



**ADDIS ABABA UNIVERSITY**  
**COLLEGE OF DEVELOPMENT STUDIES**  
**CENTER FOR ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

***ASSESSING THE INFLUENCE OF INFORMAL SETTLEMENT ON THE  
URBAN FOREST COVERAGE OF YEKA SUB CITY, ADDIS ABABA***

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*A thesis submitted to the Center for Environment and Sustainable Development, Addis Ababa  
University in partial fulfillment of the requirements for the degree of Master of Art in  
Environment and Sustainable Development*

**June 2023**

**Addis Ababa**

**Ethiopia**



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I am certifying that the thesis prepared by *Mr.MENBERELEUL MATHEWOS*, entitled “*Assessing the influence of Informal Settlement on Urban Forest Coverage of yeka sub city, Addis Ababa*”, complies with all of the university's requirements and a high standard of originality and quality in fulfillment of the Master of Art in Environment and Sustainable Development requirements.

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## **ABSTRACT**

*The principal aims of this study was to assess the influence of informal settlement on the urban forestry of Yeka sub city in case of Ankorcha site. Mixed research approach was utilized. Both probability-based and non-biased sampling methods were used. Questionnaires, interviews, and observational methods were employed to gather data. The data were collected from both primary and secondary data sources. In this study the Researcher were able to determine causes and consequence of informal settlement and its influence on forest degradation. The method of data analysis used were descriptive statistics and inferential statistics using SPSS 26. Forest degradation was assessed using Object Based Image Analysis (OBIA) from Land Sat 8 satellite images. In addition, to analyze the trend of forest degradation and the extent of LULC change Geographical Information System software (GIS 10.7) was used. In the last two years interval (2020-2022), forest change was 767 hectares of forest land became degraded. In the year 2020, about 1,749 hectares of land were occupied by built-up area, this number has highly increased to 3,905 in the year 2022. That means the built-up area was increased by about 2156 hectares of land between two years This implies that about 767 hectares of land were changed from forest coverage to Bare land and built-up area. The person correlation coefficient was used to analyze the relation between the root causes of informal settlement and forest degradation. As a result of this study the main causes of the informal settlement were the increasing cost of house rent in urban areas had a strong significance correlation by .947 at  $p = .000$ , Poor land management .947\*\* at  $p=000$ , delay of affordable house provision for the low-income group by .447\*\* at  $p=000$ , urban expansion by .447\*\*at  $p=000$ , and rural to urban migration by .418\*\* at  $p=000$ , had a moderately significant influence on the expansion of informal settlements. Influence of informal settlement had a moderate correlation with forest degradation and land use land cover change was moderately influenced by the expansion of informal settlement in the study area with person correlation coefficient by .314\*\* and .322\*\* at  $p$ -value = .000 in Ankorcha of Yeka sub city respectively. In this study, the expansion of informal settlements was the major cause of forest degradation. The study also showed that delays in affordable housing and increase in house rent had highly enforced people to construct informal settlements in the area of forest coverage. The controlling strategies of informal settlement and forest degradation were community awareness, Urban land supply, availability and affordability of urban housing, and developing and implementing a modern cadastral information system were the key and major controlling strategies of informal settlement and forest degradation respectively.*

**Key terms; Informal settlement, forest coverage, Forest degradation, yeka sub-city, Ankorcha**

## **LIST OF ACRONYMS /ABBREVIATIONS/**

<b>AACPPO</b>	Addis Ababa City Plan Preparation Program Office
<b>AACSP</b>	Addis Ababa City Structural Plan
<b>AADIPO</b>	Addis Ababa Development and Improvement Project office
<b>CBD</b>	Central Business District
<b>CSA</b>	Central Statics Agency
<b>ECLAC</b>	Economic Commission for Latin America and the Caribbean
<b>GPS</b>	Geographical Information System
<b>IS</b>	Informal settlement
<b>LULC</b>	Land Use Land Cover
<b>MoUDC</b>	Ministry of Urban Development and Construction of Ethiopia
<b>MPI</b>	Global Multidimensional Poverty Index
<b>ORAAMP</b>	Office of For the Revision of Addis Ababa Master Plan
<b>PCC</b>	Post-Classification Comparison
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>TWCs</b>	Thrust master Weapon Control System
<b>UM</b>	University of Minnesota
<b>UNCHS</b>	United National Center for Human settlements
<b>USGS</b>	United States Geological Survey

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## **ACKNOWLEDGMENTS**

First and foremost, I would like to thank the Almighty God Jesus Christ, the Son of Virgin Mary, for the tremendous strength, courage and patience to withstand the inconvenience, which I came across through all the process of education and this paper.

Next, my especial gratitude goes to my adviser Dr. Engidawork Assefa for his critical and helpful comments, assistance and continuous encouragement to complete this task effectively. Next, I want to express my sincere gratitude to the Addis Ababa University College of Development studies lecturers.

And also, I would like to say thank you for my parent, lovely wife misses Mekdes Doyiso, friends, brother and sister for their moral, spiritual and financial encouragement.

I would like to thanks Ankorcha area informal settlers in particular for taking the time to meet with me and give information about any circumstances of the study area. Similar organizations include yeka sub-city right creation office, code of enforcement and planning office, Environmental Conservation and Green Development Bureau, Land Registration and Development Bureau for their joy full devotion in providing free time for running research, relevant data, collecting data from the sample area.

Finally, I would also like to pass my deepest gratitude for the research for Addis Ababa University Regional and local developmental study department of urban land administration and management for giving me the opportunity to conduct this research.

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# CHAPTER ONE

## 1. INTRODUCTION

### 1.1. Background of the Study

Globally, socioeconomic activities carried out by those residing in informal settlements, which are connected to urban cities and affect the deterioration of forest ecosystem services, have an impact on environmental management in informal settlements (Mutiganda 2020). With the increase in urban populations comes a global phenomenon known as the rise of slums, informal settlements, and impoverished residential areas (Devi *et al.*, 2017).

The informal settlement is a common attribute of urbanization and urban settlement patterns in the developing world (Gottdiener *et al.*, 2018). In 2018, around 55% of the world's population lived in cities, this is expected to rise to more than two-thirds by 2050 (UN 2021). The total population of informal dwellers across the world is estimated to reach 3 billion by 2030 (Daniel 2015). According to UN- Habitat's (2010) global slum assessment, 828 million people, or 33% of the urban population in developing nations, live in slums. The urban population is expected to grow by 84% by 2050, from 3.4 billion in 2009 to 6.3 billion by 2050 (Brunn *et al.*, 2012).

The world has experienced rapid urbanization in the 20<sup>th</sup> and 21<sup>st</sup> centuries (Mossamamam *et al.*, 2017). Yet, the urbanization process has failed to be consistent with the demands of increasing urban dwellers particularly in areas of access to job opportunities; housing; infrastructure and services (WB 2013 as cited in Shibru 2018). Land conversion reduced land cover of green vegetation that turns into a built-up area. This shows that, there is a negative relationship between built-up area and vegetation coverage (Sejati *et al.*, 2018).

The growth of urban drives deforestation or clearance of forests at least in two cases. Firstly, urban areas by their nature are pulling factors in attracting rural residents into cities. That means rural people leave their permanent settlement and make their final destination in cities. A second factor related to urban growth to deforestation is that cities are horizontally expanding into farmland areas and natural habitats including forests (Kassaw and Tilaye 2022). Additionally, deforestation and forest degradation reduce the provision of ecosystem goods and services from forests, especially in developing countries (Duguma *et al.*, 2019).

African countries are facing serious situations of informal settlements; about 70 percent of the African population is living in informal settlements (Emma porio *et al.*, 2018). Tanzania has one of the highest informal urbanization rates in sub-Saharan Africa, followed by Mozambique and Ethiopia (Shubira and Daniel 2018). This has led to the development of informal settlements in the urban environment (Peters and Jake's 2018).

In the past 50 to 100 years, deforestation has accelerated dramatically in developing nations, particularly in Africa (Othow *et al.*, 2017). Most significantly, the loss of forestland causes habitat disruption and land degradation, which occasionally lower soil productivity and water availability (Danano *et al.*, 2018). For instance, a study done in Ethiopia's central rift valley reveals that a sustained loss of forest and woodland cover results in a rise in temperature (Muluneh *et al.*, 2017).

Forests are important sources of livelihood for millions of people and contribute to the national economic development of many countries in the world (Othow *et al.*, 2017). Additionally, the forest provides an income source by attracting visitors, serving as recreational facilities, preventing silting of lakes and dams, and cleaning, regulating, and distributing water. Forests also used for construction as well as for tools, furniture, fuel, medicine, grass, and herbage, for forage and provide edible fruits (Langat *et al.*, 2016). Forest stores a greater amount of carbon dioxide to reduce global warming, give off oxygen and renewing the atmosphere (Balitta *et al.*, 2017).

In Ethiopia, such studies have been done so far to investigate land use/land cover and forest covers issues (Solomon *et al.*, 2018). In addition, According to Abagissa (2019) physical expansion has been rapid in Addis Ababa. These trends were partly influenced by spontaneous growth, which has resulted in the emergence and development of informal settlements. In Addis Ababa, the number and size of informal settlements have been increasing over time as new houses are built in existing informal settlements and unoccupied areas (Abagissa 2019). According to Alemayehu (2008) informal settlement of Addis Ababa can categorize into three types: (1) non-planned old inner-city settlements, dominated by kebele housing and occupied by tenants with some tenure rights. (2) Informal peripheral squatter settlements, built on vacant land with little or no infrastructure and with uncertain or no tenure rights (AACPPPO 2021). (3) Inner-city squatters with no tenure rights. Therefore, due to the seriousness of the challenges, this study focuses on assessing the influence of informal settlement on the loss of urban forest coverage of yeka-sub city Addis Ababa.

The largest percentage of the identified forest coverage of Addis Ababa city was accounted for by the Yeka sub-city (42.37%) followed by the Gulele sub-city (28.45%) (Desta *et al.*, 2015). The study conducted by Kassaw and Tilaye (2022) focused on mapping plantation forests in the upper catchment of Addis Ababa city, their study focused on the northern part of Addis Ababa which includes Yeka, Gulele, Kolfikeranyo, Akaki-kality, and Bole. However, these studies were not comprehensive enough in scope and not focused on the specific influence of informal settlement on urban forests. Therefore, this study was conducted in the Yeka sub-city, one of the 11th sub-cities of Addis Ababa.

Yeka sub-city is one of Addis Ababa's eleventh sub-cities, which signifies that its rate of urbanization is higher. The number of people living in this sub-city is growing at alarming rate on the peripheral sites of the sub-city, and the built area is expanding through formal and informal settlement and land purchase. Land conversion reduced land cover of green vegetation that turns into a built-up area. This shows that, there is a negative relationship between built-up and vegetation (Sejati *et al.*, 2018). Therefore, this assessment includes influence of informal settlement on urban forest, causes and consequence of informal settlement, assessing the extent of influence of informal settlement expansion on urban forest degradation in the study area.

## **1.2. Research Question**

1. What are the main causes and consequences of informal settlements in Yeka sub-city?
2. How much forest land has been changed and influenced by informal settlements in Yeka sub-city?
3. How are informal settlements and forest degradation reduced?

## **1.3. Statements of the Problem**

In developing countries like Ethiopia governments cannot satisfy the basic needs of all citizens. Thus, people choose another option or ways to fulfill their interest in housing. In recent years the demand for housing in Ethiopian cities including Addis Ababa increased as a result of many factors. These factors cause the expansion of informal settlement (Dessalegne 2019). Informal settlements are built without the consensus of the city administration and without having building authorization offered by the city administration (Alene 2022). According to studies, informal

settlements in developing nations should be especially concerned about deforestation, inadequate sanitation, and a lack of sewage and clean water (Devi *et al.*, 2017).

As one of the cities in the developing countries, Addis Ababa has experienced a rapid rate of expansion. Even though, informal settlement in Addis Ababa is illegal or not permitted by the city Administration or the sub-cities, in peripheral areas of the cities people choose as the only option to own land for housing purposes. In the former case, massive population movement to the area lessens the complicated challenges that Addis Ababa city is facing. This is also highly seen in the Yeka sub-city of peripheral areas and people can easily buy land parcels at low prices compared to legal ones from local farmers, brokers, and speculators. This situation has aggravated the unplanned and rapid horizontal expansion led to increasing costs in terms of infrastructure and degradation of the environment.

The expansion of Addis Ababa was followed by slums, informal settlements, loss of agricultural land, deforestation, and less environmental and river buffer protection. In Addis Ababa, Informal settlements are seen on hillsides, green space land, parks, and roadsides, on the urban peripherals, and even on valuable land in the cities' centers; this increment of an informal settlement in Addis Ababa city led to the deterioration of urban forest coverage and aesthetic value of the city (Abagissa 2019). Consequently, numerous public and private workers intend to live in peripheral areas of Addis Ababa including the yeka sub-city for the sake of benefiting from low housing costs and a simple living style. In the latter case, converting ecologically sensitive landscapes such as wetlands, grasslands and vegetation to settlements has huge environmental costs and will not be sustainable.

The study investigated by Kelemu (2016) stated that the weakness of the legal land provision and high housing rents in the city's center are the main causes of squatting in the city. The lack of a comprehensive legal response to the issue of squatting, the government's lack of focus on controlling open spaces, the code enforcement officer's (Denb Maskeber in Amharic) limited ability to regulate the construction of informal settlements, and the practice of land sales by land speculators as a means of profit are additional factors mentioned by those government officials that have contributed to the emergence and proliferation of informal settlements. As stated by Yeka sub city urban land Development and management office informal settlement is the problem of the sub-city and this mostly seen in peripheral areas of the sub-city and in the sub-city informal

settlement is still the problem of urban land Administration in peripheral areas of the sub-city (Yeka sub-city ULDM 2017).

As mentioned in the above findings, spatial extent change and driving forces for the informal settlement growth and its implication on the forest coverage of the sub-city are not well studied and identified. Therefore, this study is conducted in the yeka sub-city, one of the 11<sup>th</sup> sub-cities of Addis Ababa. The assessment includes; Analysis of forest coverage status, evaluate the extent of influence of informal settlement expansion on forest land degradation, identify the causes and consequences of forest degradation, explore the environmental implication of forest degradation, and intervention measures to reduce the influence of informal settlement and forest degradation in the study area.

#### **1.4. General Objective of the study**

The general objective of this study was to assess the influence of informal settlement on the urban forestry on Ankorchha of yeka sub city.

##### **Specific objectives were**

1. To assess causes and consequence of informal settlement in Ankorchha of yeka sub city
2. To identify the main influence of informal settlement on the urban forest coverage and trends of forest degradation in Ankorchha yeka sub city.
3. To assess informal settler opinion on the intervention measures of forest degradation

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

In Ethiopia, different studies have investigated the cause and consequences of informal settlements, but there is little and no well-addressed on the factors for informal settlement expansion and its influence on urban forestry. This study may provide insight into the factors contributing to informal settlement expansion and its influence on the urban forest area of Addis Ababa. Second, it may also be important in formulating administration policies and strategies on land management, forest conservation, and preservation measures at the city level. Third, it may contribute to the creation of awareness for the community on the influence of informal settlement on forest coverage and baseline information for further work who would like to conduct detailed and comprehensive studies in Addis Ababa town. Finally, it is believed that the findings of this

study used as input for the implementation and renovative land management planning of the city. Again, this study put baseline information for further work who would like to conduct detailed and comprehensive studies in the same title and the study was part of the master of Arts Degree program on Development studies with a specialization on Environment and sustainable development.

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

The scope of this study was specific that entitled assessing the influence of informal settlements on urban forestry does not consider all sub city. The study was focused on the one sub city which have unprecedented expansion of informal settlement on the area of forest coverage. Therefore, this study was conduct by selecting Ankorchha of yeka sub-city Administration. Following three objectives used as follows; to assess causes and consequence of informal settlement in Ankorchha of yeka sub city. to identify influence of informal settlement on LULC of forest coverage and trends of forest degradation in Ankorchha of yeka sub city and to assess informal settler opinion on the intervention measures of forest degradation of the study area.

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

The first limitation of this study was the inability to include all sub-cities of Addis Ababa city which have an expansion of informal settlement. The Second limitation of this study derived when collecting data from the respondents, who thought that the information collected, they considered the researchers as the government bodies that collected the information to evict and demolish them from the informal settlement area. This is, however, overcome by assuring them that the research is purely academic and that the information they provided was not being used against them.

In Addition to that, it is thought to the current political instability in Ethiopia was a challenge in gathering information and the study population were afraid to give accurate and relevant information. Despite the explanation given to them about the usefulness of the study, the willingness of selected households to give reliable information and participate in the survey is also another difficulty. In general, since no such kind of study has been conducted so far in the sub-city, the lack of references, and baseline data on informal settlements were also the major problems. Finally, lack of time series high-resolution satellite data and a lack of historical forest

degradation data. Forest inventory data with also unavailable at local and national levels and financial facilities were the major.

## **Operational definition**

- **Informal settlement:** unplanned settlements and areas where housing is not in compliance with current planning and building regulations (UN-HABITAT 2003)
- **Informal settlers:** households in squatter housing, or housing which has no title to the land on which it stands, and who pay no rents
- **Yeka sub-city:** it is one the sub-city of Addis Ababa and composed of a number of Woredas.
- **Wereda:** Administrative stricture next to the sub-city and composed of number of Blocks.
- **Right creation /Meht Feteral,** houses built illegally will be legalized
- **Law enforcement /Denb Askebare/:** - is either an office or a group of law enforcement officers who room around settlement to ensure that buildings are constructed in accordance with the preventing rules and regulations.

## CHAPTER TWO

### 2. REVIEW OF LITERATURE

#### 2.1. Definition of Informal settlement and Urban Forestry

##### **Informal settlement**

The definitions used to describe informal settlements vary from country to country. Informal/squatter settlements generally are “units of irregular, low-cost dwellings, usually on lands belonging to third parties, and most often located in the periphery of the cities” (UNCHS 1996 cited in Philimon 2019). As squatters do not possess the formal right to occupy land, the informal settlement is an illegal one (Soyinka and Siu 2018). The informal settlement is “uncontrolled mass urbanization” (Lejano and Bianco 2018). Different naming includes spontaneous, irregular, unplanned, squatter, illegal, marginal, unauthorized, and informal settlements (Jemal 2019).

Informal settlements defined as 1) the residents have no security of tenure over their land and dwellings, which can vary from squatting to informal rental housing, 2) the neighborhoods usually lack, or are cut off from, basic services and city infrastructure and 3) In addition to not complying with current planning and building regulations, the housing is often located in geographically and environmentally hazardous areas (UN-Habitat 2003). Informal land settlement is a social, political, and economic growing problem in Ethiopia. Informal land settlement is usually referred to residential areas where a group of housing units has been constructed on land to which the occupants have no legal claim, or which they occupy illegally.

The United Nations has defined "informal settlements" as i) residential areas where a group of housing units has been built on land to which the occupants have no legal claim, or (ii) unplanned settlements where housing is not in compliance with current planning and building regulations, unauthorized housing (UNSDS 2015). Globally, informal urban settlement is becoming a predominant shelter setting for poor urban communities in the 20th century (Matamanda 2019). Specifically, in the Global South (Africa, Asia, and Latin America), because of the rapid growth of urbanization, formal urban sectors cannot meet the growing needs of housing or shelter for urban poor communities (Zhang et al., 2020).

The rise of the urban poor is caused by a high migration rate from rural to urban areas in search of job opportunities and better living conditions and natural population growth. According to Castille (2018), migration to cities is due to several factors that differ from country to country. Land use in urban areas is regulated through site planning. Planning determines what should take place and where (Madanipour 2017). Spatial planning (physical planning) mainly aims at the economic use of land, orderly settlements, and permanent safeguarding and maintenance of the physical environment. Spatial planning covers all activities of man in its spatial aspect (Needham 2018).

## **Urban forestry**

The urban forest is a network of all woodlands, groups of trees, and individual trees located in urban and peri-urban areas (Sabatier 1998 cited in Bosana *et al.*, 2023) that provide ecosystem services. Humans gain from the urban forest in terms of societal, economic, and ecological factors. The ecosystem's function and services are among the urban forest's ecological advantages. It contributes toward landscape connectivity through corridors, networks, and patches which form a nested spatial hierarchy to conserve biodiversity and climate change mitigation (Barona *et al.*, 2020).

Urban forestry is defined here as the planned, integrated, and systematic approach to managing urban and peri-urban forests for their contribution to the economic, environmental, sociological, and psychological well-being of urban society. According to the MEFCC (2018), a forest is any region in Ethiopia where there are trees (both natural and planted, including bamboo) that reach a mature height of more than 2 meters, have a canopy cover of more than 20%, and are at least 20 meters wide.

Urban forestry is sometimes used synonymously with urban greening. However, urban greening is a newer concept and field of study than urban forestry that includes urban agriculture, permaculture, and urban forestry, and incorporates street trees, parks or urban open spaces, trees at homes, nurseries, green corridors, and community, and residential food gardens. Land use in urban areas is regulated through site planning. Planning determines what should take place and where (Madanipour 2017). Spatial planning (physical planning) mainly aims at the economic use of land, orderly settlements, and permanent safeguarding and maintenance of the physical environment. Spatial planning covers all activities of man in its spatial aspect (Needham 2018). In

the context of Addis Ababa (AACPPO 2019) describes forests as a network of multi-purpose green spaces that provide ecosystem functions. Urban forests are defined as woodlands located in urban areas for the purposes of this research.

## **2.2. Empirical Review**

### **2.2.1. Informal Settlement Expansion at Global Level**

Urbanization is a social process that has played a significant role in determining the shape of the urban built environment (UN-Habitat 2020; UN 2019). In 2018, 55.2% of the global population lives in urban areas (UN-Habitat 2020). In recent centuries, rapid urbanization has been experienced in most developing countries. In this sense, in developing countries, urbanization has been a result of industrialization associated with economic advancement. However, in the global south countries particularly in Africa and Latin American countries, urbanization has resulted in frequent rural-urban migration and high natural population increase (Akiros 2021). In 2019, one billion (16.67%) of the world's six billion people have become squatters. In the world, one billion people are existing in squatter settlements, 61% were in Asia, and 30% up to 85% of sub-Saharan Africa's urban population are living in squatter housings (Deeyah *et al.*, 2021).

The study by Lengoiboni and Zevenbergen (2021) stated that most cities in the global south are expanding horizontally than vertically, and the ever-increasing population is moving to unplanned settlements in the peripheral at the expense of agricultural land and areas of natural beauty. Thus, such unplanned settlements have created new peripheral spaces on the edges of urban territories commonly known as informal settlements. Informal settlements are dense and unplanned settlements with irregular shapes of settlements pattern comprising communities house that are self-constructed and without formal land tenure (Akiros 2021).

Informal settlements have been standard practice in developing countries over the last decade, and are often viewed as the result of an enforced demand for shelter by urban poor groups (Matamanda 2019). Furthermore, in some developing countries, including Ethiopia, informal urban settlements have emerged and expanded not only as a result of a lack of urban housing for the poor, but also as a type of business option for some people, particularly brokers or dealers and high-income groups (Akiros 2021 and Gebere Selassie 2019). This shows the predictable increment of the world's squatter population. The prime reason of increasing squatter settlers is the incapability to

afford any housing and the independence from rent and public responsibilities. A preliminary character in informal settlement is irregular, inaccessible, prepared from poor-quality materials like plastic, firewood, mud, grasses, and corrugated metal sheet (Bikis 2022).

However, metropolises or conurbations with poor access to fundamental facilities, for instance, clean water, hygiene, electricity, waste disposal, and drainage control are usually blocked and have low quality of housing and uncertain capital privileges. The geographical breakdown of the housing market and the emergence of squatter settlements are typical of metropolitan centers in developing countries (Ogas-Mendez and Isoda 2021). According to Mohammed, Muhammad (2006) and Begna (2017) explained that the key problem in most nations is that of delivering a sufficient number of houses with a good standard that is preferred. City administrators must work with the informal sector to improve the well-being of informal settlements in relation to exposure to problems. Thus, direct and indirect prices to the urban poor would be involved to accurately mirror and solve the range of impacts on the most exposed settlement in particular and the city in general (Jean-Baptiste et al., 2018).

### **2.2.2. Development of Informal Settlement in Ethiopia**

In most of developing countries the cause for expansion of informal settlements and the consequences are more or less similar, it is characterized by weak land Administration system, inequitable allocation of resources among citizen in within one country, inability of the government to minimize unemployment rate from time to time, expansion of corruption and so on. The above problems can results citizen live in poverty, crime, low living condition and this affects the sustainable developments one of the countries. Literatures show different causes for the creation of informal settlement although the consequences are more or less similar. It is true that informal settlements occur when the current land administration and planning system fails to address the needs of the whole community.

The essential variables that lead to the creation of informal settlements are inextricably linked to several important interconnected changes: Poverty; rapid urbanization and the flow of people into cities; war, natural disasters, and earthquakes leading to the massive movement of people to places of opportunity and safety; Ineffective Housing Policies; this was a critical problem of developing countries including Ethiopia, inefficient public administration, inappropriate planning and inadequate land administration tools (Gebreselase 2019). There are fast urbanization and unequal

development of cities in Ethiopia with numerous physical, social, financial, and environmental consequences. The city is growing in an organic traditional urbanization pattern (Steel *et al.*, 2017). One of the unfavorable impacts of unplanned urbanization is discrimination against poor people and the development of informal settlements (Mohanty 2019). Ethiopia is currently under stress due to increasing urbanization and rising urban housing demand (Koroso *et al.*, 2021).

In general, Ethiopian cities have a high proportion of substandard housing stock and a limited affordable formal rental market (Matsumoto and Crook 2021). For this reason, in many urban centers of Ethiopia informal marketing of land plots and grabbing open public land from the periphery for the construction of residential houses considered as a solution for the housing problem of the communities. Governments around the world grapple with fiscal deficits and therefore promote and subsidize industrial sectors that can revitalize the economy. In addition, governments have implemented policies to provide housing for the urban poor but their efforts have proved futile.

Several governments have pursued anti-urbanization measures, according to Housing the Urban Poor. They have evicted residents from informal communities, destroyed their homes, and relocated them to the countryside. These strategies are ineffective in stemming the flow of urban migration. Rapid urbanization and influx of people into urban areas is another major cause of informal settlements. Rapid industrialization and urbanization have brought an increase in the number of people living in urban areas (JETEMS 2015).

### **2.2.3. Development of Informal Settlement in Addis Ababa**

Addis Ababa's population is estimated to reach about 3,434,000 Central Statistical Agency (CSA 2017). The Ministry of Works and Urban Development estimate that 70% of the people in Addis Ababa presently up to date 2020 live in informal settlement and informal urbanization. In informal construction, the buildings are low, with highland intensity (Vernon-Henderson *et al.*, 2020).

In the last decade, informal settlements are common practices in developing countries and are typically considered the product of an enforced need for shelter by the urban poor communities (Matamanda 2019). Moreover, in some developing countries including Ethiopia, informal urban settlement is not only the result of a lack of urban houses for the poor but also it is emerged and expanded as a sort of business option for some groups of people, especially for brokers or dealers

and high-income groups (Akirso 2021; Gebre Selassie 2019). According to Misgana Secho *et al.*, (2019) report that informal settlement in the periphery has expanded from 29% in 1997 to 37% in 2007, and 41% in 2017.

Informal settlements and informal urbanization are built without the consensus of the city administration and without having building authorization offered by the city administration (Ioannidis *et al.*, 2009; Alene 2022). The expansion of Addis Ababa was followed by slums, informal settlements, loss of agricultural land, deforestation, and less environmental and river buffer protection. The housing shortage, rapid urban growth, and has been evicted from different places resulted in squatter settlements and informal urbanization. This has become a change in economic, social, and environmental aspects especially in infrastructure provision, social services distribution and deteriorated houses, and health risks to residents in the city (Steel *et al.*, 2017; Habtamu 2021).

In Addis Ababa, this informal settlement is called the “*chereka bet.*” Squatter settlement, the word *chereka bet* in its precise translation, denotes “house of the moon” indicating that the unlawful building of houses is completed at dark night. According to Endecela (2020) Addis Ababa City, urban development policy and housing development programs have focused more on investment and manufacturing industry development, but the policy has given less attention to low-income housing, land purchase, land lease, and land speculation issues. Many informal settlements are being built, and then the concerned body has demolished their homes rather than providing sustainable solutions and management. Several studies have been undertaken on the consequences of informal settlement and informal urbanization, which are frequent in developing countries and provide a problem (Roberts and Okanya 2018; Misgana Secho *et al.*, 2019).

### **2.3. Causes of Informal Settlement**

Although the causes for the formation of informal settlements vary, the outcomes are generally similar. It is true that informal settlements occur when the current land administration and planning system fails to address the needs of the whole community. When the system fails to address social housing needs, then people use their own paths in settling on somebody else’s land (Gebreselasse 2019). According to Gebreselasse (2019), the fundamental causes enabling the establishment of informal settlements are significantly tied to many major interconnected changes: poverty; quick urbanization and the influx of people into urban areas; war, natural disasters, and earthquakes

leading to the massive movement of people to places of opportunity and safety. Ineffective Housing Policies; this was a critical problem of developing countries including Ethiopia, inefficient public administration, inappropriate planning, and inadequate land administration tools.

The study conducted by Zerihun (2019) various studies have shown that the magnitude of Informal settlements in different countries is considerable and huge today. They have become the fastest-growing type of human settlements in developing countries. Their growth is closely linked to the rapid urbanization that has been taking place in most developing countries over the past three decades. The breakdown in the system of delivering land to the urban poor, which makes it legally accessible often aggravates the problem on one hand. On the other hand, in former socialist countries where there is no land market the origin of illegal statements is not due to market rather than government failure and public inefficiency in land management (Zerihun 2019).

### **Urbanization and Rural-Urban Migration of people**

The population dynamics and ever-increasing urban population pressure complemented by the low income of the people, both the original residents (the urban poor) and immigrants can be taken as the key reasons for the emergence of informal settlements (Debela 2021). Due to the success or failure of internal migration, many people living in the cities of developing countries, have no benefit from the amenities, dwellings, services, and economic opportunities. As cities grow the number of people unable to afford a legal house will increase (Abagissa 2019). According to AERUS in Philimon (2019), there is a strong correlation between informal settlements and poverty. Urbanization is one of the most pressing issues of the twenty-first century, with 68% of the world's population expected to live in cities by 2050 (Parikh *et al.*, 2020).

Rapid urbanization and a lack of ability to meet the housing needs of residents in developing-world cities have contributed to the growth of informal settlements (Akirso 2021). Controlling and controlling the growth of informal settlements in the peri-urban area necessitates an integrated and thorough understanding of the informal settlements process, particularly its driving elements. Previous research has found that no single cause accounts for the global spread of informal settlements (Abebe *et al.*, 2019; Diab El Shaarawy and Yousry 2020).

Several issues, including weak planning laws and regulatory standards, population expansion, excessive property prices, and the government's failure to provide services, are driving forces for

the formation of informal settlements, especially in the cities of the global south (Meshkini *et al.*, 2015; Msuya, Mosha, and Mtili 2017; Weber and Mendelsohn 2017). Moreover, rising corruption, poverty, rapid urbanization, and strict government policies for housing development also cause the development of these kinds of settlements (Matamanda 2019 and Wondimu 2021). In some instances, income insecurity may also be a means to the expansion of informal settlements where the government fails to provide affordable housing to the urban poor communities. This forced them to inhabit illegal land in peri-urban locations where essential infrastructure was inaccessible (Fouad and Abbas 2021).

According to UN-HABITAT (2011) and Philemon (2019), the main reasons for the emergence and growth of squatter settlements and slums are (i) "governments' inability to create equal and efficient land allocation"; (ii) "the inability of low-income groups of urban dwellers to afford the acquisition of land"; and (iii) "sluggish bureaucratic processes of acquiring land." In most developing nations, informal settlement problems are directly linked to a lack of political will, failed policies, ineffective regulatory frameworks, poor urban governance, and corruption (Shibru 2018).

In addition, the causes of the growth of informal settlements are identified as unrealistic urban planning, high (unattainable) building standards for the majority of people, rising housing rents, an ineffective Controlling unlawful construction system and practice, as are delayed replies and procedural setbacks of legitimate land allocation, as well as substantial temptations for land speculation (Fanta, cited in Shibru 2018). The major actors of informal settlements as observed in many LDCs are; informal land developers, corrupt civil servants, professionals, brokers, speculators, and the urban poor (Debela 2021). The efficient use of urban land and delivery systems is hampered by a lack of legal framework, bureaucracy, transparency, inclusivity, dishonesty toward land demanders, and responsibility. Ethiopia is experiencing unplanned urban growth as a result of the country's rapid economic growth and population growth (Teferi and Abraha 2017). According to projections, Ethiopia's urban population will increase by between 3.8% and 5.4% per year (MUDHC 2021).

Ethiopia is currently under pressure from increasing urbanization and rising urban housing demand (Koroso *et al.*, 2021). For this reason, in many Ethiopian metropolitan areas, the informal sale of land plots and the appropriation of public property on the outskirts for the construction of

residential buildings as seen as solutions to the community's housing problems (Akirso 2021). The governments of many African nations, including Ethiopia, have failed to meet the housing needs of the majority of urban populations (Matsumoto and Crook 2021).

### **Poor Land Management System**

The recent rapid growth, which has been exhibited in the Ethiopian economy, has implications for the rapid expansion of urban areas. In turn, urbanization would result in an increase in the land area occupied by Ethiopian cities. According to World Bank data, Ethiopia's urban land area was 5.2 thousand square kilometers in 2010, but it is expected to grow significantly in the future due to the increased demand for land to provide housing and all other necessary services to the growing urban population (Haile 2022).

According to MUDCo's (2020) report, the ministry's land supply performance against the national level aim was 59.61 percent of the plan over the previous five years, around a 40 percent demand gap. Even though the urban local governments have significantly increased land production, from a very low base, they are far short of targets and identified demands. Referring to the World Bank Report, the annual average performance against the plan of Addis Ababa, Mekele, and Adama was 35 percent, 88 percent, and 14 percent, respectively, from 2013 to 2017(WBG 2018).

The report also showed that most of the land supply (more than 70 percent of the developed land was allocated directly without bidding for projects such as integrated housing development programs, micro and small enterprise cluster development, office building, health, schools, and infrastructure development, etc. Such administrative direct allotments of land for subsidized projects without at least the cost of recovery principles are exacerbating the land management problems. This is making the cities incapable of addressing the land supply shortage and providing sustainable solutions to the problem (Haile 2022).

Research revealed that, in contrast to many other studies on comparable terrain, the economic poverty of squatter households in Burayu town is not the primary driver of the growth and spread of squatter communities. Delivering the land to the applicants is more complicated by the agency for land development and management's poor performance and lengthy procedures (Bekele 2014). Land use change detection is a useful tool for determining the extent of land cover loss and growth

over time. Understanding the features, extent, and pattern of land use land cover change (LULCC) is a critical decision-making tool (Armenteras *et al.*, 2019; Yan *et al.*, 2018; Tolessa *et al.*, 2017).

Detecting land use change over time is a growing concern for environmental managers (Kiswanto and Mardiany 2018; Mensah *et al.*, 2019). Therefore, studying the rate of LULCC support a decision-making process. Due to the world population boom and advancement in science and technology, natural resources are overexploiting for the sake of economic activities with high severity in developing countries. A significant study has been undertaken in different countries at various times to investigate the amount of land use land cover change (LULCC) (Lark *et al.*, 2017; Gibson *et al.*, 2018; Ru- Mucova *et al.*, 2018; Lei and Zhu 2018). The forest is the most vulnerable of the current LULCC to anthropogenic-driven destruction (Fokeng *et al.*, 2019).

#### **2.4. Consequence of Informal Settlement on Urban Forest**

Forests are important sources of livelihood for millions of people and contribute to the national economic development of many countries in the world. Furthermore, the forest generates revenue by attracting visitors, providing recreational opportunities, preventing silting of lakes and dams, and cleaning, regulating, and distributing water resources. In the previous 50 to 100 years, the pace of deforestation has increased dramatically in emerging nations, especially in Africa (Othow *et al.*, 2017). Furthermore, deforestation and forest degradation are reducing the availability of valued ecosystem goods and services from forests, particularly in developing nations (Duguma *et al.*, 2019). Most notably, the loss of forest cover causes habitat disturbance and land degradation, which occasionally reduces soil productivity and water availability (Danano *et al.*, 2018).

According to the World Bank (WB 2017), between 1990 and 2015, East Africa's Forest cover declined by 1% per year, while the human population expanded by 2% per year. As a result, changes in forest cover can be linked to population growth. Africa is responsible for 27.4% of land degradation, with an estimated 500 million hectares practically damaged (Ru- Mucova *et al.*, 2018). In Ethiopia, a forest is defined as a territory populated by trees (natural and cultivated, including bamboo) with a mature height of more than 2 meters, a canopy cover of more than 20%, and an area of more than 0.5 ha with a minimum width of 20 meters (MEFCC 2018).

Various scholars have researched Ethiopian forest loss and degradation (for example, Geeraert *et al.*, 2019; Belay and Mengistu, 2019; Minta *et al.*, 2018; Feyissa and Gebremariam 2018, Tolessa

*et al.*, 2017). The urban forest provides ecological benefits such as ecosystem function and services. It adds to landscape connectivity by forming a nested spatial hierarchy of corridors, networks, and patches to protect biodiversity and mitigate climate change (Barona *et al.*, 2020).

Informal settlements and informal urbanization are built without the consensus of the city administration and without having building authorization offered by the city administration (Alene 2022). The expansion of Addis Ababa was followed by slums, informal settlements, loss of agricultural land, deforestation, and less environmental and river buffer protection. In the context of Addis Ababa, (AACPPO 2019) describes forests as a network of multi-purpose green spaces that provide ecosystem functions. Forest depletion and degradation affect the sustainability of agricultural production systems and endanger the economy of the country. In Ethiopia, three major factors affect LULCC: resettlement programs, population growth, and increasing agricultural investments (Degife *et al.*, 2018).

## **2.5. Consequences of Informal Settlement on urban forest of Ethiopia**

Ethiopia is one of the most rapidly urbanizing countries in Sub-Saharan Africa (Larsen *et al.*, 2019). Urbanization certainly cannot be separate from land conversion. Land conversion reduced the land cover of green vegetation that turns into a built-up area. This shows that there is a negative relationship between built-up and vegetation (Sejati *et al.*, 2018).

In 2007, the urban population of Ethiopia was about 11.9 million; this figure will increase to 42.4 million by 2037. Firstly, urban areas by their nature are pulling factors in attracting rural residents into cities. That means rural people leave their permanent settlement and make their final destination in cities. It can be symbolizing the movement of people from rural to urban areas. A second factor related to urban growth to deforestation is that cities are horizontally expanding into farmland areas and natural habitats including forests (Kassaw and Tilaye 2022). Since the 1990s, improvements in forest management have included the federal government delegating responsibilities to regional governments, the inclusion of non-state actors in forest management, and the development of Participatory Forest Management (PFM), which was included in the 2007 forest law (MEFCC 2018).

## **2.6. Consequences of Informal Settlement on Urban Forest of Addis Ababa**

There has been few research on urban woods in Addis Abeba, Ethiopia's capital city. A study conducted by Deribew (2020) focused on the spatiotemporal analysis of urban growth on forest and agricultural land. The changes in the land use of urban forests were shown a decrease from 12,168 ha (23.4 %) to 10,301.5 ha (19.7 %) which covers the city area in the year 2003–2016 (Azagew and Worku 2020). The study presented by Abebe and Megento (2016) shows the loss of forests with a net change of 24.4 % from 2000 to 2015; and 16.66 % from 1986 to 2019 (Deribew 2020). In addition, the built-up areas within the forest area are increasing (AACPO, 2017) the forest was cleared for new settlements and cropland (Deribew and Dalacho 2019; Deribew 2020) the reserved land for the woodland forest in Akaki Kality, and forest patches in Nifas-Silk sub-cities were converted into built-up areas (Azagew and Worku 2020). Besides, the city's urban forest has significantly deteriorated due to the high rate of deforestation (MEFCC 2018).

The expansion of human settlements has been the major cause of pollution of groundwater sources, most of which are located on the periphery of the cities. this is because most of the time poor disposal of liquid and solid wastes around informal settlements which additional cause for loss of vegetation and this results in affecting living things around the environment including human beings. Another effect of informal settlement is that the accessing to municipal services, utilities, infrastructure like roads, water supply, sanitation, and solid and liquid waste disposal sites is never provided. Wastes that generate from the houses are thrown properly into deranged channels and which consequences in flooding and erosion of the area (Gebere Selasse 2019).

The city plan from 2013 to 2023 is guided by the current, 2017 structure plan. The plan also includes the conservation of forestry on sloppy areas and recreational park development on gentle slopes. In this regard, the plan indicates the need to increase per capita green space by 9 m<sup>2</sup> per person in the future 25 years (AACPO 2017), which is considered an ambitious plan (Yeshitela 2019). This structure plan suggests reserving about 2730 ha of land used for recreational parks.

According to the study conducted by Sisay (2022) the rate of deforestation has increased extremely in developing countries including Africa in the last 50 to 100 years (Othow *et al.*, 2017). Furthermore, deforestation causes environmental degradation, including land degradation, water resource depletion, and biodiversity loss. Even now, there is a rapid disappearance of those woods that are still aged, non-replicable indigenous tree species, which have different economic, cultural,

and ecological, medical, and other purposes. Most notably, the loss of forest cover causes habitat disturbance and land degradation, which occasionally reduces soil productivity and water availability (Danano *et al.*, 2018).

Forest cover loss is a key issue in developing countries because agriculture is critical to the livelihood of the larger society. Because of Ethiopia's substantial reliance on agriculture, the effect of forest degradation has been a chronic concern, with most of the landscape remaining barren due to previous deforestation (Belayneh *et al.*, 2018). The depletion of forest resources and the subsequent negative environmental effects are difficult to quantify in monetary value although resource depletion illustrates numerous observable environmental impacts in the study area.

Forest loss also exposes the area to significant soil erosion and degradation, which raises the sediment load on water resources, reduces land productivity, and reduces forest products, negatively affects biodiversity, and changes the microclimate. These will have tremendous socio-economic impacts on the communities. For example, Out-migration, disguised unemployment, prolonged hunger, increased restoration costs of the degraded ecosystem, and food insecurity are only a few examples (Belayneh *et al.*, 2018). On the contrary, third-world towns such as Addis Abeba are experiencing enormous issues as a result of deteriorating urban environments. The magnitude and severity of slums and Informal settlements are significant indicators of the troubled urban environment. Living standards in slum areas are far below the acceptable level and the water, soil, and air qualities greatly depreciated (Gebre Selasse 2019).

## **2.7. Theoretical Literature review**

**Informal settlement theories:** Different assumptions and theories of informal settlement have been seen since the early 1960s in the history of informal settlements. The theories were based on the assumption of other writers based on the economic, social, political, and cultural statuses of informal settlers of different countries. Considerable Wandel der Denkungsart (change of thinking) has taken place. Oscar Lewis' famous culture of poverty concept Lewis O (1966) is based on fatalistic assumptions about the urban poor. Lewis' theory was used to legitimize increased government expenditures in housing and servicing urban middle-class populations. The other side of the coin is the total abandonment of policies to improve informal settlements. Charles Abrams provided the first countervailing wave of thought. He strongly refuted Lewis' contention that the

urban poor are unwilling to act and lack an underlying desire to care for adequate housing conditions (Abrams 1966).

Abrams uses his actual experience in many TWCs (e.g., Ghana, Turkey, Pakistan, the Philippines, Nigeria, India, Jamaica, and Bolivia) to show that assisting the poor is not a waste of time. He maintained that empowerment to self-help was the most appropriate solution pathway. He also proposed to adopt a different perception of slums and squatter settlements. The 'shantytowns,' 'bidonvilles,' and 'favelas,' according to Abrams, are neither the source of urban evils nor the embodiment of a poverty culture in and of themselves; they are the poor response to a situation: a rational step on the route to self-improvement (Abrams 1966).

Building on Abrams' breakthrough ideas, John Turner and William Mangin made crucial contributions to how to initiate change and build an environment conducive to releasing the poor's energy toward improving their housing standard and social livelihood. Turner regards land tenure security as a pivotal incentive in facilitating the poor's commitment to the progressive transformation of their shelter (Turner 1967). Accordingly, tenure security is the primary step for solving the problem of squatter settlement by the government.

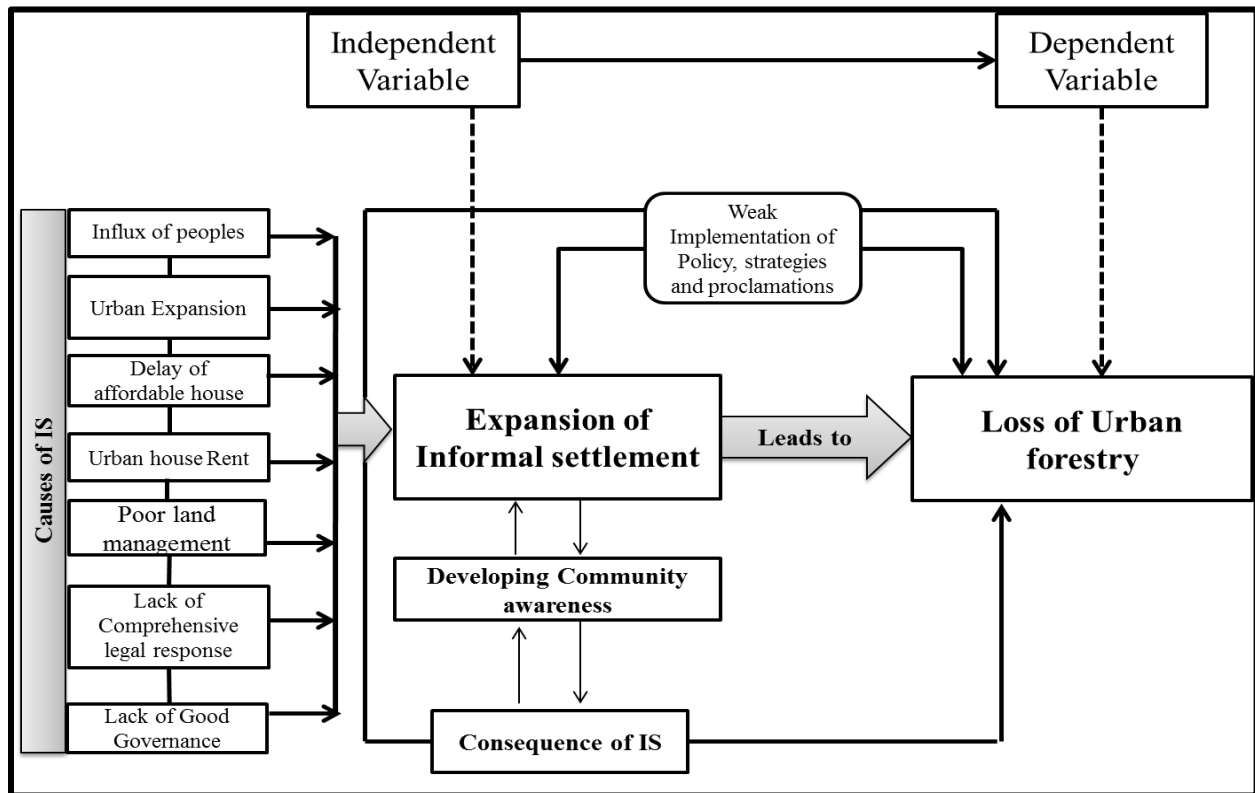
Another principle enunciated is the reduction of the burden of charges for informal settlement dwellers by sharing the workload with the government. As a result, the government provides basic services and amenities that are beyond the capacity of the residents. The inhabitants are then expected to complete a reasonable percentage of the labor. This scheme has been termed 'sites-and-services', which will be analyzed in depth in the subsequent sections. Mangin (1967), also highlights the prime necessity for creating access to basic social infrastructures in squatting neighborhoods, where some shelters might probably be over the standard, but where the (unplanned) physical environment remains an obstacle to access or enjoying social benefits.

The development theories proposed by Abrams, Turner, and Mangin for informal settlements firmly emphasize the categories of ownership and dignity. This is directly related to Sen's beloved concept of capacity building for the urban poor. Sen has definitely been authoritative in the moral-ethical shift that occurred in the scholarly and policy-directed discourse upon the TWCs' poor in general and upon the poor informal settlements dwellers in particular. The World Bank's acceptance and zealous promotion of the self-help idea, in conjunction with the sites-and-services

schemes, has played a significant role in legitimizing the capability and freedom approach in international development assistance. The demise of structural adjustment programs (Bracking 1999) in favor of the ideology of ‘Poverty Reduction Strategy Paper’ (PRSP), despite being perceived by some as a rhetorical masquerade starved of genuine innovation evidence, once again, the re-centering of the poor in terms of capability-building (Mosley 2001).

## 2.8. Conceptual Frame Work

Figure 1 Conceptual framework of the study.



Source; Developed by the researcher, 2022

## CHAPTER THREE

### 3. RESEARCH METHODS

#### 3.1. Description of the Study Area

The study area was located in the capital city of Ethiopia, northeastern parts of the city of Addis Ababa. Addis Ababa is the capital city of the Federal Democratic Republic of Ethiopia and home to the African Union (AU) and the United Nations Economic Commission for Africa (UNECA) (Bikis 2021). Addis Ababa is the country's political, economic, and cultural center. In the central plateau of Ethiopia, it is located between latitude  $8^{\circ} 58'50''N$  and longitude  $38^{\circ} 45'28''E$  and lays 2350 m elevation. It covers an area of  $540\text{km}^2$ .

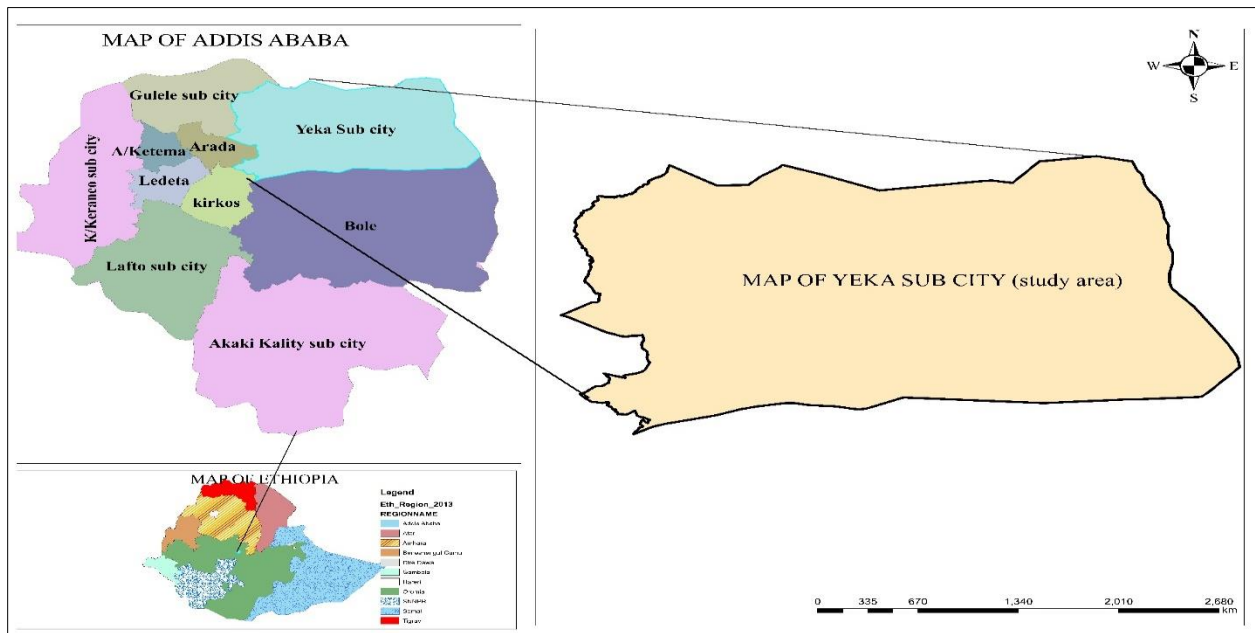
The city is a few miles west of the East African Rift Valley, which splits the country in two. Addis Abeba is located at a height of 7,726 feet above sea level. This makes it one of the highest capital cities in the world, and the highest in Africa. The metro area population of Addis Ababa in 2022 was 5,228,000 (UN 2022). The city has a tropical highland climate. The north and northwest part of the city has sloppy topography, and the south and southeast part has flat topography (Bikis 2021). The city has three layers of government: city government, sub-city administrations, and Woreda administrations (Figure 2 below).

Yeka sub-city is located in the northeastern sub-urban of the city. It borders the districts of Gullele, Arada, Kirkos, and Bole. This study has focused on one sub-city in the northeastern parts of the city of Addis Ababa Ankorch of yeka sub-city. According to the data from the yeka sub-city Land Administration (YLAO 2022), the sub-city has a total size of  $85.98\text{ km}^2$  and covers 8213.11 hectares, constituting 15.8 % of the total land area of the city, which makes it the third huge Sub City next to Bole and Akaki. The total population of yeka Sub City is 488,537 Ethiopian Statistics Service (ESS web 2022). Yeka Sub-city is one of the 11th Sub-Cities of Addis Ababa.

The researcher was selecting Yeka Sub-City for this study purposively due to the unprecedented expansion nature of informal settlement and deforestation practices for the purpose of the expansion of informal settlement and trends of this settlement are increased from time to time without any preventive measures. According to the Yeka sub-city, "*Sened Aleba*" office and "*mebt fetera*" team leader this area is the most expansion site of informal settlement and a large number

of informal settlers are found there. Therefore, the Ankorchha site was selected for this study because of its mountainous forest nature and the habit of forest degradation and informal settlement expansion is increasing from time to time and growing highly. Thus, the purpose of this study was to assess the influence of informal settlement on urban forestry in the Yeka sub-city.

Figure 2 Map of Addis Ababa and Yeka sub-city



Source; GIS output by the researcher, (2022).

### 3.2. Study Design

The study is based on a mixed research approach, which is useful to capture the best of both qualitative and quantitative data. In this study qualitative approach is suitable in which the problem is understood concepts and phenomena from open-ended surveys and interview questions, literature reviews; whereas the quantitative approach is related to which the problem is identifying the factors that influence the results, to understand frequencies and averages; the utility of an intervention and testing conceptual framework. The explanatory method is used to explain and identify the causal factors. The descriptive survey method is used to describe the identified causal factors or variables, so the explanatory followed by the descriptive method is employed, because this method is generally broad in scope and is more relevant to determine the opinions of a specific population, take the knowledge and experience from those who are familiar with the issue. Therefore, the structure of the research is presented in the following figure by interlinking one step

to the other. Key informant interviews were held with purposefully selected individuals who believed to have comprehensive knowledge about the study area and the subject matter under the study.

### **3.3. Data Types and source**

Both primary and secondary data have been collected to undertake this research work. The primary data was collected through the first-hand questionnaire, key informant interview, field observation, and by Analyzing Google Earth Map by using Arc GIS version 10.7. Secondary data were analyzed from Google Maps, and satellite images, and secondary data was used through literature review analysis. Structured and semi-structured questions were developed to answer the research questions regarding the institutional and governance structure responsible for the influence of informal settlement on urban forest coverage. The key informants were selected from different government organizations by representatives. Semi-structured question catalog has been presented for the discussion and outputs summarized qualitatively by using SPSS version 26.

#### **3.3.1. Primary Data**

In this research basically, primary sources of data were used for firsthand information to achieve the objectives of this research. The primary data was gathered through informal settler household questionnaires and interview surveys, which provide information on the influence of informal settlement on the urban forest coverage, and the causes and consequences of informal settlements on forest resources in the study area. Based on the likely data availability the researcher took six officials who have a deeper and better knowledge about the issue in the area of study and have given their opinions.

The interviewee includes the Yeka Sub-city Land management head officer, the yeka Sub city "*Sened Aleba*" team officer and "*mebt fetera*" team officer, the yeka sub city beautification office head, land banking office head, building permit expert, and informal settlers from *Ankorcha*. It also enabled an informal interview with different people who were not related to the area but could still give relevant information. The researcher has selected the questionnaire due to time, cost, and participants' benefit, it can cover a large number of people, easy to code and control over types of data collection. The Arc GIS Map analysis to explore the consequence of informal settlement on the urban forest coverage was analyzed by using Arc GIS Version 10.7.

### **3.3.2. Secondary Data Sources**

The secondary data sources were Gathered information from both published and unpublished Documents, relevant proclamations, working papers, previous research findings, reports of sub-cities, and websites. It was also collecting information from Ethiopian forest conservation policy, Land Management and Registration proclamation, and Right Creation Directive documents to triangulate the reliability of the information that was obtained from the local community.

### **3.4. Sampling Design**

The research design used to undertake this analysis was descriptive, and mixed-method approaches that involve both qualitative and quantitative approaches were employed. The cross-sectional descriptive research design aids in describing existing trends in a specific context and narrating facts. Besides, the mixed approaches help the researcher to carry out the integration of both qualitative and quantitative data collection and analysis rigorously and intend to minimize the limitation of these approaches. Moreover, in-depth interviews, participant observation, and structured questionnaires were administered to collect the required information. However, to recruit sample respondents from the total study population, both probability and non-probability methods of sampling were used. The probability sampling method systematic sampling was selected, because it eliminates biases and avoids an error that could arise in the sampling process. Besides, purposive sampling has been used to include key informant respondents, including those managerial bodies, to gain relevant data circumference with the rampant situations of informal settlements.

Yeka sub-city is classified into 13 woredas, and the concentration of informal settlements varies in each woreda. From those woredas, the researcher selected a specific site Ankorchha for this study because of time constraints. Yeka Sub-city were selected for this study because in contrast to other Sub-Cities were seen there is a large number of unauthorized home building that proliferated by deforesting the existing mountainous urban forests in a substantial amount of forest cover. On the other hand, Ankorchha of yeka sub-city is recently expanding due to horizontally developed and has significant infrastructural issues among the peripheral site of yeka sub-city.

The sample size was determined based on those who construct their informal house from January to December 2020 and from January to December 2022. The researcher selected a total of 164 informal settlers and six key informants as a sample from 7902 informal settlers by using Kothari's

(2004), formula which stratified based on their location for handmade questioners. Probability samplings were used to minimize biases and to ensure the representativeness of the study. In addition to this, purposive or judgmental sampling methods were used to select sample units that aim in obtaining detailed information from different officials and experts to increase the validity of the study. The total sample size selected for this study was 164 questionnaires collected from informal households; six samples of sub-cities land Administration officers, peace and security Authority, Green and Environment protection officers, Rule enforcement office, and three key informant interviews from concerned Authorities.

### **3.4.1. Population and Sampling Frame**

As the time allotted to conduct this study was very short makes difficult to include all woredas in the study. Taking a sample site for this study was necessary because of the vastness of the informality in the study area. So that the researcher was selecting Ankorchha of yeka sub-city site for the purpose of this study. The rationale of the study area was selected based on the available problems and information from the yeka sub-city Administration Green Development Affairs Office on the influence of informal settlement on the urban forest. Therefore, the researcher was taking Ankorchha of Yeka sub-city site as a peripheral area that was purposely considered as a sample framework from which study participants were taken. These are woreda ten. The analysis unit was the heads of the Department of Environment Protection, peace, and Security as well as the staff and managers of the peace and security, informal settlement protection taskforce of the sub-city, and respondents who participated in the study.

### **3.4.2. Sample Technique**

In the household survey, data were collected from random samples. The target populations from which the research sample was drawn included the informal settlers around urban forestry. Systematic random sampling was adopted to select informal settlers from the list of informal settlers of yeka-sub city land registration and administration office. The sample frame for this study was 7902 informal households; from this, about 164 samples were randomly selected from informal settler's sites. Both probability (proportional stratified random sampling and systematic random sampling) and non-probability (judgmental or purposive sampling) methods were employed. In order to determine the sample size for this study, the sample size determination formula set by (Kothari 2004) was used.

$$n = \frac{Z^2 * P * q * N}{e^2 * (N - 1) + Z^2 * P * q}$$

Where: Where n = desired sample size, Z = standard normal variable

at the required confidence level, p = estimated characteristics of target population, q = 1-p, e = level of statistical significance of target population Z = 1.81, p = 0.5, q = 0.5, N=7902, e = 0.07 (in which 93% accuracy is assumed).

$$\text{Therefore, } n = \frac{(1.81)^2 * 0.5 * 0.5 * 7902}{(0.07)^2 * (7902 - 1) + (1.81)^2 * 0.5 * 0.5} = 164 \Rightarrow 164$$

So that, according to Kothari (2004) if N < 10,000 the above formula was using:

In the non-probability sampling technique – purposively selected key informants for the interview. Based on this, the researcher selected and interview six respondents who were from the land administration office, Green and Environment protection office, peace and security officials of yeka Sub City, and officials from the study area who participated in this study. According to Kothari, the quantitative method of data collection of the sample size was determined by using the following formula the total population is less than 10,000.

Therefore, the total study participants are 164 respondents participated in this research. As stated above, the sample size of the study was 164. Out of the total sample size, 164 were households of the non-legal registered informal settlement householders and the remaining six were officials that have at Yeka sub-city Land Administration Office, Environment protection Office, Peace and Security Office, and Yeka Sub-city regulation enforcement taskforce officials /*Denb Maskeber*/participated on the sample size of this study.

### **3.5. Data Collection Methods**

#### **3.5.1. Remotely Sensed Data**

Primary data sources or existing large-scale representative survey data to assess and examine a particular issue gives superior results. However, it is not effective when the scope of implementation becomes a larger geographical scale due to budget and time constraints, and better to use the remotely sensed data (Rathinam *et al.*, 2017). Remotely sensed imageries are data that are collected without physical contact between the sensor and the earth's surface as a target. These data are collected from artificial satellites or aircraft and can be used as a main data source for land use land cover mapping.

In this study, the remotely sensed satellite data specifically the Landsat satellite images from the United States Geological Survey (USGS) was downloaded and used mainly to assess the level of informal settlement area of Ankorcha of yeak sub city through producing time series LULC maps for the past two years: 2020 and 2022. These periods selected because to examine the recent expansion status of informal settlement and land use within two-year interval and due to lack of land sat image between the year 2000 to 2020. All of the images that were used in this study expected were clear and nearly free from cloud cover which was captured during dry season. In addition to this, ground truth data were collected from the field using Handheld GPS that was used for validating the LULC classified image into different classes by observing the real LULC of the town.

### **3.5.2. Household Interview**

About 164 questionnaires were prepared and disseminated to respondents and were filled by the investigator during the data collection process. The questionnaires were containing open and closed-ended questions to achieve the first and the third specific objectives of this study. The researcher collected 164 (100%) questionnaires from the respondents and analyzed the data qualitatively by using SPSS Version 26. The Participants living in informal settlements was selected purposely and the questions included in the questioners were how participants built their informal settlement; how to find land and ask an issue to explain what type of services are available in their area of residence, the conditions that precede informal settlements, and their implications for urban forest degradation. Generally, in this section, the issue of awareness of study participants was interviewed on the influence of informal settlement on the urban forest coverage, the level of problems, and the Solution to the problem were presented in detail.

### **3.5.3. Key Informant Interview**

About six key informant experts participated namely the sub-city Green and Beauty Officers, Land Administration Officials, and Peace and Security Experts are nominating at the key informant interview. The questions for the key informant focused on the expansion status of informal settlements, major aggravating factor, and their serious impact on the Environment and the information were collected through mixed questionnaires.

#### **3.5.4. Field Observation**

Observation in qualitative research typically entails spending a significant amount of time in a situation. Using direct observation, the investigator collected data for the purpose of first-hand information through personal observation. Throughout the observations, field notes are taken that are focused on what is seen. Many researchers also record notes to assist in determining what the observed events might mean and to provide help for answering the research questions during subsequent data analysis (Fetterman 1989).

### **3.6. Data Analysis Methods**

#### **3.6.1. Spatial-temporal Analysis**

The practice of finding variations in the state of land usage throughout distinct time periods is known as spatiotemporal analysis of land use. The following procedures were implemented to produce the LULC maps and change detection which gives us to assess the level of Built, Bare land and forest coverage area. USGS Earth Explorer Images of 2020 and 2022 were downloaded from Landsat-8 satellite and Arc GIS 10.7 software was used for image processing and image classification analysis respectively.

#### **3.6.2. Cause and influence Analysis**

The investigation of the study has been translated, based on the nature of the data collection approaches (Bikis and Pandey 2021). In analyzing the data, both qualitative and quantitative were employed depending on the nature of the data. The interview and key informant data have been described qualitatively. The quantitative data were analyzed and interpreted by using percentages, tables, graphs, and pictures. The qualitative data were analyzed by using narrative and photographs. After checking the data collected from the sample of households, were coded and filled into SPSS version 26 software was used for the analysis.

#### **3.6.3. Data presentation**

Data were presented depending on the technique and nature of the data. The quantitative data was presented by percentages, tables, graphs, and pictures while the qualitative data was presented mostly by narration, photographs, and Google Earth Map interpretation was used.

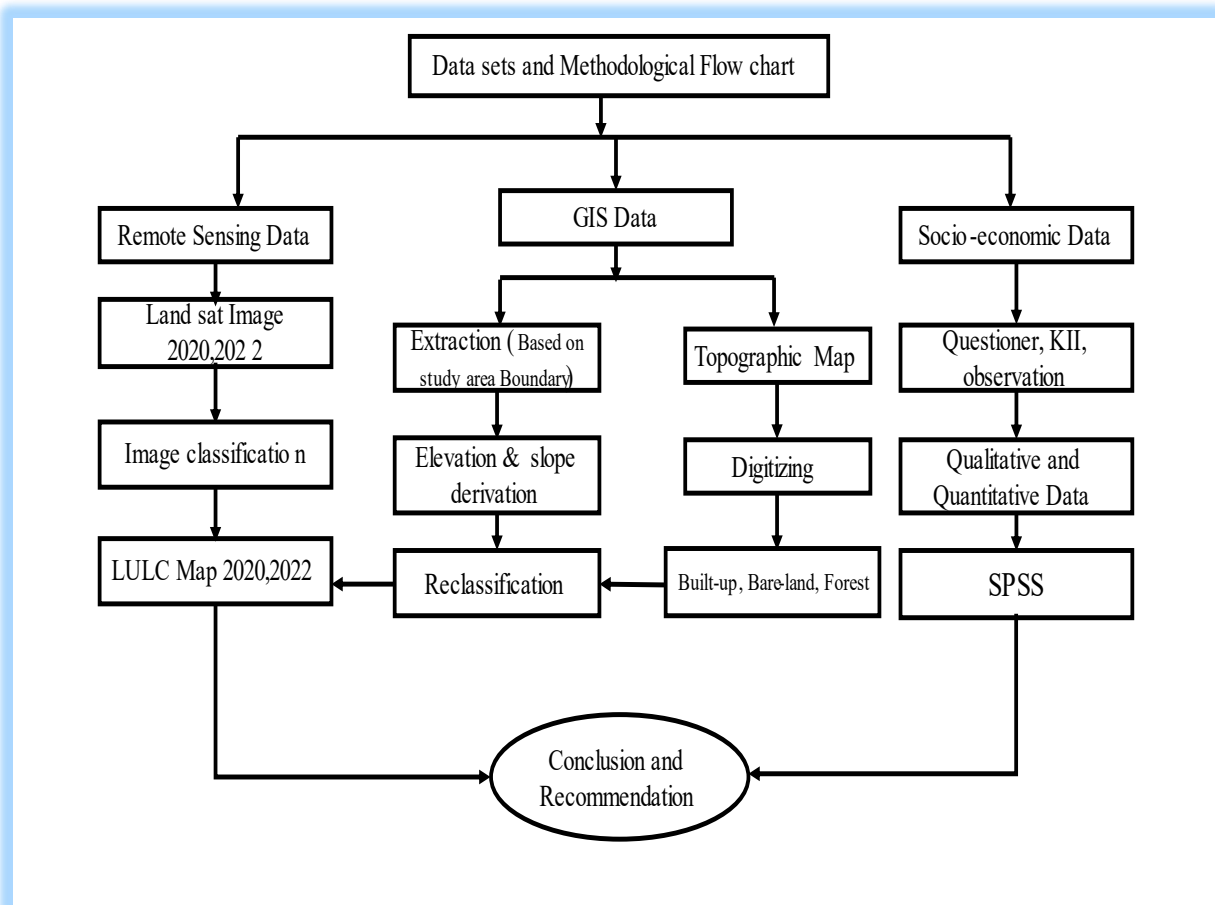
### 3.6.4. Data Reliability

The reliability of measurement is shown to range between 70% - 90% using Crobanci's alpha, which is used to quantify internal consistency, or how well a set of items correlates inside a group. Then, to further the study's authenticity, proclamations, and other official papers were included, along with answers from homeowners in informal housing communities.

### 3.7. Ethical Considerations

To carry out this study, Addis Ababa University provided ethical clearances and approval, and a cover letter was added to the questionnaire promising respondent's anonymity and confidentiality, as well as that information gathered from them would not be divulged to a third party.

Figure 3 Research methodology Flow chart



Source; Designed by the researcher, 2022.

## CHAPTER FOUR

### 4. DATA ANALYSIS, RESULT AND DISCUSSION

#### 4.1. Data Analysis and Result

This chapter is a section where the responses given by the study participants to the questions at each level were presented in depth analytically, and the participants who were involved in building informal houses or living in houses built illegally were included. About 164 participants were included. In addition to the above reasons, the chapter contains the results and discussion section in detail on the influence of informal settlement, causing the factor of forest coverage degradation in the study area. The information being reviewed was gathered from a household questionnaire survey, informal settlement controlling team leader /*Mebt fetrera*/ experts, and the officials of the yeka sub-city. Spatial temporal Analysis of Remote sensed image classification, Demographic and socio-Economic Data were employed on analyzing qualitative and quantitative data to achieve the specific objectives of the study.

##### 4.1.1. Demographic and Socio-Economic Characteristics of Informal Settlers

A study conducted by Bikis (2022) stated that search for work, better livelihood (extreme poverty), homelessness, landlessness, helpless by family, marital factors (divorce, newly married), living style (wanting a new way of life), and loss of a job are the major push factors for the expansion of informal settlement in Addis Ababa. Of the total sample of 164 informal households who live in Ankorcha, of yeka sub-city informal settlers, about 51.8% of the respondents are male and 48.2% are female respondents (Table 1 below). The proportion of male and female participants in this study is almost approximately equal. In this study, male and female households headed independently were not considered rather the data were collected from whoever was available and willing to respond.

From the total sample of 170 informants, the majority of the sample respondents 81.1% are married couples and the remaining 14% are single, 5% of them were widowed and 1.8% of them were Divorced (Table 1 below). Marriage is a universal practice in Ethiopia, i.e., everybody is expected to marry and live as a couple and thus being single is discouraged by society 's customs and traditions. It also was a sign that a majority of those interviewed had families and were there for them in the current houses they lived in. Here singles constitute males and females, usually civil

servants, privately employed, self-employed, and others (student and daily pensioned) (Table 1 below). Singles are also those who recently arrived in urban or peri-urban areas. Thus, most singles are renting houses from landholders at lower rental prices compared to the central parts of the city.

In this study, the majority of informal households 84.8%, are thus between the ages of 26 – 55 years, which is the period of greatest productivity and implying that they were able-bodied and independent to make decisions on where to live with their dependents (Table 1 below). According to, the Population pyramid of Ethiopia 25-54 years are prime working age and 55-64 years is the mature working age World Factbook (WFB 2021). This implies that the majority of informal households put a lot of effort into obtaining official residential properties.

Table 1 Demographic characteristic of the Respondents

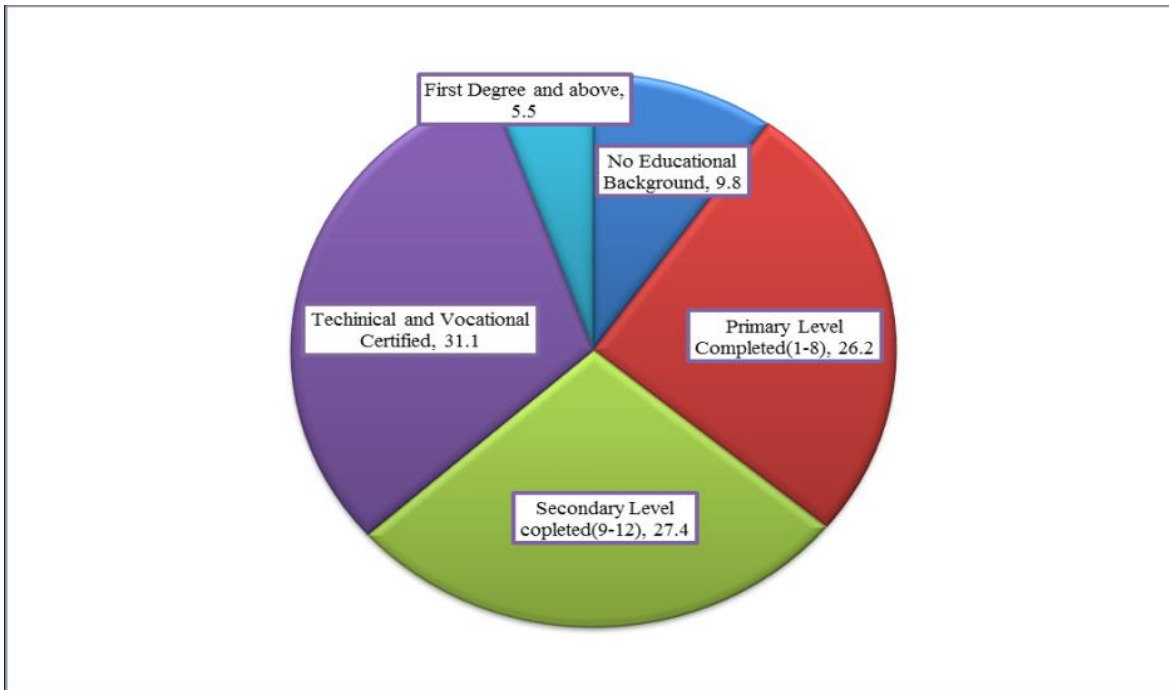
Sex of Respondent * age of Respondent *Marital Status of Respondents								
		Age of Respondent					Total	Person X <sup>2</sup>
		18-25	26-35	36-45	46-55	≥56		
sex of Respondents	M	9(10.6)	18(21.2)	31(36.5)	22(25.9)	5(5.6)	85(51.8)	.840
	F	7(8.9)	21(26.6)	29(36.7)	18(22.8)	4(5.1)	79(48.2)	
Total		16(9.7)	39(23.8)	60(36.6)	40(24.4)	9(5.5)	164(100)	
Marital Status of Respondents (%)								
		Single	Married	Widowed	Divorced	Total	Person X <sup>2</sup> =0.426	
Sex of Respondents	M	12(14.1)	68(80)	3(3.5)	2(2.4)	85(51.8)		
	F	11(13.9)	65(82.3)	2(2.5)	1(1.3)	79(48.2)		
Total		23(14)	133(81.1)	5(3.0)	3(1.8)	164(100)		

Source: household survey, 2022

### Educational Background of informal households

According to the pie chart, among the respondents who took part in this survey, 26 % of the heads of the sample of casual dwelling households have completed their primary school. About 31% of them held a Technical and Vocational Diploma certification, and about 27% had completed their secondary school. Six percent of those surveyed held a bachelor's degree and above and finally, just 10% of respondents had no formal education but were able to read and write. The results show that living informally and avoiding following the law is not caused by a lack of education (Figure 4 below).

Figure 4 Pie Chart the Educational background of informal settlers



Source; household survey, 2022

### Occupation and Income of Informal Householders

Among 164 study participants, 36% of the respondents were Civil servants, 23.8% were privately employed, and about 34.1% of the respondents were self-employed. The remaining 3.7% of the respondents were farmers, and 2.4% of the respondents were engaged in other occupations. However, farming is not considered an occupation in city economic activities. Farmers who live in the sub-city growth zones and work in the neighboring agricultural areas run the risk of being evicted.

Regarding the income level of the study participants, from the total sample of 164 about 38.4% of the informal settlers earned a monthly salary between 2001 – 4000 ETB per month, while 23.9% of the respondents earned a monthly salary between 4001 – 6000 ETB per month. Whereas the remaining 16.4% of the respondents were earning a monthly salary of less than 2000 and 15.2% of the respondents were earning a monthly salary between 6001-8000 and 6.0% of participants earn a monthly salary of more than 8000 ETB (Table 2 below). The most recent publicly available survey data for Ethiopia's MPI estimation refer to 2019. According to these estimations, 68.7 percent of Ethiopia's population (80,553 thousand people in 2020) is multidimensionally poor,

while another 18.4 percent is vulnerable to multidimensional poverty (21,509 thousand individuals in 2020). The intensity of deprivation in Ethiopia, which is the average deprivation score among people living in multidimensional poverty, is 53.3%. In terms of income, most of the settlers are "middle to high-income groups and speculators. In this view informality is not considered as the only domain of the poor; it is also an area of strong groups, who have power and influence. In Ethiopia, the average monthly wage is roughly 8,900 ETB. Salaries range from 2,250 ETB (the lowest average) to 39,700 ETB (the highest average, but the true maximum pay is higher). The typical monthly payout includes housing, transportation, and other benefits. The global poverty line must be adjusted on a regular basis to reflect changes in price levels around the world. That's why in September 2022 the international poverty line is being updated from \$1.90 to \$2.15 per person per day (WB 2022).

However, in Ethiopia due to different factors, the living conditions of the community are affected by the inflation nature of the economy, and that enforces the low-income community to construct informal settlements. As we have seen in the above analysis, the composition of the demographic situation and socio-demographic situation was to find out which part of the society participates in informal house construction. It can be understood from the results that although the respondents who participated in the questionnaire have a different demographic situation and socio-demographic situation even if there is, it can be understood that all sections of society are working on informal house construction to solve the housing problem in the city.

Table 2 Socio economic characteristics of Respondents

Occupation of Respondents * sex of Respondent						
		Sex of Respondent		Total	Person X <sup>2</sup>	Asymptotic sig.(2-sided)
		M	F			
Occupation of Respondents	Civil servant	30(35.3)	29(36.7)	59(36)	4.701	.319(df=4)
	private employed	21(24.7)	18(22.8)	39(23.8)		
	self employed	28(32.9)	28(35.4)	56(34.1)		
	Farmer	2(2.4)	4(5.1)	6(3.7)		
	Other (pensioned, students, etc.)	4(4.7)	0	4(2.4)		
Total		85(51.8)	79(48.2)	164(100)		
Salary of Respondents*Sex of Respondents						
Monthly Salary of the Respondents	<2000	16(18.8)	11(13.9)	27(16.4)	4.325	.364(Df = 4)
	2001-4000	29(34.1)	34(43.0)	63(38.4)		
	4001-6000	23(28.2)	16(20.3)	39(23.9)		
	6001-8000	14(16.5)	11(13.9)	25(15.2)		
	>8001	3(3.52)	7(8.9)	10(6.0)		
Total		85(51.8)	79(48.2)	164(100)		

Source; household survey, 2022

#### 4.1.2. The way to access land or informal settlement holding systems

From 164 study participants, about 36% of the informal settlers responded that they occupy land informally or invade open land and/or forestland and built informal houses without the consent of the city in Yeka-sub city. While about 28.7% of the respondents explained that, they bought land from the landholders or houses from the householders (Table 3 below). This demonstrates that there is no inventory of public land, which has an impact on effective land management. Additionally, a high frequency of informal land purchases demonstrates that farmers sold their land to squatters because the compensations offered by the city authority were insufficient. The main reasons for the proliferation of squatter settlements and unplanned expansion at the city's periphery, according to the interview response from the Yeka sub-city "*Mebt fetera*" office head, are that peasants in the city provide urban land to individuals without the authorization of the relevant legal urban authorities.

The low availability of inexpensive land for housing for the urban population by the sub-city in particular and municipal government, in general, is indicated by the high percentages of informal land acquisition. Land transfers are handled through negotiations between brokers, sellers, and buyers. The price is negotiated and paid hand in hand, which results in the loss of a sizeable portion of the city administration's revenue from the collection of land transfer taxes. The study conducted by (Ayele 2019) explained that in the lafto-sub city of Addis Ababa, 8.8% of the household heads invaded open land with similar means of land acquisition system in the yeka sub-city. From the total study participants, the remaining 28.1% of the respondents rent the house from householders with the minimum amount of pension, and about 7.3% of the respondent's access land through inheritance or donation from their Family (Table 3 below).

Table 3 Land and Informal settlement holding way of Respondents

Sex of respondents * way to access Land or House		way to access land or settlement				Total
		Bought land/house from the holders	Occupy land informally/invade open land and/or forest land/	Rent the house	Inheritance and/or donation	
sex of Respondents	M	27(31.8)	30(35.3)	21(24.7)	7(8.2)	85(51.8)
	F	20(25.3)	29(36.7)	25(31.6)	5(6.3)	79(48.2)
Total		47(28.7)	59(36)	46(28.1)	12(7.3)	164(100)

Source; household survey, 2022

### **4.1.3. Causes of Informal Settlement in Yeka Sub City**

#### **Urban Expansion**

The study conducted by Expansion led by government and private sectors mainly mass housing programs like condominiums, single residential and real-state constructions, and other developmental activities such as construction of roads and factories are visible evidence for the eradication of green spaces in the city (Warkaye and Bisrat *et al.*, 2018). Over the last decades, urban areas have quickly changed and analysis of urban LULC dynamics is essential to monitor urban growth (Deribew and Dalacho 2019; Deribew 2020; Mohamed *et al.*, 2020). More than 50 percent of the world's population now lives in cities and this proportion is expected to rise to 66 percent by 2050 (UNDESA 2014 cited in Getahun 2021). According to the respondents, the expansion of unauthorized home constructions is caused by a variety of interconnected factors, as shown in Table 4 below. From the total study participants, about 11% of the respondents replied that urban expansion is the major cause of informal settlements.

The study conducted states that Ethiopia's urbanization may see in the outward growth of the built-up area and the conversion of agricultural land into residential and commercial purposes (Awoke 2019). Rapid urbanization and extraordinary population expansion have put immense strain on Addis Abeba's ability to offer cheap housing and access to essential amenities for its citizens, particularly low-income households. Since the early 2000s, however, Addis Ababa has lost a significant proportion of its green and open areas including riversides. This is a result of the massive population growth of the city which paved the way for a construction boom, and intense competition for land, which in Ethiopia is almost exclusively state-owned (UN-Habitat 2017).

#### **Delay of the implementation of affordable housing for low-income**

From the total study participants, about 24.4% of the respondents replied that delay in the implementation of affordable housing for urban low-income groups with a correlation coefficient value (of 0.447 at P-value = 000). This result signifies delays in the implementation of affordable housing for low-income citizens had greater relationships as causes of informal settlement (Table 4 below). Accordingly, providing adequate and affordable housing is a core national policy objective, especially given its impact on inequalities. Lower-income households usually live in lower-quality housing, which consumes a larger portion of their disposable income. Studies by

Mohammed outlined how population expansion in the capital and the movement of people from rural to urban areas had increased the need for housing (Mohammed 2019).

The gap has grown as more demands have been placed on the city, which has a massive backlog of housing needs. Due to government ownership of the land and its dominant role as a provider of housing in the capital, the supply of housing has remained extremely low. The Ethiopian government is committed to expanding access to affordable housing for the poor. Ethiopia's major policy strategy documents provide a conceptual and operational definition of what constitutes housing affordability. From 2000 to 2015, Addis Ababa's population grew by 37% (from 2.8 million to 3.8 million) and its built-up area by 32% (from 85km<sup>2</sup> to 113km<sup>2</sup>) (OECD 2021).

### **Increasing Cost of Urban Housing Rent**

According to the results in Table 4 below the majority, 29.9% of informal settlers responded that increases in the cost of housing rent in Addis Ababa are the major cause of informal settlement expansion in the yeka sub-city of Ankorcha (Table 4 below). Although estimates of the scale of urban informality vary greatly (Getachewu 2019), informal unplanned housing provision accounts for a significant share of the overall housing supply. The study conducted by Gebayehu (2016) in Gondar City, Ethiopia, founds that the high housing rents in the city center and lack of access to land in the center caused the expansion of informal settlement (Ayelu 2018). According to the study conducted in the yeka sub-city about 70.56 % of the total respondents, from informal settlers mentioned that the shortage of houses in the sub-city and the high rental price of the existing houses are causes for informal settlements expansion. The study conducted by Desalegn (2018) concluded that in Addis Ababa of yeka sub city, from the study area 70.56 % of the total respondents, informal settlers mentioned that the shortage of houses in the sub-city and high rental price of the existing houses are causes for informal settlements expansion.

### **Rural to Urban Migration**

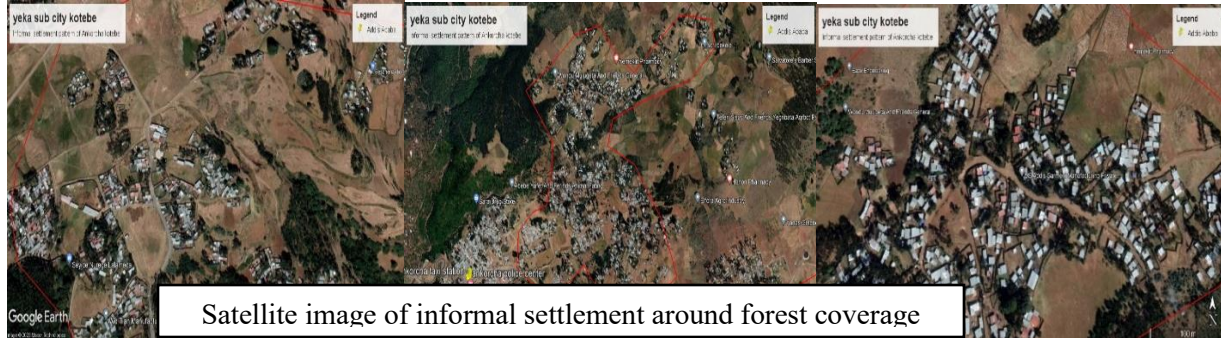
That means rural people leave their permanent settlement and make their final destination in cities. It can be symbolizing the movement of people from rural to urban areas. This movement can be caused by searching for better living standards, job opportunities, education, and others (Kassaw and Tilaye 2022). According to this finding in Table, 4 below about 24.4% of the respondent replied that Rural-urban migration of the people was the major cause for the expansion of informal settlements in the study area of Addis Ababa with  $\chi^2 = 4.099$ , Ass significance 0.393 (Table 4

below). Getahun (2021) cites a lack of agricultural land, a scarcity of non-agricultural employment opportunities, the prevalence of early marriage, rural livelihood shocks caused by drought and famine, poverty, interrupted education, ethnic conflict, proximity to main roads, and high population densities as some of the causes of migration. In 2013, for example, recent migrants accounted for 61 percent and 59 percent of the population in secondary cities such as Bahir Dar, Hawassa, and Adama, respectively. Recent migrants represent 40% of the population of Addis Ababa (OECD and ILO 2019).

Table 4 Distribution of variables on causes of informal settlements in the study area

Causes of informal settlement * Sex of Respondent		sex of respondent		Total (%)
		M (%)	F (%)	
Causes of informal settlement	delay of the implementation of affordable housing	25(29.4)	15(19)	40(24.4)
	increasing cost of housing rent in the urban	25(29.4)	24(14.6)	49(29.9)
	Rural to urban Migration of people	19(22.4)	21(26.6)	40(24.4)
	urban Expansion	10(11.8)	8(10.1)	18(11)
	poor land Management	6(7.1)	11(6.7)	17(10.4)
Total		85(51.8)	79(48.2)	164(100)

(Source: household survey, 2022)



Sources; Photo image of Informal settlement in Ankorchu by researcher, (2022)

#### **4.1.4 Influence of informal settlement on forest degradation in yeka sub city**

Correlation analysis, also known as bivariate, is primarily concerned with finding out whether a relationship exists between variables and then determining the magnitude and action of that relationship. The relationships between the influence of informal settlement and respondents' variables are shown in Table 5 below, reveal that forest degradation were moderately influenced by expansion of informal settlement in this study area with person correlation coefficient by .314\*\* at  $p\text{-value} = .000$ . This indicates that the expansion of informal settlement was moderately influenced the degradation of forest coverage in this finding.

Deforestation or forest degradation in Ethiopia takes a leading among the major problems that forest resources are encountered. Although cities in the developing world, including Ethiopia, have expanding populations and increasing wealth, one concomitant aspect of urbanization is the growing concentration of poverty and social inequalities (Sampson 2017), particularly the blooming of informal settlements or slums (United Nations Human Settlements Programmed (UN-HABITAT and IHS-Erasmus University Rotterdam 2018). Similarly, the relationship between the influence of informal settlement on land use and land coverage was influenced by the expansion of informal settlement in this study area with a person correlation coefficient of .322\*\* at  $p\text{-value} = .000$ . which indicates that the expansion of informal settlement was moderately influenced LULC change in this finding (Table 5 below). Literature Argued that the major drivers of urban land use changes can be economic, political, and social issues merged with circumstances of modernization to make people want to migrate from rural to urban areas (Gao and O'Neill 2020).

In this study the influence of informal settlement had correlation with surrounding environment by coefficient correlation of 0.069 (Table 5 below). Which are correlations ranked between 0.1 - 0.29, implies that informal settlement linked with environment problems like, Forest degradations, reduced biodiversity, land use land coverage changes, disrupted water cycle, liquid and solid waste management challenges in the study area. The unsustainable development of these socio-economic activities in informal settlement contributing much to pollution and forest ecosystem services degradation such as lack of trees production, water reduction, air pollution, floods, soil erosion, loss of biodiversity and land resources to a great magnitude compared to the actions taken to improve forest ecosystem services sustainability in urban city. The major environmental issues

affecting Ethiopia are soil erosion and land degradation, and forest degradation, water scarcity, rapid biodiversity loss, and pollution (Wassie 2020).

Similarly, As shown in Table 5 below, the correlation index for the relationship between the influence of informal settlement and poorly planned urban development was .063, which lies between 0.1-0.29 intervals, implying that poorly planned urban development had relationships with informal settlements (Table 5 below). Cities that are poorly planned and managed also introduce new hazards that threaten to destroy current development benefits. Natural disasters can be exacerbated by a lack of proper infrastructure and services, dangerous housing, and inadequate and bad health care. Poor solid waste management, for example, can cause stormwater and sewage networks to get clogged, resulting in waterlogging and flooding. Water scarcity or contamination can result from infrastructure destruction or damage. The ability of urban inhabitants to recover is hampered by a lack of access to safe housing with adequate provisions for water, sanitation, health care, and education.

Table 5 Relationship between influence of informal settlement and Respondents Variable

<b>Correlations</b>				
Influence of informal settlement leads to	Forest Degradation	surrounding environmental pollution	Land use Land cover change	poorly planned urban development
Pearson Correlation	.314**	.069	.322**	.063
Sig. (2-tailed)	.000	.379	.000	.420
N	164	164	164	164
**. Correlation is significant at the 0.01 level (2-tailed).				

Source; house hold interview, 2022

## 4.2. Discussion

In this study, the result implies that increasing cost of housing rent in the urban, delay of the implementation of affordable housing, rural to urban migration, urban expansion, and poor land management (29.9%), (24.4%), (11%) and (10.4%) was the major causes of informal settlement in the study area respectively (Table 8). Correlation is a statistical method that is used to determine whether a relationship between variables exists and to determine whether two or more variables are related and to determine the strength of the relationships between or among the variables are used (Allan 2009). As indicated in Table 5 below, the correlation index for the relationship between the increasing cost of rent houses and causes of informal settlement was 0.947, which was

greater than 0.5. This implied that increasing the cost of house rent from time to time had a strong relationship which leads to the expansion of informal settlement in the study area. Whereas, the correlation index for the relationship between informal settlement and delay of affordable house provision and urban expansion was 0.447 (Table 6 below). This shows that significant relationship between the expansion of informal settlement in the study area with respondent variables. Following this fact, poor land management and Rural to urban Migration had a significant relationship with the expansion of informal settlement.

If the correlation result lies between -1 and 0, the two variables are positively related. Furthermore, according to Field's (2005) general guidelines correlations of 0.1 – 0.29 are considered small, correlations of 0.30 – 0.49 are considered moderate and correlations above > 0.5 are considered strong correlation ships. In this study, the research has identified the relationship between causes of forest degradation. Based on the questionnaires which were filled out by the respondents, the result of the correlation analysis between those variables was listed in Table 6 as stated below. As indicated in Table 6 below, the correlation index for the relationship between informal settlement and forest degradation was 0.549, which has strong relationship resulting in loss of forest.

Table 6 Relationship between causes of informal settlement and Respondent Variable

<b>Correlations</b>						
Respondents Variables		delay of affordable	Poor land Managem ent	Increase cost of housing	Rural to urban Migration	Urban Expansion
Causes of Informal settlement	Pearson Correlation	.447**	.464**	.947**	.418**	.447**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	164	164	164	164	164
**. Correlation is significant at the 0.01 level (2-tailed).						

Source: house hold survey (2022)

The result from the Analysis of Landsat 8 satellite images of forest coverage of the yeka sub-city was decreased stages between 2020 to 2022 and the informal settlement built-up area footprint was expanded enormously from time to time. The major problems which contribute to the expansion of informal settlement in the city are; natural population growth, weak Land Administration system, migration of people from rural Ethiopia to the city, high unemployment

rate, lack of good governance, corruption, the contribution of local Farmers, brokers and speculators are the problem.

As literature shows that the main causes that contribute to the expansion of informal settlement in Ethiopia and through its cities including Addis Ababa are; Population growth, the Failure of Governance, and Institutional and legal failure. It is true that informal settlements occur when the current land administration and planning system fails to address enough supply of land for housing to full fill of the demand people in the cities (Gebre Selasse 2019). In the Yeka sub-city, the rates of informal settlement are minimized by the sub-city and take a measure at different times but still, the peripheral areas of the sub-city are characterized by informal. As a result, they have significantly contributed to the unplanned and rapid horizontal expansion of the built-up area, and the problem is still observed in the sub-cities of woreda 10, 13, and 12 (Yeka sub-city; ULDM 2017).

Large plot size and encroachment of housing found in informal settlements (Bikis 2022). According to the Yeka sub-city" Sened Aleba" office head, the main reasons for the proliferation of squatter settlements and unplanned expansion at the peripheries of the Addis Ababa city are that peasants in the city provide urban land to individuals without the authorization of the relevant legal urban authorities. Public authorities do not recognize the people of informal settlements as an integral part of the city and they ignored physical and social infrastructure like water supply, sanitation, electricity, roads, drainage, schools, and health centers that affect both the health of the residents and the environment. Different kinds of literature show different causes for the formation of informal settlements. It is true that informal settlements occur when the existing land administration and planning system fails to address the needs of the whole residents. When the system fails to address the needs of housing and then people use their own paths to land for residential housing and such settlement is characterized by rapid and unplanned development (Addis 2021).

#### **4.2.1. Trends of Forest loss by using Normalized difference Vegetation Index**

The normalized Difference Vegetation Index (NDVI) is the most commonly used method to extract the area covered by vegetation from the area covered by another type of land use land cover. According to Mesfin (2009), the normalized difference vegetation Index is the most common method to analyze the amount of change in vegetation versus no vegetation by calculating the Normalized Difference Vegetation Index (NDVI). Healthy vegetation is a good absorber of the

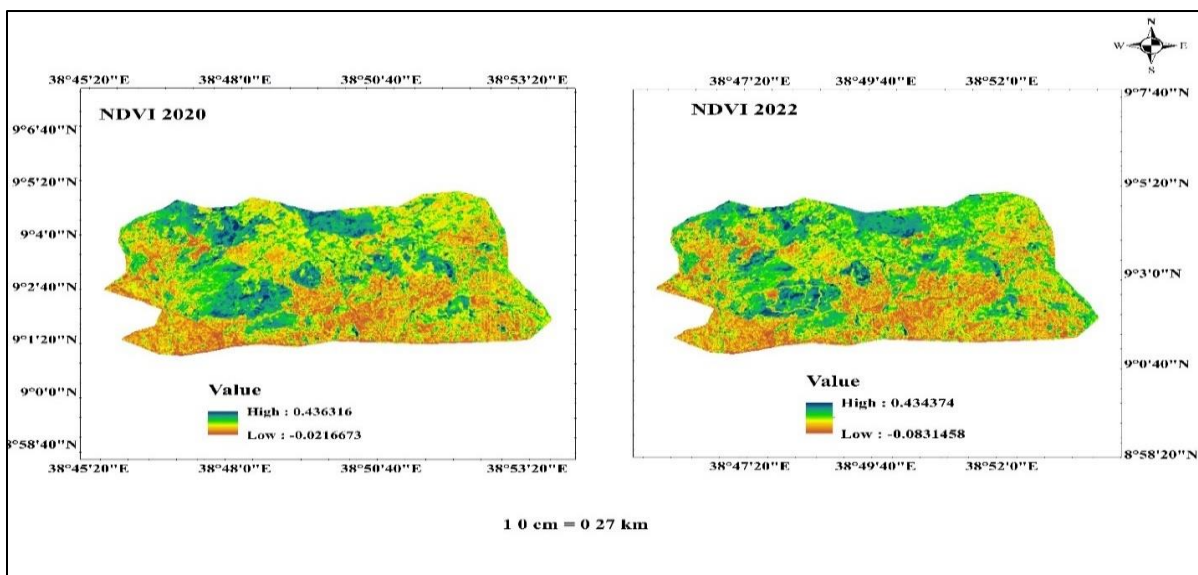
electromagnetic spectrum for visible reasons. Chlorophyll in vegetation highly absorbs (0.4-0.5µm) and red (0.6-0.7µm) spectrum and reflects near-infrared (0.7µm-1.3µm) and green (0.5-0.6µm) spectrum. Since plants highly reflect near-infrared and absorb the red spectrum, these bands are used to calculate NDVI (Kassaw and Tilaye 2022).

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

The NDVI formula were different for different Landsat, but for this NDVI Analysis the researcher was use Landsat 8 the  $NDVI = \frac{BAND\ 5 - BAND\ 4}{BAND\ 5 + BAND\ 4}$

The NDVI Values range from 1 to -1. NDVI Values closer to zero represent Bare soil and rocks, and moderate values (0.2 to 0.3) represent shrubs and grasslands. High NDVI Value (greater than 0.5 represent dense vegetation). Besides the classified images, the researcher has used the NDVI to see the change in vegetation coverage in the yeka sub-city from 2020 to 2022. Accordingly, the value from the NDVI has shown that the forest coverage declined due to the expansion of the built-up area. In this study, the result indicates that the area occupied by forest in Hectares by 2020 is equal to 4416 hectares and it decreased to 3649 hectares in 2022. This implies that the magnitude of conversation due to build-up area including informal settlement for the last two-year interval decreased to 767 hectares.

Figure 5 NDVI Analysis of 2020 and 2022 of Yeka sub city



Source: Output of Landsat image (GIS and RS, 2022)

In the year 2020, about 1,749 hectares of land were occupied by a built-up area, this number has highly increased to 3,905 in the year 2022. This implies the built-up area was increased by about 2156 hectares of land between these two years. From the total built-up area in 2020 about 620 hectares of land remained built up, whereas about 1,129 hectares of land were lost to other land use land cover types. Among these, about 1389 hectares of land were converted to bare lands and about 767 hectares of land has converted to the built-up area (Table 7 below). As reported by Jemal (2019) states that the expansion of informal settlements in Addis Ababa is among the main urban planning and management challenges for the proper growth of the city.

In Table 7 below, from the total of 8065 hectares of forest land, about 6361 hectares of forest coverage remained unchanged, but about 5655 hectares of land were occupied by built-up area, and from 1704 hectares of land cover occupied by informal settlements and about 3951 hectares of land were occupied by other types of built up. That means about 21.2 percent of forest coverage was degraded by the expansion of informal settlements in the study area within two-year intervals. According to the result in Table 7 below in the study area, built areas including informal settlements were 1749 hectares in 2020 and 3906 hectares in 2022, from this result the researchers concluded that the amount of land in hectares taken by built-up area from the forest land in the year 2020 -2022 was 2157 hectares or 55.2 percent of land cover were occupied by built-up area from the forest land (Table 7 below). So, the influence of built-up areas including informal settlements on urban forest coverage areas is increasing from time to time. This implies that informal settlement has a high influence on forest loss or degradation.

The area of the Yeka sub-city of Forest coverage has been reduced from 44.16 square kilometers to 36.49 square meters within two years. The study conducted by Mare *et al.*, (2015) on the Mapping of Plantation Forest in the Upper Catchment of Addis Ababa stated that the change detection of the forest covers the area of Yeka plantation has been reduced from 15 Square kilometers to 14.9 Square kilometers within two years interval. The finding shows that the degradation of forests was still high and continued at an alarming rate within two-year intervals of time. According to Derso E N *et al.*, (2022), rapid LULC changes in Akaki have occurred over the past 30 years, with the urban area expanding by 21% and the agricultural area shrinking by 24% during the study period.

Table 7 Influence of Informal settlement in forest overage of Ankorchha of yeka

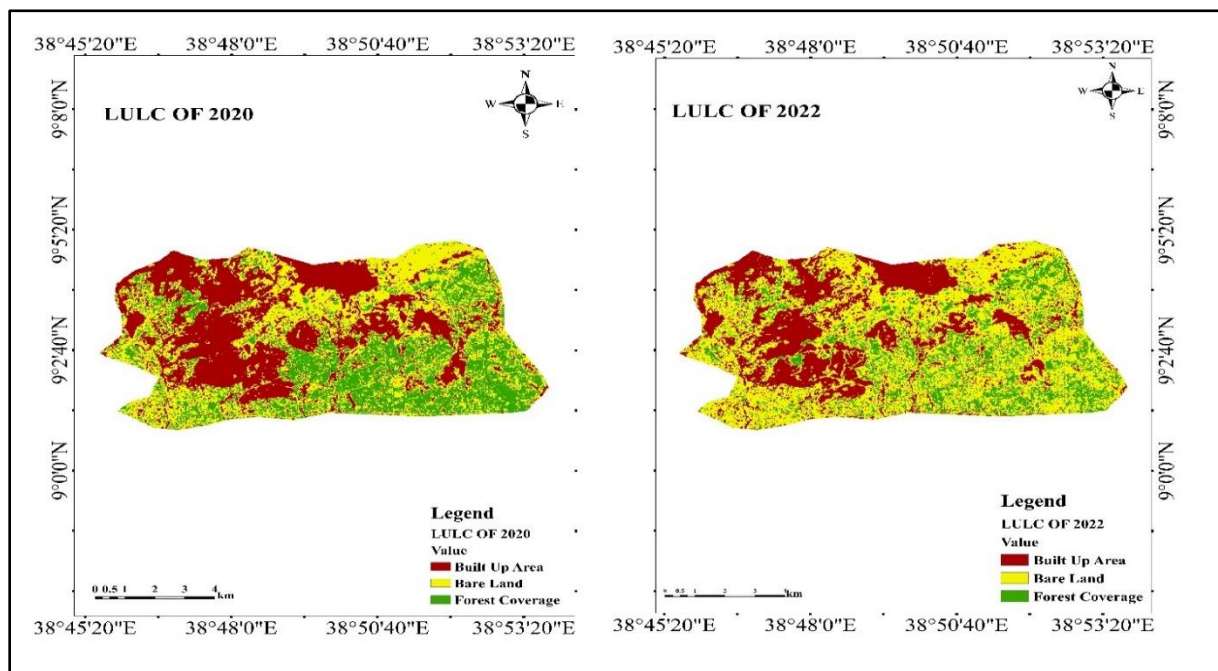
year	Built Up area in hectares	Land cover in Hectares taken by built-up area from forest	Land cover in percentage taken by built-up area from forest	Forest change	Built Up Area in ha
2020	1749	-	-	5441	1749
2022	3906	2157	55.2	3649	3906
2020-2022		2157	55.2	1792	2157

Source: Yeka sub-city Right creation team and Arc GIS Analysis 2022

#### 4.2.2. Land use Land cover Matrix of yeka sub city

To acquire changes in the three land cover classes over the study period (2020-2022), the change matrix was conducted through cross-tabulation to investigate the trend, net change, and percent change between the 2020 and 2020 study periods. The study reveals that the built-up is expanding in the periphery of the city, particularly in Ankorchha of the yeka sub-city (figure 6 below). The study reports that the built-up land increased, which is inconsistent with previous study. In recent years the urban forest of Addis Ababa including the upper catchments of the Entoto Mountain and other forest areas of Addis Ababa has been declining at an alarming rate supported by (Hancock 1995). Humans and their domestic animals have had a major impact on both the vegetation and the terrain, with little natural highland vegetation remaining today (Addis 2015).

Figure 6 LULC changes of yeka sub city in the year 2020 and 2022



Source: Output of GIS and RS, 2022

As indicated in the change matrix Table 9 below, the yeka sub-city from 2020 and 2022 was shown in the above Land sat image Map analysis. According to satellite imagery research, the forest coverage of the Yeka sub-city decreased between 2020 and 2022. As observed from the above change Matrix Table 9 below, about 4416 hectares of land were covered by forest in the year 2020 (Table 8 below).

In 2022 the area covered by Forest declined to 3649 hectares within two-year intervals. This means within an interval of two years forest coverage has declined by about 767 hectares or 82 percent of forest land were declined to another type of land use land cover. This implies that about 767 hectares of Land were changed from forest coverage to Bare land and built-up area. From the total land occupied by forest in the year 2020 about 768 hectares of land remained unchanged, whereas about 3648 hectares of land covered about 1751 hectares to Build area, and about 1897 hectares of land converted into Bare Land (Table 8 below). According to the most recent study conducted by the Addis Ababa city Administration from 2018-2020, about 87,182 square meters of illegal land invasion including informal settlement takes place within two-year intervals (Bayera 2021).

Table 8 Change Matrix of LULC changes between 2020 and 2022

		<b>2022</b>			
		Built Up Area	Bare Land	Forest Coverage	Grand Total
<b>2020</b>	Built Up Area	620	766	363	1749
	Bare Land	1535	1389	2518	5441
	Forest Coverage	1751	1897	768	4416
	Grand Total	3906	4052	3649	11607

Source: Output of GIS and RS, 2022

As indicated in Table 7 below from the year 2020 to 2022 the magnitude of forest in the study area was 7.67 square kilometers or 17.3 percent of forest were degraded in the study area within the last two years interval. According to Mare and Fikrte (2015)'s study on the Mapping of Plantation Forests in the Upper Catchment of Addis Abeba, the area of the Yeka plantation was reduced from 15 square kilometers to 14.9 square kilometers in two years. The study conducted at the yeka sub-city by Kassaw and Tilaye (2022) described that 48.65 percent of the forest was degraded within twenty-year intervals. Therefore, the result implies that the decline of forest coverage in the study area continued at an alarming rate without the forbiddance of any concerned bodies. The area occupied by forest in Hectares by 2020 is equal to 4416 hectares and it decreased to 3649 hectares

in 2022. The magnitude of conversation due to build-up area including informal settlements for the last two-year interval decreased to 767 hectares as the result obtained from Arc GIS and Remote sensing analysis indicated. This clearly indicated that informal settlement was the leading cause of forest degradation.

Table 9 Area occupied or magnitude of changes from 2020 to 2022

year	Area occupied by forest in Hectares	Magnitude of changes	
		In hectares	In percentage
2020	4416	-	-
2022	3649	767	17.3
2020-2022	-	767	17.3

Source: Output of GIS and RS, 2022

#### **4.2.3. Controlling Strategies of Informal settlements and forest degradation**

Based on the information portrayed in Table 7 below, informal settlement created a significant influence on forest degradation. To alleviate these problems, controlling strategies should be taken. The distribution of household respondents on controlling strategies of informal settlement and forest degradation replied that community awareness, Urban land supply, availability and affordability of urban housing, and developing and implementing a modern cadastral information system were the key and major controlling strategies of informal settlement and forest degradation respectively.

According to the result, 67.1% of household respondents strongly agree and 22.0% agree on developing and implementing action of a modern cadastral information system followed by availability and affordability of urban housing 64.6% of respondents strongly agree and 23.8% agree. Studies on urban housing affordability show that only 35.9% of urban Ethiopian houses can afford or have the capacity to buy a low-cost urban housing unit with a construction cost of US\$ 7397 Center for Affordable Housing Finance in Africa (CAHFA 2017). Many urban dwellers are likely to be urban housed in a less emphasized urban housing strategy alternative or be burdened by the cost of living. Urban housing affordability affects urban housing access, health, labor market performance, finance, community sustainability, economic growth, and urban and regional integration, among other things. As a result, it is critical to have a complete awareness of the rental sector's predicament and to come up with a viable solution to the challenges.

Of the two controlling strategies, others like urban land supply 44.5% of the informal house holder strongly agree and 39.0% agree. About 43.9 percent strongly agree and 43.3 percent agree on community awareness as controlling strategies of informal settlement and forest degradation. The mean score for all views of controlling strategies toward informal settlement and forest degradation was 4.3 SD 0.98 (Table 6 below). This implies that the above-listed strategies had a highly positive contribution playing a great role in solving the problem of informal settlement and its influence on forest coverage. In addition, the interviewee from Addis Ababa Land Governance Assessment Framework officials also replied that some basic controlling strategies, like vertical building, protecting illegal deforestation, encouraging and giving incentives for privately owned trees, parking green space and establishing nursery sites in each woreda and implementation of forest law play a great role as a preventive system, and again they argued that whether land information systems provide sufficient, relevant and up-to-date data on land ownership to the general public is among the indicators that conform a land administration system is progressing from lack of good governance to good practice (AALGAF 2022).

In line with this, the Addis Ababa City Administration has developed and implemented a modern cadastral information system (AACADIS) which consists of integrated sub-systems namely RECS, RPRS, and AA-LIS. Addis Ababa Land Holding Registration and Information Agency, Ethiopian Information Network Security Agency, and Addis Ababa Science and Technology Agency have been working to make this real. The study conducted by Endecela (2020) stated that in Addis Ababa City, urban development policy and housing development program have focused more on investment and manufacturing industry development, but the policy has given less attention to low-income housing, land purchase, land lease, and land speculation issues. Land in the periphery of Addis Ababa is ineffectively manipulated and the conditions have highly influenced to the rapid informal settlement expansion.

Table 10 distribution of controlling strategies of informal settlement and forest degradation

Controlling strategies of informal settlement and forest degradation	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Deviation
Community awareness	5.5	4.9	2.4	43.3	43.9	4.15	1.06
Urban Land supply	3.7	5.5	7.3	39.0	44.5	4.15	1.02
Availability and affordability of urban housing	1.8	6.1	3.7	23.8	64.6	4.43	0.95
Modern cadastral information system	4.9	5.5	4.9	22.0	67.1	4.47	0.92
						4.3	0.98

Source; house hold interview, 2022

They also suggested that a community awareness campaign should be implemented in order to solve this problem in general and to make conservation of the existing forest habit for the community in particular. According to the World Bank Group (WBG 2018) formal land supply has failed to fulfill the demand and informal land supply is filling the gap, as evidenced by mushrooming squatters around the peripheries of cities. According to MUDCo's report (2020), the ministry's land supply performance versus the national level target in the previous five years was 59.61 percent of the plan, indicating a 40 percent demand gap. Even though the urban local governments have significantly increased land production, from a very low base, they are far short of targets and identified demands. The study conducted by Kassaw and Tilaye (2022) argued that to support the low-income group, land for housing up to 175 square meters was given free of charge. Besides this, special emphasis was given and is still given to housing cooperatives. For example, of the total 40,000 plots supplied in the six years about 60% was given to housing cooperatives. However, despite all these efforts, there is a huge gap between demand and supply. The delay in providing land, insufficient institutional setup, unfavorable procedures and requirements in land supply, etc. are among the major factors that worsen the situation of land supply.

## CHAPTER FIVE

### 5. CONCLUSION AND RECOMMENDATIONS

#### 5.1. Conclusion

Based on the findings of this study the following conclusions were drawn in line with the research objectives. To assess the influence of informal settlement on forest coverage by mean score were computed. The influence of informal settlement on forest degradation was high. The trend of forest degradation was increasing at unprecedented rate from time to time due to informal settlement and urban expansion as a result obtained from GIS output, questionnaire and interviewee. 7.67 square kilometers or 17.3 percentage of forest were degraded in the study area within the last two years interval.

From the comparison result on Table 8 in the study area, built up area including informal settlement were 1749 hectares in 2020 and 3906 hectares in 2022, from this result the researchers concluded that the amount of land in hectares taken by built up area from the forest land in the year 2020 - 2022 was 2157 hectares or 55.2 percent of land cover were occupied by built up area from the forest land. So that, the influence of built-up area including informal settlement on urban forest coverage is increasing from time to time. This implies that informal settlement has great influence on forest degradation.

The relationships between influence of informal settlement and respondents' variables in this study reveals that forest degradation were moderately influenced by expansion of informal settlement in the study area. The controlling strategies of informal settlement and forest degradation replied that community awareness, Urban land supply, availability and affordability of urban housing and developed and implemented a modern cadastral information system were the key and major controlling strategies of informal settlement and forest degradation respectively.

The major problems which contribute for expansion of informal settlement in the sub city is; natural population growth, weak Land Administration system, migration of people from rural Ethiopia to the city, high unemployment rate, lack of good governance, corruptions, contribution of local Farmers, brokers and speculators are the problem etc. Natural population growth is one of a factor for expansion for informal settlement this because in recent year in rural areas of Ethiopia

the population is highly growth and this cause for increasing unemployment rate and for migration of people to Addis Ababa for searching of job.

## **5.2. Recommendation**

In general, informal settlements/moon-houses/ are the cause of many problems, especially deforestation in the areas of forest cover, Environmental degradation and environmental pollution. Flood is common in the areas where there is no infrastructure development. They are prone to landslides, and measures to prevent informal settlements should make with attention. So that; the Researchers have the following Recommendations;

### **1. Addis Ababa city Administration should emphasize on: -**

- Expansion of adequate housing supply for the growing population
- The government should properly study and identify the cause of the proliferation of moon houses in the city and record informal land acquisitions and housing settlements. It is required to investigate and identify those who have invaded the land through illegal business and take action in a legal way.
- There is a need to properly study the problems of individuals who have settled houses without legal authority, build affordable houses from areas with forest cover, and transfer them to the residents in various ways to facilitate the redevelopment of forest areas.
- There is a need to develop a system to control the legal and illegal brokers and investors involved in illegal land invasion and house settlement.
- It is necessary to study and identify the doors and structures of corruption in the government structure and work to prevent the problem from occurring.
- Displacement from different parts of the country aggravates the building of informal settlement in the city should need effective and efficient sustainable political work for the citizens of the country.

### **2. Addis Ababa city Administration Environment Protection Authority**

- Should have a permanent and committed government forest management
- Should have Implementation of consistent and sustainable forest management structure
- Establishing a system to control the authorities and brokers involved in illegal land occupation and taking action against those who violate the law.

- Should have expanded the integrated and participatory forest management systems with the society.
- Should have control and regulate informal settler from Illegal connect and discharge liquid and toilet sewage to the flood drainage line, dispose of solid waste in an unauthorized place, open manhole covers, block holes and flood drainage line or prevent and control damage; He takes action. He causes it to be taken.

3. **Addis Ababa city Administration code of Enforcement /*Denb Maskeber*/ Authorities**

- Engages the community in all fields by holding open discussions with the community on any way environmental protection activities and illegal prevention activities.
- To prevent the effects of illegal settlements on the surrounding Environment they should replace informal settlement demolishing area by forest plantation and should regulate the illegal houses in the forest area according to the law to build houses that follow the local development plan and protect green areas.

4. **Addis Ababa City Administration Landholding Registration and Information Agency**

- Prepares and updates basic and legal cadaster maps; Collects current spatial and non-spatial information and studies of urban land, fiscal infrastructure and social institutions from relevant institutions, organizes and manages a data bank through GIS and cartography; develop and implement cadaster technology system.

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## Annex I: Questionnaires for Informal Settlers

Addis Ababa University  
College Of Development Studies  
Department Of Environment and Sustainable Development  
*Questionnaires for informal settler, Government officials and Experts of yeka sub city*

### Consent Form

#### Dear Participants of the study

My name is Menbereleul Mathewos Maja. I am a graduate student of Addis Ababa University, College of development studies. The purpose is to qualify the requirement for awarding the Master of Arts (MA) in Environment and Sustainable Development at Centre for Environment and Sustainable Development. As a partial fulfillment of the study, conducting a thesis project has expected. To this end, I am about to work on a thesis project entitled “*Assessing influence of informal settlement on forest coverage of Addis Ababa, the case of Yeka sub-city*”. In this regard, your participation is very vital for the successful complementation of this project. For that, you have selected to participate in the study because you will be concerned about influence of informal settlement in your life. The Participation is voluntary, and you can choose not to take part or you can quit anytime of the interview if you feel so. Moreover, you should know that all the information you will provide kept confidential, also your name will not be mentioned in the report. Hence, if you confirm your willingness to participate in the interview, I will be interested to audio-record our discussion in order to grasp the details of the valuable information you will provide on the subject of my study. However, recording will depend on your willingness. Otherwise, the researcher will take notes as much as possible. So now, can you confirm your willingness to participate in the interview?

#### Direction:

- Please try to answer every question in accordance to the instruction provided.
- For multiple choice questions, please answer by putting “√” sign in the box provided. c. For questions that require your opinion, please give short, precise and honest answer.

**Respondent ‘s signature**..... **Date:** .....

Thank you very much for your willingness!

**Part -I: - personal information**

1. Gender: 1) Male  2) Female
2. Age 1) 18 to 25 years  2) 26 to 35 years  3) 36 to 45 years  4) 46 to 55 years  5) Above 56 years
3. Occupation 1) G/ employed  2)Self-employed  3)Daily laborer  4) Farmer   
5) Other

**Part - II: - Informal Settlers Socio Economic Information**

4. Your Per month salary (ETB) 1) <2000 ETB , 2) 2001 – 4000ETB , 3)4001– 6000ETB 4) 6001-8000ETB  5) >8001
5. Marital status 1) Single  2) Married  3)Widowed  4) Divorce
6. Level of education 1) primary (1-8) , 2) secondary (9-12) , 3) technical and vocational certified , 4) Diploma certified  5) B.Sc. 6) M.Sc.  7) Ph.D.
7. For how long you lived in this place?  
1) <2 Years  3) 2-5 Years  4) 5.1-10 year's  5) 10.1-25 Years

8. Where you lived before? 1. Rural area  2. Urban Centre  3. Other specify -----  
-----

**Part-III: - General information about informal settlements by study participants of Ankorchha of Yeka sub city**

9. How do you access land or house? 1) Bought land/house from rural land holder 3) Rent the house  
2) Occupy land informally/invoke open land and/or forest land/ 4) Inheritance/donation
10. which of the following causes aggravate informal settlement in Ankorchha of yeka sub city?  
1. delay of the implementation of affordable housing  
2. increasing cost of housing rent in the urban 4) Rural to urban Migration of people  
3. urban Expansion 5) poor land Management

11. what is your degree of agreement on the following influence of informal settlement in Ankorchha of yeka sub city?

Major influence of informal settlement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Forest Degradation					
Land use Land cover change					
poorly planned urban development					
surrounding environmental pollution					

Mention if other influence in your locality -----  
-----  
-----

12. what is your degree of agreement on the following Controlling Strategies of Informal settlements and forest degradation

Controlling strategies of informal settlement and forest Degradation	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Community awareness					
Urban Land supply					
Availability and affordability of urban housing					
Modern cadastral information system					

## Annex II: Key Informant Interview Questions

This thesis attempted to explore the impact of informal settlement on the surrounding Environment in yeka sub city, Addis Ababa. Your involvement in this study is voluntary. The data that will be supplied amid the study will stay private and unspecified, and will be employed for the intentions of study only. Signing the consent below displays that you grasp the motivations behind this study and willing to take part in it.

**Respondent 's signature**..... **Date:** .....

- 1) Do you think that informal settlements are suitable for residential purposes? If not, why?  
-----
- 2) Where in the place where informal settlement is prevalent in your locality?  
A) Open spaces                      B) Tree or forest sites                      C) Riverbanks  
D) Specify if others -----
- 3) Do think that Deforestation will take place during informal settlements in the sub city?    A) Yes  
B) No
- 4) If you're Answer for the question Number seven is yes, what do you think will do to the surrounding environment? A) Deforestation                      B) Environmental pollution
- 5) Do you believe that informal settlement is on the rise/increasing/? A) Yes, I believe                      B) I do not believe
- 6) If your answer to the 9 question is yes, I believe, why does it seem to be expanding or increasing?  
A) Incompatibility between citizens' housing needs and government housing supply  
B) Illegal housing is a key way to solve housing problems C) Population growth and population migration to the city D) The government has not put in place a system to prevent illegal housing E) In the absence of a law to prevent illegal settlement F) There is no rule and regulation to prevent informal settlement
- 7) Do you believe that informal settlement is widespread among low-income and poor segments of society?  
A) Yes, I believe                      B) I do not believe
- 8) Do you believe that the areas where informal settler is taking place have adequate infrastructure for the community A) Yes                      B) No
- 9) What do you believe the government should do to reduce or stop illegal housing or informal settlement?  
-----  
-----
- 10) what are the major causes of informal settlement? -----  
-----  
-----
- 11) what is the consequence of informal settlement in Addis Ababa? -----  
-----  
-----
- 12) Mention some of the controlling strategies of informal settlement and forest degradation? -----  
-----  
-----

### **Annex III: Field Observation Checklists and Photos**

In order to demonstrate the physical outward expansion of informal settlements of Ankorcha the researcher conducted field observation with key informants.

1. Trends of physical growth of informal settlement and degradations of forest status.
2. Assessing the status of informal settlements and forest coverage areas.

**THANK YOU VERY MUCH GRATEFUL TO YOU FOR YOUR TIME AND COOPERATION**

**Annex IV: Field survey photo image by the researcher**



## Annex V: Correlation Matrix Table of Variables

		Correlations Matrix											
		way to access Land or House	Delay of Affordable	Increase cost of housing	Rural to urban Migration	land garbling	Urban Expansion	pollution	Forest Degradation	poor settlement pattern	poor land use intensity	poor sanitation	forest degradation
way to access Land or House	Pearson Correlation	1	.076	.083	.016	.188*	.188*	.188*	-.009	-.024	-.129	-.126	.124
	Sig. (2-tailed)		.336	.288	.840	.016	.016	.016	.907	.760	.099	.107	.113
	N	164	164	164	164	164	164	164	164	164	164	164	164
Delay of Affordable	Pearson Correlation	.076	1	.947**	.418**	.447**	.447**	.447**	-.029	.065	-.028	-.098	.549**
	Sig. (2-tailed)	.336		.000	.000	.000	.000	.000	.709	.407	.719	.214	.000
	N	164	164	164	164	164	164	164	164	164	164	164	164
Increase cost of housing	Pearson Correlation	.083	.947**	1	.404**	.484**	.484**	.484**	-.040	.053	-.041	-.110	.605**
	Sig. (2-tailed)	.288	.000		.000	.000	.000	.000	.610	.497	.605	.159	.000
	N	164	164	164	164	164	164	164	164	164	164	164	164
Rural to urban Migration	Pearson Correlation	.016	.418**	.404**	1	.236**	.236**	.236**	-.008	.103	.096	.036	.251**
	Sig. (2-tailed)	.840	.000	.000		.002	.002	.002	.916	.190	.222	.650	.001
	N	164	164	164	164	164	164	164	164	164	164	164	164
land garbling	Pearson Correlation	.188*	.447**	.484**	.236**	1	1.000**	1.000**	-.035	.051	-.054	-.059	.460**
	Sig. (2-tailed)	.016	.000	.000	.002		.000	.000	.658	.514	.491	.455	.000
	N	164	164	164	164	164	164	164	164	164	164	164	164
Urban Expansion	Pearson Correlation	.188*	.447**	.484**	.236**	1.000**	1	1.000**	-.035	.051	-.054	-.059	.460**
	Sig. (2-tailed)	.016	.000	.000	.002	.000		.000	.658	.514	.491	.455	.000
	N	164	164	164	164	164	164	164	164	164	164	164	164
po	Pearson Correlation	.188*	.447**	.484**	.236**	1.000**	1.000**	1	-.035	.051	-.054	-.059	.460**

	Sig. (2-tailed)	.016	.000	.000	.002	.000	.000		.658	.514	.491	.455	.000
	N	164	164	164	164	164	164	164	164	164	164	164	164
Forest Degradation	Pearson Correlation	-.009	-.029	-.040	-.008	-.035	-.035	-.035	1	.495**	.486**	.551**	.058
	Sig. (2-tailed)	.907	.709	.610	.916	.658	.658	.658		.000	.000	.000	.463
	N	164	164	164	164	164	164	164	164	164	164	164	164
poor settlement pattern	Pearson Correlation	-.024	.065	.053	.103	.051	.051	.051	.495**	1	.646**	.800**	.175*
	Sig. (2-tailed)	.760	.407	.497	.190	.514	.514	.514	.000		.000	.000	.025
	N	164	164	164	164	164	164	164	164	164	164	164	164
poor land use intensity	Pearson Correlation	-.129	-.028	-.041	.096	-.054	-.054	-.054	.486**	.646**	1	.663**	-.022
	Sig. (2-tailed)	.099	.719	.605	.222	.491	.491	.491	.000	.000		.000	.782
	N	164	164	164	164	164	164	164	164	164	164	164	164
poor sanitation	Pearson Correlation	-.126	-.098	-.110	.036	-.059	-.059	-.059	.551**	.800**	.663**	1	-.011
	Sig. (2-tailed)	.107	.214	.159	.650	.455	.455	.455	.000	.000	.000		.892
	N	164	164	164	164	164	164	164	164	164	164	164	164
forest degradation	Pearson Correlation	.124	.549**	.605**	.251**	.460**	.460**	.460**	.058	.175*	-.022	-.011	1
	Sig. (2-tailed)	.113	.000	.000	.001	.000	.000	.000	.463	.025	.782	.892	
	N	164	164	164	164	164	164	164	164	164	164	164	164
*. Correlation is significant at the 0.05 level (2-tailed).													
**. Correlation is significant at the 0.01 level (2-tailed).													