoor sports fields and facilities*
10. *Temporarily vacant land*
11. *Natural and semi-natural land (urban forests and wetlands)*
12. *Steep slopes and rocky land*
13. *Urban agricultural and horticultural land*
14. *Green roofs and living walls*
15. *Urban Seedling Nursery*

The Right-of-way sub- chapter of the NUGIS, which is also one of the focus of this research, categorizes the UGI components and facilities on a typical urban street into four and discusses them in different details. These are:

- a) The green component
- b) The gray component
- c) Stormwater managment
- d) Urban agriculture

For the complete section of the green component of the Right – of – way sub chapter of the NUGIS, please refer Annex B.

2.7. Literature Review on Method of Analysis and Survey Methods

The research employs different survey methods to collect relevant data. Similarly, it uses some methods of data analysis to extract findings from the collected data to answer the guiding research questions. As the research is predominantly a qualitative research, it collected the majority of the primary data in the form of in-depth interview. This calls for a clear and reliable analytical framework to analyze the interview data and reach on the anticipated findings. To this end, the **Thematic**

Analysis (TA) was chosen as the main analytical framework to analyze the qualitative data from the interviews.

Furthermore, to specifically answer the second research question, the **KAP Survey and Analysis** was employed during the course of the research. A brief literature review of the above two methods is presented below.

2.7.1. Thematic Analysis

Thematic Analysis is defined by Boyatzis as follows:

“Thematic analysis is a method for identifying, analysing, [sic] and reporting patterns (themes) within data. It minimally organises [sic] and describes your data set in (rich) detail. However, it also often goes further than this, and interprets various aspects of the research topic (Boyatzis, 1998) as cited in (Braun & Clarke, 2006, p. 6).

Virginia Braun and Victoria Clark are two senior psychologists who have done extensive work in qualitative research methods. In 2006, they have published a paper in titled ‘Using Thematic Analysis in Psychology’ and this paper was claimed by Google Scholar to be the ‘most cited paper in academia in 2006 which also had a significant impact on the landscape of qualitative research. The aim of this review focuses on reviewing this paper and summarize the core points for the subsequent utilization for the data analysis purpose of the research.

Qualitative approaches are incredibly diverse and complex. (Holloway & Todres, 2003) as cited in (Braun & Clarke, 2006). Braun and Clarke argue that, “Thematic analysis should be seen as a foundational method for qualitative analysis. It is the first qualitative method of analysis that researchers should learn, as it provides core skills that will be useful for conducting many other forms of qualitative analysis” (Braun & Clarke, 2006, p. 4).

To understand the method of Thematic Analysis, it is mandatory to get a clear understanding about Themes.

“A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set.” (Braun & Clarke, 2006, p. 10).

It is common to read as themes ‘emerging’ or ‘discovered’ from the data. In the data analysis process, themes are not meant to be ‘emerged’ or ‘discovered’ but rather the researcher actively has to identify the patterns / themes, select which are of interest and report them to the readers (Taylor & Ussher, 2001) cited in (Braun & Clarke, 2006). This is an active process and it is the core of TA.

For easy of using TA, Braun & Clarke proposed, **A 6-phase guide to doing Thematic Analysis**, which are explained as follows:

A 6-phase guide to doing Thematic Analysis (Braun & Clarke, 2006)

i. Phase 1 - Familiarizing yourself with your data

To get immersed in the data till its contents gets well familiarized. This involves ‘repeated reading’ of the data in an active way that is searching for meanings, patterns and so on. The process of transcription is an excellent way to get familiar with the data (Riessman, 1993).

ii. Phase 2 - Generating initial codes

The repeated reading and familiarization of the data leads to identify list of ideas with potential points of interest to the analyst. These points are initial codes from the data. Boyatzis defines codes as: “the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon”. (Boyatzis, 1998)

iii. Searching for themes

This phase involves sorting different codes that have relation to each other and categorizing them into potential themes. At this stage, the use of visual representation will be helpful. These might be the use of tables, mind-maps and different kinds of listing and organizing methods could go. (Braun & Wilkinson, 2003)

iv. Reviewing themes

This phase primarily involves in the refinement of the selected candidate themes. In the refinement process, some themes will be dropped, merged or broken down till the actual themes are clear in meaning and distinctively identifiable from others are sorted out. The outcome of the theme refinement process could be presented as thematic map.

v. Defining and naming themes

At this phase, the themes will get refined, defined and named. Meaning in the essence of each theme and the overall themes will be identified. What aspect of the data they capture determined. Complex Themes will be checked if they contain sub-themes.

vi. Producing the report

This phase is for the final analysis and write-up of the report. The report should be presented in a concise, logical and non-repetitive manner to convey to the reader the essence of the data with the merit and validity of the analysis.

2.7.2. KAP Survey

“The triad of knowledge, attitude and practice in combination governs all aspects of life in human societies, and all three pillars together make up the dynamic system of life itself.” (Badran, 1995, p. 10)

“A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic... In most KAP surveys, data are collected orally by an interviewer using a structured, standardized questionnaire. These data then can be analysed [Sic] quantitatively or qualitatively depending on the objectives and design of the study” (ACSM, 2008, p. 6). “The KAP survey tradition was first born in the field of family planning and population studies in the 1950s. KAP surveys were designed to measure the extent to which an obvious hostility to the idea and organization [Sic] of family planning existed among different

populations, and to provide information on the knowledge, attitudes, and practices in family planning that could be used for programme [Sic] purposes around the world (Launiala, 2009, p. 1). “The attractiveness of KAP surveys is attributable to characteristics such as an easy design, quantifiable data, ease of interpretation and concise presentation of results, generalisability [Sic] of small sample results to a wider population, cross-cultural comparability, speed of implementation, and the ease with which one can train enumerators (Launiala, 2009, p. 2)

In its simplest form, the juxtaposition of the Knowledge, Attitude and Practice of professionals has a potential to indicate the capacity of those professionals to contribute to the overall performance of their institution. First and foremost, performance is directly and indirectly affected by the level of relevant knowledge the professionals have. This is a fundamental requirement. But only knowing about the subject matter doesn't guarantee that it will be applied. High performance is expected when an individual or a team of individuals believe in the knowledge they possess and feel the willingness to apply it. This is Attitude. The dictionary meaning to attitude also justifies this by defining attitude as:

“A complex mental state involving beliefs, feeling, values and disposition to act in certain ways” (Offline Advanced English Dictionary)

The most common methods to evaluate the level of attitude is posing questions which will be answered by one of the three choices of *'agree, not sure and disagree'*. But for this study, to further evaluate the attitude level and provide a more clearly quantifiable results, the interview questions for the attitude test are presented as questions asking to rate the opinion of the respondents in a five grade scale rather than a simplified affirmative or negative answers.

In addition to possessing a relevant knowledge and the right attitude, practice is the third crucial practical requirement for performance. All the knowledge and the right attitude has to be materialized at the end of the day as practice. All the three methods come together in KAP Survey.

The three components of KAP survey, namely Knowledge, Attitude and Practice, explores the three different forms of from a given data in a structured way. To

conduct an effective KAP survey, it is advisable to know these three different dimensions. (Badran, 1995) Defines the three components as follows:

Knowledge

“Knowledge is the capacity to acquire [sci], retain and use information; a mixture of comprehension, experience, discernment and skill... The nature of knowledge rests on the different modes of acquisition of ideas: perception, imagination, memory, judgement, [sci], abstraction and reasoning. The pinnacle aim of knowledge is the truth and is studied by that branch of metaphysics known as epistemology.”

Attitude

“Attitude refers to inclinations to react in a certain way to certain situations; to see and interpret events according to certain predispositions; or to organize opinions into coherent and interrelated structures.”

Practice

“By practice we mean the application of rules and knowledge that leads to action. Good practice is an art that is linked to the progress of knowledge and technology and is executed in an ethical manner.” (Badran, 1995, p. 9)

2.8. Summary to the Chapter

Street greenery provide numerous environmental, social and economic benefits to urban areas and their inhabitants. These benefits are so influential, they are considered as infrastructure. They are major part of the Urban Green Infrastructure. The location of street greenery along urban streets, is generally harsh and polluted for growth, but put them at the frontline to combat the challenges from the transportation means and infrastructures of modern day cities.

For street greenery to get established and provide their benefits as part of the UGI, they have to be located properly in the urban streetscape. Mostly, the carriage way (traffic lane) tends to dominate over the pedestrian walk way and other components of the streetscape capable of supporting greenery. Space allocation for street greenery is context specific. Internationally, municipalities follow their own standards to guide the allocation of space for street greenery. On the other hand, international standards like the GSDG helps to provide a global spatial outline for best practices for 'complete street design'.

Nationally, the NUGIS provide standards for the implementation of UGI in Ethiopian urban centers. One of the sub-chapters of the NUGIS is the Right-of-Way. In the Right-of-Way sub-chapter, specific space allocation requirements are presented. This part of the standard is used as a basis to answer the first research question.

3. Chapter Three: Contextual Review

The aim of this chapter is to give a general overview to the conditions of street greenery on Addis Ababa's streetscape in order to give a contextual background to the research. In doing so, this contextual review is made not to be limited only to the actual theme of the research that is space allocation for street greenery. It covers highlights showing the different conditions in which the city's street greenery exist.

Different functions and utilities exist in juxtaposition on urban streetscape in the constrained width of the right-of-way. This juxtaposition of functions creates interactions among the functions and utilizes. In this review, the different interactions that Addis Ababa's street greeneries have with other street elements is also presented followed by some good practices of street greenery on the city's streetscapes.

3.1. Background information about Addis Ababa

"Addis Ababa is the capital city of Ethiopia and the African Union and is often called the "African Capital" due to its historical, diplomatic, and political significance for the continent. Located in the foothills of the Entoto Mountains and standing 7,726 feet (2,355 meters) above sea level, it is the third highest capital in the world. It is located in the geographic center of the country... The city possesses a complex mix of highland climate zones, with temperature differences of up to 10°C (50° F), depending on elevation and prevailing wind patterns. The high elevation moderates temperatures year-round, and the city's position near the equator means that temperatures are very constant from month to month. (Encyclopedia, 2019)

3.2. Overview of challenges in Addis Ababa's street greenery

To generalize the situation of Addis Ababa's street greenery is not a straight forward task. The city has different localities that have huge differences in age, planning approaches and other socio-economic patterns. But while discussing about challenges faced by the city's street greenery, it is possible to attempt to categorize them into broader groups of challenges that are shared by most of the city's street greenery development. In this section, seven groups of challenges are discussed as follows. Each case is presented supported by pictures from the current state of Addis Ababa's streetscape conditions.

3.2.1. Space Allocation

The dire situation regarding to the proper space allocation on Addis Ababa's streetscape is vivid and can be identified with a simple observation. But this does not mean that there are no good practices elsewhere in the city. There are a few streets that are properly designed for street greenery development with specific attention given to proper space allocation. These will be covered as 'sample streets' in a separate section in this contextual review.

On Addis Ababa's streetscape, it is common to see street greenery in a condition so bad that it makes the evidence for the lack of attention given to them by the responsible bodies. The root of the problem for the conditions of these street plants starts with the neglect in the provision of planting spaces during the design and construction phases of the streets. It will be followed by the sub-standard planting practice and maintenance procedures. Here are some pictorial examples of street greenery challenged by inadequate planting spaces:



Most of the streets of the city are designed and constructed without proper consideration to planting space allocation for street greenery. The greenery are planted later on by removing the paving materials of the finished street. They are more or less like afterthoughts. This type of practice, in addition to causing damage to the street hardscape structure it also results in sub-standard planting practice which significantly affect the street greenery development adversely.

Picture 23 : Example of the convergence of failure to allocate appropriate space and sub-standard practice of planting (Source - Author)



It is a common sight to see narrow median spaces in the middle of wide streets. These spaces are not proportional as a planting spaces for street trees. Some of this narrow median spaces are even paved and are not intended for planting at all. But despite being paved and not wide enough as a planting space, large species of trees like *Grevillea robusta* are being planted on them. To begin with, this is not a suitable softscape for greenery development and eventually the growth of the trees will create a significant structural damage on the street structure.

Picture 24 : Narrow median space provision and planted median space with un-proportionally large tree species. (Source - Author)



There are exceptionally too wide median spaces mainly in the middle of Principal Arterial Streets. These large spaces left in the center of street are intended to be used for street greenery and/or as reserve space for future expansion of the street infrastructure, if any. But most of them are fully being used for other functions different from street greenery or just as a waste land in the middle of the city. Some of the activities on this large median space are counterproductive for citywide aesthetics or hazardous from traffic point of view.

Picture 25: Large median spaces used for other functions other than street greenery. (Source - Author)



Some inner city streets are totally devoid of any kinds of streets greenery. And some of this localities are also going through redevelopment schemes which is a second chance to get a standardized and well develop street greenery. But the reality is that, most of the inner-city redevelopment schemes miss this opportunity and make a mistake by repeating the old challenges or even worse. The best example will be the Basha Wolde area redevelopment project in Aratkilo locality (picture on the right)

Picture 26: A wide street with absolutely no space provision for street greenery and a newly redeveloped area with no street greenery development. (Source - Author)

3.2.2. Planting Location

On the already constrained space of the urban streetscape, a wrongly placed street plant creates various challenges on the street users and other infrastructures. This is true both on pedestrian walkways and medians. In another scenario, unless an appropriate type of plant is planted on the right location, it results in the underutilization of that particular softscape space of the street.



Error in planting location resulting in making the street greenery an obstruction for pedestrian traffic

Picture 27: Physical obstruction due to wrong planting location. (Source - Author)



Planting narrow tree species on median space which has a potential to support large tree species with large canopy is an underutilization of the allocated space.

Picture 28: Under-utilized median space by the selection of narrow tree species. (Source - Author)

3.2.3. Species Diversity

Street greenery are situated in the most popular public domain of urban centers, which are the streets. They are in direct contact with a vast strata of the urban society. They are so widely spread over, that they can give character to cities. They can affect public safety both positively or adversely. Their maintenance is a continual process and do have a financial consequence. All the above issues and more are manageable by the selection of the right species for street greenery. Errors and negligence in species selection will results in citywide adverse consequences.



The widely spread *Grevillea robusta* creates a monoculture in Addis Ababa. This results in earning the city the name “Grevillea City”.

Picture 29: Monoculture in Addis Ababa’s street greenery. (Source - Author)



The extremely poisonous plant species of *Nerium oleander* which is common on Addis Ababa’s streetscape for its ornamental quality.

Picture 30: Poisonous plants in Addis Ababa’s street greenery. (Source - Author)



Maintenance is a very important factor in the selection of street greenery. Plants such as *Phoenix washingtonia* are high maintenance tree species and any neglect in maintenance resulted in unsightly features on the city's streetscapes.

Picture 31: High-maintenance plants in Addis Ababa's street greenery. (Source - Author)

3.2.4. Interaction with other infrastructures

Different infrastructure lines are installed following Addis Ababa's street network. This is true both on the overhead and subterranean spaces of streets. As part of the Urban Green Infrastructure, street greenery are also located on the streetscape with direct competitions for space with the other infrastructure lines. This juxtaposition of various infrastructures on the constrained space of the urban street scape eventually created adverse interaction with each other. Following are some sample cases of adverse interaction between street greenery and the other infrastructures on the streetscape.



The pedestrian walkway supports lots of infrastructures including the green infrastructure. Addis Ababa's streets are subjected to frequent changes and reworks in underground utility lines posing serious challenges for the rooting systems of street greenery.

Picture 32: Trench cut through the main root system of street trees. (Source - Author)



Above ground, the interaction with overhead power lines and street greenery is counterproductive to both infrastructures.

Picture 33: Struggle for space. Interaction between overhead power lines and street trees. (Source - Author)



Unplanned and short sighted planting of street greenery makes them obstructions to traffic lights which could cause serious traffic accidents.

Picture 34: Traffic light obstructed by street tree. (Source - Author)



Street greenery (especially street trees) have the potential to damage the street's structural component or the hardscape. While the selection of tree species play a huge role for this phenomenon, but at the same time, the street's soil strata has to a certain level be conducive for the rooting system of street trees.

Picture 35: Serious damage on pavement by the root system of street tree (Grevillea robusta). (Source - Author)

3.2.5. Soil Strata

The urban soil strata in general is densely compacted. And particularly, the soil strata of streets and roads is granular and highly compacted and consolidated to support the heavy axial load of vehicular traffic. Street greenery have to strive on this granular and highly compacted soil structure. Therefore, due consideration must be given in the planting process of street greenery so that neither their rooting system is adversely affected by the street's soil strata or the street's structure is damaged by the rooting system.



The rooting system of street greenery has to strive in a very granular, highly compacted, consolidated and contested space by other subterranean utility lines which makes the growth and survival of street greenery highly challenging.

*Picture 36: Planting situation for street greenery: Granular and compacted in the making also contested by drainage pipes.
(Source - Author)*

3.2.6. Air Quality

Addis Ababa is becoming so much vulnerable to air pollution. This is a point source pollution where the prime source is from the city's streets. The main culprit for the degradation of the city's air pollution is the exhausts from the numerous old vehicles on Addis Ababa's streets. One of the benefits of street greenery is to combat urban air pollution. In doing so, they exist at the front line of the pollution source.

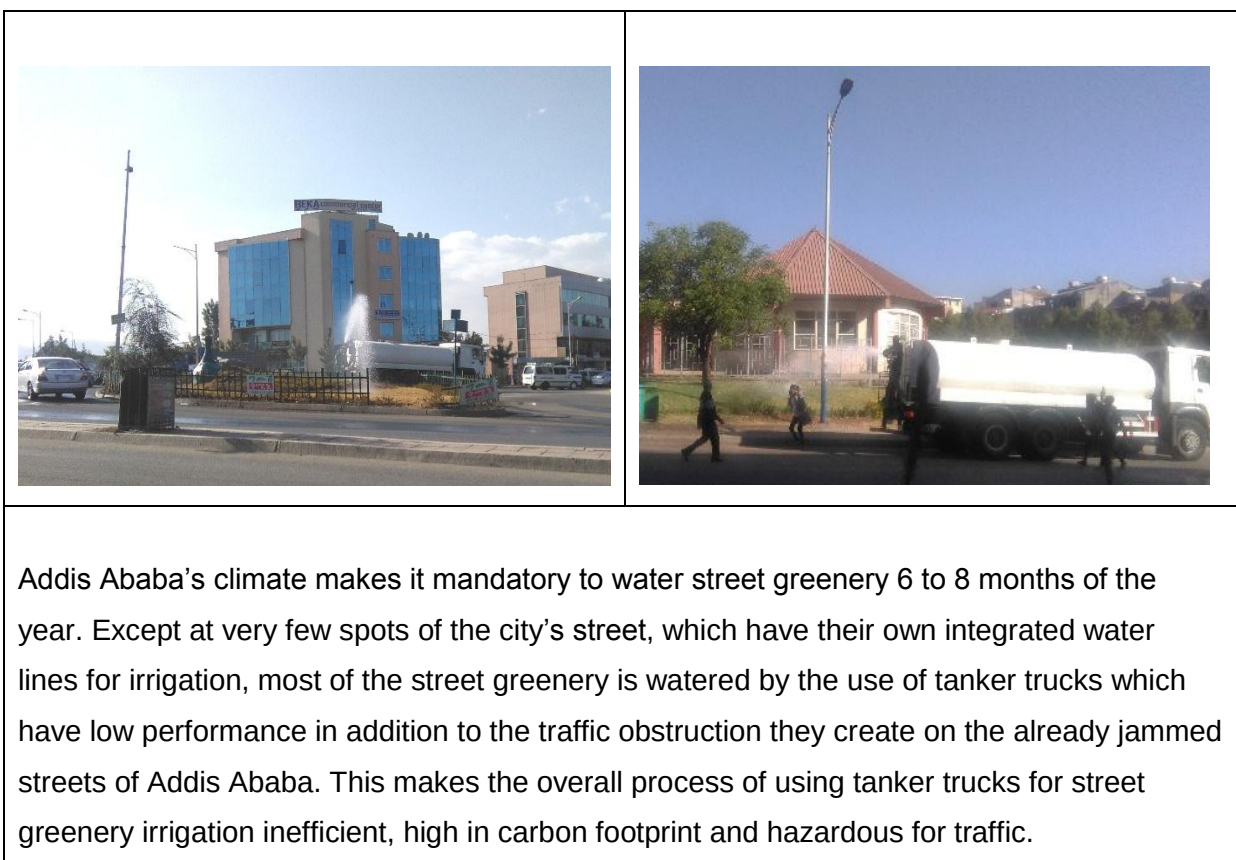


Addis Ababa's level of air pollution is quite vivid from the physical structures and the greenery on its streets. Heavy soot from vehicle's exhaust covers the street side physical structures and street greenery themselves. Even though this condition is a sign that shows one of the benefits of street greenery in combating air pollution, it also shows how extremely harsh the city's environment is for street greenery.

Picture 37: Soot covered street side elements, including street greenery. (Source - Author)

3.2.7. Maintenance

As living things, street greenery require continuous maintenance. This maintenance could be watering, pruning, weeding, hoeing or the provision of fertilization. For a city, in order to have a developed street greenery, it is must allocate sufficient budget, system and human resources for this continual maintenance process. In Addis Ababa, there are clear indications to show the poor performance of the maintenance process.



Picture 38: Water trucks watering street greenery. (Source - Author)



Street trees need additional maintenance care in the form of pruning and inspection for rotten trunks. Failing to do so results in fallen trees that could harm lives and damage property. The picture shows an example of clear neglect of a half-rotten trunk of a massive tree still standing on the streetscape of Addis Ababa, still waiting to fall.

Picture 39: A half-rotten tree trunk left to still stand along a busy street. (Source - Author)

3.3. Good practices on the city's streets

Even though the condition on most of the streetscape of Addis Ababa is generally speaking similar, there are some good practices and features worthy of mention. In this section, these good practices are presented into two categories. The first deals with good practices related to space allocation and details. This category is closely related to the theme of the research and selects two specific streets and discusses the good practices on them. The second category is more of a general observation of interesting features from Addis Ababa's streetscape which one could learn a lesson from them. This category is presented as Miscellaneous Best Examples.

3.3.1. Space Allocation and Details

Some streets of Addis Ababa exhibit a well-thought and executed features of street greenery. The author believes that the fundamental reason for these streets that

makes them unique is the fact they are designed to the finer details of street elements. These details ranges from the small curbstone detail to large ecological considerations. In these section, two brief discussions of Taitu Street (in front of the Sheraton Hotel) and Africa Avenue (Bole Road) are presented and discussed. On this brief discussion the space allocation for street greenery and some ecological considerations are given emphasis.

A. Taitu Street (in front of Sheraton Hotel)

The Sheraton Hotel was inaugurated in 1998. Hence the Taitu Street, along where the Sheraton Addis Hotel is located, was redesigned and reconstructed together with the hotel project some 21 years ago. The fully grown street trees could be indication to 20 years to be enough time to develop a mature street trees.



The Pedestrian Walkway of part of the Taitu street is wide and has a width of 7.4 meters. The surface is finished with asphalt finish for the Through Way and Granite cobble stones for the Furnishing Zone trimmed by granite curbstone from the carriage way side. The two space are separated elegantly with roughly polished granite ribbon frame. This walkway is one of the best designed and comfortable pedestrian realms in the city. From the ecological point of view all the cobble stone finished Furnishing Zone is ideal for water percolation in the immediate root zones of the street trees. One drawback of this area is on the selection

tree type which are very tall and narrow palm species which couldn't provide adequate shade for the walkway. To make the challenge worse, a number of these exotic palm species have started to die out.

Picture 40 : Pedestrian walkway on Taitu Street, along Sheraton Addis Hotel. (Source - Author)



The Median of part of the Taitu Street is as interesting as the pedestrian walkway. This wide median has a total width of 5 meters. It is framed all around by elegantly detailed granite curbstone with 75 cm cat walk for maintenance purposes. The median is planted with well-spaced *Spathodea campanulata* trees which provide shade on the carriageway. The undergrowth is densely and uniformly cover by well pruned *Dovialis abyssinica* plant to create an impressive and wide hedge.

Picture 41: Median on Taitu Street, along Sheraton Addis Hotel. (Source - Author)

B. Africa Avenue (Bole Road)

Africa Avenue (Bole Road) is one of the popular streets in Addis Ababa. This street was completely redesigned and constructed anew in 2013 by Chinese design consultants and contractors. Primarily, the main features of the redesign was widening the street to eight lane with pedestrian walkways and median, the provision

of different bridges and over passes and space provision for street greenery at the pedestrian walkways and median. What makes this street project unique from other street projects of city was that the project package include landscaping works and during the project handover, all the spaces allocated for street greenery were planted with different trees, shrubs and perennials.



The pedestrian walkway at Bole Road has a total width of 4.75 meters. This total width of the pedestrian walkway is allocated as 0.7 m Edge Zone, 1 m Furnishing Zone and 3.05 m Through Zone. Also, separate from the planting strip with in the furnishing zone are 75x75 cm tree pits planted with *Jacaranda mimosifolia* trees. Originally, the planting strips used to be planted with a variety of colorful perennials but now a days a hedge of *Duranta* starts to dominate.

Picture 42: Pedestrian walkway at Bole Road. (Source - Author)



The median of Bole Road has a total width of 3 meters. It has 40 cm cat walk at both sides for maintenance purposes. This fenced median is planted with *Araucaria biramulata* trees together with Hibiscus shrubs. The rest of the median's planting space is covered with grass. Originally, at the place of the *Araucaria biramulata* trees there used to be *Spathodea campanulata* trees. But for unknown reason for the public, the *Spathodea* trees were rooted out after they established well and replaced by the *Araucaria* trees. Also the various colorful perennials were taken over by the grass cover in the center of the median.

Picture 43: Median at Bole Road. (Source - Author)

3.3.2. Miscellaneous Best Examples



A large *Mimusops kummel* (Ishe) tree in the middle of median space. Example of the elegant features of some indigenous trees as potential street trees.

Picture 44: A large *Mimusops kummel* (Ishe) tree in front of Yohannes Church on Arbegnoch Street. (Source - Author)



A large *Acacia abyssinica* (Bazra Girar) tree on pedestrian walkway space. Example of the elegant features of some indigenous trees as potential street trees. And also the spectacular span of *Acacia abyssinica* and its high potential as shade tree.

Picture 45: A large *Acacia abyssinica* (Bazra Girar) tree on Ethio-China Street (Wollo Sefer). (Source - Author)



Large *Spathodea campanulata* (Yefim Zaf) trees around stadium area which cast dense shadows on the carriage way and have significant cooling effect on the microclimate.

Picture 46: Large *Spathodea campanulata* (Yefim Zaf) trees on General Abebe Damtew Street around stadium area. (Source - Author)



The colorful and matured *Jacaranda mimosifolia* (Yetemja Zaf) trees in front of the National Theater which gave its own unique character to the area.

Picture 47: *Jacaranda mimosifolia* (Yetemja Zaf) trees on Churchill Avenue, Beherawi Area. (Source - Author)



The Taitu Street, one of the best designed and constructed streets in Addis Ababa with its character giving *Spathodea campanulata* (Yefim Zaf) trees on its median.

Picture 48: The Taitu Street, one of the best designed and constructed streets in Addis Ababa. (Source - Author)



Tall and matured *Casuarina equisetifolia* (Shiwshiwe) trees at the center of the old city part of Casa Inchis covering half of the street with their shades. Also it is possible to observe that the total median space of 2 meter and the effective planting width of 1.1 m is just the right width to support a matured tree development. This kind of matured street tree developments have a high potential as a feedback for minimum space allocation standards for street greenery in regional and national UGI standards such as the NUGIS.

Picture 49: Zewditu Street -Casa Inchis Area. (Source - Author)

3.4. Summary to the Chapter

The contextual review reveals the numerous challenges faced by the practice of Addis Ababa's street greenery and some potentials for improvements. Primarily, it was possible to learn the fundamental challenge to street greenery development of Addis Ababa to be the lack of sufficient softscape space on the streets. There are many evidences of lack of sufficient spaces designated for street greenery both on the old and new street developments. And whenever there is space, the practice shows flaws in species selection, location, and up keeping. Similarly, a lot has to be done regarding proper considerations about interaction of street plants with other infrastructures on the city's street.

Simultaneously, it was also possible to observe the positive potential of proper design and maintenance on street greenery from few sample streets of Addis Ababa as best practices.

4. Chapter Four: Materials and Methods

In this chapter, the research procedures followed to answer the guiding research questions are discussed. These include the choice of methods to conduct the research as well as procedures related to the collection of the relevant data and the way the data are analyzed to reach on the anticipated findings.

4.1. Choice of Methods

The study uses an **Exploratory Research** to identify the problem and to structure the consecutive problem statement. The exploratory research was conducted by means of preliminary **Contextual** and **Literature Reviews**. The result of this initial exploratory research shows that, the problem is evident and worthy of a research. In addition to that, the different responsible institutions who play a role in the process of space allocation for street greenery in Addis Ababa have been identified.

The study is predominantly a **Qualitative Research** in terms of approach and it utilize both the **Descriptive** and **Explanatory** research methods.

- i. **The Descriptive Research Method** is used to describe the problem explicitly. It related the theoretical frameworks with the contextual realities aiming to identify and describe the gaps and the discrepancies between the two. This method utilized three research tools to reach on its goal:
 - a) **Observation Study** is used to assess the overall state of Addis Ababa's streetscape in general and the allocated spaces for street greenery in particular.
 - b) **Document Analysis** is used to establish the theoretical framework for the research and to collect additional secondary data. The document analysis was done by conducting a literature review and analysis of design documents. Literature review was conducted on:
 - Relevant policies, strategies and standards of Ethiopia

- Relevant municipal standards from other cities with best practices in street greenery from around the world.
- Scientific research works on the subject of street greenery.

Document analysis was conducted on selected AACRA's street design projects.

c) In Depth Interview was employed to collect rich primary data for the research and to triangulate the data collected by the document analysis. The in-depth interview was conducted in four sets to the four governmental institutions who have different mandates and level of influence over Addis Ababa's practice on space allocation for street greenery. (See *Annex C* for sample formats of interview question).

	Sample Population	Brief description of relevant responsibilities	Theme of the interview
1	The Ministry of Urban Development and Housing (MUDH)	Responsible for the preparation of the NUGIS, works on its awareness creation, and monitors its implementation.	The National Urban Green Infrastructure Standard
2	The Addis Ababa City Road Authority (AACRA)	Responsible to overlook the planning, designing, construction and maintenance of street projects in Addis Ababa.	Space allocation for street greenery in street design
3	The Addis Ababa City Government Planning Commission (AACGPC)	Responsible for the preparation of Addis Ababa's master plan, analyses the implementation and handle its revisions.	Space allocation for street greenery in AA's master plan
4	The Addis Ababa City Government River Basins and Green Areas Development and Administration Agency. (AACGRBGADAA)	Responsible for planting and maintenance of Addis Ababa's street greenery	Functionality of allocated spaces for street greenery

Table 1: Brief description of responsibilities of the sample population and theme of the interview.

- ii. **The Explanatory Research Method** is used following the results of the descriptive method that is gaps and discrepancies between the theoretical framework and contextual realities. It engaged the *Ex post facto* research procedures to reach on the root causes of the problem and answer the question of why the problem is there. According to (Zegeye, et al., 2009) pp 34, the Ex post facto method is described as:

“The Ex post facto in research means, after the fact or retrospectively and refers to those studies which investigate possible cause-and-effect relationships by observing an existing condition or state of affairs and searching back in time for plausible causal factors.”

Therefore, generally speaking, the second and third research question are from the explanatory part of the research while the first research question is from descriptive part of the research.

4.2. Selection of Case Study Street Projects

Considering the thematic scope of Addis Ababa’s current practice of space allocation for street greenery, data with physical parameters from case study street projects become of fundamental importance. The current practice of space allocation for street greenery is what is being practiced on the most recent street projects. Therefore, it is mandatory to closely study the recent street projects’ space allocation concept and the underlying planning principles in order to compare and contrast against local standards pertinent to space standardization for street greenery.

To this end, a time frame has to be specified to select which new streets to consider as case study street projects. For this purpose, the publication date of the ‘National Urban Green Infrastructure Standards’ (NUGIS) published by the MUDH in November 2015 was taken as benchmark for the beginning of the time frame. Similarly, considering the time schedule of the research, November 2018 was taken as the end to the time frame. Furthermore, streets with width less than 20m are found to be not wide enough to be taken as samples to express the practice of space allocation for street greenery.

Therefore, all streets designed under the mandate of ACCRA from November 2015 up to November 2018 and have width of 20m and above were taken to be eligible as case study street projects. The list of selected case study street projects are presented in 4.3.2.1 *Sample Population and Study Unit* section of this paper

4.3. Methods of Data Collection

4.3.1. Data Types and Sources

The study used both primary and secondary data sources.

Primary data are collected from selected governmental offices who have relevant responsibility and influence over the process of space allocation for street greenery.

Secondary Data are collected from the country's policy and strategy documents as well as from standards and manuals of the responsible governmental offices. International standards and best practices from other countries are also used as a supporting secondary data. Relevant and current street designs were analyzed as part of the document analysis to establish the current practice dictating the physical features of Addis Ababa's streets. Furthermore, a comprehensive literature review has been conducted on relevant research papers to explore the scientific knowledge in the field.

4.3.2. Sampling

4.3.2.1. Sample Population and Study Units

For this research, the **sample population**, particularly for the primary data collection are four selected governmental institutions who have relevant responsibility and influence over the process of space allocation for street greenery in Addis Ababa. These are:

1. The Ministry of Urban Development and Housing (MUDH)
2. The Addis Ababa City Government Planning Commission (AACGPC)
3. The Addis Ababa City Road Authority (AACRA)
4. The Addis Ababa City Government River Basins and Green Areas Development and Administration Agency. (AACGRBGADAA)

The selection of these four governmental institutions as sample population is based on their duties and responsibilities mandated to them. From these selected responsible governmental institutions, their relevant technical sections are selected as **study units** for the research from which some of the primary data are collected by interviewing their professional staffs. To insure higher data richness, the selection of interview respondents in the study units is made to include staffs from different administrative hierarchies. (See *Annex A for List of Interview respondents and their positions*). The particular study units for each of the above sample population are presented in *Table 2: Sample population and Study units of the research*, below.

No.	Sample Population	Study Units
1	The Ministry of Urban Development and Housing	Urban Greenery and Beautification Directorate
2	The Addis Ababa City Government Planning Commission	Spatial Design Directorate
3	The Addis Ababa City Road Authority	Road Construction and Maintenance, Design Revision and Implementation follow-up Directorate
4	The Addis Ababa City Government River Basins and Green Areas Development and Administration Agency	Plaza and Aesthetic Directorate Engineering Directorate

Table 2: Sample population and study units of the research.

Similarly, some selected case study street projects are taken as sample population for the secondary data collection. Based on the selection parameters presented on section 4.2 *Selection of Case Study Street Projects*, the list of the case study street projects are presented in *Table 3: Case Study Street projects*, below.

No.	Design contract month	Package	Road Name	Length (M)	Width (M)	Remark
1	December 2015	34	Bole Michael – Bole Bulbula 40/60 condominium	1400 8100	20 30	Design completed
			Bole Bulbula – Kaliti RR – Kilinto road junction	320 323 1720	25 30 50	
			Kaliti RR – Kilinto Condominium	6610	40	
2	December 2015	7	Bole Arabsa 6	17475	60,40,30,20	Design completed
			Bole Goro Selassie	6008	12,10	
3	July 2016	10	Bole Qitila	18715	30,21,10,6	Design completed
			Bulbula V	2521	30,25,10	
4	July 2016	11	Bole Arabsa 7	10488	50,30,25,16, 12,10,8,6	Design completed
			Bole Cheri	19110	30,21,20,16. 12,10,8,6	
5	July 2016	12	Koye Fiche 2 phase 2	31922	60,40,30,25,20, 15,12,10,6	Design completed
6	July 2016	36	CMC Ayat road junction – Gurd Shola Summit road and CMC Summit road – Meri	1177 913	20	Design completed
			Koye Fiche - Tulu Dimtu and Tulu Dimtu Condominium access	2400 1415	40	
			Fafa Food Factory – Dama Hotel Beheretsege – Sene Zetegn School – Debezeit Road	883 2530	20 15	
			Gofa Military Camp – Gofa Mebrat Condominium and Gofa Mebrat Condominium – NOC Fuel Station Junction	600	20	
7	May 2017	38	Kality Total – Akaki Bridge	2700	40	Design completed
			Akaki Town – External Ring Road	1650	20	
			Ayer Tena - Wolete	5660	30	
			Lafto – EEPCO road junction – Behere Tsige –	2300	25	

			Adey Ababa – Ring Road			
			CMC junction – Summit Micheal and Goro CMC overpass bridge junction – CMC roundabout- Summit road junction	2700	20	
			Tulu Dimtu lot 1 – Tulu Dimtu external ring road	1400	25	
8	November 2017	39 Lot 1	Ayat-Kara-Yeka Abado-Legetafo	8933	30	Design on progress
			Summit Moha Factory – Addis Ababa Border	5537	40	
			Summit Condominium 1	4557	30	
			Summit Condominium 2	2400	30	
			Teklehaymanot Jerba Teshay real estate - Kara	2121	20	
			Bole Ayat condominium – Bole Lemi	8773	30	
			Ayat Bridge – Meri 40/60	1201	20	
			Bole Lemi Industrial Zone – Information Technology/ Goro 1	2900	50	
			Bole Lemi Industrial Zone – Information Technology/ Goro 2	2000	60	
		39 Lot 2	Gerji Giorgis – Bole Lemi Center	3976	40	Design on progress
			Bole Homes – Gumruk	3057	60	
			Amanuel Hospital Road	1459	20	
			Saro Silasse – Meri – Kotebe Road	402	20	
			Furi Hana – Kaliti Crown Area	284	30	
			Akaki Gelan – Condominium Salo Giorgis	5212	25	
			60m road – New Ring Road	6592	60	
			Akaki Town – Gari Bridge – New Ring Road	3364	20	
9	November 2017	40 Lot 1	Erei Bekentu / Degole Bridge – Huletigna Police Station	400	25	Design on progress
			Afencho Bere – Kedeste Mariam	1000	15	
			Felwoha – Orma Garage – Piyassa Statistic R3	200	30	
			Bele – Ferensay Park	600	20	
			Flamingo - Gazebo	940	20	

			Bulgariya – Sarbet Oromiya Bureau	1200	15	
			Addisu Micheal – Abebe Bikila Stadium	1300	25	
			Document Authentication and Registration office /Autobis Tera/ - Paster	1300	20	
			Lebu Roundabout – Jemo Roundabout	4500	60	
			Megenagna – Bole - Stadium	1200	25	
		40 Lot 2	Lebu – Varnero	950	30	Design on progress
			Varnero – Dombosko	2300	40	
			Jemo RA – Repi	3800	60	
			Infront of Anbessa garage – Nasaw real estate	2100	30	
			Lafto – Adey Ababa R2	700	20	
			Around Mickyleland Condominium Lot 1	1200	15	
			Mickyleland Condominium – Asko Road	300	15	
			Ayertena - Repi	2100	25	
			From 18 mazoria – Philipose road	950	20	

Table 3: Case study street projects.

4.3.2.2. Sampling Methods and Sample Sizes

In this research, **Purposeful Sampling Method** is used for the purpose of data collection by considering the limited size of the sample population and study units. By the use of the purposeful sampling method, sample populations and study units are selected strategically and with adequate justification as data sources. Once the study units are selected, to determine the individual respondents for the interview, the **Snowball Sampling Method** is used. The sample size is also made to grow by the same snowball sampling method till the collected data reach the point of redundancy.

4.3.3. Data Collection Techniques

Both primary and secondary data are collected by the use of various data collection techniques. Observation study and Semi structured Interview are used to collect the primary data. Similarly, for the secondary data, Document Analysis and Literature Review are utilized.

4.3.4. Purpose of Data Collection

The purpose of the data collection is primarily to understand the reality about the state of the city's practice of space allocation for street greenery and to understand explicitly the challenges faced. Furthermore, the collected data are helpful to understand the depth of the problems and reach on the actual root causes.

4.4. Data Analysis and Survey Methods

For both quantitative and qualitative data, appropriate data analysis methods were chosen and utilized. Thematic Analysis is used for general analysis of qualitative interview data (See section 2.7.1. Thematic Analysis for more details). The KAP Survey method is used to answer the second research question (See section 2.7.2. KAP Survey for more details). This predominantly qualitative research has some quantitative data in it which were analyzed by simple statistical methods.

Core issues of the Research Questions		Data Type	Data Sources	Sampling Methods	Sample Population	Study Unit	Sample size	Data Collection Techniques	Method of Data Analysis
1	Influence of the NUGIS on the current professional practice. Knowledge, Attitude and Practice of the responsible bodies. Level of participation among the responsible bodies.	Primary Data	Responsible governmental offices	Purposeful & Snowball Sampling	MUDH	Professionals in Urban Greenery and Beautification Directorate	5	Semi Structured Interview	Thematic Analysis & Statistical methods
					AACGPC	Professionals in Spatial Design Directorate	4		
					AACRA	Professionals in Road Construction and Maintenance, Design Revision and Implementation follow-up Directorate	8		
2					AACGRBGADAA	Plaza and Aesthetic Directorate Engineering Directorate	4		
			Case Study Streets	Purposeful Sampling	Existing streets in Addis Ababa			Observation Study	
3					New Road designs from ACCRA	Package 34,7,10,11,12,36,38		Document Analysis	Statistical methods
		Secondary Data	Policies Strategies Standards Researches					Literature Review	

Table 4: Summary to materials and methods

5. Chapter Five: Results and Discussion

In this chapter, data from different data collection techniques are presented and analyzed using relevant data analysis methods and the resulting findings are also presented for each research question. Based on the research questions, the analysis and findings are presented under the core issue of each research question as follows:

5.1. Influence of NUGIS on the current professional practice of space allocation for street greenery on street design projects of Addis Ababa.

The approach followed in this data analysis to answer the first research question primarily analyzes the NUGIS itself in light of the first research question to search for the core theoretical parameters to back the analysis process. While details are presented on the literature review section of this paper, here it is worth stressing on the clarity the NUGIS sets its minimal standards. Therefore, the minimal space allocation standards are taken as the core theoretical parameters to back the analysis process.

The NUGIS presents street trees as very significant UGI element on the right-of-way. It describes the benefits of street trees as follows:

“Trees located at the source of the pollution, i.e. streets, can well mitigate air pollution and sequester carbon dioxide. They tie the streetscape together and reinforce vistas. Trees are amenities that soften and humanize the urban concrete texture.” (MUDH, 2015, p. 25)

For this reason, the NUGIS considers the spatial requirement for street trees as baseline unit to allocate streetscape components supporting street greenery. In the standard, the minimum planting width for a tree in the street's hardscape is considered to be 0.7m. This minimum width is used directly and indirectly to

determine the minimum width of the pedestrian walkway and the median supporting street greenery. Hence, the NUGIS sets the following minimum space allocation standards for pedestrian walkways and medians intended to support street greenery:

Minimum width of a planted pedestrian walkways should be 2 m

Minimum width of a planted medians should be 1.2 m

The above minimal space allocation standards have been put into effect for the last three years. Within these three years, even though major impacts on the country's urban streets by the standard might not be expected to be manifest, yet it is enough to observe influences at least on the trends of the current street designs.

This analysis seeks to identify the influences of the NUGIS on Addis Ababa's space allocation for street greenery on its current street designs by seeking to identify whether the minimal space allocation standards set by the NUGIS are followed or not.

5.1.1. Street design

Most of the street designs for the city of Addis Ababa are done by consultants. In this process, AACRA plays the role of client (representing the city's government). AACRA has a directorate to overlook its design related tasks. This directorate is known by the name '*Road Construction and Maintenance, Design Revision and Implementation Follow-up Directorate*' or simply as the '*Design Directorate*', and it is led by a director and three team leaders. Most of the professional staffs of this directorate are young civil engineers. The main task of these professionals is to work as 'Design Evaluators'. The task of a design evaluator is to work as AACRA's counterpart in the preparation of street design. In the design process, ACCRA as a client, assigns its counterpart 'Design Evaluators' to get involved in the design process by supervising the design process and evaluate and approve the design at different stages. The evaluation process is based on AACRA's manual.

The street design data were collected from the design evaluators for those design projects under their responsibility. The collected design data are mostly final designs. But there are few preliminary design data as well. In the case when the available design data are only preliminary designs, it is clearly indicated as remark in the data analysis process. Also during the data collection process it was possible to observe that there are some modifications on physical parameters of street width and length on the design document different from the information on the contract document.

The design data collection was made to focus on typical sections and particularly on the size of pedestrian walkways and the median. The data was entered in tabular format for ease of comprehension and to generate quantifiable data. See *Table 4: Summary to street design data analysis*, below.

Space allocation analysis for eligible street projects (from Nov 2015 to Nov 2018)

No.	Design contract month	Package	Road Name	Total Width (M)	Number of Carriage Ways	Width of each Carriage Way (m)	Number of Traffic Lanes	Width of Median (m)	Width of each Pedestrian Walkway (m)	Allocated green space in the walkway	Remark
1	December 2015	34	Bole Michael – Bole Bulbula 40/60 condominium	20 30	2 2	7 10	2x2 = 4 3x2 = 6	0.2 1	3 4.5	0 0	
			Bole Bulbula – Kaliti RR – Kilinto road junction	25 30 50	2 2 2	7 10 10.5	2x2 = 4 3x3 = 6 3x2 = 6	5 1 19	3 4.5 5	0 0 0	
			Kaliti RR – Kilinto Condominium	40 60	2 2	10.5 10.5	3x2 = 6 3x2 = 6	9 29	5 5	0 0	
2	December 2015	7	Bole Arabsa 6	60 40 30 20	2 1	10 9	3x2 = 6 3	23 0	8.5 5.5	2 2.2	Postponed Postponed
3	July 2016	10	Bole Qitila	30 25 20	2 2 2	10.1 9.1 6.5	3x2 = 6 3x2 = 6 2x2 = 4	1.2 1 1	4.3 2.9 3	0 0 0	
			Bulbula V	30 25	2 2	9 7	3x2 = 6 2x2 = 4	2 2	5 4.5	0 0	
4	July 2016	11	Bole Arabsa 7	50 30 25	 	 	 	 	 	 	Postponed Postponed Postponed
			Bole Cheri	30 21	 	 	 	 	 	 	Postponed Postponed

				20							Postponed
5	July 2016	12	Koye Fiche 2 phase 2	40 30 20	2 2 2	14 10 6.8	4x2 = 8 3x2 = 6 2x2 = 4	1 1 0.4	5.5 4.5 3	0 0 0	
6	July 2016	36	CMC Ayat road junction – Gurd Shola Summit road and CMC Summit road – Meri	20							Postponed
			Koye Fiche - Tulu Dimtu and Tulu Dimtu Condominium access	40							Canceled
			Fafa Food Factory – Dama Hotel Beheretsege – Sene Zetegn School – Debezeit Road	20	1	13	4	0	4.5	0	
			Gofa Military Camp – Gofa Mebrat Condominium and Gofa Mebrat Condominium – NOC Fuel Station Junction	20							Postponed
7	May 2017	38	Kality Total – Akaki Bridge	20	2	6	2x2 = 4	1	3.5	0	
			Akaki Town – External Ring Road	25	2	8.5	3x2 = 6	1	3.5	0	Preliminary
			Ayer Tena - Wolete	30	2+BRT	6.5	2x2 = 4	0.5x2	4.5	0	With BRT
			Lafto – EEPKO road junction – Behere Tsige – Adey Ababa – Ring Road	25							
			CMC junction – Summit Micheal and Goro CMC overpass bridge junction – CMC roundabout- Summit road junction	20	2	6	2x2 = 4	1	3.5	0	Preliminary
			Tulu Dimtu lot 1 – Tulu Dimtu external ring road	25	2	6.5	2x2 = 4	2	5	0	Preliminary

Table 5: Summary to street design data analysis

Note: Dimensions conforming NUGIS are designated

by



As presented above in Table 5 the data collection process finds out that some street projects are canceled and the design process of others is postponed. This result in 23 street designs to be eligible for analysis. The data analysis primarily is based on comparison of the designs against the minimal width of 1.2m of median space and 2m pedestrian walkway width set by the NUGIS. The analysis is made separately for these two spaces.

Median design

Analyzing median space is relatively simpler than pedestrian walkways. A pedestrian walkway supports the movement of pedestrians in addition to supporting street greenery and other street furnitures. In the case of medians, mostly street furnitures and pedestrian traffic is not expected on them except for crossing pedestrians. Therefore, the space on street medians is primarily used for street greenery.

Out of the 23 eligible street designs only 9 streets (39.1%) fulfill the minimal median width of 1.2 m set by the NUGIS (See Table 6). But during analysis it was possible to observe that the range of median width is very large, ranging from the minimum standards limit of 1.2 m up to 29m median width. The upper limit of the range, which is from 19 to 29 meters, is so large. It looks that the space left as median might serve additional purposes. This is clarified by respective design evaluators during interview about the purpose behind the presence of such a large space at the center of streets. This large median space is mostly found in wide streets of total width of 50 and 60 meters and the main purpose of the space is as a reserve for future expansion projects such as bus lanes, train tracks and for additional expansion for the street's carriage way. The interview also revealed that, there is no intention to utilize the lower median width range of 1.2 to 5 meters as reservation for future development and expansion works.

Here, it is important to know the reason behind the reservation in order to have future development plan on median spaces. For instance, the city's Light Railway Train project (LRT) was one of the major interventions on the medians some years ago. During the construction of the LRT lines, street median were completely taken by the new project. Street greeneries on medians were also completely lost without any consideration to provide other alternative ways to redevelop them. The presence of the LRT line also causes big challenges for crossing pedestrians. In

addition to the LRT project, median spaces also converted into carriage ways in order to answer the city's traffic congestion. This also significantly reduced the ratio of softscape to hardscape in the city's streets which directly affect the significance of the urban streetscape as major element of the Urban Green Infrastructure.

Coming to the lower range of the median width of 1.2 to 5 meters, the data analysis shows that there are only 5 roads (21.7%) of the eligible roads do fulfill the minimum standard set by NUGIS and are specifically allocated as street median without any plan to reserve them for other future development and expansion works.

Total number of eligible roads for analysis	23 roads
Range of median width in the eligible roads for analysis	0 to 29 meter
Minimum standard for median width set in NUGIS	1.2 meter
Total number of Medians meeting minimum width set by NUGIS	9 roads (39.1 %)
Total number Medians specifically allocated for street greenery spaces	5 roads (21.7 %)

Table 6: Summary to median design data analysis.

Pedestrian walkway design

The analysis of the design data on pedestrian walkways has to consider and supports multiple functions such as pedestrian traffic, street greenery, street furniture and utility lines. In this study the analysis first started by identifying whether or not the minimal width of 2 m of pedestrian walkways set by NUGIS is kept or not. Second, the study explored and analyzed the specific space allocation for street greenery on the pedestrian walkway. Out of the 23 eligible road designs, all of them fulfill the minimal pedestrian walkway width of 2 m which shows that the standard is followed 100%.

The eligible designs for the study have walkway width ranging from 2.9 to 8.5 meter. The study also checked the presences of specifically allocated street greenery spaces in the pedestrian walkways or not. The result showed that, 2 roads (8.7%) of

the eligible designs have provisions for street greenery in the form of specifically allocated planting stripes integrated as part of the pedestrian walkway (See Table 7). The design evaluators of ACCRA, during interview, revealed that the allocation of these planting stripes is done specially for street greenery and these spaces are designed and designated in detail designs as well. For the 21 roads, street greenery is considered only as graphical representations in the form of street trees on typical road sections and there is no consideration for street greenery on detail design level. This means, when the streets are constructed, the pedestrian walkways will be made without provision for planting softscape and all the walkway surface area will be finished with hardscape.

In summary, the result showed that while 100% of the eligible street design comply the minimum width of 2m set by the NUGIS, but only 8.7% of the eligible street designs allocated specific spaces for street greenery on pedestrian walkways. In other words, 91.3% of the 23 streets, street greeneries on the pedestrian walkways are either omitted or developed later by demolishing part of the walkway's hardscape. That resulted in the pattern of frequent removal of pavement tiles and digging for planting trees on brand new streets in Addis Ababa in search for planting spaces.

Total Number of eligible roads for analysis	23 roads
Range of pedestrian walkway width in the eligible roads for analysis	2.9 to 8.5 meter
Minimum standard for pedestrian walkway width in NUGIS	2 meter
Total number of Pedestrian walkways meeting minimum width set by NUGIS	23 roads (100 %)
Total number of Pedestrian walkways with specifically allocated spaces for street greenery.	2 roads (8.7 %)

Table 7: Summary to pedestrian walkway design data analysis

The design data analysis answers the descriptive part of the researches which describes and clarifies the problem. Hence, at this stage of the analysis, the current practice of space allocation for street greenery has a low compliance to NUGIS. Furthermore, the result also showed that, there is no pattern of progressive improvement on the level of compliance with the current practice of space allocation for street greenery to the NUGIS throughout the 3 year timeframe. These call for further analysis on different data set which aims to answer why this happens. This will be the explanatory part of the research and it is discussed in the section below.

5.1.2. Root causes for the low compliance of NUGIS

The NUGIS is a national standard which is prepared at federal level to be implemented in all urban centers of Ethiopia including Addis Ababa. The results of the design data analysis indicate that the current practice of space allocation for street greenery in Addis Ababa has a low compliance to the NUGIS, it leads to the subsequent question as to why this happens. The research was aimed to get an answer for this question from semi structured interview on four governmental institutions that are responsible in one way or another for the space allocation for street greenery in Addis Ababa. Table 1 summarizes the four governmental institutions and their responsibility related to the city's street greenery.

The interview was conducted on 21 respondents composed from the four selected institutions. (See Annex A for the list of respondents). Four sets of specific interview questions were utilized for each of the four institutions. These four sets of interview question formats were structured around a theme which refers to the specific task of the institution that it targets. Similarly, each interview questionnaire is structured in three categories for each of the research question. (See Annex C for the interview questions formats). The interview data was analyzed by the method of Thematic Analysis to find out the core themes. (See 2.8.1 Thematic Analysis for details). Fundamentally, the data analysis focuses on exploring the **Knowledge about NUGIS** and the **Application and Influence of NUGIS**.

The MUDH is the author of the NUGIS whereas the other three institutions namely AACRA, AACGPC, AACGRBGADAA are the different implementers of the standard. Hence, the interview questions were customized for each of them in search of the different information on how the standard is applied and rate the level of influence it has on the practice space allocation for street greenery in Addis Ababa.

Respondents from MUDH were asked to rate ‘the influence of the standard on the current street development of Addis Ababa’. The result of the analysis is presented in Table 8 below. The result showed that, 40 % of the respondents rate the influence of the standard as highly influential and influential level while 40 % of the respondents rate it as poorly influential.

Interview question: How do you rate the <u>influence of the standard</u> on the current street development of Addis Ababa?							
Institution	Total Number of Respondents	Highly Influential	Influential	Average	Poorly Influential	Not Influential	Abstain
MUDH	5	1 (20%)	1 (20%)	-	2 (40%)	-	1 (20%)

Table 8: Influence of the standard on the current street development of Addis Ababa

The respondents also gave their justification for the above survey results. Some of the representative justifications are as follows:

“A significant movement was created in the launching ceremony in the presence of the then Prime Minister Hailemariam Desalegn. That has created a significant influence. And it would have been great that momentum was made to continue.”

“I don’t think this standard reached to the level of the professionals to create the anticipated influence. I don’t think it is addressed in their tasks. If it was addressed, It would have the ability to change designs and solve many challenges.”

“We don’t have any relation with AACRA. So I can’t say whether they got influenced by the standard or not. Even when we give training, their professionals don’t participate”.

Respondents from AACRA, AACGPC and AACGRBGADAA were asked about their knowledge about NUGIS. Out of the 16 respondents, 12 of them (75 %) responded that “they don’t know what the NUGIS is”. Only 4 (25%) respondents have prior knowledge of the NUGIS. (See Table 9 for detail survey results).

	Sample Population	Number of respondent	Knowledge about NUGIS	
			I know about it	I don’t know about it
1	The Addis Ababa City Road Authority (AACRA)	8	0	8 (100%)
2	The Addis Ababa City Government Planning Commission (AACGPC)	4	0	4 (100%)
3	The Addis Ababa City Government River Basins and Green Areas Development and Administration Agency. (AACGRBGADAA)	4	4 (100%)	0
	Summary	16	4 (25%)	12 (75%)

Table 9: Knowledge about NUGIS

The respondents were asked to explain how they come to know about NUGIS. 3 respondents got their knowledge from the formal means such as training and awareness creation workshops organized by MUHD. Some of the representative responses are presented as follows:

“Yes I know it. I know it in the office. The standard is basically good. And actually it did create awareness also. But whether that is practical in our capacity is debatable. But it helped us to get similar consensus. In it, it has very useful information at the same time it has its own drawbacks. But these drawbacks could be easily managed had it been revised after collecting feed backs.”

“Yes I know it. But I didn’t get it formally from the office. I got it from the internet when I do my MSc thesis.”

From the above analysis, it is evident that, 4 respondent from AACGPC and 8 respondents from AACRA don’t have any prior knowledge about the NUGIS. This is also an indication that the standard don’t have any influence over the task of these institutions which are so influential for the decision making on the space allocation for street greenery in Addis Ababa.

As for the third institution, which is the AACGRBGADAA, since the respondents have prior knowledge about the standard, their opinions have to be explored about the level of influence the NUGIS has on Addis Ababa’s space allocation for street greenery. Therefore, an interview question was posed asking to rate the ‘influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa’. (See Table 10 for detail of the survey results).

Interview question:

How do you rate the influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa?

Institution	Total Number of Respondents	Highly Influential	Influential	Average	Less Influential	Not Influential
AACGRBGADAA	4	-	-	-	-	4 (100%)

Table 10: Influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa

According to the above results, all the 4 respondents from **AACGRBGADAA** rated that the NUGIS is not influential on the current practice of space allocation for street greenery in Addis Ababa. And the main reasons they mention are lack of follow up and poor implementation of the standard. These are excerpts from the responses.

“Everything is forgotten after the training. There is no follow up or monitoring. And after all it is just a standard. It is not a law. It has no enforcing power. There is no consequence by not following it.”

“We don’t have clear information about what to do and not to do while we do our work. The standard is there in our office. But for whom did it prepared unless we get the benefits out of it. To begin with, when this standard is on the process of preparation, they have to get us involved.”

“The training sessions were interesting and resourceful but after that there was no progress in the implementation process. The standard is almost got forgotten.”

The above results show that, the NUGIS is not influential at all on the current professional practice of space allocation for street greenery in Addis Ababa. The results also triangulate the low compliance to the NUGIS by the current street design practice shown by the previous results got from street design data analysis. And the main reason for this lack of influence and applicability is found out to be the significant lack of awareness about the existence of the standard by the professional staffs of the responsible governmental institutions. In addition to this, the lack of follow up in the form of monitoring and evaluation on the implementation process by the responsible body also contributed its role for the standard to lose its influence and applicability in the context of Addis Ababa’s practice of space allocation for street greenery in particular, and the street greenery development in general.

5.1.3. Attitude towards the national standards

The NUGIS is found to be not influential on the current practice of space allocation for street greenery in Addis Ababa. But the research, beyond answering this first research question, further proceed to explore the attitude of the professionals on the need to have one national standard like the NUGIS and their level of willingness to abide by such a common national standard if it exist. To this end, respondents were asked to rate *‘the benefit of having one national standard to guide the street greenery development on the city’s street design’*. Respondents from the MUDH were exempted from this question due to their role as the author of the standard. But the other three institutions, namely, AACRA, AACGPC and

AACGRBGADAA, are supposed to be the implementers of this national standard are involved in the survey. The results of the survey show that 12 respondents (75%) rated the level of having one national standard to guide the street greenery development on the city's street design as '*Highly Beneficial*', 3 respondents (18.8%) as '*Beneficial*' and with 1 respondent's (6.2%) '*Abstention*'. (See Table 11 for details of the survey results)

Interview question: How do you rate the <u>benefit of having one national standard</u> to guide the street greenery development on the city's street design?							
Institution	Total Number of Respondents	Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial	Abstain
AACRA	8	6 (75%)	1 (12.5%)	-	-	-	1 (12.5%)
AACGPC	4	3 (75%)	1 (25%)	-	-	-	-
AACGRBGADAA	4	3 (75%)	1 (25%)	-	-	-	-
Summary	16	12 (75%)	3 (18.8%)	-	-	-	1 (6.2%)

Table 11: Benefit of having one national standard to guide the street greenery development on the city's street design

Most of the respondents strongly agree with the idea of having one common standard. They described such standard as 'a basis to begin with' and 'unify the effort of the different responsible institutions'. Some of the representative responses that are given by the respondents for the above interview questions are as follows:

"To begin with, it is a challenge to select a representational standard that represent all the cities. But if the standard takes into consideration the different specific conditions of different urban centers, it is highly beneficial."

"Take for example 'New Metric' or 'Time Saver standard' standards in architecture. How beneficial they are for the professionals. If there is a standard, it means that there is a 'basis to start from'."

“Lack of standard is the main challenge for most of our tasks. Even preparing a standard itself is a challenge. So it is simply a surprise for me that this standard is developed at federal level and yet we don’t know it. Federal standards are important because all will utilize them. Of course there might be contextual issues. But it could be customized gradually. Most definitely, it is a good start and we cannot argue the necessity of standard.”

“To be frank, there is no integration among the institutions working on road projects. Verbally, it might be claimed that the institutions must work together but the reality is that, their integration is very poor. Hence such standard brings about the integration. Also, I think it will be ideal to have a body to monitor the implementation of such standards.”

Furthermore, the respondents also mention their concern with such national standards. Their main concern was that, such national standards should take into consideration the various specific conditions of the different urban areas and hence must be flexible for revisions and updates. The abstention by one of the respondents is basically the doubt that such national standard will become too general and ignore local and specific conditions. Some representational responses are presented as follows:

“To answer such questions, first I have to see the standard. Because a national standard will be implemented on all cities of the country and many scholars and professionals have to participate on it. It has to set only minimum standard and further it has to be context specific. It has to be presented contextually by considering traffic volume and width of road. If this standard considered these, it is ok. But if not and based on assumptions, it will create a problem somewhere. It could even be an obstacle. If it consider all this, anything nationwide is good.”

"In the context of our country, this kinds of standards are not exhaustive and short of information. At the same time the professionals take them too literally and don't inquire more and their harm might over weigh their benefits. The other challenge of standards is when they are not context specific."

One particular respondent from AACRA, who is a member of the revision committee of AACRA's manual expressed the high benefit of the kind of national standards like NUGIS as an input in the revision process of AACRA's manual. Furthermore, he expressed his interest to incorporate the result of this research in addition to the NUGIS document as inputs to the revision. Excerpt from this response is presented as follows:

"It will have a very high benefit. On the TOR for the revision of ACCRA's manual, the issue of street greenery is included already. I am one of the member who prepare the TOR and if we were aware about this standard, it could have been very useful as an input." (When asked if the recommendation of this research together with the standard is presented to AACRA, do you think it will be helpful in the revision of ACCRA manual? Answered...) "Correct, we can submit it as input. Because in the TOR, it is mentioned that best international practices and relevant researches could be included as input for the revision."

Respondents were requested to express their 'willingness to abide by one national standard that guide the street greenery development of Addis Ababa'. The results of the survey showed that 13 respondents (81.3%) rated as 'Highly willing', 2 respondents (12.5%) as 'Willing' with 1 respondent's (6.2%) abstention. (See Table 12 for details of the survey results)

Interview question:

How do you rate your willingness to abide by one national standard that guide the street greenery development of Addis Ababa?

Institution	Total Number of Respondents	Highly Willing	Willing	Average	Less Willing	Not Willing	Abstain
AACRA	8	6 (75%)	1 (12.5%)	-	-	-	1 (12.5%)
AACGPC	4	4 (100%)	-	-	-	-	-
AACGRBGADAA	4	3 (75%)	1 (25%)	-	-	-	-
Summary	16	13 (81.3%)	2 (12.5%)	-	-	-	1 (6.2%)

Table 12: Willingness to abide by one national standard that guide the street greenery development of Addis Ababa

The results show that, most of the respondents believe that having one common national standard is highly beneficial and are highly willing to abide by one national standards that guide the city's street greenery development. They mention their belief that such standards create common understanding among different stakeholders and bring about large scale changes. They also mention that, the lack of awareness about the existence of such standards is the major problem that holds them back from utilizing these kinds of standards. But at the same time, the respondents also expressed the adverse impact of standards which are prepared without due consideration of local conditions. Some representational responses are presented as follows:

"As far as we are working to create all participatory streets, it is good to follow such standards. Mostly the problem is, lack of awareness. Otherwise we do refer even other foreign standards like NACTO and Tanzania's standards which has street greenery chapters. I think the body who prepare this standard hadn't done enough publicity work for it."

“It could be of use to bring about a large scale change and a common understanding among different stakeholders.”

“Anything done based on standards and guidelines will have quality in it. If we do it as we wish, there will be drawbacks. So following guidelines is highly advisable”

“The kind of standard matters, I can’t respond till I evaluate it whether it fits our current demand or not.”

5.2. Knowledge, Attitude and Practice among the professional human resource

Recalling the main actors and responsible institutions who could have various level of significant influence over Addis Ababa’s street greenery are: MUDH, AACGPC, AACRA and AACGRBGADAA. Each institution, with its unique mandate, specialization and activity, has a capacity to leave its footprint in the process of space allocation for street greenery on the streetscape of Addis Ababa.

The states of professional human resource of the responsible institutions have a significant influence on the performance of an institution and it is one of the objectives for this study. To this end the *KAP Survey* method is selected to study the state of the professional staffs of the responsible institutions who are responsible for the space allocation for street greenery on Addis Ababa’s streetscape.

A cross-sectional KAP survey was conducted on the professional human resource of the selected study units from the four responsible institutions using in-depth interview. (See section 4.3.2 Sampling for details on the study units). A series of semi-structured interview questions were prepared for this purpose and the interview was conducted on 21 respondents from all the four institutions. (See Appendix A for detail of the respondent’s profile)

Mostly Identical open and closed-ended questions were presented and the question flow is structured from general to specific issues. Each interview question is planned specifically to address one of the three component of the KAP survey. The closed ended questions are intended to generate quantifiable data for the descriptive part of the study while the open ended questions are intended to answer and provide justification for the explanatory side of the research. For the open ended explanatory questions, the *Thematic Analysis for Qualitative Interview* method is used as analytical framework. (See section 2.7.1. Thematic Analysis for details). The result of the interview categorized in two different topics: General Topics and Context Specific Topics.

5.3.1. General Topics

The respondents were posed with a question to explain '*what street greenery are and to list about their benefits*'. While this is a knowledge test, it is followed by an attitude test which request from the respondents to rate the '*benefits of street greenery to a city, to its inhabitants and to its environment*'.

Therefore the results show that, out of the 21 respondents, all the respondents are found to have a certain level of knowledge about street greenery. Everyone defined street greenery in its own words and from the perspective of their specialization. Some of the definition are: '*plants on the urban streetscape*', '*one component of the urban green development*', '*features that help streets to reclaim their natural state*' are some to mention from.

Similarly, all the 21 respondents are found to be aware of the benefits of street greenery and managed to list some. The most common benefits mentioned are: shading, urban aesthetics, environmental balance and micro climate regulations, road organization and safety and psychological benefits. From the particular professional perspective of the respondents, two responses from MUDH and AACRA respectively are worth quoting here for their unique understanding of the benefits of street greenery.

“....In addition to the above benefits, in the absence of street vegetation, there is a high chance that garbage will be disposed on streets. Therefore street greenery also contribute to the cleanliness and sanitation of a city by discouraging littering.”

“Street greenery are beneficial specially to restore the ecosystem of the area after it was disturbed and destroyed by the road construction.”

In general it can be concluded that the professional staffs of all the four governmental institutions have a certain level of knowledge about street greenery and their benefits but this knowledge is not complete and it is relative to the specialization of the respondents .

Interview question were also posed to the respondents to evaluate their attitude towards street greenery. The respondents were asked to rate the *‘benefits of street greenery to a city, its inhabitants and its environment’*. The result showed that, 18 respondents (85.7%) rated it as *‘Highly Beneficial’* while 3 respondents (14.3%) rated it as *‘Beneficial’*. This result indicated that the professionals have high level of positive attitude towards the benefits of street greenery. (See Table 13 for details of the survey analysis)

<u>Interview question:</u> How do you rate the <u>benefits of street greenery</u> to a city, its inhabitants and its environment?						
Institution	Total Number of Respondents	Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial
MUDH	5	4 (80%)	1 (20%)	-	-	-
AACRA	8	7 (87.5%)	1 (12.5%)	-	-	-
AACGPC	4	3 (75%)	1 (25%)	-	-	-
AACGRBGADAA	4	4 (100%)	-	-	-	-
Summary	21	18 (85.7%)	3 (14.3%)	-	-	-

Table 13: *Benefits of street greenery to a city, its inhabitants and its environment*

A question was posed for the 21 respondents from all the four responsible institutions about their involvement in tasks or studies related to street greenery in Addis Ababa or other Ethiopian urban centers. The summary result showed that 14 respondents (66.6%) replied that they have some relevant practice while the remaining 7 (33.4%) replied that they don't have relevant practice. However, their practice vary with the specialty of their institution they belong to. These includes: preparation of standards and manuals, project evaluation, preparation of local development plans and detail designs and the development of the physical street greenery. Among the four institutions, respondents from AACGRBGADAA have the highest proportion of staffs that have practice in street greenery related activities whereas AACRA has the lowest. (See Table 14 for details of the survey analysis)

Interview question: Have you ever got involved in <u>tasks or studies related to street greenery</u> in Addis Ababa or other Ethiopian cities and towns?				
Institution	Total Number of Respondents	Yes	No	Summary to type of involvement
MUDH	5	3(60%)	2 (40%)	• Preparation of standards and manuals
AACRA	8	4 (50%)	4 (50%)	• Pedestrian walkway refurbishment • Street project evaluation with details to greenery • Pedestrian safety study schemes
AACGPC	4	3 (75%)	1 (25%)	• Preparation of local development plans and detail designs
AACGRBGADAA	4	4 (100%)	-	• Own force, capital and refurbishment projects
Summary	21	14 (66.6%)	7 (33.4%)	

Table 14: Tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns

5.3.2. Context Specific Topics

In this section KAP survey was conducted on the respondents based on contextual conditions of Addis Ababa. The questions were presented from general to specific. Accordingly, the first question was on the general overview of *Addis Ababa's Street Greenery Development* followed by the specific questions on *Space Allocation for Street Greenery along Addis Ababa's Streets*. Respondents were asked to rate the level of Addis Ababa's street greenery developments. Accordingly, 13 respondents (61.9%) rated the street greenery development of Addis Ababa as '*Poorly Developed*' while 8 respondents (38.1%) rated it as '*Average*'. (See Table 15 for details of the survey analysis)

Interview question: How do you rate <u>Addis Ababa's street greenery development?</u>						
Institution	Total Number of Respondents	Highly Developed	Developed	Average	Poorly Developed	Undeveloped
MUDH	5	-	-	4 (80%)	1 (20%)	-
AACRA	8	-	-	3 (37.5%)	5 (62.5%)	-
AACGPC	4	-	-	-	4 (100%)	-
AACGRBGADAA	4	-	-	1 (33.3%)	3 (66.7%)	-
Summary	21	-	-	8 (38.1%)	13 (61.9%)	-

Table 15: Addis Ababa's street greenery development

The result showed that the majority of the respondents believed that, the street greenery development of Addis Ababa is categorized as '*poorly develop*'. When the respondents were asked about their level of knowledge, their explanation showed that there is adequate level of knowledge among the respondents about the issue of Addis Ababa's street greenery development. The justification given by the respondents provided valuable information about the rating. Excerpts from the responses are presented as highlights as follows:

“The practice is there but it is not coordinated. The knowledge and capacity about the issue is poor. The street designs are not guided by urban design, therefore they don’t go down to the human scale. In the international practice, street design is not only about traffic design but mainly it is the domain of urban design. Even the ownership of street greenery in Addis Ababa is debatable among AACRA and AACGRBGADAA. Because AACRA is claiming that it also has its own environmental team.”

“To begin with there is no enough plants on the streets. Additionally, out of the existing, how many of them do consider the context? Mostly they are monocultures and non-indigenous. They are also damaging the streets. The other problem is their location. They are creating obstacles for the street users.”

“There is the start but it is not supported by research in a sustainable manner. All in all, the professionalism in this area is very low.”

“Basically there is no attention given to street greenery. In Addis Ababa, land value is very high. And on the streets, the carriage way gets all the attention while the spaces for street greenery are simply ignored.”

“We are not planting following the science but rather as a campaign. There is also very little planning in it. Even we don’t select the species type with care. That is why Addis Ababa is called the ‘Gravelia City’.”

Responses like the above show that the problem to the city’s poor development of street greenery is well known among the professionals of the institutions that have the power to make a difference in the situation.

The other question raised to the respondents were about the adequacy of space allocated for greenery along the streets of Addis Ababa. Among the 21 respondents, 16 respondents (76.2%) rated for 'poorly adequate', while 3 respondents (14.3 %) rated as 'average' with 2 respondents (9.5%) abstain. Variations observed among experts from different institutes on the adequacy of space allocation for greenery. Among these, 100 % of AACGRBGADAA and 87.5 % of ACCRA voted for poorly adequate while 40% of MUDH voted for average rate (See Table 16 for details of the survey analysis)

Interview question: How do you rate the <u>adequacy of the space allocated for greenery along the streets of Addis Ababa?</u>						
Institution	Total Number of Respondents	Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate
MUDH	5	-	-	2 (40%)	3 (60%)	-
AACRA	8	-	-	1 (12.5%)	7 (87.5%)	-
AACGPC	4	-	-	-	2 (33.3%)	2 (66.7%)
AACGRBGADAA	4	-	-	-	4(100%)	-
Summary	21			3 (14.3%)	16 (76.2%)	2 (9.5%)

Table 16: Adequacy of the space allocated for greenery along the streets of Addis Ababa

From the above survey, the majority of the respondents rated the space allocation for street greenery development in Addis Ababa as '*Poorly Adequate*'. To evaluate the level of knowledge the respondents have in the subject matter, a question was posed to explain their ratings which is presented above. Some of the responses from AACGRBGADAA which all respondents give rating of '*Poorly Adequate*' explain the case in a summarized manner as follows:

“We are planting street greenery following the street infrastructure. But the street infrastructure development does not have enough consideration for its street greenery development.”

From the start, the street space allocated for greenery is not adequate. Whenever it is allocated, it is not with detail study. Even now we are planting on wherever space available on the street space even small left over spaces.

“The allocation on the master plan is adequate. But the green space allocation on the physical street is not enough. Even at some streets, street green areas are being sacrificed for other infrastructures like the train.”

Basically, street greenery development follows the development of the transportation corridor. Therefore, space allocation for street greenery is directly affected by the planning, design and implementation of the streets themselves. The responses from the other institutions that regulate the planning and implementation of the city's streets is not far from the above responses. Some of the other responses are presented as follows:

“There is the design, implementation, and the maintenance for greens. On the design part, we don't design specifically for greens. Let alone green, even the walkway was not well designed for pedestrians. May be it might be lack of knowledge or attention. Even if there is design, there is clear gap on implementation. And finally, this green space needs watering and frequent caring. This is also poor. I can add the fourth that is the level of awareness of the society. The responsibility for damaging street plants is very low in the society.”

“Currently we claim that the 25% ratio of street coverage is about to be fulfilled in Addis Ababa. But I don’t believe we also provide adequate green areas for the individual units of streets. At last, when the ratio is getting fulfilled, we start giving attention to greens along streets. But if it were at the beginning of the development, that would have been great.”

“The master plan assign 30% of the city’s area to be allocated for greenery. But in reality is not like that. That might be because it is not followed in designs, the interventions are not based on research, not involving qualified professionals and lack of emphasis are some of the reasons. The emphasis is mostly to just provide the transport infrastructure.”

The above responses showed some of the reasons for the poorly adequate space allocation for street greenery in Addis Ababa from different professional perspectives. Furthermore, it showed the existence of diversified level of knowledge of the respondents, who are officials and professionals, and who have influence and responsibility over the city’s space allocation for street greenery.

5.3. Level of inter-institutional involvement among the various responsible institutions.

It was discussed in Chapter 4 that the four governmental institutions who have different responsibilities on the process of space allocation for street greenery development in Addis Ababa are the MUDH, AACGPC, AACRA and AACGRBGADAA. Parallel to the mandates and responsibilities of each institution, inter-institutional involvement on common tasks is required from them to play their roles effectively.

The word 'Involvement' itself has a connotation of necessity in it. The Online Google Dictionary defines 'Involvement' as: *"To include (something) as a necessary part or result"*. Similarly, it is defined in Dictionary.com as *"To include as a necessary circumstance, condition or consequence"*. Therefore, assessing the level of involvement of the above four institutions on the subject matter of the study, that is space allocation for street greenery in Addis Ababa assumes that, involvement is no more an option for these institutions.

Before starting the data analysis, it is proper to briefly discuss here what the legal frameworks which gave these institutions their mandate and responsibility in relation to the subject matter of this study says:

MUDH

The mandate and responsibility for the MUDH, as a federal institution, was given by the House of Representatives of the federal government of Ethiopia. In Proclamation No. 1097/2018, under the title "A proclamation to provide for the definition of powers and duties of the executive organs of the Federal Democratic Republic of Ethiopia" it is stated that the ministry:

- Undertake studies related to urbanization, and set criteria for grading urban centers
- Sets and follow up the compliance of standards for construction works

On the other hand, the AACGPC, AACRA and AACGRBGADAA are regional institutions under the city government of Addis Ababa. While the first two report to the mayor of the city, AACGRBGADAA reports to EPGAA (Environmental Protection and Green Area Agency). The power and responsibility for these institutions were given by The Addis Ababa City Council in its Proclamation No. 64/2019 under the title "Addis Ababa City Government Executive Organs Re-Establishment Proclamation". From this proclamation, part of the mandate and responsibility for each institution related to the subject matter of the study is read as:

AACGPC

- It prepares and implements the city's Structural Plan, Local Development Plan and Coordinated Infrastructure Plan
- It provides support and advice to the different plan implementer bodies of the city government.

AACRA

- It prepares and facilitates the preparation of street and bridge design and related construction and maintenance works.
- It prepares or facilitates the preparation of street design which allocate green spaces on the sidewalks, medians and traffic islands. Furthermore, it shares the necessary information with AACGRBGADAA.
- Together with other stakeholder bodies, it sets the type and quantity of street side trees and supervises the implementation process.

AACGRBGADAA

- It plants and maintains street trees in collaboration with other stakeholder bodies on allocated green spaces of the city's arterial and sub-arterial streets which are designated in AACRA's street design.

Here, it has to be noted that, the AACGRBGADAA reports to the EEGAA, in this study the EEGAA is not included among the four governmental institutions to affect the space allocation for street greenery in Addis Ababa. This is due to the mandates and responsibilities of EEGAA which shows that it is more focused on the environmental protection tasks and implements the green development part of its responsibility by leading and supervising the AACGRBGADAA.

It is possible to observe from the above mandates and responsibilities of the four institutions, inter-institutional involvements in the form of follow-ups, information sharing, provision of support, and the like are specifically listed. And accordingly, these institution are recommended to get involved. But do they? If Yes, in what level? If No, why not? The data analysis in this section aims to clarify these questions.

It is possible to categorize these four governmental institutions into two broad categories based on their roles. These are the **Strategic Planners** and the **Implementers**.

Institutions such as MUDH and AACGPC are among the strategic planners. Their responsibility is giving strategic guidance and leadership through the preparation of standards and plans respectively. In line with this, the MUDH prepared the National Urban Green Infrastructure Standard (NUGIS). Similarly, the AACGPC prepared the city's master plan and various local development plans. On the other hand, as implementers, AACRA is responsible for the design and construction of the city's streets while AACGRBGADAA is responsible for the development and maintenance of the city's green areas including the street greenery.

For the successful development of street greenery in the city, all the responsible institutions have to work jointly. The lack of inter-institutional involvement among them will have a direct consequence on the level of development itself. Therefore, in order to understand the level of involvement among the responsible institutions, questions focused to some specific vital tasks of the institutions were posed to respondents and the data was analyzed. These tasks which naturally need inter-institutional involvements are like the preparation of the NUGIS, street network plan of Addis Ababa, the design process of the city's streets and the development process of the city's street greenery.

To measure the level of involvement in a quantitative manner, interviewees were asked to choose from a scale of four. And to come up with answers and explanation to the reasons and underlying factors, the data from the in-depth interview have been analyzed using the Thematic Analysis method (See Section 7.7.1. Thematic Analysis for details). The analysis process and the results are presented as follows:

5.4.1. Level of involvement in MUDH

The NUGIS could have been a significant support to the development of street greenery in Addis Ababa by providing standards and guidelines to lead the development. However, in the previous sections it was found that, the NUGIS is not influential to the current professional practice of the space allocation for street greenery on the current street projects. In this section, the study will explore the level of involvement during the preparation of the NUGIS and the underlying factors and root causes.

The study unit selected for the interview is the *'Urban Greenery and Beautification Directorate'* in the MUDH. This directorate was primarily responsible body for the preparation of the NUGIS. The director of this directorate was also the chairperson of the *Technical Committee* for the preparation of the standard. Most of the other respondents were also either part of the technical committee or are well aware of the preparation process of the NUGIS.

According to the in-depth interview, the preparation of the NUGIS was done with a joint collaboration between the MUDH and GIZ. GIZ engaged some local professionals from EIABC to work as consultants who contributed significantly in the preparation of the standard. Throughout the process, drafts were criticized and developed by the Ministry's Technical Committee and the Mini Cabinet. In short, the process of the NUGIS's preparation took a different approach other than involving different stakeholders. This was explained during the interview. Most of the respondents agree that, the quality of the standard would have been better if different stakeholders were allowed to get involved and contribute on it. On the other hand, they still don't believe that basic information's are left out. This was reflected in the following excerpt from one of the respondents.

"Of course there could have been lots of benefits from involvement of stakeholders. But even if this is true, as far as the document is prepared based on international standards, basic concepts and information will not be missed out. But still, if the draft was presented in forums like workshop for criticism and development, it would have been much better."

5.4.2. Level of involvement in AACGPC

AACGPC is responsible for the preparation of the city's master plan and overlook its implementation by the different sectorial offices. It is also responsible to revise the master plan based on feedbacks obtained from the implementation process. In this section of the study, the level of involvement during the preparation of the master plan is analyzed and presented. The data is acquired from the in-depth interview conducted on different officials and professionals of the office. The interview questions first explore the level of involvement in the preparation of the master plan in general and subsequently, in the street network part of the master plan in particular.

All the four respondents (See Annex A for detail profiles) agree on the necessity of involvement in the process of preparation of a master plan and they all label this as 'Highly necessary' as shown in table 17 below.

Interview question: How do you rate the <u>necessity to involve different relevant stakeholders</u> in the process of preparation and/or revision of a master plan?						
Institution	Total Number of Respondents	Highly Necessary	Necessary	Average	Less Necessary	Not Necessary
AACGPC	4	4 (100%)	-	-	-	-

Table 17: Necessity to participate the different relevant stakeholders in the process of preparation and/or revision of a master plan

The response of one of the respondents summarizes this as follows:

"Without doubt it has to allow high level of involvement. Master plan is for everyone. So if the preparation is participatory it will be easy for implementation. It will also be easy to enforce it. I believe, when this master plan is prepared it has involved the stakeholders. But it might not be sufficient."

Street networks are one of the main elements of any master plan. The need to identify which institutions got involved particularly on street network section of the Addis Ababa's master plan preparation and at what level was the next task of the data collection. According to the respondents, AACRA, Transport Authority, Sanitation and Beautification Office, Land Management Office, Rail Road Corporation (for the LRT) and City Bus companies were involved in the preparation of the master plan's street network element. The respondents also described a high level of involvement of these stakeholders. Among the 4 respondents three of them took part in the preparation of the master plan and categorized the level of involvement by these stakeholders as 'Empowered' from the scale of four. (See Table 18 for details below)

Interview question: Please indicate the <u>level of involvement</u> by the responsible stakeholders?					
Institution	Total Number of Respondents	Informed	Consulted	Took-part	Empowered
AACGPC	4	-	-	-	4 (100%)

Table 18: Level of involvement during the preparation of street network plan

They stated that the stakeholders were member of the *Technical Board* and they had the mandate to raise the interest of the institution they represent in the master plan. However, they uncover challenges faced during the preparation process and implementation stage through stakeholder involvement. Among these, lack of motivation reflected by the participants during the preparation stage and the high turnover in the leadership and professionals at the implementation stage is found to adversely affect the master plan. These two interview excerpts clarify some of these challenges in detail.

"The main stakeholder was AACRA, then comes Transport Authority, Rail Road Corporation (for the LRT), City Bus companies, these were the main stakeholders. Other than that, there were professionals sent to participate from Sanitation and Beatification Office and Land Management Offices as well. And also from

universities. But the main challenge is on the capacity and dedication of the professionals sent to represent their offices and take vital information back to their respective offices and implement it accordingly. They were given full mandate to present and justify the interest of their institutions while the master plan is being prepared and later take the mutual decision and implement it and play their role. There was a lot of effort to participate and pull together different institutions to collaborate for the effective preparation and implementation of the master plan. The evidence for this is the merger of the four or five different offices to create the office now known as Riven Basin and Green Areas Development Agency. Our office created that.”

“There was a technical board which comprises institutions related to land management and transport sectors. The stakeholders do participate in this technical board as members. But the common problem is the very high turnover among the leadership and professionals who participated in the master plan who took specific tasks to be implemented in their institutions. The position which was delegated by a certain official is currently occupied by a third or fourth round of other new officials. That seriously affects the effectiveness of the participation, particularly on the implementation process.”

Even though the process of the master plan’s preparation is found to be participatory and the level of involvement by the stakeholders is ‘Empowering’ yet the above mentioned challenges have high potentials to seriously jeopardize the successful realization of the master plan. The challenges are related to human factors. Lack of dedication, work ethics and team spirit are all found out to be the most significant challenges among the participants. This has raised doubt on the selection of some of the participants for the assignment. The following excerpt from the interview describes it well as follows:

“They (the participants) were represented in the master plan’s technical committee, they get information but they neither participate diligently nor are they keen to implement the decisions that were made collectively. To be frank, there were many people sent here to represent their institutions but their main interest was on the daily allowance they get. That is how bad it was. The proof for this is that they attend meetings only when we prepare the meeting outside of Addis. Even in Addis Ababa, they won’t come unless we invite them in big hotels. Even after they come, their output is very unsatisfactory. They display the same poor performance while they were in the committee or back at their institutions. This shows the wrong participants were delegated for the responsibility.”

5.4.3. Level of involvement in AACRA

The responsibility of The Addis Ababa City Road Authority (AACRA) is mainly designing, construction and maintenance of Addis Ababa’s streets. The office has many directorates specializing in various tasks. The Design Directorate is one of the directorates assigned to oversee the design and construction of the city’s street projects. The in-depth interview conducted on 8 members of this directorate (See Annex A for detail profiles of respondent) is used as a data source for this section. The interview questions are designed in a structured manner to explore the perception among the office’s professionals about the general necessity to involve utility infrastructure companies, the perception of street greenery as infrastructure and the level of involvement of the responsible body for street greenery in the design process. As the research focuses on the current street design projects in Addis Ababa, the queries on involvement also revolve around the current trend in the design of these street projects.

With regard to the general necessity of involvement of different stakeholders responsible for various infrastructures in the design process, 7 out of 8 respondents rated it as ‘Highly Necessary’ while 1 respondent labeled it as ‘Necessary’. (See Table 19 for details below)

Interview question:

How do you rate the necessity to involve different responsible stakeholders in the design process of the city's road projects?

Institution	Total Number of Respondents	Highly Necessary	Necessary	Average	Less Necessary	Not Necessary
AACRA	8	7 (87.5%)	1 (12.5%)	-	-	-

Table 19: Necessity to involve different responsible bodies in the design process of the city's road projects

The stakeholders listed by the respondents includes the Ethiopian Electric Power Corporation (EEPCO), Addis Ababa Water and Sewerage Authority (AAWSA), Ethio Telecom and Traffic Management Office and the Agency for Greenery. Some of the explanation given for their rating to the necessity of involvement as 'highly necessary' is presented in the following excerpts:

"...Unless we involve them at this stage, in the future when one of them wants to do something, the road will get damaged and the road will always be as if on construction stage. But if we involve them now, the road will be complete and stay that way to provide the intended service efficiently."

"Because, we can't consider these infrastructures separate from the street. They are always there. Therefore, if they are involved, the road will be kept in good condition."

The respondents were asked to designate the level of involvement of these responsible bodies during the design process of new street projects from the provided scale of four. The result showed that 50% of the respondent described the level of involvement as 'Empowered' and the other 50% as 'Took part'. (See Table 20 for details below)

Interview question: Please indicate the <u>level of involvement</u> of utility companies in the design process of Addis Ababa's streets					
Institution	Total Number of Respondents	Informed	Consulted	Took Part	Empowered
AACRA	8	-	-	4 (50%)	4 (50%)

Table 20: level of involvement of utility companies in the design process of Addis Ababa's streets

By Empowering, the utility companies prepare their own designs which will be part of the final street design documents and furthermore, most of them construct it by themselves. The other group of respondents explained by 'Taking part' the utility companies participate actively in the coordination schemes as design team members. The following excerpts of the interview responses justify these statements.

"...They do their designs and together we do the coordination works which include the consultants also. Within this, there is a high level of involvement."

"...We give them full road data like: elevations, profiles and plans and based on that they prepare their design including the quantity. Then we directly tender it."

The study further assessed the level of involvement of the AACGRBGADAA in the street design process. In Addis Ababa's context, AACGRBGADAA is responsible for the development and maintenance of street greenery. Technically, street greenery is one component of the Urban Green Infrastructures. The interview questions were designed to explore the perception of the engineering professionals of AACRA about street greenery whether it is part of street infrastructure or not, and to find out the level of involvement of AACGRBGADAA on street design process for new projects.

Accordingly, respondents were asked whether they consider street greenery as infrastructure or not. 6 out of 8 respondents answered as 'yes', 1 respondent

answered ‘I don’t know’ and 1 respondent answered as ‘No’. Here, a common trend that is observed irrespective of their answers show sign of hesitation and thinking twice. This might indicate that they are not familiar to relate street greenery with infrastructure and the concept is not popular. When the respondents were asked to identify institutions responsible for the development of street greenery infrastructure, all responded AACGRBGADAA. At this point, it was possible to take notice that, none of the respondents gave the institution’s formal name but with some short phrases like “Sanitation and Beautification Office” and “Beatification and Parks Office”. Furthermore, most of them added words such as ‘*I think*’, ‘*I am not sure*’ and ‘*something like*’. The second point noticed was, none of the respondents did not realized that the name of the office is formally changed to the current name of AACGRBGADAA. Both observations showed the low level of attention given by AACRA’s design professionals to the office responsible for street greenery infrastructure as their design partner.

Finally, the level of involvement of the AACGRBGADAA in the design preparation process for new street projects of Addis Ababa was evaluated. All respondents confirmed that the AACGRBGADAA didn’t involve on all street design processes. The respondents also indicated that there is an effort to establish cooperation between the two offices. The following excerpts from the interview summarize and clarify the findings.

“To tell you the truth, we don’t even notify them about new street projects. Actually, we informed them when we do the current inner city walkway upgrading project. That is only because we were going to affect their greenery.”

“As far as I know, there is no involvement by them. I watched on TV around six months before that the two offices agree to work together. May be in the future they might work together.”

“They don’t get involved in the design process. They plant whatever they choose after the road is completed. We leave for them medians and paved pedestrian walkways and they finally come and dig and plant on the medians and remove the tiles of the pedestrian walkways and plant on it. But that trend affected the roads negatively so nowadays agreement is reached between them and us. In this agreement, the plan is to do all the design and planting work together and the up keeping tasks for the plants will be handled by them.”

5.4.4. Level of involvement in AACGRBGADAA

The Addis Ababa City Government River Basins and Green Areas Development and Administration Agency (AACGRBGADAA) is a newly established conglomerate office of different offices who are responsible for the city’s green areas, river basin developments, parks and zoos. In the context of Addis Ababa’s street greenery, this agency is responsible for the development and maintenance of street greenery. In this section, the author evaluated the level of involvement that the agency has with other institutions while executing its tasks. The data source is from the in-depth interview conducted with 4 staffs from 2 different directorates of the Agency (See Table 2 for the details of the study unites.)

The interview questions were structured to explore the perception among the agency’s professionals about the necessity of involvement, the level of involvement the agency had and the specific contribution made by the agency in the decision making process of space allocation for street greenery on Addis Ababa’s streetscape. The responses showed that all the 4 respondents interviewed agreed on the necessity to involve different stakeholders in the development and utilization of urban streets as and they labeled this as *‘Highly Beneficial’*. (See Table 21 for details below)

Interview question: How do you rate the <u>necessity to involve different stakeholders</u> in the development and utilization of urban streets?						
Institution	Total Number of Respondents	Highly Necessary	Necessary	Average	Less Necessary	Not Necessary
AACGRBGADAA	4	4 (100%)	-	-	-	-

Table 21: Necessity to involve different stakeholders in the development and utilization of urban streets

Even though the level of involvement is very low, the respondents list some of the institutions that the agency involve particularly in street greenery development. The following excerpts summarizes quote some of the responses:

"We work with AACRA, private consultants and contractors, the Mayor's office, EPA, the police and the like. But the participation levels is very low."

"It is common to see on streets that the projects done by one damaged by the other projects. We have memorandum of understanding between other similar institution like AACRA and AAWSA. But the question is how much do we realized it. At the end of the day, we are all working under the City Manager. But that unity is only at higher level and on the day to day, practical and professional level, the cooperation is weak and has its own problems."

The last set of the interview questions were presented to explore and measure the level of involvement the agency has with the most prominent decision making institutions with regard to space allocation for street greenery like the AACGPC and AACRA. The finding showed that the agency doesn't has a say on the space allocation decision making process for street greenery. Therefore, there is also no level of involvement to be measured. Some excerpts of the interviews clarify this in detail.

“No. The space allocation decision is passed only by them (AACGPC and AACRA) almost in a readymade fashion. Not only that, we do our planting by searching suitable place on the street by ourselves.”

“Actually the proclamation gave the ownership of Addis Ababa’s streets to AACRA. And they have in their structure a section for beautification of streets. That is by itself redundancy. For example, the greenery on Bole Road is done by Chinese contractors. The full mandate given to us is for public parks. Streets are more or less like additional responsibility.”

6. Chapter Six: Conclusions and Recommendations

In this chapter, the conclusion and recommendation forwarded in line with the research findings from the collected and analyzed data during the study are presented. Both the conclusions and recommendations are organized and presented according to the research questions stated above at the beginning of the thesis work.

6.1. Conclusions

Influence of the ‘National Urban Green Infrastructure Standard’ (NUGIS) on the current professional practice of space allocation for street greenery on street design projects of Addis Ababa: The NUGIS did not have influence on the current professional practice of space allocation for street greenery on street design projects of Addis Ababa. Lack of awareness about the existence of NUGIS itself among the professionals of the responsible institutions and weak follow-up mechanisms by MUHD about the implementation process of the NUGIS are found to be the two main reasons for the lack of influence by the standard.

On the contrary, there is a very high interest of having national standards, such as the NUGIS, and willingness to abide by them among the professionals. This is a paradox that there is a national standard with no influence on the practice and on the other hand there is a high level of interest and willingness to exercise and abide by a national standard. Therefore, filling this gap may have a significant contribution on the space allocation for street greenery in Addis Ababa.

Knowledge, Attitude and Practice among the professional staffs of the responsible institutions who are responsible for the space allocation for street greenery on Addis Ababa’s streetscape: The professionals in the responsible institutions for street greenery have a certain level of knowledge about street greenery and their benefits. But this knowledge is not all rounded and needs

development to meet the desired outcomes from these professionals. Similarly, the respondents also have a high level of positive attitude towards the benefits of street greenery. Furthermore, two third of these professionals show some form of relevant practice in tasks related to street greenery but this practice primarily focuses only on the specialty of the institution they belong to. In order to fill this gap recommendations are made in the form of guidelines.

Level of inter-institutional involvement among the various responsible institutions who are involved in space allocation for street greenery on Addis Ababa's streetscape: There is a common belief among the officials and professionals from all the four responsible institutions in having strong inter-institutional involvement with each other as a requirement for best results. But, when it comes to the actual performance of each institution, there is wide inconsistency in the level of inter-institutional involvement which is reflected in their performance as well.

As for the preparation of the NUGIS by MUDH, many suggested that, had it been a result of involvement of different stakeholders, it would have a higher success rate to be implemented. The experience of the master plan's preparation of Addis Ababa by AACGPC is considered as the best example of creating a platform for empowering level of involvement by the different stakeholders, even though it has its own challenges too. The street designs by AACRA also demonstrates best practices of involving its utility infrastructure partner companies. Yet, it avoided the AACGRBGADAA, who is developing and maintaining the city's street greenery, from involving in its design decision making processes.

6.2. Recommendations

Influence of the ‘National Urban Green Infrastructure Standard’ (NUGIS) on the current professional practice of space allocation for street greenery on street design projects of Addis Ababa: The NUGIS is a very good start by the MUDH to standardize the different UGI elements in urban centers of Ethiopia. But it is not influential on the current practice of space allocation for street greenery in Addis Ababa. This study puts forward the following guideline to enhance this lack of influence by the NUGIS as follows:

Guidelines to enhance the level of influence by the NUGIS on the current practice of space allocation for street greenery in Addis Ababa

The guideline proposes three procedural steps to enhance the influence of NUGIS on the current practice of space allocation for street greenery in Addis Ababa, which are:

- Awareness creation
- Ownership creation
- The establishment of revision mechanism

1. Awareness creation

The complete lack of awareness about the NUGIS within the relevant leadership and professional staff of AACGPC and AACRA has to be addressed as these two institutions are very influential role players in Addis Ababa’s spatial planning. The fundamental first step should be awareness creation about the NUGIS itself. This could be achieved by the provision of sufficient, effective and professional introductory trainings to the responsible leadership and professional staffs of AACGPC and AACRA. The awareness level of the relevant leadership and professional staff at AACGRBGADAA should also be refreshed. Similarly the NUGIS document should be made readily available in these institutions. The task of awareness creation should be the responsibility of the author of the NUGIS, who is the MUDH.

2. Ownership creation

The second procedural step to enhance the influence of the NUGIS on the space allocation for street greenery in Addis Ababa is the creation of ownership to NUGIS by the responsible institutions. The AACGPC, ACCRA and AACGRBGADAA together are the major actors in the planning, designing and construction of the city's streets and the development of its street greenery respectively. None of these institutions refer the NUGIS as one of their technical manual while executing their responsibilities. In other words, they don't own it even though it is a national standard. The single task of making the NUGIS among the standards referred to by these institutions is expected to create a significant influence in the introduction of UGI elements in Addis Ababa's urban fabric. After the process of awareness creation is successfully accomplished, these institutions should be directed, motivated and encouraged to include the NUGIS as one of their technical manuals guiding their activities. Hence, these institutions will own the NUGIS and its principles. This will not be a hefty task as the findings of this research show a high level of interest and motivation among the leadership and professionals in all the three institutions towards a common national standard of this sort. The task of ownership creation should also be the responsibility of the author of the NUGIS, who is the MUDH, and The City Government of Addis Ababa.

3. The establishment of revision mechanism

The process to enhancement the influence of the NUGIS on the current professional practice of space allocation for street greenery in Addis Ababa should be progressive and sustainable. To this end, the third procedural step of this guideline recommends the establishment of a strong monitoring and feedback collection mechanism by the MUDH on the performance of the NUGIS and its principles. These feedbacks are expected to be vital as they come from the practice of the largest and populous urban center of Ethiopia, which is the city of Addis Ababa. Alongside the monitoring and feedback collection, there should be an efficient revision mechanism established by the MUDH to update the NUGIS as required.

Knowledge, Attitude and Practice among the professional staffs of the responsible institutions who are responsible for the space allocation for street greenery on Addis Ababa's streetscape: The research draws a general outline in the level of Knowledge, Attitude and Practice of the professional staffs from the four responsible institutions for space allocation for street greenery in Addis Ababa. This general outline shows both the relevant potentials and shortcomings of the professional staffs of these institutions. In this recommendation, while the potentials are recognized, corrective measures are indicated for the shortcomings and remedial measures are put forward to enhance them. The recommendations are presented for each of the three component of the KAP survey:

Knowledge: Generally, most of the professional staffs from all the four responsible institutions have a certain level of knowledge about street greenery but their knowledge is found to be mostly not all rounded and usually lean only to their specialty. These institutions are significant role players for the development of street greenery in Addis Ababa. So are their professional staffs. For the objective of establishing an effective street greenery development for Addis Ababa, the professionals of these institutions should get a planned, all rounded and professional introductory trainings about street greenery. The following are guidelines recommended for the above mentioned training schemes:

**Guidelines for training of professional staffs of the responsible institutions
about street greenery**

The objective of this guideline is to highlight points to conduct an effective training over fundamental issues of street greenery.

1. The training should be given to the leadership and professional staffs of MUDH, AACGPC, AACRA and AACGRBGADAA.
2. Giving the training for the staffs of the four responsible institutions together is more recommended for its potential to create a team spirit.
3. The training is recommended to be given by the academia which is neutral and knowledge focused establishment.
4. The training should be designed to be all rounded to include the following

topics about street greenery:

- a. Definition and fundamentals concept of street greenery
 - b. Various benefits of street greenery
 - c. Component of the urban streetscape for street greenery
 - d. Basic concept of Urban Ecology
 - e. Basic concept of Urban Green Infrastructure
 - f. Basic concept of planting design for street greenery
 - g. Types and benefits of indigenous plants for street greenery
 - h. Maintenance for street greenery
 - i. Interaction of street greenery with other street based infrastructures
5. Finally, beyond the level of training, it is recommended for a few of the staff of these institutions to get specialization in Landscape Architecture field of study. These staffs, in the long run could conduct their own inter-institutional training sessions as a continual capacity building program.

Attitude: There is a very high level of positive attitude among the leadership and professional staffs of the four responsible institutions towards street greenery. This must be recognized and encouraged as a great potential for all future interventions to enhance the state of Addis Ababa's street greenery development. But at the same time, the allocation of space for street greenery in Addis Ababa is mostly found to be poorly adequate. This poorly adequate space allocation for street greenery in Addis Ababa happened despite favorable attitudes towards relevant national policies and strategies which are very supportive to green development. This is a paradox which needs to be deeply researched. And this situation is wrapped up by suggesting potential research question for other researches in the topic. The question, "Why do responsible professionals and leadership, who show a highly positive attitude towards street greenery, led by favorable national policies, failed to allocate adequate spaces for street greenery in Addis Ababa?" is recommended.

Practice: The practice related to street greenery by the professional staffs of the four responsible institutions is relative to Addis Ababa's poor level of street greenery development itself. They engage in different aspects of street greenery activities but the trend of practice requires further development regarding technical, practical and theoretical aspects. Similarly, their practice is mostly bounded to the activities of their institutions and lack the required level of cooperation with others. (The details in the level of participation will be discussed in the next section). This study puts forward the following guidelines to develop the level of practice by the professional staffs of the four responsible institutions as its recommendation.

Guidelines to enhance the level of relevant practice by the professional staffs of the responsible institutions for space allocation for street greenery on Addis Ababa's streetscape.

The objective of this guideline is to highlight points to develop the level of practice related to street greenery by the professional staffs of the four responsible institutions to allocate space for street greenery on the streetscape of Addis Ababa.

1. Strong determination of the political leadership to enhance the practice of street greenery is the most fundamental requirement.
2. Sufficient budget should be allocated.
3. Achievable goals should be set and the performance of the practice should be measured accordingly.
4. Experience sharing for the leadership and professionals from international best practices and from local cities having better practices in street greenery is recommended.

Level of inter-institutional involvement among the various responsible institutions who are involved in space allocation for street greenery on Addis Ababa's streetscape: Fundamentally, all the four responsible institutions for space allocation for street greenery in Addis Ababa are bound to work together by law. The

duties and responsibilities given to them by the federal and regional proclamation clearly direct these institution to work together on common assignment in different degree. And the first recommendation for these institutions in this regard is to respect this legal responsibility.

Generally, it is possible to categorize the level of involvement among the four responsible institutions for space allocation for street greenery in Addis Ababa into *Forgoing Involvement* and *Ongoing Involvement*.

In the process of forgoing involvement, which has already happened, only the feedback from it is relevant. The involvement while preparing the NUGIS and the Addis Ababa's Master are both Forgoing Involvements.

The preparation of the NUGIS was criticized by the professionals of other stakeholder institutions for not being participatory to them. But the conclusions of this research indicates that, if the preparation of the NUGIS were participatory and allow the involvement of other stakeholders, it would have been easier during the implementation stage by creating a certain level ownership among the stakeholders. Even though, this is a foregone procedure, it is highly recommended to make the subsequent revisions of the NUGIS actively participatory allowing a higher level of involvement of all the relevant stakeholders.

The preparation of Addis Ababa's Master Plan by the AACGPC could be taken as a typical example to a process allowing higher involvement among stakeholders who are empowered to engage freely representing their institutions. But one of the two main challenges witnessed during the preparation and implementation process of the master plan is caused by the participants themselves. These challenges are mostly related to human factors such as: the lack of motivation, dedication, work ethics and team spirit largely exhibited by the participants during the preparation process of the master plan. This challenge could be taken as the 'tip of an iceberg' showing symptoms of behavioral malfunctions at individual and societal level. These participants represent a profile of the society. Witnessing this educated professional profile of the society exhibiting an irresponsible and self-centered behavior towards societal and national issues and interests could be a potential topic for researches in relevant social study fields. This is also what is recommended by this research.

Furthermore, the second challenge for the less effectiveness to the participatory nature of the preparation of Addis Ababa's master plan is the high turnover of the participants soon after their participation in the master plan's preparation is over. This created challenges and inefficiency during the implementation stage of the master plan in the stakeholder institutions. The staff turnover is initiated by two factors. The first is the appointment, relocation and transfer initiated by the government. The second is initiated by the staffs themselves for better pay or positions. In this study, the recommendation for the high turnover initiated by the government is primarily addressed to the political leadership. The political leadership of the country should create a certain acceptable level of stability at one position for the institutional leadership and professional staffs so that ongoing tasks could get a fair chance of completion or near completion by the same people who engaged on them most. As for the high turnover initiated by the staffs themselves, which is not possible to avoid, the recommendation is to develop a rigorous culture of documentation for the proceedings of ongoing tasks so that even if the responsible staffs left and the ongoing tasks fell on new hands, the progress will not be hampered as it will be supported by the documented records of the proceedings.

The final recommendation for this study is about the 'Ongoing Involvement' among AACRA and AACGRBGADAA. These institutions are the main role players for the development of the city's streets and the street greenery development respectively. But these two institutions, while executing their respective roles, have no cooperation among themselves. This lack of cooperation between the two institutions is the root cause for the majority of the problems regarding Addis Ababa's street greenery development in general and the space allocation for street greenery in particular. In contrast, AACRA particularly has a well-developed system of cooperation with utility companies during the design process of the city's streets. But this well-developed system singled out and avoid AACGRBGADAA in all the design preparation and construction stages of the city's streets. In order to have an effective development of street greenery, it is recommended that the mutual cooperation between AACRA and AACGRBGADAA to be taken as mandatory. Their cooperation is especially critical during the design stages of the city's streets. If street greenery is considered as one of the infrastructures on the city's streets, AACRA should give it equal consideration

with the other street side infrastructures. Finally, the following guidelines are put forward to enhance the level of cooperation between AACRA and AACGRBGADAA:

Guidelines to enhance the level of cooperation between AACRA and AACGRBGADAA

1. The ongoing revision of AACRA's manual should consider Addis Ababa's street greenery seriously and set sufficient space allocation standards.
2. Landscape design with clear planting details should be part of the street design document for new street projects. The Landscape Design for new street designs should be prepared by qualified consultants under the supervision of AACRA. To this end, AACRA should also develop its professional human resource by engaging landscape architects assigned as its 'Design Evaluators'.
3. AACGRBGADAA should get participated in the design process by commenting on the landscape design part of new street projects prepared by AACRA's design consultants. AACGRBGADAA should also develop its professional human resource by engaging landscape architects who will be capable of providing evaluation and comments on new street design projects.
4. Based on the prepared Landscape Design for new street projects, the physical street greenery development on new street projects is recommended to be developed under the mandate and supervision of AACRA. So that the contractors, while handing over new street projects, they will complete the planting of greeneries the same way as they install street lighting and drainage lines.
5. AACGRBGADAA should take over the newly finished and planted streets from AACRA formally for the subsequent up keeping and maintenance tasks.

Sample Design

This last section of the study is dedicated to the presentation of a conceptual design as a sample recommendation for space related issues of the topic. In line with the study's topic, which is "The role played by the public sector institutions in the space allocation for street greenery in Addis Ababa", one of the goals for these institutions is expected to be the establishment of a well-developed street greenery in the city. The first and foremost means to achieve this is the allocation of sufficient and well-planned spaces along streets. The aim of this design proposal is to present this end goal of the institutions in terms of a street landscape design proposal. To make the design proposal more practical, the site selection for the proposal is made to be an actual street project which is currently under construction in the city. In the design process, some practical challenges and opportunities in Addis Ababa's street projects were identified and design solutions were put forward.

A. Design Concept

Streets are popular urban public spaces. They occupy about a quarter of the urban surface area and they are interconnected which also makes them an ideal choice to support UGI elements. In the city of Addis Ababa, there is a visible shortage of recreational parks and public open spaces. With appropriate planning and implementation, it could be possible to use the city's street as huge potentials in the process of solving the above problem.

The design proposal below is prepared under the design concept of "**Linear Park**". The Linear Park design concept is a whole new approach recommended for the city of Addis Ababa which recommends streets to be designed not only as conventional transportation corridors but also primarily for three core objectives. Which are:

- To be spaces of socialization
- To be elements of urban aesthetics and
- To be parts of UGI component

B. Design Brief

i. Site Location

The site for the design proposal is along a street under construction in the southern part of Addis Ababa between Bole Michael and Bole Bulbula localities. This street is also one of the case study street project in this study. (SeeTable3).

ii. Site Analysis

The Bole Michael – Bole Bulbula street project mostly has a width of 30m. While connecting these two localities, the street passes through the Bole International Airport aviation zone and the densely populated Bole Bulbula residential area. AACRA's design for this street shows that the 30m street width is sub-divided and allocated as:

- 10m each for both the 3-lane carriage ways
- 4.5m each for both the pedestrian walkways on each side of the street
- 1m median space at the center of the street

Actual physical survey of the street under construction shows that, the 1m median width mostly is not maintained and falls up to 0.85m. Basically, this median space is very narrow to plant street trees.

Furthermore, along this street project, the Bole International Airport aviation zone is a unique space from urban open space point of view. On this space, no settlement is allowed. This is due to safety factors related to the landing and take-off air traffic using the airport. This settlement free open area in the middle of the two densely populated settlements attracts many people to come here to take a walk and enjoy the fresh air. Even athletes come from far away to train in this open area.

Even though the site has such activities on it, the new street under construction doesn't take it into consideration. This is shown by the all uniform

street width both in the densely populated settlement zone and the settlement free aviation zone. This is despite the narrow median spaces which are difficult for street trees in the settlement zone. There was good chance to widen the narrow median space and other potential softscape spaces to support a good development of street trees on them. The cause for this is assumed to be related to cost.

iii. Design approach

Two design approaches were followed with a fundamental aim of maintaining the above three objectives of the ‘Linear Park’ design concept. These are based on the two different physical surroundings in which the street passes. Therefore, the two design approaches are:

- “Settlement zone” approach
- “Aviation zone” approach

iv. Physical space design

In the settlement area, there is no option of using additional spaces other than the one designated within the 30m street width. Therefore, the physical space design in the settlement zone has no option but to use this restricted space effectively based on the design concept. Therefore, the design proposes on the 4.5m wide pedestrian walkways, a planting strip to maximize the ratio of softscape to hardscape on the street and use this area to support UGI features. While designing the physical space of the pedestrian walkway, due consideration is given to space for pedestrian traffic flow and space for street furnitures. In the case of the narrow median space, it has to be handled only by planting design.

In the aviation zone, the physical space design was made to respond to the potential of the openness and popularity of the area by the local population. Therefore, either side of the street was designed in the proposal as street side park with sitting areas and jogging tracks. This street side public open area is

expected to enhance socialization, urban aesthetics and UGI, which are the three objectives of the 'Linear Park' design concept.

v. Planting design

The design proposal generally recommends the planting of indigenous trees, shrubs and wild flowers species. In doing so, two fundamental considerations are recommended regarding species selection. These considerations are based on the nature of the specific location of the plants.

Neither the 4.5m wide pedestrian walkway nor the 1m wide median space of the street project for the design proposal could not be considered as abundant. Therefore the plants have to fit in at this limited space. Therefore this makes it mandatory to pay the necessary attention to avoid any potential conflicts between the plants and other utility infrastructures on the street and the street's hardscape itself. This is could be achieved by a thorough analysis of the morphology of the candidate plants, particularly the root systems of the trees.

The second consideration is on the aviation zone. The aviation zone is a special area. Settlement is prohibited here deliberately for safety reason. But there are other airborne threats for the aircrafts. Namely birds. Considering the proximity of the runway of the airport, tree species which attract extensive bird nesting should be avoided. Also plant species attracting birds as their source of food should also be considered carefully. These potentials of plants, as nesting places and sources of food, is a positive factor for biodiversity and the whole of the ecosystem. But, at this particular location, due to aviation safety reasons of the location, they are considered as threats.

CONCEPT and SITE ANALYSIS

DESIGN CONCEPT

STREETS → LINEAR PARKS

STREETS

- 20 - 30 % OF URBAN LAND AREA
- 80% OF TOTAL URBAN PUBLIC SPACE
- WIDELY SPREADED OVER URBAN AREA
- INTERCONNECTED



LINEAR PARKS

UGI ELEMENTS

SOCIAL BENEFIT

RECREATION
HEALTHY SOCIETY
ACCIDENT REDUCTION
CRIME REDUCTION

ECOLOGICAL BENEFIT

BIODIVERSITY
HABITAT CREATION
STORM WATER RUNOFF REDUCTION
AIR CLEANING

ECONOMIC BENEFIT

SITE ANALYSIS



DESIGN PROPOSAL LOCATIONS

- 1 SETTLEMENT ZONE PROPOSAL
- 2 AVIATION ZONE PROPOSAL

- A BOLE MICHAEL
- B AVIATION RESTRICTED AREA
- C BOLE BULBULA



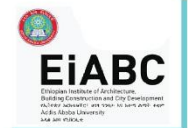
LANDSCAPE
ARCHITECTURE

THESIS
PROJECT

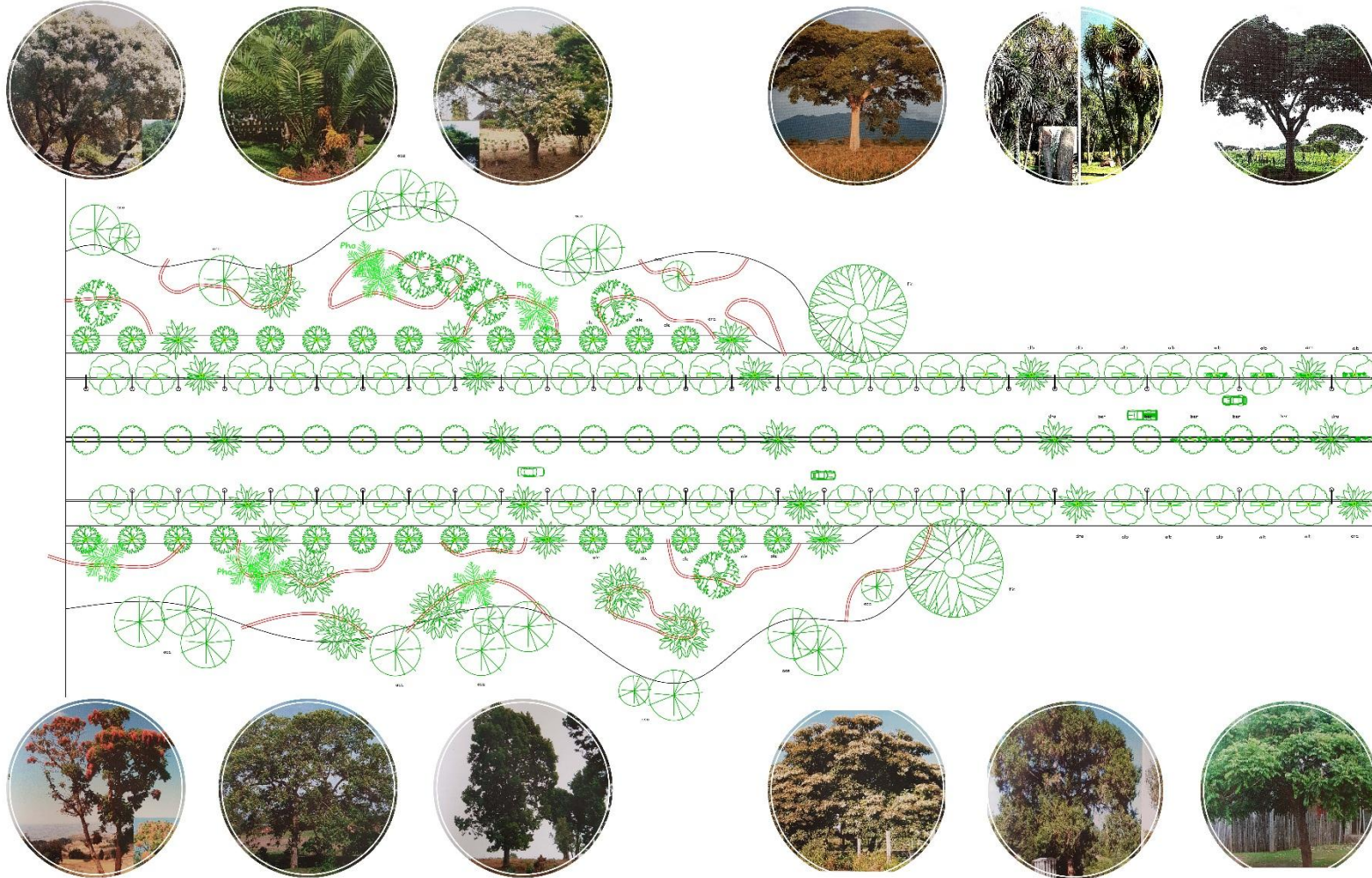
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HANI OMER

JUNE
2019

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DESIGN



**LINEAR
PARKS**

LANDSCAPE
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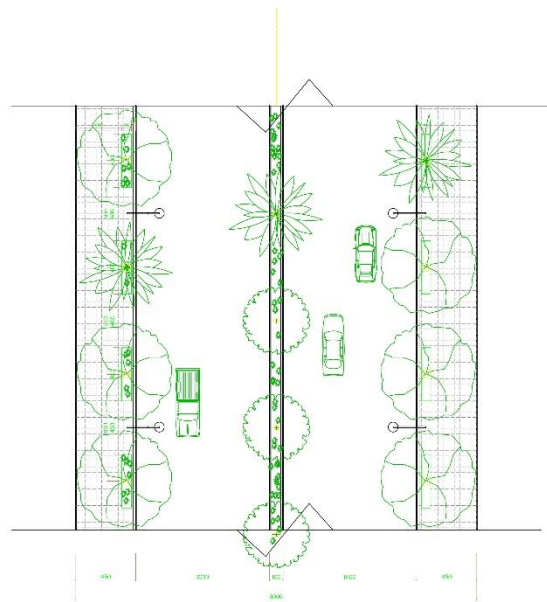
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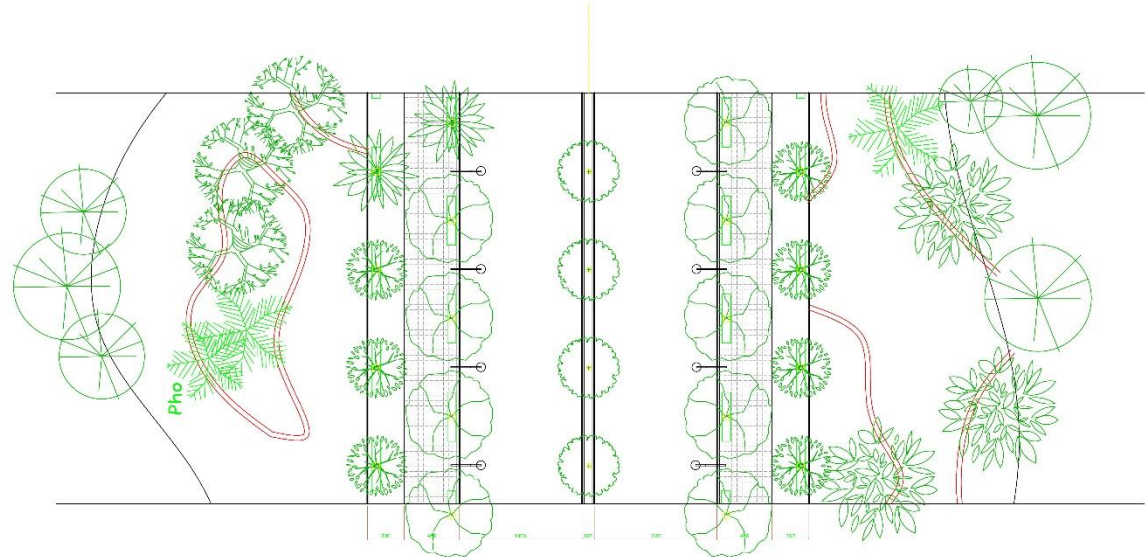




Typical Street Plan



Typical Street Section



Typical Street Plan



Typical Street Section

DESIGN
ILLUSTRATION



**LINEAR
PARKS**

LANDSCAPE
ARCHITECTURE

THESIS
PROJECT

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2019

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EiABC

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8. Annexes

■ Annex A - List of interview respondents

	Respondent Code	Gender	Institution	Department	Position	Work Experience in the position	Educational Qualification
	01-01	Male	MUDH	Urban Greenery and Beautification Directorate	Director	5 years	BSc degree in Organizational leadership
	02-01	"	"	"	Ex Office Head	2 years	BA degree in Geography and History, MA in History, MA Development studies, environment and sustainable development.
	03-01	"	"	"	Senior expert	6.5 years	BSc degree in Forestry, MSc Production Forestry
	04-01	"	"	"	expert	years	BSc Architectural Design and Drafting
	05-01	"	"	"	Senior Environmental impact assessment expert	7 years	BA Geography and environmental studies, MA Urban development and management
	06-02	Male	AACRA	Road Construction and Maintenance, Design Revision and Implementation follow-up Directorate	Team Leader	3 years	Diploma in Surveying, BSc. Degree in Architecture,
	07-02	"	"	"	Team Leader	1 year	Bsc Degree in Civil Engineering
	08-02	"	"	"	Lead civil engineer and work as Design evaluator	4 and half year	BSc Degree in Physics, BSc Degree in Civil Engineering, MSc in Structural Engineering
	09-02	"	"	"	Junior civil engineer and work as Design evaluator	2 and half year	Bsc Degree in Civil Engineering, currently MSc student in Road and Transport
	10-02	"	"	"	Junior civil engineer and	1 and half	Bsc Degree in Civil Engineering

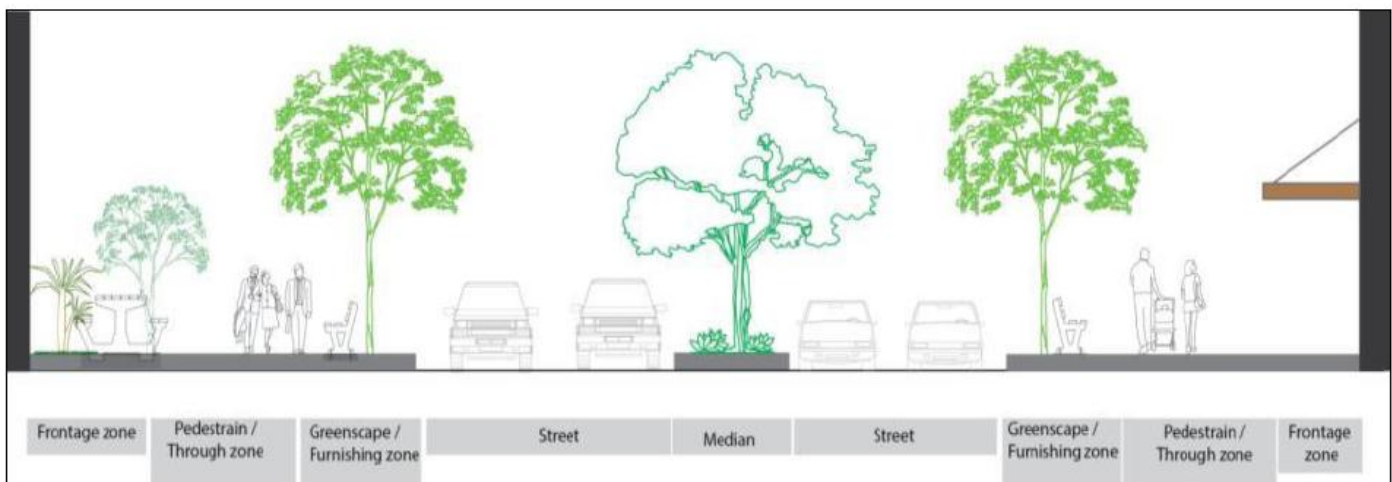
					<i>Design evaluator</i>	<i>year</i>	
	11-02	“	“	“	<i>Junior civil engineer and Design evaluator</i>	<i>3 year</i>	<i>BSc Degree in Mechanical Engineering, BSc Degree in Civil Engineering, Student of MSc. In Construction Management</i>
	12-02	“	“	“	<i>Junior civil engineer and Design evaluator</i>	<i>1 and half year</i>	<i>Bsc Degree in Civil Engineering</i>
	13-02	“	“	“	<i>Junior civil engineer and Design evaluator</i>	<i>1 year and 2 months</i>	<i>BSc Degree in Civil Engineering, MSc student in road and transportation</i>
	14-03	<i>Female</i>	<i>AACGPC</i>	<i>Spatial Design Directorate</i>	<i>Director</i>	<i>6 months</i>	<i>BSc degree in Architecture and Urban Planning, MSc degree in Architecture in Human Settlement</i>
	15-03	<i>Male</i>	“	“	<i>Vice Commissioner</i>	<i>10 months</i>	<i>BSc degree in Architecture and Urban Planning, MSc degree in Urban Design and planning</i>
	16-03	“	“	“	<i>Advisor</i>	<i>6 months</i>	<i>BSc degree in Architecture and Urban Planning, MSc degree in Urban Design and planning</i>
	17-03	<i>Female</i>	“	“	<i>Landscape design expert</i>	<i>2 years</i>	<i>BSc degree in Urban and Regional Planning, MSc degree in Environmental Planning and Landscape Design</i>
	18-04	<i>Male</i>	<i>AABPCD AA</i>	<i>Plaza and Aesthetic Directorate</i>	<i>Landscape design expert</i>	<i>2 years</i>	<i>BSc degree in Plant Science, BSc in Construction Management, MSc Environment and Climate Change</i>
	19-04	“	“	“	<i>Director</i>	<i>6 months</i>	<i>BSc degree Horticulture</i>
	20-04	“	“	<i>Engineering Directorate</i>	<i>Architect</i>	<i>2 years</i>	<i>BSc degree in Architecture, MSc. Urban Planning and Development</i>
	21-04	“	“	<i>Plaza and Aesthetic Directorate</i>	<i>Team Leader</i>	<i>1 years</i>	<i>BSc degree in Horticulture, MA degree in Development Management</i>

- Annex B - The ‘Right of way’ section of the NUGIS

2. Rights of way

2.1 General introduction and standards

- No other feature shapes the outward appearance of a community more than its streets. They can incorporate a wide variety of green infrastructure components as well as storm water management practices including trees, permeable pavements, bio retention and swales. Successful application of green techniques will encourage soil and vegetation contact and infiltration and retention of storm water.



- These days, the term ‘complete street’ is used to define roadways that are designed and operated to enable safe, attractive, and comfortable access and travel to all users. They are designed to accommodate pedestrians, bicyclists, motorists, trucks and public transport users of all ages and abilities, as well as green infrastructure and other components. The figure above shows a model cross-section of a ‘complete street’ with its distinctive zones.
- streets should be designed for the minimum required pavement width (impermeable surface) needed for lanes, parking, emergency, maintenance, service access, pedestrians and cyclists, based on the volume of motorized and pedestrian traffic;
- d. especially in streets with low traffic volume, utilities should be installed under the street pavement; the higher costs for and temporary impediment of traffic flow in

the case of repair or replacement should be taken into account but should be confronted with the benefits of larger green space;

- e. Parking requirements should be lowered wherever possible, e.g. through mass transit systems.
- f. Cycle lanes on pavements are in general the responsibility of the Ethiopian Road Authority. Cycle lanes should be marked with a white line on the pavement between where they cyclists ride and where motorists are supposed to go. Statistics in a number of countries have shown cyclists on cycle lanes are more secure than roadside cycle lanes; even so cyclists are in a danger of poor sightlines and opening car doors. Therefore cycle lanes have to follow strictly the standards of the Ethiopian Road Authority.

2.1.1 Location, capacity and accessibility

- Location, accessibility and capacity of green along rights of way depend on the transport planning of a city. Therefore, no standards are required. But please refer to standards of specific green (e.g. street trees) and gray (e.g. furnishing) components below that ensure required capacity and accessibility of e.g. sidewalks, adjacent buildings and other right of way facilities.

2.2 Components and facilities

2.2.1 The green components

- a. Trees located at the source of the pollution, i.e. streets, can well mitigate air pollution and sequester carbon dioxide. They tie the streetscape together and reinforce vistas. Trees are amenities that soften and humanize the urban concrete texture.
- b. Planters / planting strips are another possibility to make rights of way greener. They are preferable in constraint spaces where tree roots would not have enough space. Planting strips can include groundcovers and grasses, shrubs and herbaceous plants.
- c. While it should be a general goal to plant trees on all streets, not all streets may be appropriate for tree planting because of lack of space for good rooting, lack of available sunlight or other microclimatic limitations. Tree planting should be focused first on streets with good local growing conditions. If the space available does not allow tree planting, planting strips without trees may be accommodated.

- d. When planting trees or installing planters / planting strips, adequate access from the street and to building entrances must be maintained. Trees and planters shall not be planted in front of building entrances in order to allow free access for users, esp. in emergency cases.
- e. Trees on a particular street should be of a particular species or type. This creates visual continuity along a given street. Street corners may be marked by a different tree species.
- f. Neighborhood, residential or smaller streets may use a more diverse planting palette to create a rich planting variety.
- g. A monoculture within a city shall be avoided, since this could be disastrous if a disease or pest were to attack all the trees of one species.
- h. In general, trees and plants should be planted in locations that provide the best conditions for growth within a given design framework. Trees need adequate space for trunk expansion and space to develop woody structural roots for support. “But the exploration of resource space positions tree roots in seeming conflict with other site uses and structures. Conflicts are most often associated with: sewer or septic lines, storm water drains, water supply lines, foundations, sidewalks, streets, parking lots, pavements, curbs and walls. A preponderance of these conflicts is preventable, with forethought of tree growth over the long-term, and the installation of structures with proper materials and application procedures” (Coder, Kim A. – 1998).
- i. Competent authorities shall consider that all clearance and spacing standards depend on the actual tree species, its roots, and its desirable size at maturity stage. The mature size of the tree shall be the primary consideration to accurately determine the placement of the tree in relation to the location of buildings, pavements, other trees, utility lines, traffic devices and signs.

2.2.1.1 Clearance to streets and sidewalks (incl. medians)

- a. Sidewalks can be divided into following three zones:

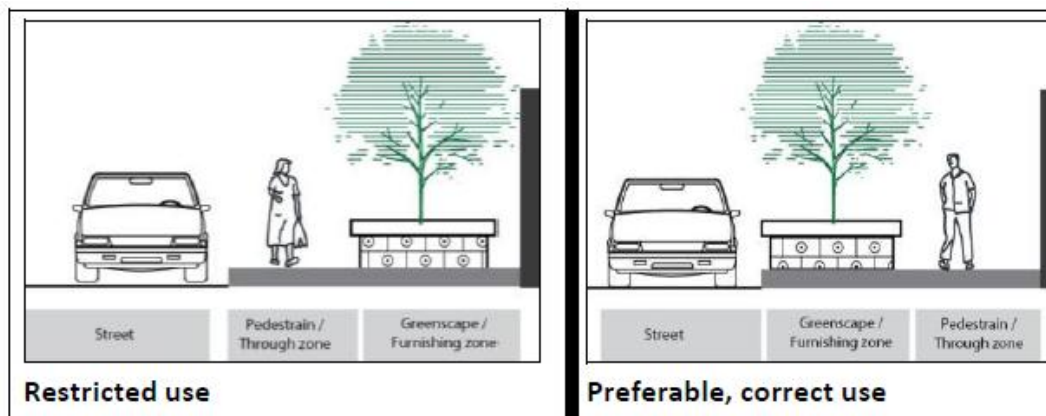


- b. The actual provision of these three zones depends on the pedestrian volume, on the hierarchy of the respective street, i.e. Local Street to expressway, and in general on the conflict between the desired width of the street for motorized traffic and the actual space available. The average width of a pedestrian is 82 cm without encumbrances such as bags. Two people need 1.5 m of clear width to walk side-by-side, and when encountering another person, width needs to be about 2.6 m. Having this in mind, the following standards shall be followed when green infrastructure components are to be integrated along right of ways.
- c. Medians (esp. raised medians) function primarily for traffic safety and as a means of beautification. They channel traffic and reduce the number of cross-traffic and turning conflicts. They provide pedestrian refuges in larger streets.
- d. Competent authorities shall ensure following standards given in the Urban Planning and Implementation Manual of Ethiopia for desired sidewalk (i.e. all 3 zones) and median widths:

S/N	Street types	Average sidewalk width (in m)	Median width (in m)
1	Urban motorway	--	
2	Principal arterial (PAS-50m)	Approx. 5.0 m (on both sides)	2.0 m / 2.5 m
3	Principal arterial (PAS-40m)	Approx. 5.0 m (on both sides)	1.5 m / 2.0 m
4	Principal arterial (PAS-30m)	Approx. 4.5 m (on both sides)	Approx. 1.0 m
5	Sub arterial (SAS-25m)	Approx. 3.5 m (on both sides)	Approx. 1.0 m
6	Collector (CS-20m)	Approx. 3.5 m (on both sides)	
7	Collector (CS-15m)	Not less than 2.0 m (preferably both sides)	
8	Local 10 m	To be decided based on local conditions (not less than 1.3 m)	
9	Local 6 m	To be decided based on local conditions (not less than 1.3 m)	

- e. Competent authorities shall ensure at all times a minimum width of 1.3 m for the Pedestrian / Through zone. In no case shall street trees, planting strips and other obstructions like utilities, furnishing etc. result in an unobstructed Pedestrian / Through zone width of less than 1.3 m.
- f. Wherever opportunities are available, wider sidewalks with a generous Green scape / Furnishing Zone should be accommodated.
- g. In high volume, high density pedestrian areas (e.g. Downtown areas), the Pedestrian / Through zone should be balanced with other zones (e.g. the Green scape / Furnishing zone) to accommodate large amounts of pedestrian traffic.

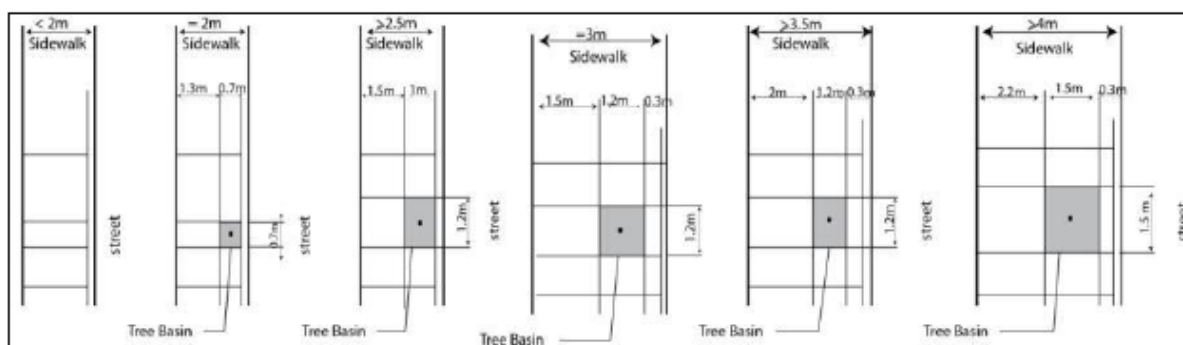
- h. The Green scape / Furnishing zone should preferably be put between the Pedestrian / Through zone and the street. This zone should be maximized to provide as much of a buffer as possible between the Pedestrian / Through zone and adjacent street traffic. However, the Pedestrian / Through zone shall not be reduced beyond the recommended minimum width of 1.3 m.



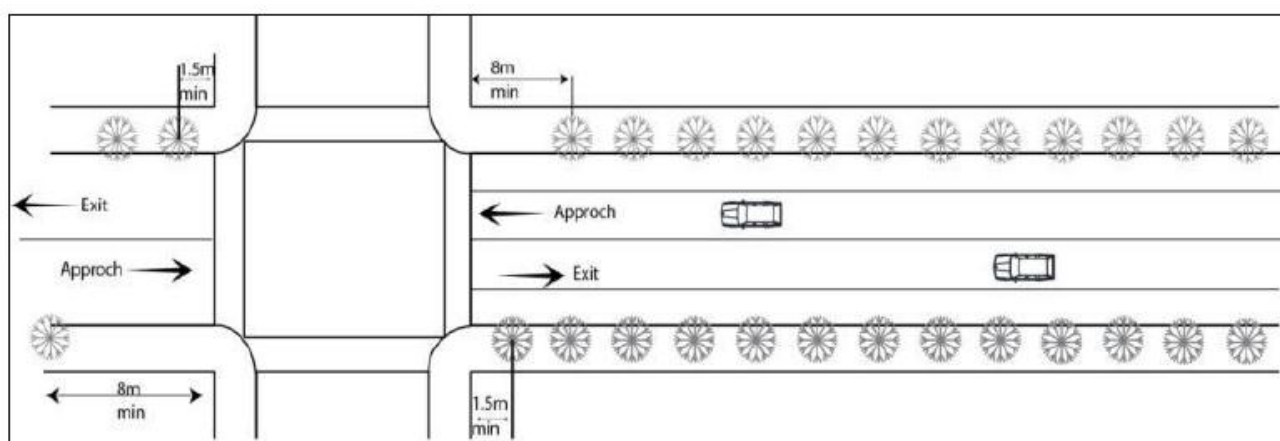
- i. Street trees and planters should generally be located within the Green scape / Furnishing zone. Trees shall be offset by at least 0.35 m from the curb (to centre of tree). Therefore, no street tree planting is allowed in sidewalks with a total width less than 2 m, in order to ensure the minimum Pedestrian / Through zone width as well as a healthy environment for the tree:

$$\begin{array}{c}
 \text{min. of 1.3 m for Pedestrian / Through zone} \\
 + \\
 \text{min. of 0.7 m of width for tree basin} \\
 = \\
 \text{min. of 2 m sidewalk width for street tree planting}
 \end{array}$$

- j. The tree's offset of 0.35 m from the curb and from the Pedestrian / Through zone is the absolute minimum and only small, narrow trees with small space required for roots shall be used. Competent authorities should always enlarge the offset and herewith the tree basin, if the total width of the sidewalk and the necessary width of the Pedestrian / Through zone allow.



- k. The minimum distance between tree stem and an intersection shall be 8 m on sidewalks at the near side of intersections and 1.5 m on sidewalks at the far side of intersections.



- l. Medians should have a minimum width of 1.2 m. In case they serve as pedestrian refuge the minimum width of the median and the crossing itself should be 1.8 m.
- m. Trees shall be planted in the center of the median.
- n. Trees shall be offset by at least 0.35 m from the curb of the median.
- o. On medians, the minimum distance between tree stem and an intersection shall be 8. The height of plantings near intersections should be restricted so that sight lines are not obstructed
- p. On medians, the minimum distance between tree stem and a crosswalk / pedestrian crossing shall be 3 m to allow sight clearance for pedestrians onto the street.
- q. Competent authorities may use raised medians (1) as an aesthetic feature, and/or (2) to increase soil volume for trees and other plants.

- r. On roundabouts, trees should be placed close to the center.
- s. Planters may be placed along sidewalks behind the curb line. They may also be placed inside curb extensions and in pedestrian plazas.
- t. Planters should be designed with curbs and inlets to withstand street sweepers, and to provide access to parking and other site-specific needs.
- u. Planters can take runoff from rooftops, sidewalks, and pedestrian plazas without pretreatment. Runoff from streets and parking lots should receive some pretreatment such as flowing through a sump or a sediment capture area.
- v. Planters may line an entire block as long as breaks are provided where on-street parking exists.
- w. Planters may be used adjacent to buildings, but generally waterproofing is desirable to prevent flooding into basements and foundations.
- x. Planters may be combined with seat walls to provide seating.

2.2.1.2 Clearance to buildings, utility lines and street facilities

- a. The minimum distance between tree stem and any adjacent built structure shall be 2 m. More space should be allowed for wider trees.
- b. Underground and overhead utility lines and trees have to be located with acceptable distance from each other because the lines are prone to tree root and branch intrusion. Any requirement provided by the competent utility authority (e.g. Ethiopian Electric Power Cooperation (EPPCO), Ethiopian Telecom (ETC), Water supply authority etc.) shall be considered along with this document. All utility lines shall be properly located and marked by this competent utility authority. Green infrastructure operations are not to commence unless these conditions are adhered to. If the following minimum clearances cannot be maintained, the competent authority shall be contacted to discuss site specific options:
- c. The minimum horizontal distance between tree stem and underground water lines shall be 1.5 m. This distance may be reduced when the line is located 5 m deep.
- d. The minimum horizontal distance between tree stem and underground electrical distribution and telephone / telegraph / television / telecommunication lines shall be 1.5 m. This distance may be reduced when the line is located 3 m deep.

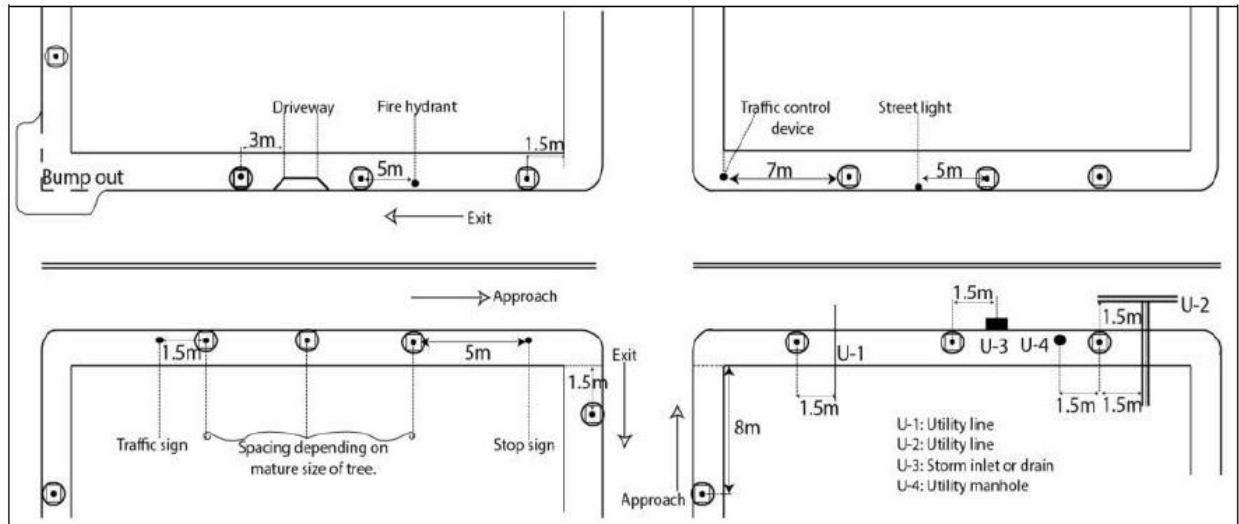
- e. The minimum horizontal distance between tree stem and a utility manhole shall be 1.5 m.
- f. The minimum horizontal distance between tree stem and a storm inlet or drain shall be 1.5 m.
- g. The minimum horizontal distance between tree stem and overhead electrical distribution / power lines shall be 3 m. Only small trees (not reaching the height of the utility line) may be planted closer to overhead electrical distribution / power lines. Their mature height should stay 1.5 m below the line. The minimum horizontal distance between tree stem and other overhead utility lines may be smaller.
- h. The minimum distance between tree stem and a traffic control device shall be 7 m.
- i. The minimum distance between tree stem and a stop sign shall be 5 m.
- j. The minimum distance between tree stem and other traffic signs shall be 1.5 m.
- k. The minimum distance between tree stem and a street light shall be 5 m.
- l. The minimum distance between tree stem and a fire hydrant shall be 3 m.
- m. The minimum distance between tree stem and a driveway

2.2.1.3 Planting spacing

- a. Street tree spacing shall be determined by the expected mature size of the tree. A tree should fit in the available growing space without major pruning since frequent pruning increases maintenance costs. Generally, trees should be planted with the following spacing:
 - small trees (< 7 m crown diameter at maturity) should be planted 6 m on center;
 - medium trees (5-11 m crown diameter at maturity) should be planted 8 m on center;
 - large trees (> 11 m crown diameter at maturity) should be planted 10 m on center.

- Wherever opportunities are available (e.g. within roundabouts), competent authorities should encourage planting trees in small groups.

Overview on clearance standards for tree location (☐):



b. Basin and root zone protection

- “The ability of a tree to grow beyond a certain size is directly related to the volume of soil available for roots; Providing sufficient rooting soil in a dense, urban environment can be costly, but is worthwhile given the unique benefits that mature trees provide; Tree roots do not survive well in highly compacted soil because it lacks the void spaces needed for air and water to circulate. Roots in compacted soil will migrate toward the surface for air and water, causing sidewalks to crack and heave; When the rooting space is severely constrained, the tree will decline and die” (City of Boston – 2013).
- The ‘tree basin’ (or ‘tree lawn space’, or ‘tree bed’) is the Green scape / Furnishing zone’s area removed for tree planting. Open tree basins allow for water and air to get to the tree roots. The size of the tree basin varies based on site opportunities and constraints. A larger tree basin allows more area for root growth, and provides increased storm water benefit.
- Competent authorities shall encourage tree basins larger than the following minimum standards so as to allow for greater tree health, increased water permeability (storm water management), and reduced sidewalk upheaval by tree roots.

- Planting medium volume should always be maximized. Larger basins and/or rectangular basins, where the dimension parallel to the curb is longer, are encouraged but shall be reviewed on a case by case basis.
- Where feasible (especially in medians), competent authorities should use connected tree basins instead of individual tree basins to increase root space and water permeability (storm water management).
- The size of a tree basin shall never reduce the minimum width of 1.3 m of a clear path of travel, i.e. for the Pedestrian / through zone.
- The absolute minimum tree basin dimension shall be 0.7 m * 0.7 m.
- A street tree should be planted in the center of the tree basin.
- Competent authorities should use structural soil for tree basins.
- In order to avoid compaction through people or cars a tree basin should have a clear demarcation, preferable of permeable material. An appropriate design for edging and demarcating the basin edges and planting zone are cobblestones or brick paving.
- Competent authorities shall protect in an efficient way the root zones of trees, considering the costs of the different options.

■ Annex C - Interview Questionnaires



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Landscape Architecture postgraduate program

THE ROLE OF PUBLIC SECTOR INSTITUTIONS ON SPACE ALLOCATION FOR STREET GREENERY IN ADDIS ABABA

Semi structured interview 1: For MUDH staff members

Main focus of the interview: **The National Urban Green Infrastructure Standard**

Personal background information

1. Respondent code: _____
 2. Gender: _____
 3. Educational Qualification: _____
 4. Specific work unit in the institution: _____
 5. Position: _____
 6. Work experience
 - 6.1. Total work experience: _____
 - 6.2. Work experience in the current position: _____
-

Part 1 – (Research question 2)

What is the level of Knowledge, Attitude and Practice among professional staffs of the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape?

7. What are street greeneries and how do you describe them? [K]
8. What are the benefits of street greenery? Please elaborate your answer by sharing some of your personal knowledge?
9. How do you rate the benefits of street greeneries to a city, its inhabitants and its environment? [A]

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

10. How do you rate Addis Ababa's street greenery development? [A]

Highly Developed	Developed	Average	Poorly Developed	Undeveloped

11. Please elaborate your reasons for the above question? [K]

12. Have you ever got involved in tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns? [P]

13. If yes, in what capacity? [P]

14. How do you compare the street greenery development of Addis Ababa with that of other Ethiopian regional cities like Bahir Dar, Dire Dawa and Hawassa? (applicable only if you have been to these cities) [A]

15. Can you suggest potential reasons for your answer of the above question? [K]

16. How do you rate the space allocated for greenery along the streets of Addis Ababa? [A]

Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate

17. Please elaborate your reasons for the above question? [K]

18. What do you think the roots causes are for the current state of Addis Ababa's street greenery space allocation? [A]

19. What do you think must be done to solve the root causes? [A]

20. Out of the tasks accomplished by your institution is the preparation of the National Urban Green Infrastructure Standard (from here after referred to as 'the standard') that was published in November 2015. Have you been directly involved in the standard's preparation? YES/NO [P]

21. If yes, in what role were you got involved? [P]

22. In what position were you during the time of the document's preparation? [P]

23. What was the motive to develop the standard? [K]

24. How do you rate the necessity of the standard for the development of the country's different urban green infrastructure? **[A]**

Highly Necessary	Necessary	Average	Less Necessary	Not Necessary

25. Please elaborate your reasons for the above question? **[K]**

26. Can you briefly describe how the preparation process of the standard was? **[K]**

Part 2 – (Research Question 3)

What is the level of inter-institutional involvement among the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape?

27. Did other institutions (both governmental and non-governmental) were involved during the preparation of the standard? YES/NO
28. If no, why not?
29. If yes, which institutions were involved during the preparation of the standard? (Please focus on the Rights of Way UGI element)
30. Please indicate their level of involvement from the scale of four and also elaborate the details? (Please focus on the Rights of Way UGI element)

Informed	Consulted	Took-Part	Empowered

31. Are there other institutions that were not involved in the preparation of the standard but you think their inputs were necessary? (Please focus on the Rights of Way UGI element)
32. Can you elaborate who they are and how their inputs will be necessary?
33. How do you rate the necessity of involvement in the preparation of the standard?

Highly Necessary	Necessary	Average	Less Necessary	Not Necessary

34. Please elaborate your reasons for the above question?
35. Generally speaking, do you consider the involvement level in the preparation of the standard enough? Yes/No
36. Please elaborate your reasons for the above question?

Part 3 – (Research Question 1)

What is the influence of the National Urban Green Infrastructure Standard (NUGIS) on the current professional practice of space allocation for street greenery on Addis Ababa's street design projects?

37. After the preparation of the standard is completed, what legal status did it acquire?
38. After the preparation of the national standard is completed, how was it publicized?
39. Do you consider the process to publicize the newly completed standard adequate enough? Yes/No
40. Please elaborate your reasons for the above question?
41. How do you rate the influence of the standard, particularly the section of UGI element 2 which is Rights of Way on the current development of Addis Ababa's inner city road design and construction?

Highly Influential	Influential	Average	Poorly Influential	Not Influential

42. Is there a mechanism to monitor the influence created by the standard?
43. Please elaborate your reasons for the above question?
44. What methods do you suggest to increase the influence of the standard on actual practice?

Closing questions

45. Who do you recommend from your institution who are best fitting to provide information for this interview question? **[Snowball]**
46. The interview is concluded. Do you have some final additional ideas to mention?
- 47.



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Addis Ababa University
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Landscape Architecture postgraduate program

THE ROLE OF PUBLIC SECTOR INSTITUTIONS ON SPACE ALLOCATION FOR STREET GREENERY IN ADDIS ABABA

Semi structured interview 2: For AACRA staff members

Main focus of the interview: **Space allocation for street greenery in AA's street design**

Personal background information

1. Respondent code: _____
2. Gender: _____
3. Educational Qualification: _____
4. Specific work unit in the institution : _____
5. Position: _____
6. Work experience
 - 6.1. Total work experience: _____
 - 6.2. Work experience in the current position: _____

Part 1 – (Research question 2)

What is the level of Knowledge, Attitude and Practice among professional staffs of the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape?

7. What are street greeneries and how do you define them? **[K]**
8. What are the benefits of street greenery? Please elaborate your answer by sharing some of your personal knowledge. **[K]**
9. How do you rate the benefits of street greeneries to a city, its inhabitants and its environment? **[A]**

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

10. How do you rate Addis Ababa's street greenery development? [A]

Highly Developed	Developed	Average	Poorly Developed	Undeveloped

11. Please elaborate your reasons for the above question? [K]

12. Have you ever got involved in tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns? [P]

13. If yes, in what capacity? [P]

14. How do you compare the street greenery development of Addis Ababa with that of other Ethiopian regional cities like Bahir Dar, Dire Dawa and Hawassa (applicable only if you have been to these cities)? [A]

15. Can you suggest potential reasons for your answer of the above question? [K]

16. How do you rate the space allocated for greenery along the street of Addis Ababa? [A]

Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate

17. Please elaborate your reasons for the above question? [K]

18. What do you think the roots causes are for the current state of Addis Ababa's street greenery space allocation? [A]

19. What do you think must be done to solve the root causes? [A]

20. Are the term Road and Street differ? If yes, how do you differentiate them? [K]

21. What are the standards AACRA follows for the design process of Addis Ababa's road? What is the most popular that is refereed? [K]

22. Is there a section in this popular standard that gives information and guidance about the space allocation for street greenery? [K]

Highly Sufficient	Sufficient	Average	Less Sufficient	Not Sufficient

23. How do you rate the sufficiency of the above sections in the standards for their purpose of giving information and guidance about the space allocation for street greenery? [A]

24. Please elaborate your reasons for the above question? [K]

Part 2 – (Research Question 3)

What is the level of inter-institutional involvement among the responsible institutions to the space allocation for street greenery on Addis Ababa's streetscape?

25. In addition to serve just as transportation corridors, streets support different infrastructures. How do you rate the necessity to involve the different responsible institutions for these infrastructures in the design process of the city's road projects?

Highly Necessary	Necessary	Average	Less Necessary	Not Necessary

26. Please elaborate your reasons for the above question?

27. What are these infrastructures installed along and supported by urban street.

28. Please indicate their level of involvement from the scale of four?

Informed	Consulted	Took-Part	Empowered

29. Please elaborate your reasons for the above question?

30. How about street greenery, do you consider it as infrastructure? Yes/No/ I do not know.

31. Please elaborate your reasons for the above question?

32. Do you know who is responsible for the development of street greenery in Addis Ababa?

33. In the overall design process of the city's streets, does the AA city Government River Basins and Green Areas Development and Administration Agency got involved? Yes/No/ I Don't know

34. If yes, please indicate its level of involvement form the scale of four?

Informed	Consulted	Took-Part	Empowered

35. Please elaborate your reasons for the above question?

36. If no, why not?

Part 3 – (Research Question 1)

What is the influence of the National Urban Green Infrastructure Standard (NUGIS) on the current professional practice of space allocation for street greenery on Addis Ababa's street design projects?

37. Do you know what urban green infrastructure is? Yes/No
38. If yes, please explain.
39. There is a national standard in titled 'The Ethiopian National Urban Green Infrastructure Standard' prepared and published three years ago in November 2015 by MUDH. This national standard has also a particular section for street greenery under the section of 'Rights of way'. What do you know about this standard?
40. If you use this standard, how do you rate the influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa?

Highly Influential	Influential	Average	Less Influential	Not Influential

41. Please elaborate your reasons for the above question?
42. How do you rate the benefit of having one national standard to guide the street greenery development on the city's road design?

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

43. Please elaborate your reasons for the above question?
44. How do you rate your willingness to abide by one national standard to guide the street greenery development on the city's road design?

Highly Willing	Willing	Average	Less Willing	Not Willing

45. Please elaborate your reasons for the above question?

Closing questions

46. The interview is concluded. Do you have some final additional ideas to mention?



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Landscape Architecture postgraduate program

THE ROLE OF PUBLIC SECTOR INSTITUTIONS ON SPACE ALLOCATION FOR STREET GREENERY IN ADDIS ABABA

Semi structured interview 3: For AACGPC staff members

Main focus of the interview: **Space allocation for street greenery in AA's master plan**

Personal background information

1. Respondent code: _____
2. Gender: _____
3. Educational Qualification: _____
4. Specific work unit in the institution : _____
5. Position: _____
6. Work experience
 - 6.1. Total work experience: _____
 - 6.2. Work experience in the current position: _____

Part 1 – (Research question 2)

What is the level of Knowledge, Attitude and Practice of the responsible bodies in regard to the process of space allocation for street greenery on the streets of Addis Ababa?

7. What are street greeneries and how do you define them? **[K]**
8. What are the benefits of street greenery? Please elaborate your answer by sharing some of your personal knowledge. **[K]**
9. How do you rate the benefits of street greeneries to a city, its inhabitants and its environment? **[A]**

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

10. How do you rate Addis Ababa's street greenery development? [A]

Highly Developed	Developed	Average	Poorly Developed	Undeveloped

11. Please elaborate your reasons for the above question? [K]

12. Have you ever got involved in tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns? [P]

13. If yes, in what capacity? [P]

14. How do you compare the street greenery development of Addis Ababa with that of other Ethiopian regional cities like Bahir Dar, Dire Dawa and Hawassa (applicable only if you have been to these cities)? [A]

15. Can you suggest potential reasons for your answer of the above question? [K]

16. How do you rate the space allocated for greenery along the street of Addis Ababa? [A]

Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate

17. Please elaborate your reasons for the above question? [K]

18. What do you think the roots causes are for the current state of Addis Ababa's street greenery space allocation? [A]

19. What do you think must be done to solve the root causes? [A]

20. Are the term Road and Street differ? If yes, how do you differentiate them? [K]

21. The width of Right-of-way is a fundamental parameter for the urban street design. In the case of Addis Ababa's streets, please explain the process of setting the width of Right-of-way for the city's street by elaborating, what the different categories are, who is entitled to set them and what criteria followed in the process? [K]

22. How do you rate the adequacy of the width of the Right-of –way set by AA's master plan for the different amenities to be supported by a typical well designed street? [A]

Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate

23. Please elaborate your reasons for the above question? **[K]**

24. Is there an area ratio set by AACGPC for greenery in the general context of the city and on the city's streets in particular? **[K]**

25. Are there standards prepared or followed by the AACGPC to be used to allocate green spaces in the general context of the city and on the city's streets in particular? **[K]**

26. How do you rate the sufficiency of the above standards for their purpose? **[A]**

Highly Sufficient	Sufficient	Average	Less Sufficient	Not Sufficient

27. Please elaborate your reasons for the above question? **[K]**

Part 2 – (Research Question 3)

What is the level of inter- institutional involvement among the responsible bodies in regard to the process of space allocation for street greenery on the streets of Addis Ababa?

28. Do you consider the preparation and/or revision of a master plan should be participatory and involve the relevant stakeholders? Please elaborate why?

29. How do you rate the necessity to involve the different relevant stakeholders in the process of preparation and/or revision of a master plan?

Highly Necessary	Necessary	Average	Less Necessary	Not Necessary

30. Please elaborate your reasons for the above question?

31. One of the scopes covered by a master plan is the street networks. Which stakeholders do participate during the preparation and/or revision of the Addis Ababa's master plan in regard to street networks?

32. Please indicate their level of involvement from the scale of four?

Informed	Consulted	Took-Part	Empowered

33. Please elaborate your reasons for the above question?

Part 3 – (Research Question 1)

What is the influence of the National Urban Green Infrastructure Standard (NUGIS) on the current professional practice of space allocation for street greenery on the street projects of Addis Ababa?

34. Do you know what urban green infrastructure is? Yes/No

35. If yes, please explain.

36. There is a national standard in titled 'The Ethiopian National Urban Green Infrastructure Standard' prepared and published three years ago in November 2015 by MUDH. This national standard has also a particular section for street greenery under the section of 'Rights of way'. What do you know about this standard?

37. If you use this standard, how do you rate the influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa?

Highly Influential	Influential	Average	Less Influential	Not Influential

38. Please elaborate your reasons for the above question?

39. How do you rate the benefit of having one national standard to guide the street greenery development on the city's road design?

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

40. Please elaborate your reasons for the above question?

41. How do you rate your willingness to abide by one national standard to guide the street greenery development on the city's road design?

Highly Willing	Willing	Average	Less Willing	Not Willing

42. Please elaborate your reasons for the above question?
-

Closing questions

43. Who do you recommend from your institution who is best fitting to provide information for this interview question? **[Snowball]**
44. The interview is concluded. Do you have some final additional ideas to mention?



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Landscape Architecture postgraduate program

THE ROLE OF PUBLIC SECTOR INSTITUTIONS ON SPACE ALLOCATION FOR STREET GREENERY IN ADDIS ABABA

Semi structured interview 4: For AACGRBGADAA staff members

Main focus of the interview: **Functionality of allocated spaces for street greenery**

Personal background information

1. Respondent code: _____
2. Gender: _____
3. Educational Qualification: _____
4. Specific work unit in the institution : _____
5. Position: _____
6. Work experience
 - 6.1. Total work experience: _____
 - 6.2. Work experience in the current position: _____

Part 1 – (Research question 2)

What is the level of Knowledge, Attitude and Practice of the responsible bodies in regard to the process of space allocation for street greenery on the streets of Addis Ababa?

7. What are street greeneries and how do you define them? **[K]**
8. What are the benefits of street greenery? Please elaborate your answer by sharing some of your personal knowledge. **[K]**
9. How do you rate the benefits of street greeneries to a city, its inhabitants and its environment? **[A]**

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

10. How do you rate Addis Ababa's street greenery development? **[A]**

Highly Developed	Developed	Average	Poorly Developed	Undeveloped

11. Please elaborate your reasons for the above question? **[K]**

12. Have you ever got involved in tasks or studies related to street greenery in Addis Ababa or other Ethiopian cities and towns? **[P]**

13. If yes, in what capacity? **[P]**

14. How do you compare the street greenery development of Addis Ababa with that of other Ethiopian regional cities like Bahir Dar, Dire Dawa and Hawassa (applicable only if you have been to these cities)? **[A]**

15. Can you suggest potential reasons for your answer of the above question? **[K]**

16. How do you rate the space allocated for greenery along the street of Addis Ababa? **[A]**

Highly Adequate	Adequate	Average	Poorly Adequate	Not Adequate

17. Please elaborate your reasons for the above question? **[K]**

18. What do you think the roots causes are for the current state of Addis Ababa's street greenery space allocation? **[A]**

19. What do you think must be done to solve the root causes? **[A]**

20. Are the term Road and Street differ? If yes, how do you differentiate them? **[K]**

21. Are there standards the AABPCDAA uses to develop green spaces along the city's streets? **[K]**

22. How do you rate the sufficiency of the above standards for their purpose? **[A]**

Highly Sufficient	Sufficient	Average	Less Sufficient	Not Sufficient

23. Please elaborate your reasons for the above question? **[K]**

Part 2 – (Research Question 3)

What is the level of inter-institutional involvement among the responsible bodies in regard to the process of space allocation for street greenery on the streets of Addis Ababa?

24. The development and utilization of urban streets involves different stake holders. How do you rate the necessity to involve the different stakeholders in the development and utilization of urban streets?

Highly Necessary	Necessary	Average	Less Necessary	Not Necessary

25. Please elaborate your reasons for the above question?
26. The development and maintenance of Addis Ababa's street greenery is the responsibility of the AACGRBGADAA. Which institutions does this office allow to get involved while accomplishing its responsibilities?
27. Please indicate their level of involvement from the scale of four?

Informed	Consulted	Took-Part	Empowered

28. Please elaborate your reasons for the above question?
29. Space allocation is the fundamental first step for the development of street greenery development. Does AACGRBGADAA got involved in the space allocation decision making with AACRA and AACGPC?
30. Please indicate the level of involvement from the scale of four?

Informed	Consulted	Took-Part	Empowered

31. Please elaborate your reasons for the above question?

Part 3 – (Research Question 1)

What is the influence of the National Urban Green Infrastructure Standard (NUGIS) on the current professional practice of space allocation for street greenery on the street projects of Addis Ababa?

32. Do you know what urban green infrastructure is? Yes/No

33. If yes, please explain.

34. There is a national standard in titled 'The Ethiopian National Urban Green Infrastructure Standard' prepared and published three years ago in November 2015 by MUDH. This national standard has also a particular section for street greenery under the section of 'Rights of way'. What do you know about this standard?

35. If you use this standard, how do you rate the influence of NUGIS on the current practice of space allocation for street greenery on the streets of Addis Ababa?

Highly Influential	Influential	Average	Less Influential	Not Influential

36. Please elaborate your reasons for the above question?

37. How do you rate the benefit of having one national standard to guide the street greenery development on the city's road design?

Highly Beneficial	Beneficial	Average	Less Beneficial	Not Beneficial

38. Please elaborate your reasons for the above question?

39. How do you rate your willingness to abide by one national standard to guide the street greenery development on the city's road design?

Highly Willing	Willing	Average	Less Willing	Not Willing

40. Please elaborate your reasons for the above question?

Closing questions

41. Who do you recommend from your institution who are best fitting to provide information for this interview question? **[Snowball]**
42. The interview is concluded. Do you have some final additional ideas to mention?