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**ADDIS ABABA UNIVERSITY  
ETHIOPIAN INSTITUTE OF ARCHITECTURE, BUILDING  
CONSTRUCTION  
AND CITY DEVELOPMENT (EiABC)**

**ASSESSING THE DRIVING FACTORS AND ACTORS FOR THE LAND  
USE/ LAND COVER CHANGES OF DESSIE CITY, AMHARA REGION,  
ETHIOPIA.**

**AUTHOR: EDEN SHIMELIS WORKU**

**ADVISOR: BIRHANU GIRMA(PhD)**

**DECEMBER, 2023**

**ADDIS ABABA, ETHIOPIA**



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Ethiopian Institute of Architecture, Building Construction and  
City Development (EiABC)**

**Assessing The Driving Factors and Actors for The Land Use/ Land Cover  
Changes of Dessie City, Amhara Region, Ethiopia.**

**By:**

**Eden Shimelis Worku**

**A Thesis Submitted to the School of Graduate Studies of Addis Ababa University,  
Ethiopian Institute of Architecture, Building Construction and City Development,  
in Partial Fulfilment of the Requirements for the Master of Science Degree in  
Urban Planning**

**Advisor:**

**Birhanu Girma (PhD)**

**December, 2023**

**Addis Ababa, Ethiopia**

## **Declaration**

I, Eden Shimelis, do hereby declare that this research work entitled " Assessing The Driving Factors and Actors for The Land Use/ Land Cover Changes of Dessie City, Amhara Region, Ethiopia" Is my own original work, and it hasn't been submitted to another university or institution for a degree or certificate or for any other reason. I have recognised and mentioned all other sources of data and materials utilised in this work.

Name: Eden Shimelis Worku

Signature: \_\_\_\_\_

Date: December, 2023

## Approval

As a member of the Examiners board of the final Master's thesis open defence of Eden Shimelis, we have read and evaluated the thesis prepared by Eden Shimelis entitled “**Assessing The Driving Factors and Actors for The Land Use/ Land Cover Changes of Dessie City, Amhara Region, Ethiopia**” and Recommended to Ethiopian Institute of Architecture, Building Construction and City Development, Addis Ababa University, to accept the thesis For The Fulfilment Of Requirements for the award of Degree of Master 's of Science in Urban Planning.

### Board of Examiners

<b><u>Birhanu Girma (PhD)</u></b>	_____	_____
<b>Advisor:</b>	Signature	Date
<b><u>Bosena Yirga (PhD)</u></b>	_____	_____
<b>External Examiner:</b>	Signature	Date
<b><u>Solomon Benti (PhD)</u></b>	_____	_____
<b>Internal Examiner:</b>	Signature	Date
<b><u>Dagnachew Adugna (PhD)</u></b>	_____	_____
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## **Acknowledgement**

First and foremost, I would like to thank God, for his countless providence throughout my study. I would like to thank my advisor, Dr. Birhanu Girma, who helped and guided me in the process of my research. And the research participants, who devote their invaluable time to respond for the designed questions deserve special thanks. I am also grateful to my instructors from the chair of Urban and Regional planning and colleagues who gave me additional support and advice. Thanks, my families for supporting me with moral and financial aspects. Last but not least, I would want to express my gratitude to everyone who was in my vicinity but whose name may not have shown above. Any oversight in this brief acknowledgement doesn't mean lack of thankfulness.

## **Abstract**

*This study evaluated the effects of migration on the land use and land cover of Dessie city between the years 2016 and 2022. Dessie cities informal settlement has led to uncontrollable changes in land use and cover, converting agricultural and protected forest areas to residential areas. Through the identification of motivating factors and actors, the use of spatial analysis of remote sensing, GIS tools, and survey methodologies, the study was carried out using both qualitative and quantitative approaches. In order to determine the perception of office workers and the community of the city on the factors and players who contribute greatly to the land use and land cover of the Dessie city, the primary data were gathered through questionnaires, semi-structured interviews, and observations and satellite images were used as data sources to gather the secondary data. The study's findings significantly indicated that built-up areas expanded from 3,467.8 ha in 2016 to 7937.5 ha in 2022 while Agricultural land declined from 6,428.9 hectares in 2016 to 4462.7 ha in 2022. Based on the findings, the study also came to the conclusion that the main driving forces behind the change in land use/ land cover of the city were population growth, employment opportunities, issues with instability, unrestricted access to property, housing preferences, urban topography, and city's plans, as well as actors like land brokers, local farmers, experts, and government officials. Finally, the research recommends to curb track of changes in land use /land cover and developments should be carried out properly in accordance with a planned strategy, there is a need in effective land management and monitoring technologies in order to guarantee a proper usage of land.*

**Key words:** Actors, Driving Factors, Informal settlement, Land Use, Land cover change, Migration

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## **List of Acronyms**

ASL:	Above Sea Level
AU:	African Union
CBD:	Central Business District
CSA:	Central Statistical Agency
DCA:	Dessie City Administration
DCASPPO:	Dessie City Administration, Structure Plan Preparation Project Office
DTM:	Displacement Tracking Matrix
E.C:	Ethiopian Calendar
ENUGISO:	Ethiopia National Urban Green Infrastructure Standard Office
FAO:	Food and Agriculture Organization
G.C:	Gregorian calendar
GIS:	Geographic Information System
IDIs:	Internally Displaced Individuals
IDMC:	Internal Displacement Monitoring Centre
IDPs:	Internally Displaced Peoples
IOM:	International Organization for Migration
LULC:	Land Use Land Cover
M-ASL:	Mean Above Sea Level
PCA:	Principal Components Analysis
RGB:	Red, Green, Blue
RK:	Rural Kebele
RS:	Remote Sensing
RST:	Remote Sensing Techniques
SNNPR:	Southern Nations, Nationalities, and Peoples' Region
TM:	Thematic Mapper
UK:	Urban Kebele
UNESCO:	United Nations Educational, Scientific and Cultural Organization
USGS:	United States Geological Survey
UTM:	Universal Transverses Mercator
WGS:	World Geodetic System

# CHAPTER ONE

## 1. INTRODUCTION

Changes in land use/ land cover (LULC) are among the most significant and obvious signs of a shift in the ecosystem and livelihood support systems (Gilani, 2014). In order to manage natural resources sustainably, maintain the environment, and ensure food security, it is crucial to measure and monitor the complexity of LULC changes (Drummond, 2012).

Through a variety of actions, humans have had an impact on the earth's surface. According to (Lambin, 2003), the goals for which humans use the land cover determine land use, which is influenced by human, socioeconomic, and political factors (Helmut, 2002). The biophysical terrestrial surface is referred to as land cover (Helmut, 2002). Therefore, it is crucial to comprehend the human factors and the dynamics of LULC changes. According to Verburg (2010), many interactions between society and the environment led to LULC transformation. Numerous research has demonstrated that social, ecological, and economic aspects have an impact on the human dimensions, and that understanding and addressing these issues requires an interdisciplinary approach (Drummond, 2001).

In the rouse of political and environmental catastrophes, migration of human populations is frequently considered as a problem (Jonatan, 2017). But a more typical demographic trend is really human movement brought on by slow-onset environmental and climatic changes (Frank, 2009). According to Henry et al. (2004), considerable populations in the developing world continue to travel to and from cities as well as within rural and border areas.

### 1.1.Study Background

There were 55 million internally displaced persons throughout the world as of December 31, 2020. Of these, over 85% had left because of conflict or violence, and just approximately 7 million had been uprooted by natural catastrophes (IDMC, 2021, pp. 7). Based on data from the AU, Kampala Convention, these internally displaced individuals (IDIs) are "persons or groups of those who have had to evacuate or abandon their homes or other regular places because of compulsion or obligation habitation, especially in response to prevent the impacts of armed conflict, conditions human rights abuses, catastrophes caused by nature or people, or acts of widespread violence, and who have not stepped foot across an internationally recognized State boundary (AU, 2009).

Ethiopia has the highest rate of severe internal displacement worldwide, according to the Displacement Tracking Matrix (IOM, 2021). Also, Ethiopia had the biggest number of new

displacements brought on by conflict and violence in 2020, ranking third in the world behind the Democratic Republic of the Congo and Syria. Conflict continues to be the main cause of displacement and displaced 1.12 million IDPs (62%), while drought displaced 331,963 IDPs (17%), flash floods displaced 169,662 IDPs (9%), seasonal floods displaced 114,496 IDPs (6%) and social tension displaced 91,822 IDPs (5%) (DTM, 2021, pp. 7-17).

According to IDMC (2021), violence is still a major problem in country like Ethiopia, where the majority of people are displaced internally for an extended period of time. According to the IDMC research, Sub-Saharan Africa, the Middle East, and North Africa will see the greatest number of new displacements as a result of war and violence in 2020. As in previous years, the majority of these displaced people were from Ethiopia, Syria, and the DRC. The main causes of internal displacement in Ethiopia were political instability and insecurity (caused by conflict, ethnic-based violence, and localized grievances); environmental factors, such as natural disasters (such as drought, famine, landslides, and floods); and planned resettlement and relocation programs because of development projects and excessive urbanization.

Regarding the socio-cultural-economic impact of internal displacement, the studies reviewed demonstrate that the displacement of local community has high effects on the socioeconomic status of the households (Fufa, 2020), degradation in the livelihood, housing conditions (Cazabat, 2020), socio-cultural confusion, loss of identity and family disintegration (Chada, 2005), limited access to adequate food, water, better housing, health care and basic education, as well as access to employment (Demisse, 2020). Additionally, some studies show that IDPs' psychological well-being, especially their mental health problems, are significantly impacted by displacement. Traumatic life experiences involving relocation are highly linked to increased mental anguish and worse quality of life.

In the highlands of Ethiopia like Dessie city, there has been a significant LULC shift during the last several decades. Previous research suggested that in the majority of Ethiopia's highlands, the loss of forest cover and the development of agricultural land towards steep slope regions unsuitable for agriculture are important examples of LULC transition. Some research showed that community-led afforestation and land restoration efforts had improved the forest cover. The majority of earlier studies on LULC changes were focused on a small number of locations, mostly in the highlands and in some regions of the Ethiopian rift valley, and they only used remote sensing images to quantify the extent of LULC changes; However, they did not provide explanations on how local people perceived the forces that were causing LULC change and its associated causes (FAO, 1995).

By traveling to specific spots on the ground, it is possible to see how the landscape has changed (Mary, 2013). However, these conventional methods are thought to be time-consuming, expensive, and inefficient because they do not produce a comprehensive result. In contrast, remotely sensed data can provide the necessary information quickly, examine time-based changes in the LULC dynamics quickly, and accurately identify environmental changes; (Schaefer & Thinh, 2013), there have been several attempts to exploit digital satellite image data (Abebe, 2017). As a result, it has been shown that both RS and GIS are quite useful for identifying LULC patterns (Atrii, 2015). The monitoring of natural resources at various scales and local environmental studies are significantly connected by remotely sensed data (Mary, 2013). According to Kotoky(2012), LULC investigations are becoming more crucial in a variety of sectors, such as ecological research, efficient land use planning, settlement surveys, and agricultural growth. A key strategy to improve effective management of natural resources is to use Landsat pictures to assess LULC alteration at different levels and to determine the rate and degree of land cover change (Meshesha, 2016).

## **1.2. Problem Statement**

In recent decades, economic factors have been the most common drivers of migration in Ethiopia, followed by political reasons including oppression, insecurity, and ethnic tensions. Migration is increasingly perceived as the only way out of poverty in Ethiopia, especially for the rural youth (IOM, 2020).

Land-use/cover changes at larger geographic scales are ultimately the result of individual land-use decisions. However, land managers primarily react to internal and external factors that affect the land-management unit, and their choices are influenced by their personality traits, the local environment, and the wider socioeconomic, political, institutional, and environmental contexts in which the land unit is embedded (Helen, 2017).

According to (UNESCO, 2018), a number of biophysical and socioeconomic variables working at various geographical and temporal scales and acting in complex webs of place- and time-specific connections all have an impact on how land use and land cover evolve. Relevant biophysical characteristics at the level of the particular land unit include the local temperature and weather, terrain, bedrock and soil type, surface water, and groundwater. The size of the household, age, gender, education, employment, attitudes, values, and personality traits of household members, site-specific conditions such as accessibility, regional land-use structure, as well as the cost of transportation, profits, parcel size, competition, costs of production, product prices, public and private financial support, land-management practises, land tenure, and owners, all have an impact on the choice of land use and decisions to change it.

Future land-use and cover change will depend, on the one hand, on the dynamic relationships among these factors and the resulting land-use patterns, from the individual to higher spatial levels, and, on the other hand, on national and international direct and indirect policies instituted to mitigate the negative environmental and socio-economic impacts of land-use and land cover change.

According to the results of the land use and housing ownership study of (DCASPPPO,2017), there are informal housing developments, migrations from other rural areas. Besides, increasingly issues concerning migrations and informal human settlements are gaining recognition in Ethiopia. Land use/land cover change caused due to internal migration and human settlement on the physical environment is also recognized. However, the impact of migration and the informal human settlement on the land use and land cover change is not assessed.

### **1.3. Objective of the Study**

#### **1.3.1. General Objective of the Study**

The general objective of the research was to assess the driving factors and actors for the land use/land cover changes of Dessie city from the year 2016-2022.

#### **1.3.2. Specific Objectives of the Study**

- ✓ To analyse the land use/land cover change of Dessie city.
- ✓ To determine the factors and actors of land use/ land cover change.
- ✓ To assess impacts on the land use/ land cover changes faced due internal migration.
- ✓ To recommend approaches to reduce unplanned land use/ land cover changes.

### **1.4. Research Questions**

1. To what extent does the land use/ land cover of Dessie city changed?
2. What are the factors and actors affecting the land use/ land cover change in Dessie city?
3. How internal migration can affect the land use/ land cover change?
4. What are the approaches to protect unplanned land use/ land cover changes?

### **1.5. Scope of the Study**

#### **1.5.1. Spatial Scope**

The research is conducted in Ethiopia, within Southern Wollo of Amhara region, in Dessie city, that experienced horizontal urban expansion.

#### **1.5.2. Thematic Scope**

Thematically, the study focuses on the assessment of land use/ land cover changes with their drivers and actors. Specifically, this study is based on the types of migration that are potentially associated

with the unmanaged urban growth of the city.

### **1.6. Significance of the Study**

The study is important to set strategies and approaches for appropriate management of land resources by comprehending effects of land use change, identifying motivating factors and actors, and impacts. It is also important to be a benchmark for academic purposes, for other scholars, policymakers, urban planners, and practitioners who are working in related fields.

### **1.7. Limitations of the Study**

First, the limited number of informants engaged voluntarily. Second, some unpublished materials may be overlooked because, the literature review in the study area are mostly relied on the published articles. Third, some conclusions might not be generalizable because they only work for the city. Fourth, there was a problem during data collection because of some conflicts in the Amhara regions neighbours. Lastly, the duration of the research time is short to conduct comprehensive and error free results.

### **1.8. Organization of the Paper**

The research is organized under five chapters. The first chapter introduces background data from a global perspective to the specific study area, statement of the problems, objectives, the research question, significance, scope and limitations of the research.

The second chapter is literature reviews of academic discourses that were significant to this study. The reviews cover contextual, conceptual and theoretical literatures.

The third chapter discusses the about the methodology and materials used in the research.

The fourth chapter contain results and discussions whereas the fifth deals about the conclusions and recommendations.

## CHAPTER TWO

### 2. LITERATURE REVIEW

#### 2.1.Introduction

This part reviewed the literature, including research articles and reports, with reference to internal migration theory as well as theories of LULC change. The evaluation also thoroughly evaluated the internal migration's primary motivators and players, the effects it had on LULC change and GIS and RS applications, and the importance of using certain tools to analyse the patterns in LULC change. Additionally, this part analysed various methodological tools and procedures before summarising the research conducted by other researchers in the same field of study and drawing a conclusion from the literature by pointing out any remaining areas of inquiry.

#### Contextual Review

##### 2.1.1. Physical Characteristic of study area

##### Area and Shape

The city is more stretched out along the asphalted highway from Kombolcha city to Haik town in the North- South. Areas of the town that do not have suitable topography for residence or infrastructural development are less elongated. The total area of the Dessie city is 19, 716 Ha.

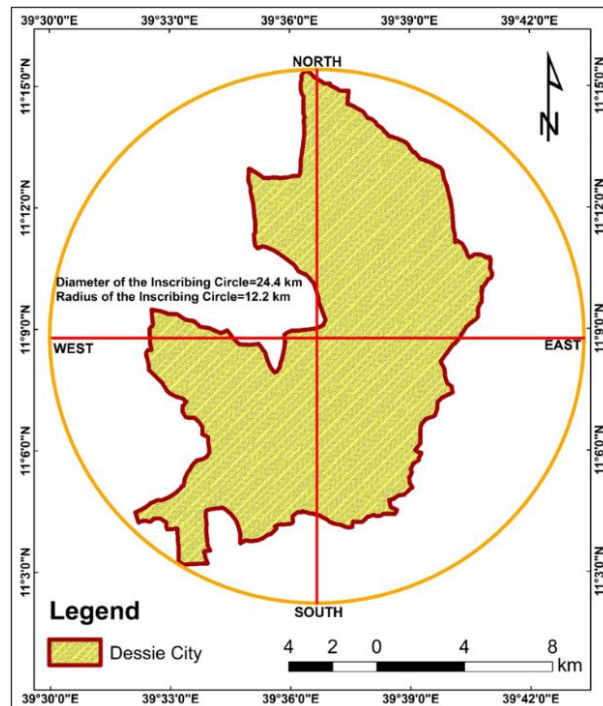


Figure 2.1; Area and shape of Dessie city

Source;(DCASPPPO, 2022)

## Topography

- 1. Very High-Altitude Areas (2800–3041-meter ASL):** These areas are found in the western part of the city. The dominant locations with this altitude are found on the Tossa mountain which stretches from the South eastern part of the city to North western part of the city. This area is mainly covered with shrubs and various vegetation species.
- 2. High Altitude Areas (2550-2800 meters ASL):** This altitude covers most part of the city mainly in the northern and central part of the city. The most well-known areas in this category includes the Azwa Gedel, Nigus Mickael Palace, Doro Mezleya, Demena Cheffe, Segno Gebeya, Boru Meda plain, Wollo University, Boru Selassie, Dandi Boru, Ager Gizat, Melaku, Menafesha, Buanbua Wuha, Tita Ber, Kurkur, Radio Tabia, Bahir Shesh, Megenagna, and other pocket areas in the southern part of Dessie. Most of these areas are covered with settlements and serving as agricultural fields.
- 3. Medium Altitude Areas (2300-2550 meters ASL):** The medium altitude areas in Dessie city are mainly found in the south and central part of the city in different pocket areas. These include the Tita plain, Hotie, Kera and parts of the Gerado area.
- 4. Low Altitude Areas (2028-2300 meters ASL):** These altitude areas in Dessie city are found along the catchments of the Borkena and the Gerado rivers in the southern part of the city. These areas are well known with particular names like Gerado wetland and gorges of Borkena river in between Arera and Kera residential areas.

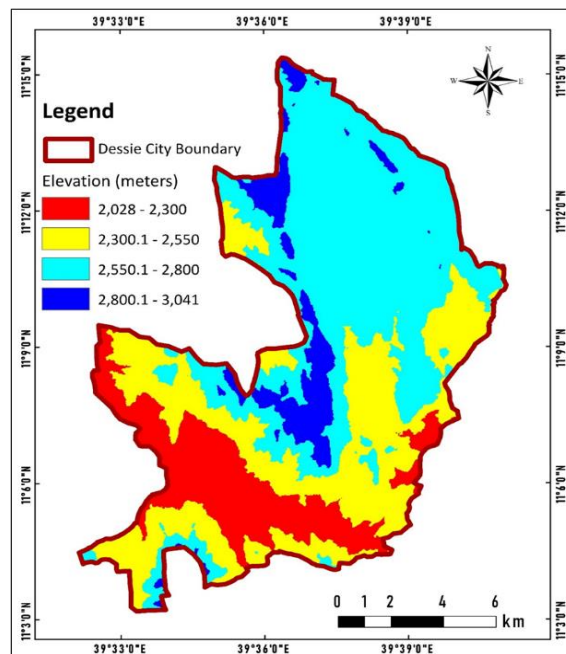


Figure 2.2; Topographic Classification of Dessie City Administration

Source; (DCASPPO, 2022)

## Slope

The Ethiopia National Urban Green Infrastructure Standard ENUGISO (2015) states, Steep slopes are defined as land having a slope greater than 20% are not recommended for urban development purposes.

However, the Dessie city is mainly characterized by steep slope, in which, 48.4% of the city has a slope of 8-30%, 23.2% of the city is between 30-50% of slope, 18.7% of the city has a slope of 2-8%, 6.4% of the city has a slope greater than 50% and only 3.3% of the city has less than 2% slope. This showed that the city has steep slope which requires special engineering considerations while designing and constructing.

Areas with a slope of less than 8% are found in Boru Meda, Tita plain and adjacent areas of Gerado River. There are also other areas with similar slope in different pocket areas of the city with small areas coverage.

Larger proportion of the city (which is about 48.4%) have the slope of 8-30% which includes most of the settlements, agricultural field and bare lands within the vicinity of the city. Areas which have a slope of greater than 30% are mainly found on the sides and top of hills and mountainous part of the city like the Tossa ridge, Azwa Gedel, and other areas in the city.

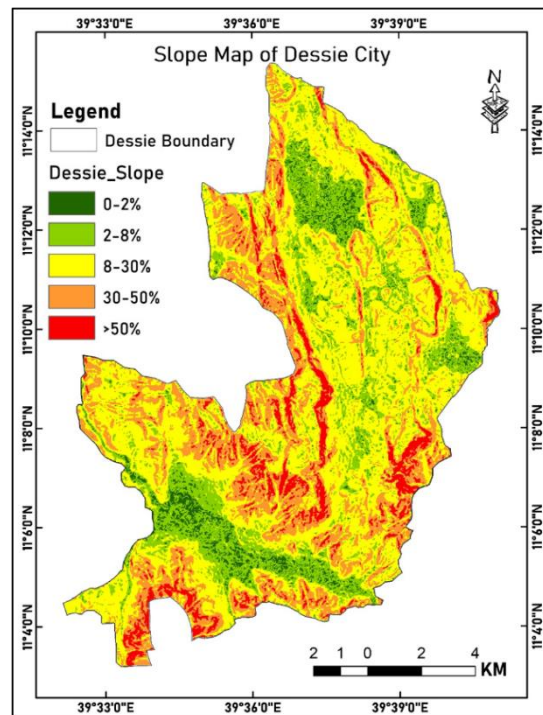


Figure 2.3; Slope Map of Dessie City Administration

Source; (DCASPPPO, 2022)

## **Conceptual Review**

### **2.1.2. Migration**

The movement of a person or a group of people, either over an international boundary or inside a State. It is a population movement that covers any type of migration of people, regardless of their size, make up, or reasons for migrating; this includes emigration of refugees, internally displaced people, economic migrants, and those relocating for other reasons, such as family reunion. ( IOM, 2020)

### **2.1.3. Migrant**

There is no agreed-upon definition of "migrant" at the international level. The term "migrant" was typically understood to refer to any situation in which the decision to migrate was made voluntarily by the individual in question out of "personal convenience" and without the influence of an outside compelling factor. This included individuals and their families who moved to another country or region in order to improve their material or social circumstances and improve the prospects for themselves or their families (IOM, 2020).

According to the United Nations, a migrant is someone who has lived abroad for more than a year, regardless of the reasons for their migration, whether they were intentional or not or whether they were legal or illegal.

## **2.2.Types of migration**

Migration is the foundation for the evolution of human society and the history of humanity (Philips, 2011). People moving between administrative/political jurisdictions within a nation or across nations has been a significant contributor to changes in societies. It is vital to comprehend migration in order to sort migration into many categories.

There are two main categories of migration: internal migration, which occurs within a nation, and international migration, which occurs beyond borders (Bhende, 2006). Internal migration has substantially different methods, factors, and outcomes than international migration.

**Internal migration:** This is a reference to moving inside the borders of a country, such as between states, provinces, cities, or municipalities. Those who relocate to another administrative territory are said to be internal migrants.

**International migration:** This refers to moving across international borders to a new habitat. Anyone who relocates to another nation is considered an international migrant (Bhende, 2006).

**Forced migration:** According to Jay Weinstein and Vijayan Pillai (2001), a third kind of migration known forced migration emerges when a person is relocated against their choice (as in the case of slaves) or when the relocation is precipitated by outside forces (natural disaster or civil war).

### **2.3. Internal migration**

Internal migration is defined operationally as a move inside a civil division or across its administrative boundary. Internal migration is categorized using a number of factors, including based on direction of movement (rural to rural migration, rural to urban migration, urban to urban migration and urban to rural migration) (Jay, 2001), based on spatial dimensions (Intra-district migration, Inter-district migration and Inter-state migration), based on the motive/reasons for migration (Marriage migration, Labour migration, Migration due to natural disasters) and based on duration of migration (permanent migration and temporary migration) (Lambin, 2003) are enlisted.

### **2.4. Drivers of internal migration**

The factors that influence domestic and international migration are largely the same. People try to enhance their well-being and the well-being of their dependents. The goal of the quest is to meet a variety of requirements, including having access to health care, social security, food, water, clean drinking water, recreation, education, decision-making, freedom of expression, freedom of religion, and, most importantly, work and adequate income (UNESCO, 2018).

#### **2.4.1. Income gaps**

According to (Todaro, 2005), the assessment of the anticipated income of prospective migrants influences migration decisions. This predicted income is primarily influenced by two variables: the average urban wage today and an individual's subjective assessment of the likelihood of finding work in the urban sector. The likelihood of migrating increases with the size of the income difference between the actual and anticipated income (Todaro, 2005).

#### **2.4.2. Access to Public Services**

Rural and urban access to public services frequently differs as a result of spatial inequality. The decisions of migrants are influenced by better roads, schools, hospitals, energy, water, and security because they wish to use these facilities or because their demands are already being met, which makes them more likely to stay around (USEPA, 2004).

#### **2.4.3. Self-Selection and Social Networks**

Self-selection is caused by personal traits, some of which are simple to see and quantify, including money and education. People are more likely to relocate if they have the means to do so without

experiencing too much hardship, if they can afford to do so and can afford to move to a location where they believe there are greater opportunities for livelihood and well-being (Mary, 2013).

#### **2.4.4. Environmental Degradation**

When a variety of environmental factors are compared, it is found that rapid-onset events (such as hurricanes or tsunamis) and anomalous precipitation (such as variations in rainfall variability and patterns) have the greatest effects on migration (Gilani, 2014).

#### **2.4.5. Armed Conflicts**

Although people will also require resources to be able to relocate securely, conflict influences migration by diminishing economic prospects at home (Poole, 2021). Beyond the obvious loss of life, war has far-reaching effects. Armed conflict frequently results in forced migration, refugee movements, financial flight, and infrastructure devastation in addition to losses on the battlefield.

### **2.5. Land, Land Cover, Land Use, Land Cover Change and Land Use Change**

#### **2.5.1. Land**

"Land is a definable region of the earth's terrestrial surface that includes all characteristics of the biosphere that are immediately above or below this surface, such as those of the near-surface climate, the soil and terrain types, the surface hydrology (including shallow lakes, rivers, marshes, and swamps), the near-surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the human settlement pattern, and the physical results of past and present human activity. (FAO, 2005)

According to Hoover and Giarratani (2000), the qualities of land also include such attributes as the topographic, structural, agricultural, and mineral properties of the site; the climate; the availability of clean air and water; and finally, a host of immediate environmental characteristics such as quiet, privacy, aesthetic appearance, and so forth.

#### **2.5.2. Land Use and Land Cover**

The literature emphasizes the distinctions between the words land use and land cover so that they can be used correctly in research on changes in land use and land cover.

"Land cover is the biophysical state of the earth's surface and immediate subsurface". In other terms, "land cover represents the physical status of the ground surface, as in agriculture, mountains, or woods". In their further statement from 2004, Meyer and Turner stated that "it covers, the quantity and kind of surface vegetation, water, and soil components". According to Moser (1995), "the term originally referred to the type of vegetation that covered the land surface, but has

broadened subsequently to include human structures, such as buildings or pavement, and other aspects of the physical environment, such as soils, biodiversity, and surfaces and groundwater".

"Land use includes both the way the biophysical characteristics of the land are controlled and the intention underlying that manipulation, the purpose for which the land is utilized" (Turner et al. ,1995). In a similar spirit, Meyer (1995), asserts that "land use is the mode and intent of human employment of the land and its resources". According to Oludare (2014), who goes on to elaborate, "Land use itself is the human employment of a land-cover type, the mechanism by which human activity appropriates the outcomes of net primary production (NPP), as defined by a complex of socio-economic determinants."

According to Chapin and Kaiser (2007), "there is a strong tendency to conceive of land in terms of yields of raw materials necessary to maintain people and their activities at territorial sizes covering enormous geographical areas. Land is a resource at these scales, because using land entails using resources. Contrarily, at the urban scale, describing land in terms of its soils' capacity for production the usage potential of the land's surface for the location rather than its sub mineral composition of different actions. The phrase "land usage" has an implied meaning that additional books on land use that are relevant to urban and regional analysis and planning".

### **2.5.3. Land Use Change and Land Cover Change**

Changes in a land use's intensity may accompany changes to the use's defining qualities or attributes. For example, low-income neighbourhoods may become high-income neighbourhood's while the buildings' physical and numerical characteristics remain the same. Similarly, suburban forests may transition from their natural state to recreational uses while the area of the land remains the same. (Clark, 2008) present a qualitative typology of changes to land use in the context of agricultural land use: Extensification, marginalization, intensification, and abandonment.

### **2.5.4. Causes of Land Use Land Cover Change**

Land-cover change is the conversion of the land-cover from one type to another and adjustment of the circumstances within a category. One of the main drivers of LU/LC change is population growth. The most valuable natural resource is people, and their sustained growth depends on them in many different ways. Land use changes represent the past and, maybe, the future (Houghton, 2001).

According to the United States Environmental Protection Agency (USEPA, 2004), the following are the main sources of LULCCs:

- Natural phenomena including wildfires and atmospheric fluctuations

- Direct effects of human activity include construction of building and other infrastructures like of roads and deforestation (clearance of trees)
- Water diversion that lowers water table is one example of the human activity that has indirect impacts

#### **2.5.4.1. Bio-Physical and Socio-Economic Drivers**

The natural environment's features and processes, such as changes in weather and climate, topography, landform, and geomorphic processes, volcanic eruptions, plant succession, soil types and processes, drainage patterns, and the accessibility of natural resources are among the bio-physical drivers (Milne, 2009). The socioeconomic drivers are composed of demographic, social, economic, political, and institutional factors and processes, such as population and population change, industrial structure and change, technology and technological change, the family, the market, various public sector organizations and the related policies and rules, values, community organization and norms, and property regime (Johnson, 2009).

The underlying social factors that, in a causal sense, connect humans to nature and result in changes to the global environment are known as human driving forces, also known as macro forces. Examples of these influences include population change, technological advancement, and sociocultural and socioeconomic structure (markets, political economies, ecological systems, and political institutions) (Kawasaki, 2017).

#### **2.5.4.2. Environmental and Socio-Economic Impacts**

A worldwide substantial change in the land cover has resulted from drainage and grassland degradation such as land deterioration, are significant environmental problems and habitat degradation, desertification, biodiversity loss, and species transfer come under the same heading since land use changes are the root of all of them (Tolessa, 2020).

“Land use changes (land conversions), which usually lead to the loss of valuable agricultural areas and tree cover, are particularly significant because they typically take place at the periphery of big metropolitan concentrations that are exposed to pressures from industrialization and urbanization. Changes in the region's hydrological balance, a rise in the danger of floods and landslides, air pollution, water pollution, etc. are only a few of their environmental effects. Other regional effects of land use change include soil erosion, sedimentation, contamination of groundwater, salinization of groundwater, extinction of native species, marine and aquatic pollution of nearby water bodies, and coastal erosion and pollution” (Musa, 2008) .

The increasingly diverse regional settings in which these changes take place are reflected in the socioeconomic effects of land use change at the regional level. These, too, are a result of the processes mentioned above and revolve around issues like the availability of land for local food production, changes to land productivity that led to (lower) profitability and changes to industrial structure, employment/unemployment, poverty, population change and migration, and issues with quality of life like health and amenity (Gray 2001).

## Theoretical Review

### 2.6. Major factors causing people to be internally displaced in Ethiopia

By using case studies from all regions, the table below shows trends in conflict-induced displacement from 2018 through 2020/21, climate-induced displacement (caused by environmental factors such as drought, seasonal floods, flash floods, and landslides), and "other" factors causing displacement (such as economic/development projects, severe wind, social tensions, and protracted displacement due to volcanic disruptions). According to the table, millions of Ethiopians were forcibly displaced within the nation and within the regions as a result of the escalation of conflict, climate-related factors, and other factors (economic/development projects, severe wind, social unrest, and protracted displacement due to volcanic disruptions) in the years 2018, 2019, and 2020/21, respectively. Looking at regional statistics from 2018 to 2020/21, the Oromia region primarily reported the largest number of IDPs.

Table 2.1; Number of persons displaced due to different factors in Ethiopia

Region	Displacement Reason	Displacement Period			Total
		During 2018	During 2019	During 2020 & Jan 21	
Addis Ababa	Conflict	31,638	22,297	5,854	59,789
	Conflict	48,839	38,8694	106,154	543,687
Amhara	Climate	8,809	712	5,139	14,660
	Other	952	-	-	952
	Conflict	4,220,545	3,297,927	1,679,469	9,197,941
Oromia	Climate	673,015	656,439	281,475	1,610,929
	Other	229,614	381,750	295,467	906,831
	Conflict	226,867	590,651	290,914	1,108,432
Tigray	Climate	6,425	1,859	-	8,284
	Conflict	96,994	111,708	133,469	342,171
Gambella	Climate	10,166	18,138	14,610	42,914
	Conflict	19,046	113,549	101,458	234,053
Afar	Climate	215,359	187,131	238,807	641,297
	Other	21,547	30,553	83,871	135,971
	Conflict	-	5,532	17,832	23,364
Benishangul Gumuz	Conflict	3,453,570	3,714,619	1,956,894	9,125,083
	Climate	2,130,545	2,046,940	1,040,204	5,217,689
	Other	-	-	174,492	174,492
Dire Dawa	Conflict	59,389	41,456	18,533	119,378
Harari	Conflict	15,046	13,141	10,565	38,752
SNNPR/SNNP & Sidama	Conflict	-	-	278,725	278,725
	Climate	-	-	160,420	160,420
	Other	-	-	9,807	9,807
Sidama	Conflict	-	-	55,857	55,857
	Climate	-	-	4,762	4,762

Source: (Displacement Tracking Matrix, round 09 to 24 data, from January 2018 to January 2021)

The government-led repatriation efforts that started in April 2019 are mostly to blame for the dramatic decreases in displacement during rounds 17 (May-June 2019), 18 (July-August 2019), and 19 (September-October 2019). However, considerable rises in the number of IDPs were recorded in rounds 20 (November–December 2019) and round 21 (February–March 2020), respectively, reaching 1.73 million IDPs and 1.74 million IDPs. According to reports, because SNNPR and Sidama areas were the new coverages and also included 93,982 IDPs, the overall number of IDPs climbed to 1.82 million in round 22 (June–July 2020). Only a slight rise to 1.84 million IDPs was seen in Round 23 (August–September 2020). Due mostly to the Northern Ethiopia Crisis that erupted, round 24 (December 2020–January 2021) saw a rise in the overall number of IDPs to 2.1 million.

In two studies (Sackey's, 2020), war was also noted as the primary cause of emigration in Ethiopia. According to Sackey's research (2020), in the West-Guji and Gedeo Zones of Ethiopia in 2018, violent conflict was the main cause of internal displacement. A violent dispute that forced individuals to evacuate their homes in order to preserve their lives resulted from an initial incident of youth-initiated community violence. It is also discovered that conflict-related displacement alone resulted in 296,000 new displacements in 2016 and 1.7 million in 2018. A violent wave that hit the border of Oromia and SNNPR in mid-April 2018 forced 200,000 people to from their homes. Up to 970,000 additional refugees were forced to flee their homes as of the end of May.

The DTM assessment report from the IOM generally demonstrates that very severe, also known as a human tragedy in the Ethiopian historic event occurred in 2018 and 2019, with more than 23 million people fleeing their homes and usual residence primarily due to conflict (i.e., intercommunal violence, regional political instability, ethnic tensions, and localized conflicts), followed by environmental factors like drought, seasonal floods, flash floods, and landslides, among other f. Conflicts are thus often the main reasons for internal relocation in Ethiopia.

## **2.7. Land-use and land-cover change in Ethiopia**

In Ethiopia, the abundance of natural resources varies by location, as does the management style. Because of variations in biogeography and terrain, there is variability. Human actions are driving changes in land use and land cover, but they are also having an impact on people (Sileshi, 2002). Water, plants, soil, animal feed, and other biophysical resources are all affected by the dynamics of LU/LC (Chughtai, 2021). Previous research indicated that due to a lack of land, Ethiopia had significant LU/LC variations in several regions of the nation, with cultivated land expanding at the expense of forestland and being extended into muddy areas. Agriculture and human settlement in

Ethiopia's highlands, in particular, have a long history. Most recently, a highland population pressure, resource depletion, and environmentally unsound behaviour (Miheretu, 2017).

Kassa (2003) in his study, in southern Wollo, reported the decline of natural forests and grazing lands due to conversions to croplands. Bewket (2003), have reported an increase in wood lots (eucalyptus tree plantations) and cultivated land at the expense of grazing land in both Chemoga watershed in north-western Ethiopia, and Sebat-bet Gurage land in south-central Ethiopian. The changes of land use and land cover that occurred from 1971/72 to 2000 in Yerer Mountain and its surrounding results an expansion of cultivated land at the expense of the grasslands (Gebrehiwet, 2004 ).

Hadgu (2008), identified that decrease of natural vegetation and expansion of agricultural land over a period of 41 years in Tigray, northern part of Ethiopia. He concluded that population pressure was an important driver for expansion and intensification of agricultural land in recent periods. Garedew, (2010) in the semiarid areas of the central Rift Valley of Ethiopia, during the period 1973-2000 cropland coverage has increased and woodland cover lost. Similarly, Feoli, et al., (2002) also reported the expansion of evergreen vegetation with increase of population.

Population growth has a paramount impact on the environment. For instance, population pressure has been found to have negative effect on Riverine vegetation, scrublands and forests in Kalu district (Tekle and Hedlund, 2000) and natural forest cover in Dembecha Woreda north-western Ethiopia (Zelege and Hurni, 2001). Similarly, Pender et al., (2001) report that the population growth has significant effect on land degradation, poverty and food insecurity in the northern Ethiopian highlands.

However, most of the empirical evidences indicated that land use and land cover changes and socioeconomic dynamics have a strong relationship; as population increases the need for cultivated land, grazing land, fuel wood; settlement areas also increase to meet the growing demand for food and energy, and livestock population. Thus, population pressure, lack of awareness and weak of management are considered as the major causes for the deforestation and degradation of natural resources in Ethiopia.

## **2.8. Land development trends of Dessie city**

When examining the expansion and land development pattern of Dessie city, it generally consists of places with intensive usage and a large portion of land covered by structures which was developed at different times (DCA, 2010).

The city's expansion or land development and demographic trends indicate the following (DCASPPPO, 2010, pp. 30-32):

- In 2000, on base year 750 ha of built-up land was accommodating about 117,166 populations with the net density of 156 persons per hectare. The 2000 Development plan of the city was also estimated/proposed the city 2229.6ha to be built-up.
- “In 2010, the city's land conception significantly shifted to 3417.23ha, which means more than a fourth (4.56)-pronged urban land conception had taken place between 2000 to 2010 mainly in the outskirts of the city. During this period, the city's land conception growth rate was more far beyond the development plan expectation/proposal. However, the population does not grow significantly during those periods from 117,166 to 162,050, also the net density significantly decreases from 156 to 47 persons per hectare. Therefore, in this period, the city expanded significantly along/until the edge of its boundary/limit sparsely.”
- “In 2020, only about 3781.79 ha (accounting for 21.31 %) of land is built-up/developed, which accounts a 1.11-pronged urban land conception carried out since 2010 to 2020. In this period, the city's land conception growth rate was slowly down from 4.56 to 1.11. However, the population growth rate and built-up density has grown from 162,050 to 281,636 and from 47 to 74 persons per hectare. This showed that the city administration only develops 364.59 ha (11 %) of land by compacting the entire settlements rather than expansion. In this an overwhelming population increase along with poor land development practiced, potential lands had not been maintained and most parts have already been utilized by unplanned squatter/illegal settlements. These illegal settlements are now a headache to the city administrators and it also a challenge for plan implementation process.”

## **2.9. Theories on migration and land use changes**

As has been mentioned, the majority of movement associated with land degradation and/or droughts in degraded areas occurs unreported, is conducted to diversify livelihoods and to adjust to changing conditions, and takes place within the context of larger global patterns like rising rates of rural-urban mobility. Large-scale migration-related migratory events due to degradation and drought can and do happen regularly, although frequently these combine with conflicts, poor governance systems, macroeconomic downturn, market price shocks, and other non-environmental pressures (Prince, 2016).

Finding trustworthy data will be difficult, even if a clear definition of migration caused by land degradation can be reached. Census records, household registration records, and surveys are the

three most popular sources of migration data (Fussell et al., 2014). Even at national scales, population estimates are frequently erratic, especially for developing countries (McLeman, 2013; Neumann and Hilderink, 2015). While efforts are ongoing to consolidate a global census, there is currently no entirely trustworthy global population database. Additionally, particular migration-related census questions are frequently absent.

Geospatial models and hotspot models are not meant to show causality; instead, they take known or assumed associations between specific factors and illustrate them in a compelling way that directs future research, identifies areas for priority action, and informs policy decisions (de Sherbinin, 2014). With each data point having a georeferenced position, these procedures often begin by adding sets of data as separate layers into GIS software. As more layers are added, the researcher may adjust the outputs and determine how combinations of chosen data from various levels are shown.

The approaches mentioned above are used to provide generalized representations and analyses of environmental migration, but they are unable to independently show or prove the relative contributions of probable causative factors that affect migration decisions and results. A last set of procedures include getting in touch with individuals and learning information directly from them through surveys, questionnaires, interviews, or focus groups. Depending on its kind, the generated data may subsequently be evaluated using a range of quantitative and qualitative methods (Warner and Afifi, 2014).

## **2.10. Land Use/ Land Cover change detection techniques**

Data on land usage and land cover may be obtained using a variety of approaches, including terrestrial surveys, mapping, and remote sensing technologies. Land usage and land cover change are greatly influenced by climate, soil, vegetation type, weather, and relief, therefore terrestrial surveys or mapping are direct mapping approaches that have the benefit of acquiring more (Guyu, 2020). Under these circumstances, it may be challenging to identify land use or land cover using traditional methods like terrestrial mapping or surveying on short time frames. Although these methods may be able to collect data across larger regions with higher spatial resolution, they take longer to do so. While the mapping is being done, there may be considerable changes in land use and/or land cover. As a result, methods like remote sensing analyses that can swiftly identify and detect land use/land cover can be highly helpful (Yimer, 2017).

The spatial resolution of the imagery utilized has an impact on the spatial accuracy of land use/land cover detection. Landsat TM imagery has a spatial resolution of 30 m, allowing for the

differentiation of urban land cover from vegetation and agricultural land cover (Guyu, 2020).  
Digital change detection of land use/ land cover

The goal of land use/land cover change detection is to compare various aspects of the categorical data between two dates. Land use/cover change can be observed using large-scale aerial photography taken at two different dates in the same geographic region, but visual interpretation has significant limits, and because the data is not digitized, it is challenging to conduct further analysis. The digital change detection approach compares and correlates two sets of photos to find differences between them. It is advised that change detection analysis be effective in four key circumstances (Fasona, 2001). The researcher should:

- ✓ Possess prior knowledge of the cultural and physical aspects of the studied location.
- ✓ Learn how accurately the multiple-date imagery is registered. It is best to reduce the spectral response that is unrelated to land use/cover.
- ✓ Recognize the restrictions placed on change detection methods.

(Singh, 2002) divides the two kinds of digital change detection approaches. The first is independent study at several dates, while the second is concurrent analysis of many temporal trends. These two kinds of digital change detection—known as pre- and post-classification approaches—remain the foundation of digital change detection (Chaudhry, 2000). Both of these approaches may be used to any method. Two separate date photos are independently categorized and tagged in the post-classification change detection technique. The modified regions are taken from the outcome. Based on the presumption that changing spectral signatures over time indicate a change in land surface conditions, the pre-classification spectral change detection approach was developed.

This method entails the conversion of two original pictures into a new single-band or multi-band image that highlights the regions of spectral change (Singh, 2002). While the post-classification approach has the advantage of overcoming challenges in change detection associated with the analysis of images acquired at various times or by various sensors, the pre-classification approach has the advantage of being able to completely eliminate the effect of mix-pixels.

### **2.10.1. Pre-classification**

#### **2.10.1.1. Image Differencing**

This process generates a new change picture with the same number of bands as the input photos mathematically. The remaining pixels should be grouped around the mean, whereas the pixels that exhibit a substantial shift in radiance are predicted to be located in the tails of the distributions of

the various images. To minimize radiometric disparities between the input photos, photographs utilized in this approach must be adjusted (Oliveira, 2019).

Image differencing has been utilized extensively in a range of applications and is straight forward to implement. (Shahrokhi, 2012) used this method to analyse the process of desertification in the Sahara, while looked at the process of change detection in temperate forests.

#### **2.10.1.2. Image Rationing**

With this technique, the ratio between the values of the relevant pixels in registered photographs at various times is calculated. The fundamental tenet of this method is that there has been no change if the intensity of reflected energy remains almost constant across images. The ratio should be either higher or lower than the ratio in the no-change zones if a specific pixel experienced a change. The standardization of certain data or the radiometric averaging of dates, like other methods, may be required (Woods, 2008).

#### **2.10.1.3. Change Vector Analysis**

Change vector analysis is the study of change based on the vector difference between the multi-band digital vectors of the pixel on two dates. A specific picture pixel can be represented as a point in this vector space with coordinates that match its brightness values in the relevant spectral components. Thus, a vector in multi-dimensional space is defined by the data values connected to each pixel and it is used to detect and categorize land cover change processes (Rahman, 2019).

#### **2.10.1.4. Direct Multi-Date Classification**

“To find regions of change, direct multi-date classification conducts a single analysis of a composite dataset comprising two or more datasets. Whether an original picture or a changed image, the combined data set may be categorised using a supervised or unsupervised technique. In the supervised technique, statistics are derived from training data related to change and no-change areas to construct sub-spaces of the feature (typically spectral) space. Cluster analysis is used in the unsupervised technique to identify spectral classes, and further examination can show where changes have taken place.” This technique was integrated with PCA by Hoffer and Lee (2000), in order to minimize the number of bands and apply it for the identification of forest change.

#### **2.10.2. Image classification and Analysis**

There are a number of approaches taken to perform digital classification, but the two generic approaches, namely unsupervised and supervised classification, are used most frequently (Sharma, 2020). Image classification and analysis operations are used to digitally identify and classify pixels

in the data. This process assigns each pixel in an image to a particular class or theme based on statistical characteristics of the pixel brightness values.

### **Unsupervised classification**

It is a scenario where the results (groupings of pixels with similar properties) are based on software analysis of an image without the user providing sample classes. To match the computer-generated clusters of pixels with similar properties to actual ground features (such wetlands, developed regions, coniferous woods, etc.), the user must be familiar with the area being identified (Campbell, 2000).

### **Supervised classification**

As Richards (2016), it is predicated on the premise that a user may choose sample pixels from an image that are characteristic of particular classes, and then instruct the image processing software to utilise these training sites as references for the categorization of all other pixels in the picture. Depending on the user's understanding, training sites, also referred to as testing sets or input classes are chosen. The user also establishes the minimum degree of similarity required to group together additional pixels.

#### **2.10.3. Post-Classification Comparison**

The most popular technique for spotting change is post classification comparison. The categorization of each image separately using this technique is followed by a comparison of the matching pixel signature to pinpoint regions of change. A supervised unsupervised technique may be used to do the classification process independently. It demonstrates the existence of change and identifies its specific nature, but it necessitates precise categorization and correction procedures (Deep, 2001).

Visually comparing classed photos is possible, as well as using computers. Another option for doing the comparison is to use a geographic information system (GIS).

A further investigation employing post-classification comparison for the identification of wetland change was reported on by Jensen et al. in 2003. Cattail and cattail mixture (sawgrass) classes were able to be identified as a consequence. For improved feature signatures to categorize land use and land cover change, this method is frequently supplemented with picture enhancement methods, resulting in what are known as hybrid approaches (Madhavan, 2000).

#### **2.10.4. Hybrid**

In various ways, the hybrid technique combines classification-based approaches with spectral change detection methods to reduce mistakes in land cover change analysis. This approach can significantly lower commission mistakes. Hybrid techniques have the advantage of solving the mixed-pixel issue and offering data on "from-to" change classes (Pimjai, 2014).

#### **2.10.5. Selection of the appropriate detection and identification techniques**

Regions with a range of physical environmental characteristics, including climate, soil, and vegetation type, weather, and growth season. Traditional change detection relies on post-classification comparison of an initial band combination confined to get accurate land use/land cover due to some noise or disturbances. Image-transformation methods that create new pictures that may be utilized in place of the original band image to detect changes in land use and land cover (Mareye, 2022).

#### **2.10.6. Filtering**

The spatial characteristics of the picture can be improved by the application of filtering techniques. By performing a mathematical operation on the original cell value and its neighbours, a filter generates a new picture by computing new values. This filter assigns the most typical value to the centre pixel. All of the photos categorized in this study underwent mode filtering enhancement to get rid of isolated pixels (Wang, 2018).

#### **2.10.7. Accuracy Assessment**

The different land cover classes to which ground truth cells have been allocated are tabulated in an error matrix produced by this process. Output also contains marginal totals for each column and row as well as errors of omission and commission. an overall error score, confidence intervals around that number, and a Kappa Index of Agreement (KIA), both for the entire sample and for each individual class (Rewanga, 2017).

## CHAPTER THREE

### 3. RESEARCH METHODOLOGY

#### 3.1. Introduction

This section overviews the research's materials, procedures, data types and sources, collection and analysis methods, data collection and analysis tools including software programs.

#### 3.2. Description of the Study Area

##### 3.2.1. Location of the study area

Dessie city is located between latitude and longitude of  $11^{\circ} 8' N$  and  $39^{\circ} 38' E$  respectively. The city has a tropical climate in which it receives overhead sun radiation twice a year. It is found in Dessie Zuria Wereda, South Wollo Administrative Zone, in the Amhara region, Ethiopia. It is situated within about 400 km from Addis Ababa, and is surrounded by a large hinterland. The city is located in Eastern Amhara and bordered by Tehuledere and Kutaber Woredas in north, Tehuledere and Dessie Zuria Woredas on east, Kutaber and Dessie Zuria on west, and Dessie Zuria form on south. According to the Ethiopian agroclimatic classification, (EAC, 2012) the City's elevation ranges from 2028 m to 3041 m asl and it is classified in Dega agro climatic zone. Based on the 2007 national census conducted by the (CSA), this woreda has a total population of 157,679, an increase of -21.72% over the 1994 census, of whom 77,626 are men and 80,053 women; with an area of 937.32 square kilometers, Dessie Zuriya has a population density of 168.22, which is greater than the Zone average of 147.58 persons per square kilometer. A total of 35,437 households were counted in this woreda, resulting in an average of 4.45 persons to a household, and 34,524 housing units.

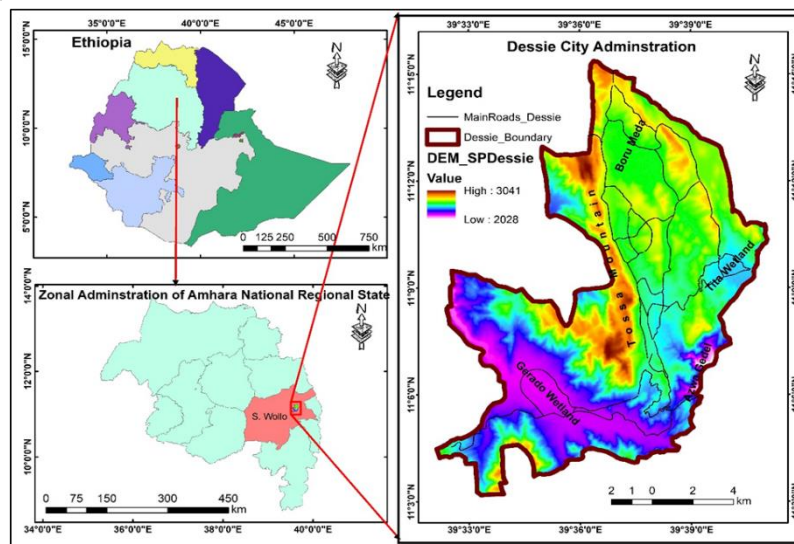


Figure 3.1; Location Map of Dessie City

Source ; (DCASPPO, 2022) and illustrated by authors

### **3.3. Research Approach**

An exploratory study design was adopted to examine internal migration and its implications on LULC change. This approach is chosen to clarify inhabitation coverage through time, as well as their impacts on LULC changes.

Both qualitative and quantitative analysis approaches, from both primary and secondary data sources were deployed. The primary data sources were gathered via semi-structured interviews, closed-ended and open-ended questionnaires and observations. Remote sensing, satellite images was used as secondary data sources, and GIS was used to process and analyse such data.

### **3.4. Research Design**

The researcher has used a spatial analysis technique by utilising RS and GIS technologies. Satellite images of Dessie City the years 2016, 2018, 2020, and 2022 were used. The images were downloaded from the Earth Explore of USGS website and processed using GIS 10.8 software. The data and findings were presented in the form of tables, graphs and percentages.

The town's officials, experts, kebele administrators, and resident's opinions were used to identify various actors and factors that significantly influenced the change in land use land cover in the Dessie City between 2016 and 2022. Their opinion was collected through semi-structured interviews, closed and open-ended questionnaires. In this regard, the sampled respondents evaluate list of land use change driving factors and actors using a five-point Likert scale that ranged from strongly agree to strongly disagree, and supported with an open-ended questionnaire included spaces for additional comments that were not listed. Data processing was done using Microsoft Word and Excel programmes and structured, examined and was presented in tables, graphs, and narration form.

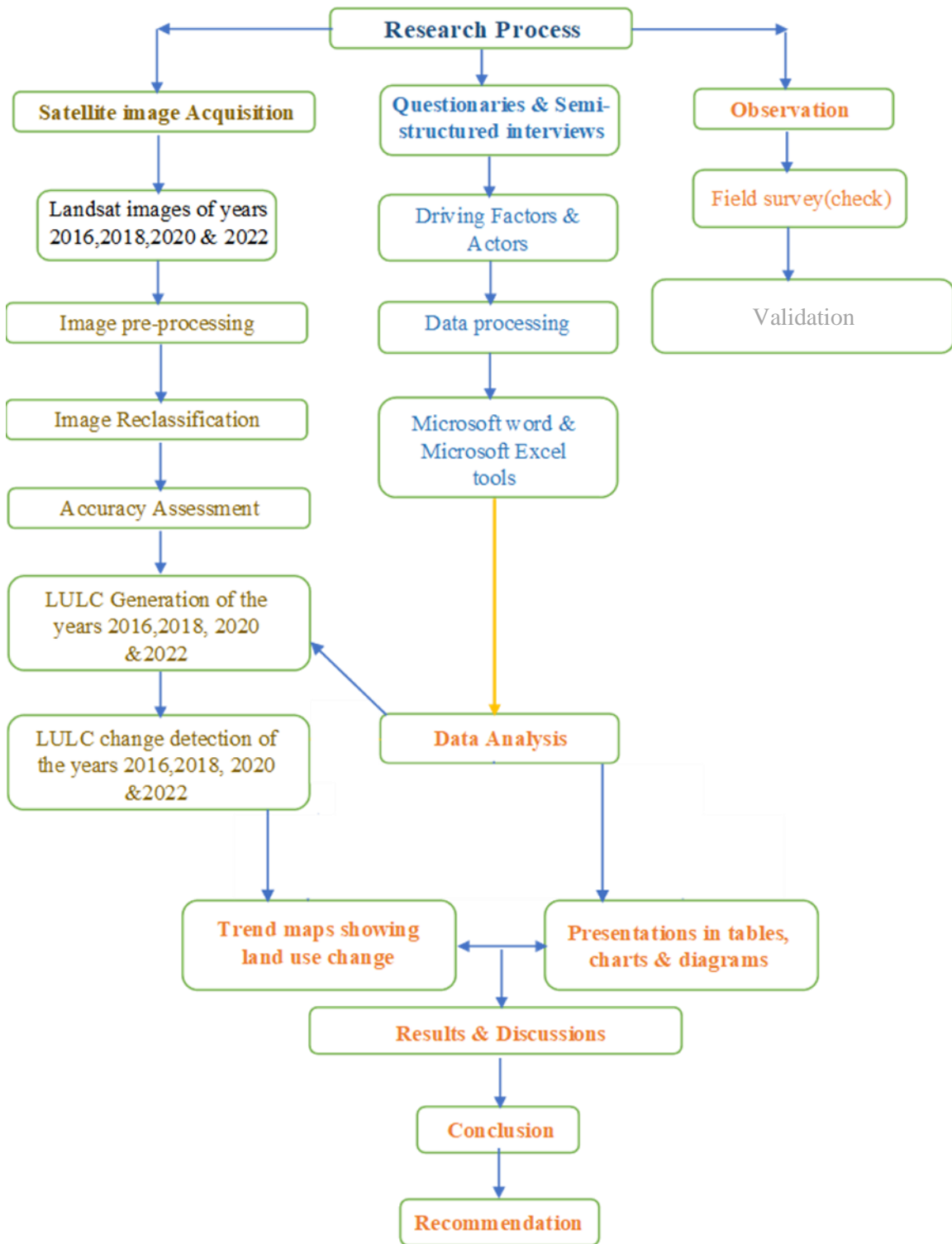


Figure 3.2; Research process diagram  
 (Source: Organized by the Author, 2023)

### **3.5. Data Types and Sources**

The research has been studied by incorporating qualitative and quantitative data analysis from both Primary data and Secondary data sources.

Quantitative data was used to obtain numerical proofs, while qualitative data was used to gather information for theoretical makeups to comprehend the core concept and determine the viability of the study.

#### **3.5.1. Primary Data and Sources**

The primary data sources were gathered by Semi-structured interviews, observations, close-ended and open-ended questioners form administrators of each Kebeles, the Community, and the Dessie City Land Development and Management Office. These data types helped to serve as the analyses' baselines and are primarily intended to be utilized to determine the study's key findings.

#### **3.5.2. Secondary Data and Sources**

The secondary data sources were gathered via internet browsing, reading, books and journals, legal documents and researches, expertise advises as well as downloading satellite images. Theoretical ideologies, various researches regarding land use change, data on displacement tracking matrices, arguments, traits, and standards related to the study's theme that are discussed in the literature were collected and examined.

### **3.6. Data Collection Methods and Tools**

#### **3.6.1. Data Collection Instruments**

In this study, questionnaires, semi-structured interviews, observations, and GIS and remote sensing techniques were used as data gathering tools. Using spatial analysis GIS and remote sensing techniques, categorical maps created from satellite pictures are used to measure the geographical growth and change of a town over time and its consequences on changes in land use and land cover (LULC).

For evaluating the spatial and temporal land use land cover (LULC) change in the research region, the parameters for detecting land cover change are utilised. Using multi-temporal data sets from satellite photos, it is possible to identify differences in land cover types by looking at a given area at several points in time. Thematic maps for 2016, 2018, 2020, and 2022 were created by processing spatial temporal satellite pictures of a particular geographic region. The maps were contrasted and overlaid to show how the area changed over time. Additionally, the percentage change for each year can be calculated.

Basically, the major data collection tools that had been used for this research were mobile phones to take photos and record videos, phones, measuring apparatuses), software's like smart applications for analysis (Arc GIS, QGIS, AutoCAD) and papers for sketching, semi structured interview questionnaire to have personal altitudes, sound recorder for recording direct words of the interviewee.

### **3.6.2. Primary Data Collection Instruments**

Questionnaires, semi-structured interviews, and observations were crucial data gathering tools utilised to create information on the main driving variables and significant actors.

#### **3.6.2.1. Questionnaires**

Both closed-ended and open-ended questionnaires were prepared. Five Likert scales of strongly agree to strongly disagree were used to gauge how authorities, experts, Sub city administrators, Kebele Administrators, and the local population felt about the reasons and people that significantly influenced the change in land use/ land cover in Dessie City between 2016 and 2022. Because the data was gathered using respondents own subjective perceptions, which might differ, and a Likert scale was used to gauge how they saw the situation.

Survey's questions were initially written in English, later translated to Amharic for the household respondents. Each respondent from the chosen sample received a comparable questionnaire from the researcher.

#### **3.6.2.2. Semi-Structured Interviews**

Stakeholders from selected technical and institutional areas as well as the community were interviewed to ascertain their response on the environment and problems encountered in their premises. And also, within this, recommendations were also given with specific reference to ways to improve or reduce unplanned land cover change.

#### **3.6.2.3. Observations**

The other data collection method used in this study was observation, which is done by adopting systematic observation with respect to relevant categories which includes: The physical surroundings, inhabited lands and housing conditions of the places where the migrants live. The author used photography to record site findings. The areas under the study had different characters that needs to be taken in photographs. Photos helped a lot to produce the existing condition with in the areas of study.

### **3.6.3. Secondary Data Collection Instruments**

#### **3.6.3.1. Satellite Imageries**

Landsat imagery/Landsat Thematic Mapper (TM) for the years 2016, 2018, 2020, and 2022 were utilised as a source of data and obtained from the earth explorer website in order to analyse land use and land cover change patterns of Dessie city.

For the years 2016, 2018, 2020, and 2022, whole sceneries with high resolution and high-quality cloud-free satellite images were chosen. To get cloud-free images for categorization and comparison purposes, the month of March was selected as the optimum time of year. The historical land use/land cover maps of the research region and trends in land use changes are created using this data.

### **3.7. Sampling Techniques**

#### **3.7.1. Sampling Method**

Non- purposive sampling was employed to select urban experts/officers. About 15 questionnaires were distributed and all 15 were collected. And purposive sampling was employed to select households from different kebeles (the smallest administrative unit) and about 203 questionnaires were distributed and only 198 questionnaires were collected and the remaining 50 respondents engaged in semi-structured interviews. And random sampling was used to select households.

A stratified random sampling technique was used to stratify a sample population that accurately represents the entire population that will be investigated while ensuring that each subgroup is represented in order to gather information about the key driving factors and actors responsible for the change in land use and cover in Dessie city. Officials, specialists from the Dessie City Land Development and Management office, members of the city plan and development commissions, teams from the Land cover development survey, Sub city administrators and kebele administrators made up the target group.

Representatives from communities (household respondents) were another target group, and a stratified random sampling approach was used to choose them and the target groups are informal settlers which was caused by internal migration.

#### **3.7.2. Sampling Frame**

The population from which the sample is drawn is the sampling frame. Officials, experts from the Dessie City Land Development and Management office, members of the city plan and development commissions, teams from the Land cover development survey, Sub city administrators, kebele

administrators, and members of the city's community (household respondents) are among the respondents of which the sample sizes are determined (Table 3.1).

Table 3.1: Sampling frame and number of respondents at sun-city level

No.	Target Population (Offices)	Sub-City	Gender		Total number of Employees	
			Male	Female		
1	Dessie City Land Development and Management office (Geologists, Urban planners, Managers)	Segnogebeya	3	-	3	14
		Arada	3	1	4	
		Hotie	1	1	2	
		Menafesha	2	-	2	
		Buanbuawuha	-	3	3	
2	City plan and development commissions (Engineers, Urban planners)	Segnogebeya	2	1	3	13
		Arada	3	1	4	
		Hotie	2	-	2	
		Menafesha	2	-	2	
		Buanbuawuha	-	2	2	
3	Land cover development survey team (surveyors, Urban land administrators)	Segnogebeya	2	-	2	14
		Arada	2	1	3	
		Hotie	1	3	4	
		Menafesha	3	-	3	
		Buanbuawuha	-	2	2	

Dessie city have 18 Urban Kebeles and 8 Rural kebeles, and the sampled kebeles (Table 3.2) are chosen considering the kebeles recorded with the highest informal settlements.

Table 3.2: Sampling frame used to identify office employees in Kebele level

No.	Target Population (Offices)	Kebele (UK: Urban Kebele) (RK: Rural Kebele)	Gender		Total number of Employees	
			Male	Female		
1	Dessie City Land Development and Management office (Geologists, Urban planners, Managers)	011 (Tita) UK	3	-	3	28
		012 (Kurkur) RK	3	1	4	
		013 (Boru Meda) RK	1	1	2	
		014 (Boru Sellasie) RK	2	-	2	
		015 (Gerado Tesfa Nechro) RK	-	3	3	
		016 (Koshem Ber) UK	1	1	2	
		017 (Gerado Kelina) RK	2	-	2	
		018 (Kelem meda) UK	-	3	3	
		019 (Bilen) UK	3	-	3	
		010 (Tita Tursina) RK	3	1	4	
2	City plan and development commissions	011 (Tita) UK	2	1	3	28
		012 (Kurkur) RK	3	1	4	
		013 (Boru Meda) RK	2	-	2	
		014 (Boru Sellasie) RK	2	-	2	
		015 (Gerado Tesfa Nechro) RK	-	2	2	
		016 (Koshem Ber) UK	3	1	4	

	(Engineers, Urban planners)	017 (Gerado Kelina) <i>RK</i>	2	-	2	<b>29</b>
		018 (Kelem meda) <i>UK</i>	2	-	2	
		019 (Bilen) <i>UK</i>	3	1	4	
		010 (Tita Tursina) <i>RK</i>	2	1	3	
3	Land cover development survey team (surveyors, Urban land administrators )	011 (Tita) <i>UK</i>	2	-	2	
		012 (Kurkur) <i>RK</i>	2	1	3	
		013 (Boru Meda) <i>RK</i>	1	3	4	
		014 (Boru Sellasie) <i>RK</i>	3	-	3	
		015 (Gerado Tesfa Nechro) <i>RK</i>	-	2	2	
		016 (Koshem Ber) <i>UK</i>	3	1	4	
		017 (Gerado Kelina) <i>RK</i>	2	1	3	
		018 (Kelem meda) <i>UK</i>	3	1	4	
		019 (Bilen) <i>UK</i>	2	-	2	
		010 (Tita Tursina) <i>RK</i>	2	-	2	

Table 3.3: Sampling frame data used to identify Household respondents

No.	Target Population	Overall Settlement from the year 2016-2022	Formal settlement from the year 2016-2022	Informal settlement from the year 2016-2022	Informal settlement from the year 2016-2022 due to migration
1	Community	112,453 HH	67,182 HH	45,271 HH	20,311 HH

(Source: Dessie city Land Development and Management Office)

### 3.7.3. Sample Size Determination

The sample size can be calculated using a variety of methods. These include employing a census for small populations, replicating the sample size of related research, and utilising algorithms to figure out the sample size. In order to determine the required sample size, for a combination of degrees of accuracy, confidence, and variability, one or more formulae must be used. As a result, the sample size is determined at a precision level of 5% and a confidence interval of 95% (Tong, 2006).

A good maximum sample size is usually around **10%** of the population (Jim, 2007). So based on this, Non- purposive sampling was employed to select urban experts/officers and purposive sampling was employed to select households from different kebeles and random sampling was used to select households.

- ❖ The sample size for each stratum (layer) is proportional to the size of the layer.

**Sample size of the strata = size of entire sample / population size \* layer size**

Table 3.4; Sample size determination

No.	Targeted population	Size of entre sample	Population size	Layer size		Sample size		Total sample size
				Male	Female	Male	Female	
1	Household respondents	10% of 2,031= 203	20,311/10 kebeles= 2,031	18,213	2,098	182	21	203
2	Land development and management office (sub-city level)	14	14	9	5	1	1	2
3	City plan and development commissions (sub-city level)	13	13	9	4	1	1	2
4	Land cover development survey team (sub-city level)	14	14	8	6	1	1	2
5	Land development and management office (Kebele level)	28	28	18	10	2	1	3
6	City plan and development commissions (Kebele level)	28	28	21	7	2	1	3
7	Land cover development survey team (Kebele level)	29	29	20	9	2	1	3
<b>Total number of samples</b>								<b>218</b>

#### 3.7.4. Sample Years of Trend Analysis

Four time periods- 2016, 2018, 2020, and 2022- were chosen in order to map immigrational and inhabitation trends and assess their effects on LULC change in Dessie city because those were the years when the city's informal settlement was at its highest level and they were also crucial thriving years for change. For more clarification, the main factors taken into account are listed below.

Table 3.5: Criteria for the selected years

No.	Sample year (G.C)	Sample year (E.C)	Selection Criteria
1	2016	2008	Before the cities' structure plan was made in 2010, land cover changes were measured and shown to demonstrate the degree of inhabitants and land usage.
2	2018	2010	To quantify and visualise how many people live there and how land use/ land cover have changed as a result of the growth of various manufacturing and industrial sectors close to the city, particularly in the Kombolcha and Dessie Zuria areas. And as the industrial park of Kombolcha has started operations in 2017, with 9 factory sheds already rented out to different Investors from the USA/Turkey, China, South Korea, and Italy, it attracts peoples in search of Job.
3	2020	2012	There was high instability in the Northern part of Ethiopia and peoples were flowing from different parts of Amhara as well as Tigray regions in search of safe place to live and work.
4	2022	2014	This year is taken to compare and contrast the actual land use/ land cover change and its impact on the environment after the informal and unconditional settlements and the year is selected because most of the recent secondary data's are given up to the given year.

### 3.8. Satellite Images Processing Method

This section shows the collection method for satellite images for the four years (2016, 2018, 2020, and 2022), image pre-processing, image categorization, accuracy evaluation, LULC change detection, and related expansion analysis.

#### 3.8.1. Image Pre-Processing

In the pre-processing stage, layers were stacked after extracting the images from the USGS Landsat archive website and downloaded from Earth Explorer. Data availability and cloud-free conditions are used to choose seasons for image collection. The images were re-projected and calibrated using Projection UTM Zone 37N, Datum WGS 1984 to match with the research region. This was done

using ArcGIS 10.8 software and all the images were clipped to match to the study area using boundary shape files.

### 3.8.2. Image Classification

After all the image pre-processing steps, image classification was done, which serves as the foundation for the change detection activity. There are two techniques for classifying images. The first method, is supervised image classification, involves choosing pixels that represent recognised land cover types. The second method, is more computer-automated, unsupervised categorization.

### 3.8.3. Accuracy Assessment

To determine a classification procedure was successful, accuracy evaluation is a crucial step. In the analysis of remote sensing data, accuracy evaluation helps us to confirm the accuracy of our findings after classifying satellite images. It happens once the interpretation and categorization are finished.

The most often used methods of evaluating accuracy are producer's accuracy, user's accuracy, overall accuracy, and Kappa coefficient (Anupam, 2017). From these, two of the accuracy evaluating methods were applied.

#### 1. Producers Accuracy

Producer accuracy refers to the correctness of a map in the perspective of a map maker. This is the chance that a certain land cover of an area on the ground is categorised as such or the frequency with which actual characteristics on the ground are accurately depicted on the classified map. Producer's Accuracy = 100%-Omission Error, where Omission Error is the complement of Producer's Accuracy. Additionally, it is calculated as the total number of reference sites for that class divided by the number of properly categorised reference sites. The equation is derived from (Anupam, 2017).

$$\text{Producers Accuracy \%} = \left[ \frac{\text{Total number of correct pixels in a category}}{\text{Total number of pixels of that category derived from the reference data (i.e., row total)}} \right] 100.$$

#### 2. Reliability or User's Accuracy

The User's Accuracy refers to the accuracy as seen by a map user, not a map producer. The accuracy of the user essentially informs us of how frequently the class depicted on the map will actually be present in reality. Reliability is what is meant by this. User Accuracy = 100% - Commission Error,

where Commission Error is the complement of User Accuracy. The user's accuracy is calculated by dividing the total number of correct classifications for a given class by the sum of the rows. The equation is derived from (Anupam, 2017).

$$\text{Users Accuracy \%} = \left[ \frac{\text{Total number of correct pixels in a category}}{\text{Total number of pixels of that category derived from the classified data (i.e., column total)}} \right] 100 \%$$

### 3. Overall Accuracy

Overall Accuracy essentially informs us of the percentage of reference sites that were accurately mapped. A percentage is typically used to represent the total accuracy, with 100% accuracy denoting a perfect classification in which all reference sources were correctly categorised. The easiest to compute and comprehend is overall accuracy, although it ultimately just offers the map user and producer basic accuracy data.

$$\text{Overall Accuracy \%} = \left[ \frac{\text{Sum of the diagonal elements (true samples)}}{\text{Total number of accuracy sample pixels}} \right] 100 \%$$

### 4. KAPPA Coefficient

A statistical test to assess the precision of a categorization yields the Kappa Coefficient. Kappa is essentially a measure of how well the classification worked in comparison to simply randomly assigning values, or in other words, did the classification do better than random. Between -1 and 1, or the Kappa Coefficient, can be found. The categorization was shown to be no better than random by a value of 0. Indicated by a negative value, the classification is markedly worse than random. If the classification is noticeably more accurate than random, the value is near to 1.

$$\kappa = \frac{p_0 - p_e}{1 - p_e},$$

Kappa coefficient ( $\kappa$ ), for the  $p_0$ , it is the overall accuracy of the model,  $p_e$  is the agreement between the model predictions and the actual class values as if happening by chance.

#### 3.8.4. Land Use/ Land Cover (LULC) Classes

It is uncommon to find precisely specified classes throughout the categorization procedure that one would want.

The land cover classes should be understood prior to gathering training samples in order to facilitate categorization. This study has developed its own categorization system based on the visual interpretation of satellite photos. Five (5) LULC major categories were chosen because they best reflect the study's primary goal, which is to identify changes in land use and land cover in Dessie City: forest, agricultural area, built-up area, green/vegetation region, and bare land/open space/grazing land are enlisted.

### 3.9. Data Analysis Method

Trend analysis, LULC change detection analysis, spatial expansion rate analysis and qualitative data analysis were used.

#### 3.9.1. Trend Analysis

Four time periods, 2016, 2018, 2020, and 2022, were chosen because of the high rates of town development and the importance of these years as a crucial affluent phase for change in order to map urban expansion patterns and assess its effects on LULC change in Dessie City. Using ArcGIS 10.8 analytical tools, the study area's urban growth maps were produced. Landsat TM was georeferenced and then clipped to the pre-existing shape file of the research region. The satellite imageries are prescribing several land use classifications. Tables, figures, charts, and reports were used to present and interpret the gathered data on land use statistics.

#### 3.9.2. LULC Change Detection Analysis

In order to create themed maps for 2016, 2018, 2020, and 2022, spatial temporal satellite pictures of the study region were processed and categorised. The classified maps were then contrasted and overlaid to show how the area changed over time. As Sewenet (2017) stated, we can calculate the land use change detection.

$$\text{Change in \%} = \left[ \frac{\text{Total Area in } T_2 - \text{Total Area in } T_1}{\text{Total Area in } T_1} \right] 100 \% \quad \text{Where T refers to the given time.}$$

#### 3.9.3. Qualitative Data Analysis

Open-ended questions and semi-structured interviews allowed respondents to voice any concerns on the main factors and important players who contributed to the change in Dessie City's land use and land cover.

The responses were sorted and categorised into primary themes in accordance with the respondents' main concerns. These topics were examined, as well as the outcomes of close-ended surveys based on the connections of their concerns

### 3.10. Tools and Software Programs

Because the focus of this study is evaluating the effects of internal migration and human settlement trends and how they affect the detection of changes in land use and land cover (LULC), ArcGIS 10.8 software was primarily used for data processing and trend measurement. More information about the specific tools and software programmes is provided below:

Table 3.6: Tools and Software programs that were used for the study

No.	Software & Tools	Function
1	Arc GIS 10.8	To build a shape file, choose the path and row of the research area, manage data, georeferenced images, process them for improvement and transformation, classify them using explanation and extracting, and construct the layout for the concluding mapping and recording.
2	Techniques of Remote Sensing	To identify changes in land use and land cover throughout various time periods
3	USGS website	The convenient source of satellite image
4	Microsoft Word	To organize, write and publish the paper
5	Microsoft Excel	To organize statistical data's and give findings
6	Adobe Photoshop	To illustrate graphical elements
7	Adobe Illustrator	To illustrate graphical elements
8	Camera	To capture actual images on the ground
9	Voice Recorder	To record samples populations during interviews
10	Stationary materials	To record data collected via different medias

## **CHAPTER FOUR**

### **4. RESULT AND DISCUSSION**

#### **4.1. Introduction**

Out of the anticipated 218 people, 198 questioners were collected from (15 from office staff and 203 from households). Among the 198 respondents, 148 (15 from office workers and 133 from communities) completed all of the survey's closed- and open-ended questions correctly, and the remaining 50 from household respondents participated in the survey's semi-structured interview. By prioritising service seniority, educational attainment, educational qualification, history, location of employment, job role, and year spent in the position, the researcher made a concerted attempt to normalise the quality of the data.

#### **4.2.Trend Detection Mapping**

##### **4.2.1. Unsupervised change detection**

The Dessie City's land use/ land cover changes were evaluated using remote sensing images of 2016, 2018, 2020, and 2022, from Earth Explore USGS Landsat web site by applying unsupervised classification.

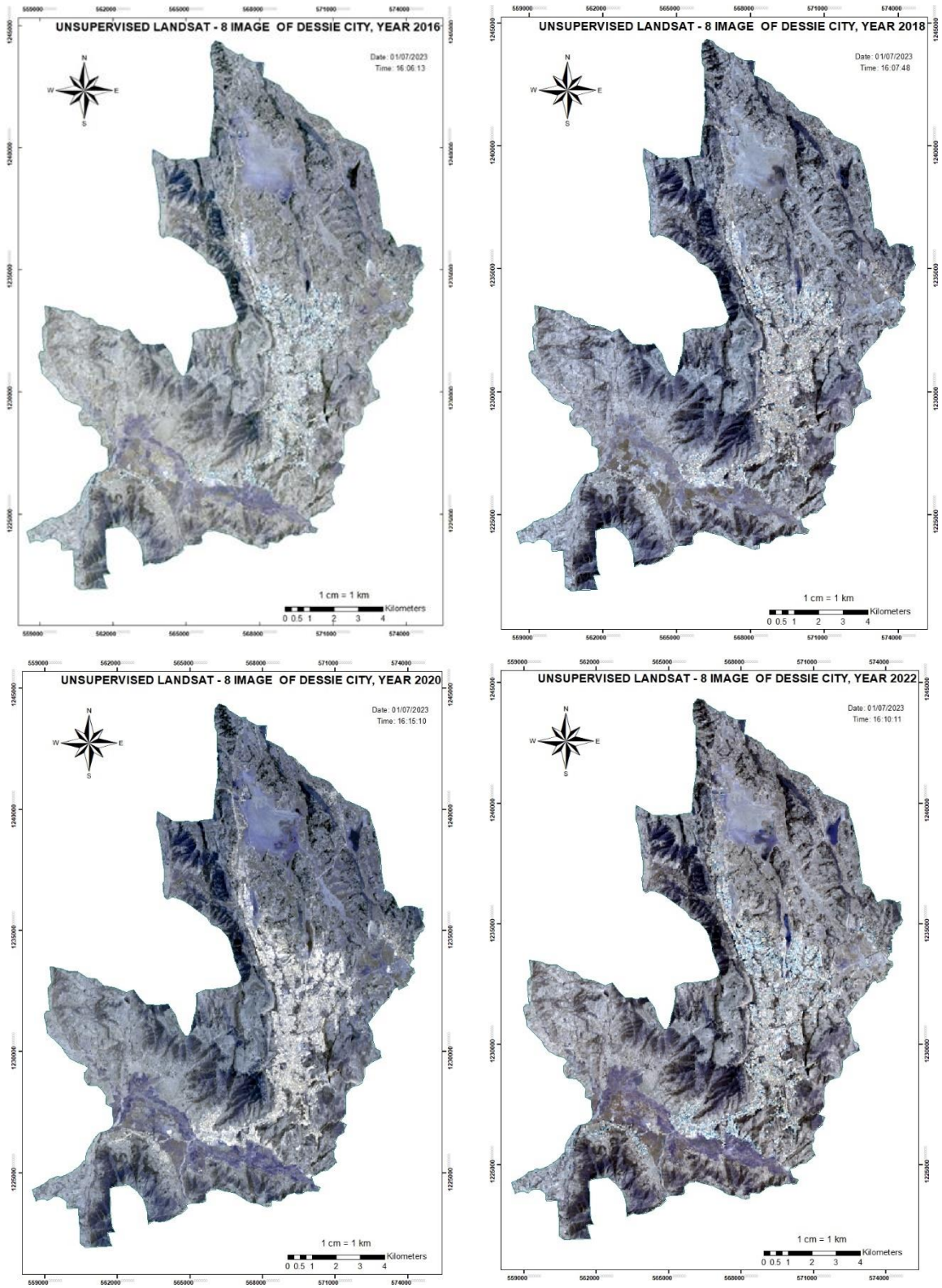


Figure 4.1: Unsupervised Landsat image of Dessie city

#### **4.2.2. Supervised change detection**

Between the year 2016 and 2022, the city's expansion persisted and there was a significant change in the city's land use/ land cover. Built up area expanded significantly from 3,467.8 hectares (17%) to 6,137.5 hectares (40%). As a result of turmoil in Ethiopia's northern region, which causes forced migration and informal settlements, there has been an increase in the usage of grazing land as well as agricultural land, particularly since the year 2018.

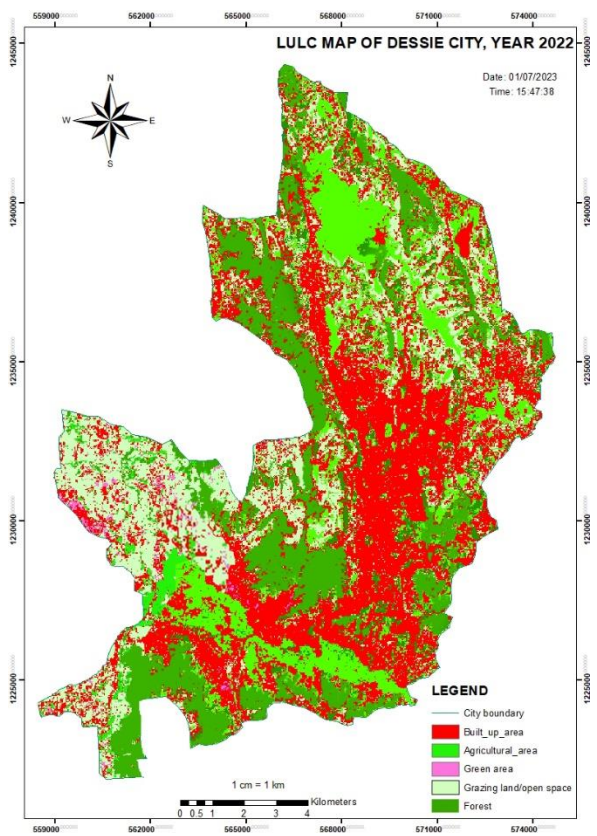
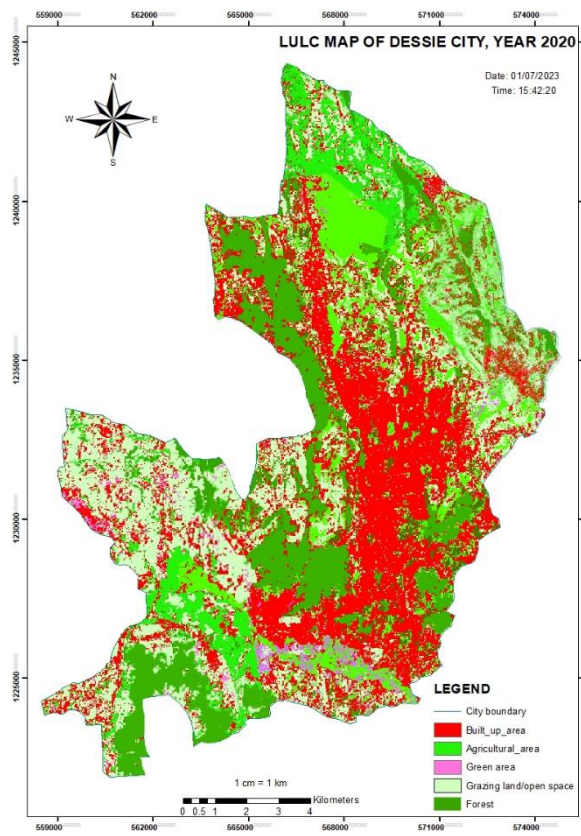
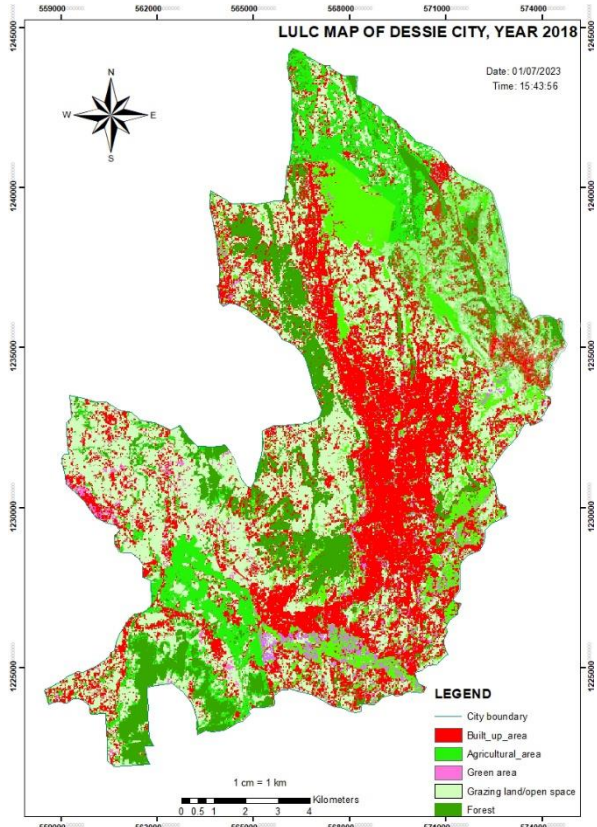
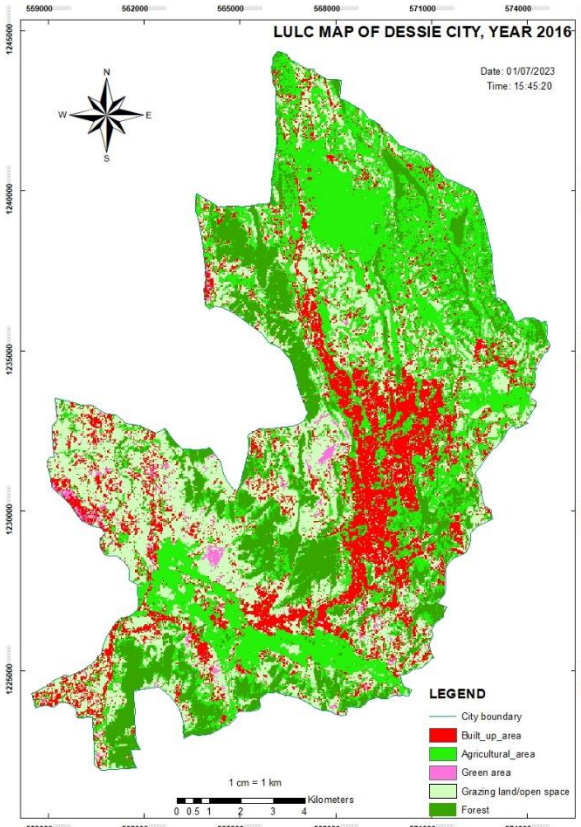


Figure 4.2: Supervised Landsat - 8image of Dessie city

### 4.2.3. Accuracy Assessment

#### i. Producers' Accuracy

Accordingly, the findings indicated that the minimal producers' accuracy result for the study was 77.70%, 85.7%, 80.0%, and 77.7% for the years 2016, 2018, 2020, and 2022, respectively. Whereas for all the years included in the study, the maximum outcome was 98.1%, 99.7%, 99.1%, and 99.1% for the years 2016, 2018, 2020, and 2022, respectively.

#### ii. Users' Accuracy

The findings revealed that users' accuracy ranges between 77.7% and 99.2% for the year 2016, 85.7% and 99.1% for the year 2018, 80.0% and 97.6% for the year 2020, and 87.5% and 98.4% for the year 2022. Therefore, both producers' and users' accuracy shows that the image and its classification was very successfully achieved, and the error margins are within acceptable accuracy.

Table 4.1: Accuracy assessment results of the year 2016

	Built-up area	Agricultural area	Green area	Grazing land/open space	Forest	Total (User)	Users' accuracy (%)
Built-up area	7	1	0	1	0	9	77.7
Agricultural area	0	7	0	0	1	8	87.5
Green area	0	0	1	0	0	1	98.9
Grazing land/open space	1	1	0	3	0	5	60
Forest	0	0	0	0	7	7	99.2
Total (Producer)	8	9	1	4	8	30	
Producers' accuracy (%)	87.5	77.7	98.1	75	87.5		

(Source: Satellite image analysis of 2016 using GIS 2023)

Table 4.2: Accuracy assessment results of the year 2018

	Built-up area	Agricultural area	Green area	Grazing land/open space	Forest	Total (User)	Users' accuracy (%)
Built-up area	6	1	0	0	0	7	85.7
Agricultural area	0	8	0	0	0	8	97.3
Green area	0	0	2	0	0	2	98.2
Grazing land/open space	1	0	0	7	0	8	87.5
Forest	0	0	0	0	5	5	99.1
Total (Producer)	7	9	2	7	5	30	
Producers' accuracy (%)	85.7	88.8	99.7	97.6	98.7		

(Source: Satellite image analysis of 2016 using GIS 2023)

Table 4.3: Accuracy assessment results of the year 2020

	Built-up area	Agricultural area	Green area	Grazing land/open space	Forest	Total (User)	Users' accuracy (%)
<b>Built-up area</b>	8	1	1	0	0	<b>10</b>	<b>80</b>
<b>Agricultural area</b>	0	8	0	0	0	<b>8</b>	<b>96.9</b>
<b>Green area</b>	0	1	1	0	0	<b>2</b>	<b>50</b>
<b>Grazing land/open space</b>	0	0	1	5	0	<b>6</b>	<b>83.3</b>
<b>Forest</b>	0	0	0	0	4	<b>4</b>	<b>97.6</b>
<b>Total (Producer)</b>	<b>8</b>	<b>10</b>	<b>3</b>	<b>5</b>	<b>4</b>	<b>30</b>	
<b>Producers' accuracy (%)</b>	<b>99.1</b>	<b>80</b>	<b>33.3</b>	<b>99.7</b>	<b>97.8</b>		

(Source: Satellite image analysis of 2016 using GIS 2023)

Table 4.4: Accuracy assessment results of the year 2022

	Built-up area	Agricultural area	Green area	Grazing land/open space	Forest	Total (User)	Users' accuracy (%)
<b>Built-up area</b>	6	0	0	0	0	<b>6</b>	<b>98.4</b>
<b>Agricultural area</b>	0	9	0	1	0	<b>10</b>	<b>90</b>
<b>Green area</b>	0	0	1	0	0	<b>1</b>	
<b>Grazing land/open space</b>	0	0	1	7	0	<b>8</b>	<b>87.5</b>
<b>Forest</b>	0	0	0	1	4	<b>5</b>	<b>80</b>
<b>Total (Producer)</b>	<b>6</b>	<b>9</b>	<b>2</b>	<b>9</b>	<b>4</b>	<b>30</b>	
<b>Producers' accuracy (%)</b>	<b>97.4</b>	<b>98.4</b>	<b>50</b>	<b>77.7</b>	<b>99.1</b>		

(Source: Satellite image analysis of 2016 using GIS 2023)

### iii. Overall accuracy

In addition, the overall accuracy was determined and the percentages of the categorised maps for the years 2016, 2018, 2020, and 2022 were, 83.3%, 93.3%, 86.6%, and 90.1%. respectively.

### iv. KAPPA Analysis

The results of the total kappa statistics for the years 2016, 2018, 2020, and 2022 are 0.813, 0.913, 0.825, and 0.901, respectively, which indicate the classification procedure was successful in avoiding 81.3%, 91.3%, 82.5%, and 90.1% of the mistake during classification.

## 4.2.4. Land Use/ Land Cover Analysis

### 4.2.4.1. Land Use/ Land Cover Comparison from 2016-2022

Data on land cover shows the percentage of an area that is made up of forests, wetlands, impermeable surfaces, agricultural land, and other forms of land and water. Whether for

development, conservation, or a combination of the two, land use reveals how humans utilise the terrain. The various types of land cover can be used or managed in quite diverse ways (Kindu M. , 2013).

The result shows, the total area of LULC changed shift between the years 2016 and 2022.

Table 4.5: The land use/ land cover total area in hectares for each category between 2016 and 2022

No.	Land use/ Land cover type	Years and Area coverage in (ha) & (%)							
		2016		2018		2020		2022	
		Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
1	Built up area	3,467.8	17%	5368.6	27%	6986.4	35%	7937.5	40%
2	Agricultural area	6,428.9	33%	5169.4	26%	4928.7	25%	4462.7	22%
3	Grazing land/ Open space	3,517.6	18%	2951.2	15%	2534.6	13%	2296.4	12%
4	Forest	6,032.4	30%	5875.6	30%	5059.9	26%	4865.1	25%
5	Green area	269.3	2%	351.2	2%	206.4	1%	154.3	1%

As shown above, agricultural land decreased in all years from 6,428.9 hectares (33%) in 2016 to 4462.7 hectares (22%) in 2022, while the total area of the built-up class increased from 3,467.8 hectares (17%) in 2016 to 7937.5 hectares (40%) in 2022. Other categories' trends change over time, increasing and declining at certain points. Grazing land/Open space decreased from 3,517.6 hectares (18%) in 2016 to 2296.4 hectares (12%) in 2022. The expansion in built-up areas, particularly after 2018, was mostly brought on by the turmoil that erupted in Ethiopia's northern region and resulted in widespread migration and informal settlements.

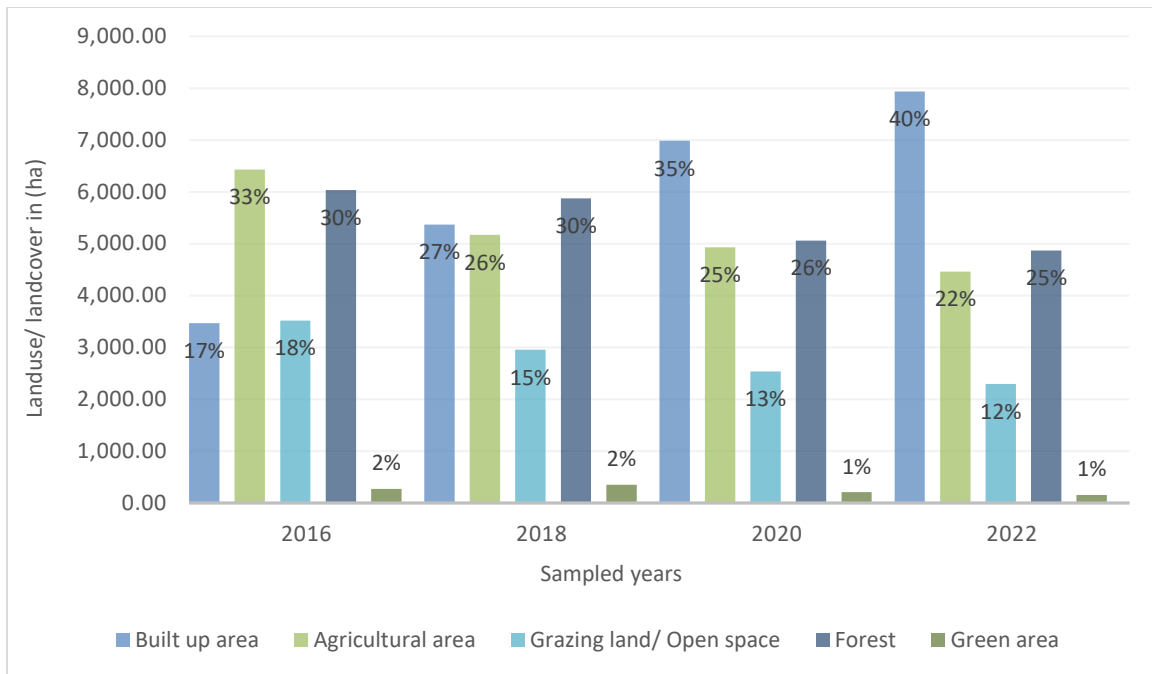


Figure 4.3: Total area for all land use land cover classes from 2016–2022

(Organized by the Author (2023))

Based on the equation provided above in the theories, it was also possible to calculate the percent change, amount of growth (positive), and amount of decline (negative), for each year.

Table 4.6: Change in percent in trend analysis from 2016-2022

No.	Land use/ Land cover type	Change (2016-2018)	Change (2018-2020)	Change (2020-2022)
		Percentage	Percentage	Percentage
1	Built up area	10%	8%	5%
2	Agricultural area	-7%	-1%	-3%
3	Grazing land/ Open space	-3%	-2%	-1%
4	Forest	No change	-4%	-1%
5	Green area	No change	-1%	No change

(Source: Change in percent in trend analysis from 2016-2022 using GIS (2023))

(Organized by the Author (2023))

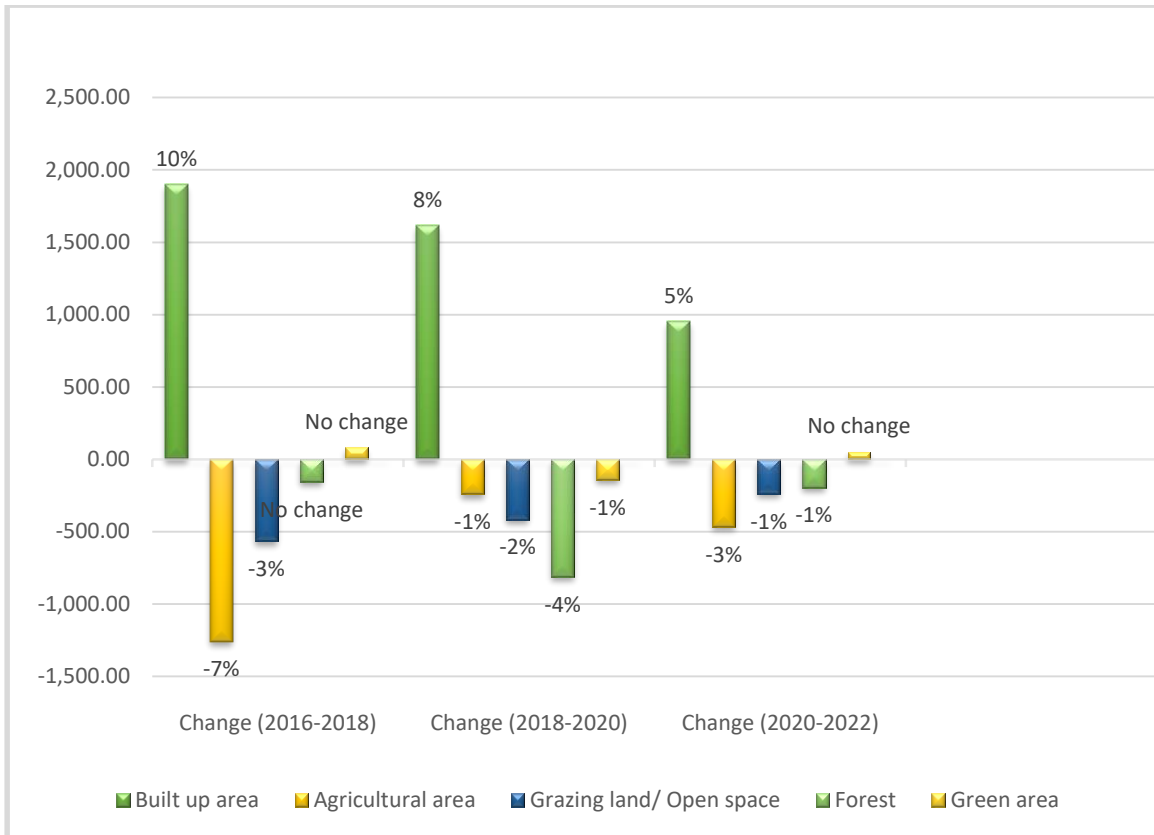


Figure 4.4: Change in area in time series analysis from 2016-2022

(Organized by the Author (2023))

According to the results above, the built-up area rose by (10%) from 2016-2018, (8%) from 2018-2020 and (5%) from 2020-2022. While agricultural land fell (-7%) from 2016-2018, (-1%) from 2018-2020 and (-3%) from 2020-2022. Grazing land, open space, and woodland areas (forest areas) have primarily declined as the built-up area coverage has expanded.

#### 4.2.4.2. Overlay Analysis /Change in Built-Up Area (2016-2022)

Visualising each categorization result independently on a single map to highlight the growth of built-up area in each year allowed researchers to map and compare the change in built-up area between the years 2016 and 2022. The map depicted the change for each year, with the red colour denoting the built-up area in 2016, the yellow colour in 2018, the blue colour denoting the increase of the built-up area in 2020, and the green colour denoting the dramatic rise of the built-up area in 2022.

Table 4.7: Change in built-up area in time series analysis from 2016-2022

No.	Land use/ Land cover type	Years and Area coverage in hectare & Percentage							
		2016		2018		2020		2022	
		Area	Percentage	Area	Percentage	Area	Percentage	Area	Percentage
1	Built up area	3,467.8	17%	5368.6	27%	6986.4	35%	7937.5	40%

(Source: Change in percent in built-up area from 2016-2022 using GIS (2023))

(Organized by the Author (2023))

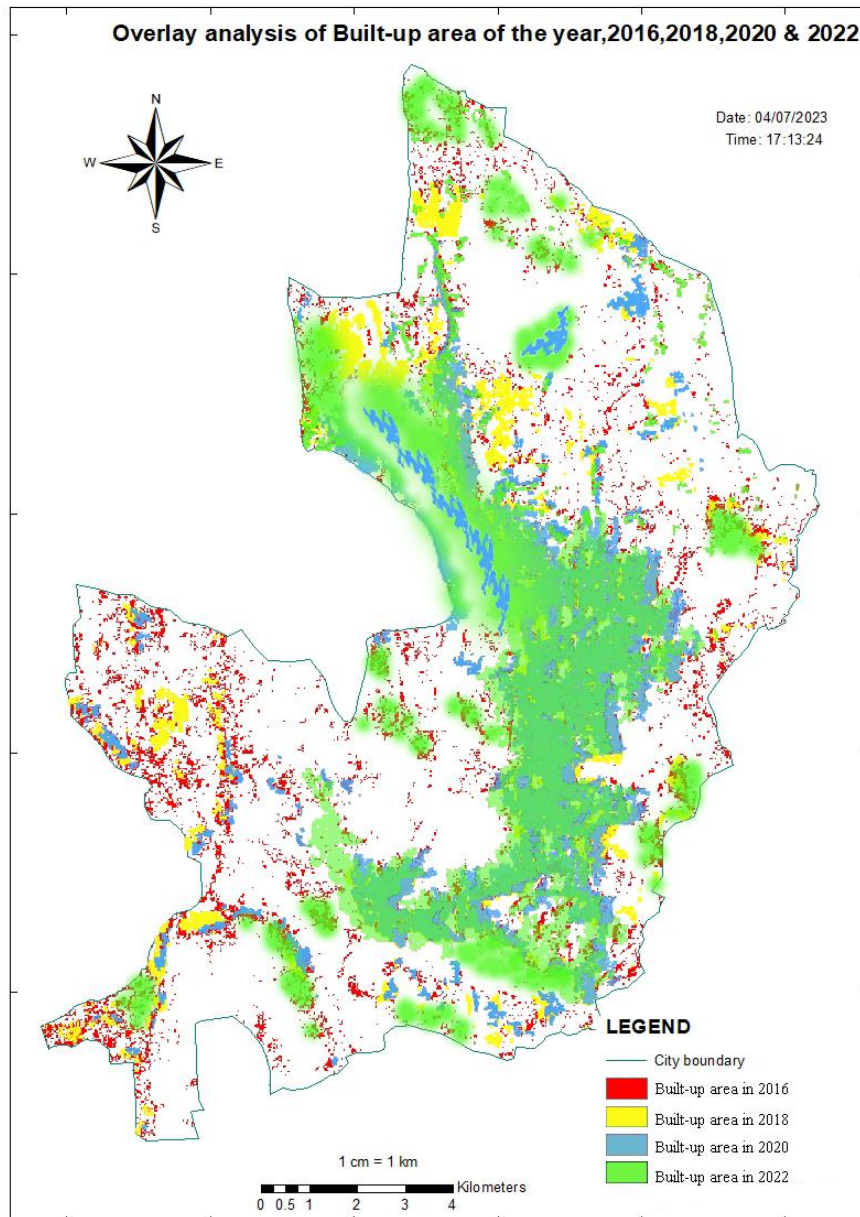


Figure 4.5: Overlay analysis of Built-up area of the years

### 4.3. Description of Respondents

#### 4.3.1. Background of Office Employees

Among the 15 office respondents 60% of them were men, while 40% were women. The ages of the respondents also vary. And the respondents with 41-50 years was 27%, and from 31-40 years was 73%, which indicate more than half of the sampled office workers are categorized in the working age groups.

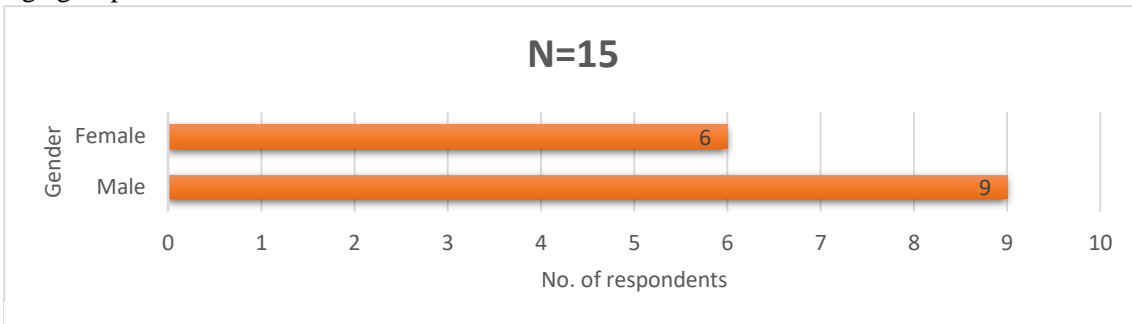


Figure 4.6: Gender character of office employees

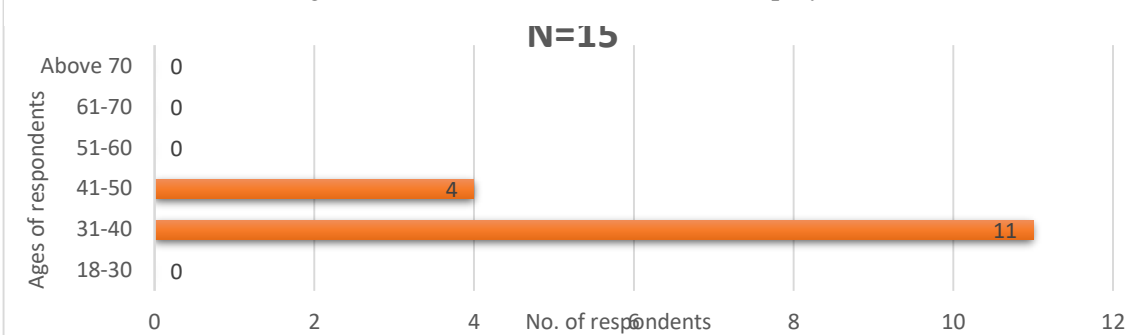


Figure 4.7: Age character of office employees

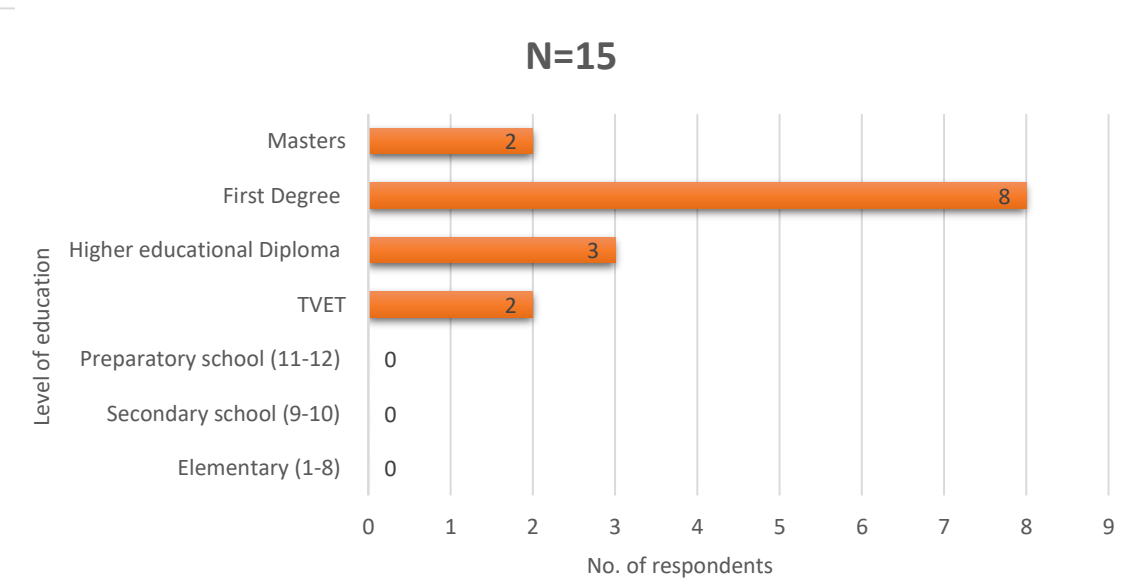


Figure 4.8: Level of Education of office employees

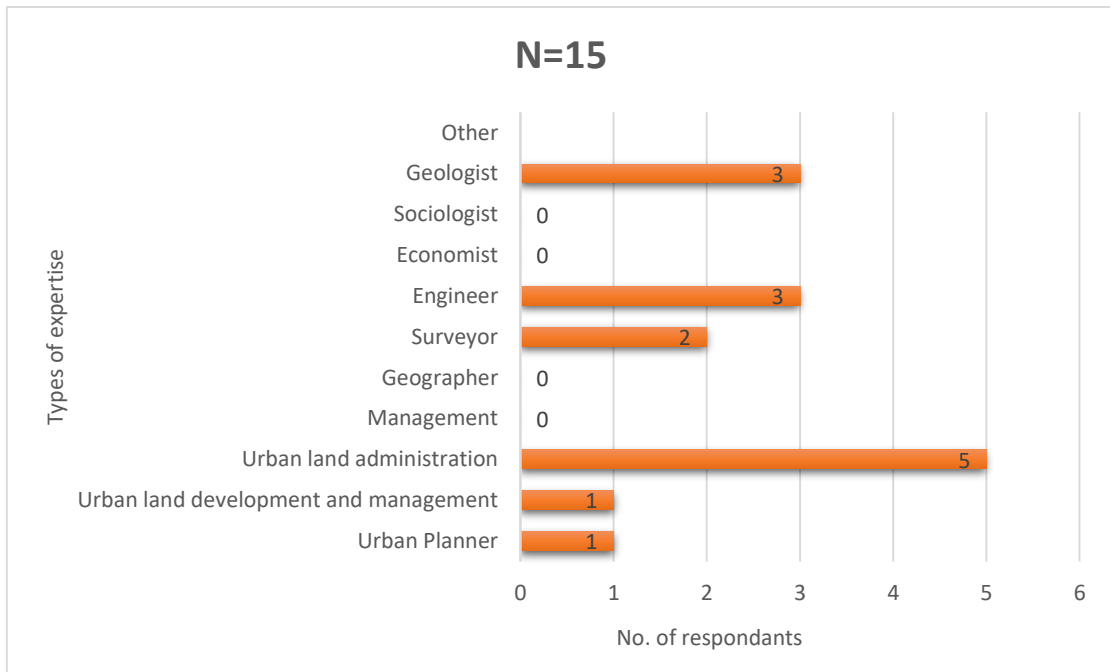


Figure 4.9: Educational qualification background of office employees

From the 15 office workers, the majority (54%) are first degree, followed by those who received higher education diplomas (20%), master's degrees (13%), and TVET (13%). Of the sampled office workers, those with a background in urban land administration are about 33%, that of engineers (20%), geologists (20%), surveyors (13%), urban planners (7%) and urban land developers (7%) respectively. This suggests that they are all professionals or specialists which helps the researcher ensure the accuracy and validity of the data gathered.

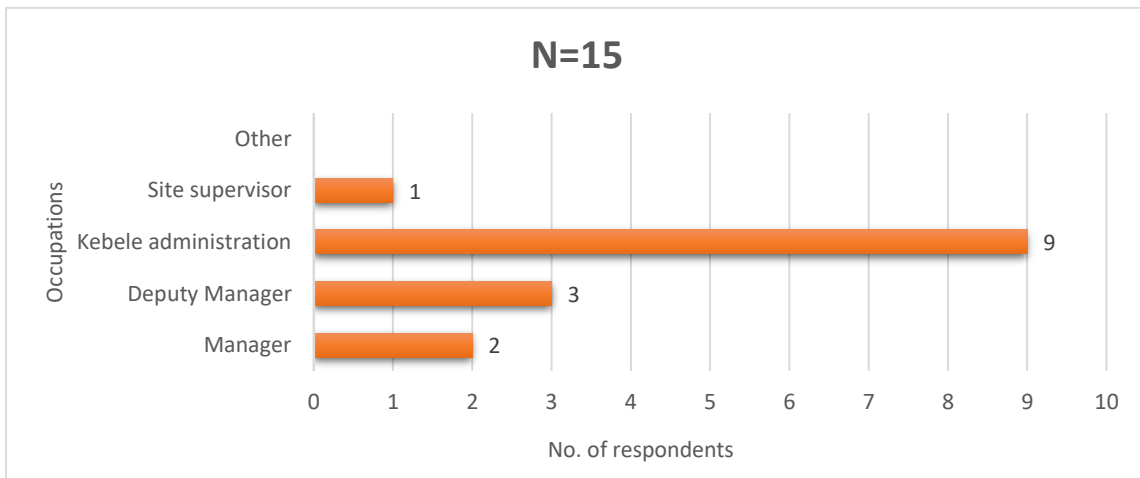


Figure 4.10: Occupation of office employees

About 60% of the sampled office staff members were Kebele administrators, from all ten (10) kebeles of Dessie city administrations. Deputy managers of the sub-city and kebele sectors make up around 20% of the workforce, managers make up 13%, and site supervisors make up 7%. This demonstrated that the study attempted to evaluate the information and data from certain city neighbourhoods in terms of involvement, as well as where the data was acquired and the study was conducted with practically all specialists in their particular programme, as they are closer to the issue.

#### 4.3.2. Background of the Household Respondents

Among the 183 respondents that were sampled, the findings show, 14%, 12%, 8%, 10%, 9%, 8%, 9%, 10%, 9%, and 11% of household respondents were interviewed from the kebeles 01, 02, 03, 04, 05, 06, 07, 08, 09, and 10 respectively.

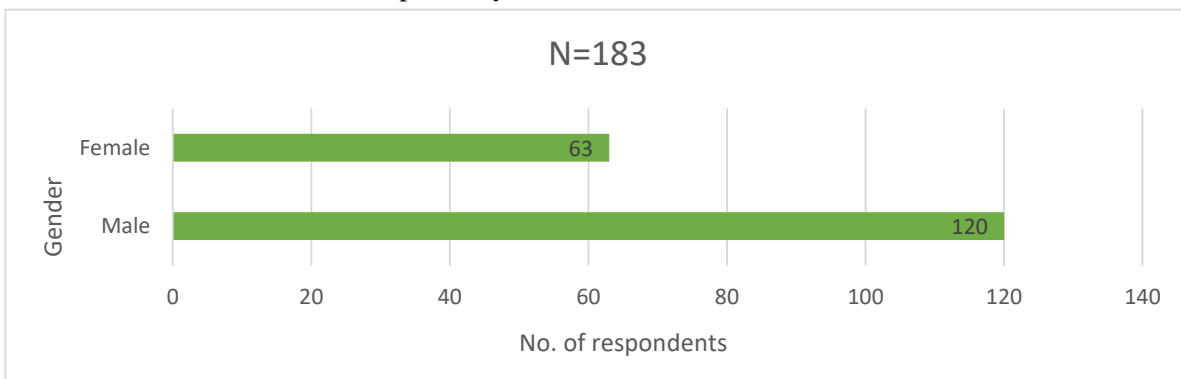


Figure 4.11: Gender of communities

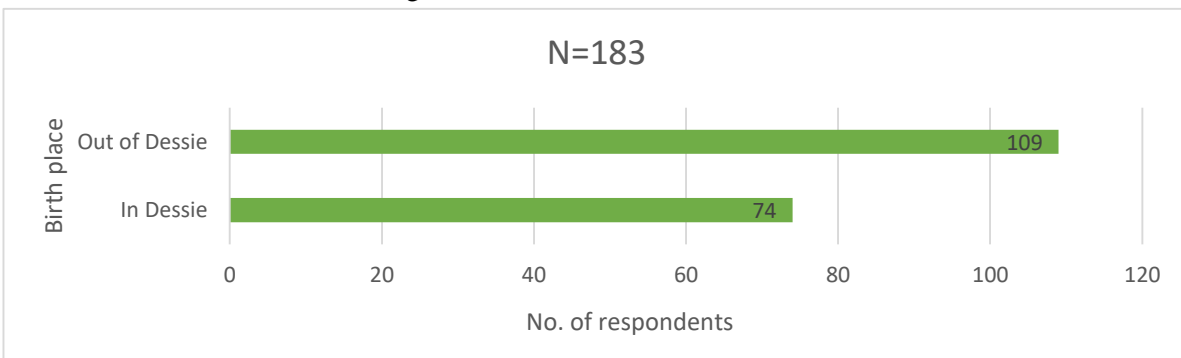


Figure 4.12: Place of birth of communities

One factor that affects equity and participation is the respondents' gender. In light of the data as they have been provided, it can be seen that, of the 183 respondents that were gathered, 66% were men and 34% were women. Additionally, as shown in the figure below, the age distribution of the sampled communities ranges from a lower group of 1% for the age group 51–60 years to a higher group of 8% for the age groups above 70 years, 9% for the age groups 61–70 years, 15% for the age groups 41–50 years, and 46% for the age groups 18–30 years. And also as presented in the

figure, most of the planned sampled communities which migrated from other towns and cities were about 60 % and only 40 % of sampled communities were born in Dessie city. This indicated that there was rapid population growth through migration to the city due to in need of work and mainly uncertainty issues like wars and violence's according to the informants during survey. So, within the relation to the objectives of the study, as of more than half of the scheduled sampled communities were in their productive ages and most of them have migrated to Dessie city, it can be used to analyse and assess the impacts on the land use/land cover in relation to internal migration.

Most people in the communities that were planned to be sampled went to secondary school, which was approximately 26% of them, followed by a first-degree programme about 26%, TVET, a preparatory school about 11%, and a higher education diploma about 4%. This showed that more than half of the responders in the intended sample were professionals in their particular programme. So, as a result of their understanding and closer to the problem, this supports the study's conclusion with information produced as they recommend appropriate strategies to reduce unplanned land use/land cover changes.

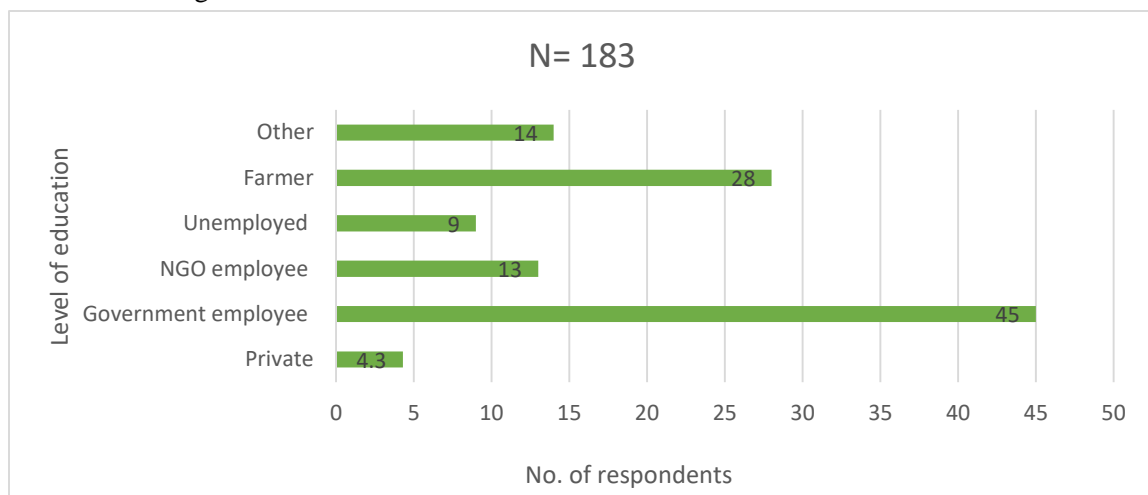


Figure 4.13: Household respondents level of education

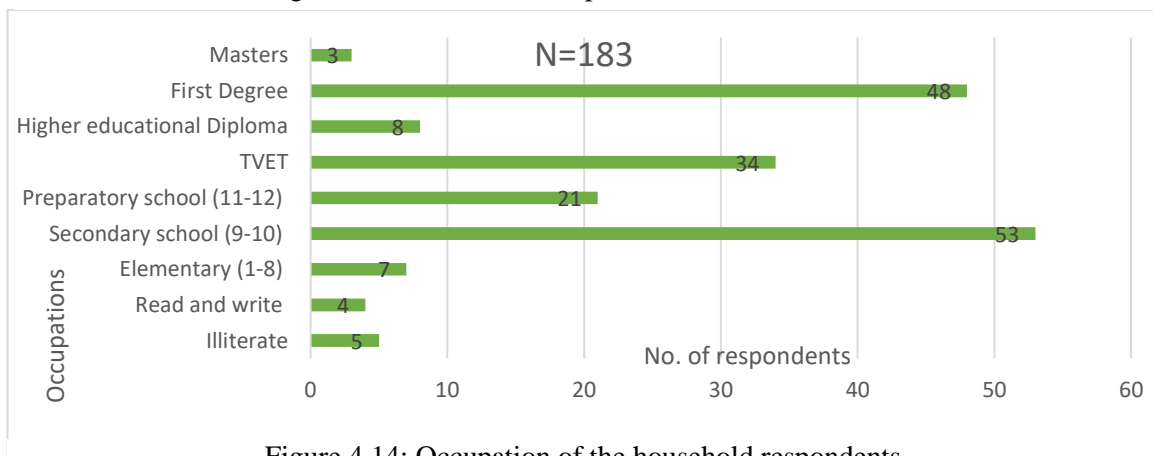


Figure 4.14: Occupation of the household respondents

According to the findings, the majority of household respondents were identified as government employees, who made up about 40% of the samples, followed by farmers about 25%, NGO workers about 12%, the unemployed about 8%, privately owned workers about 4%, and people who worked in other fields, who made up about 11%. And these findings are very helpful in determining the factors and actors of the land use/ land cover change.

#### 4.4. Driving Factors

The driving factors for the land use/ land cover change, for different respondent groups are as follows:

##### 4.4.1. Perceptions of Office Employee’s on Driving Factors

Office employees identified seven land use/ land cover change driving factors, including instability issues (31%), an increase in work opportunities (10%), an increase in population (15%), its plans (1%), the topography of the city (23%), informal access to land (19%) and housing preferences (1%) between the years 2016 and 2022.

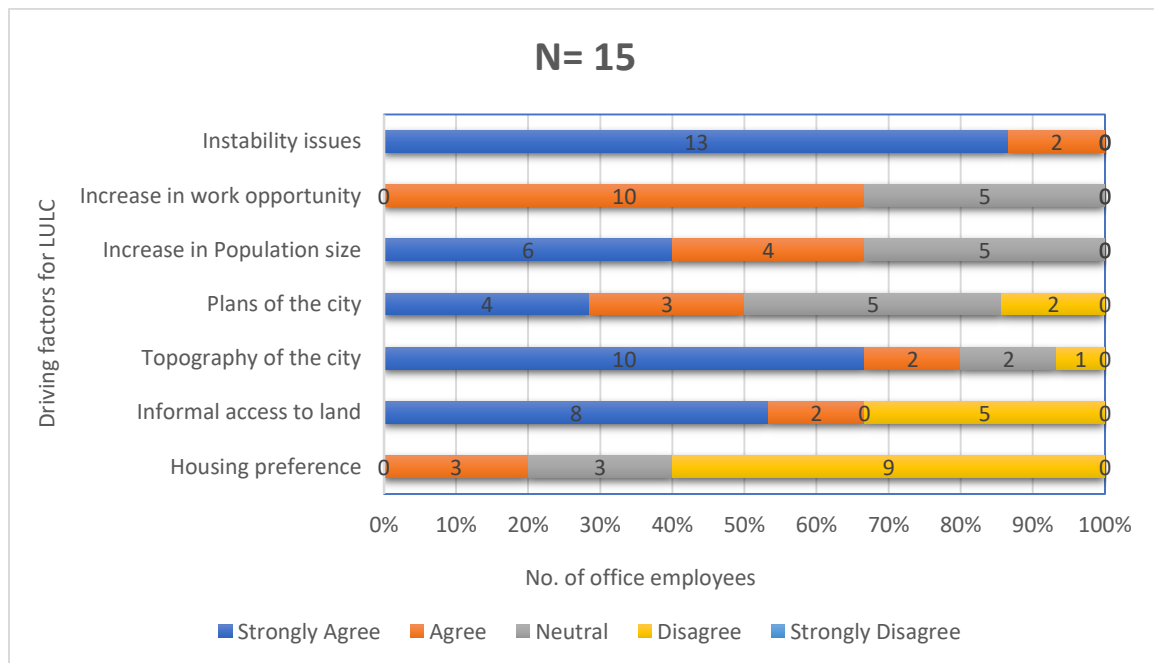


Figure 4.15: Showing land use change factors assessment according to office employees

##### 4.4.2. Perceptions of Household Respondents on Driving Factors

Communities were given the opportunity to share their own perceptions in semi-structured interviews during the survey's final phase. On the other hand, it was also expected to observe the links between respondents' replies and other factors that significantly influenced the change in land

use and cover in Dessie City between 2016 and 2022 by using both open-ended and closed-ended questionnaires.

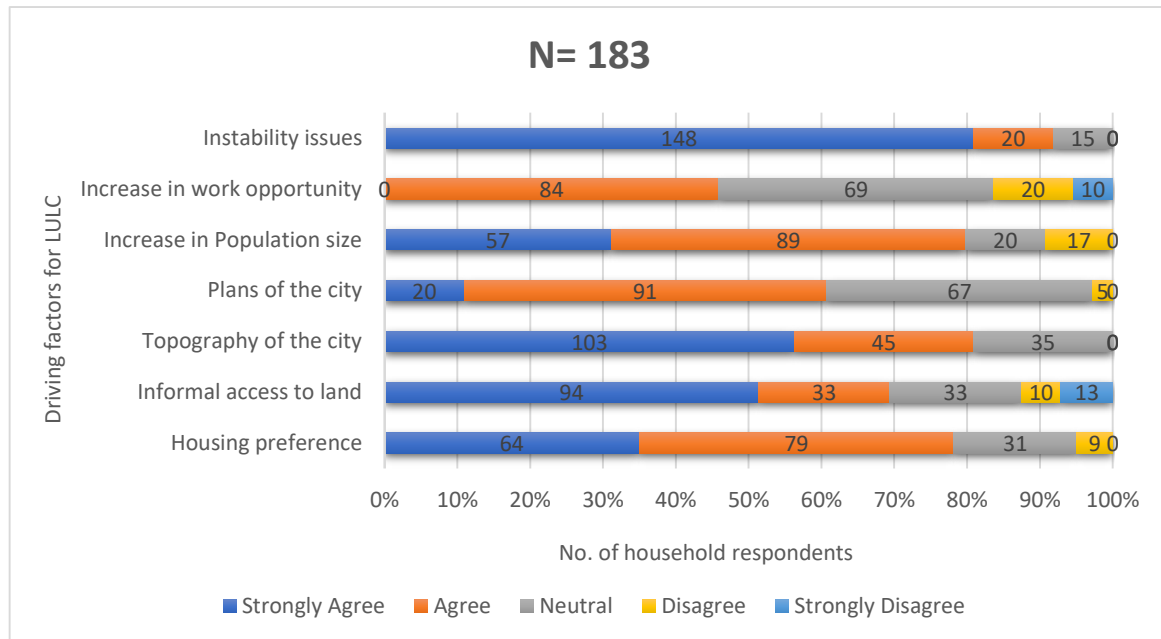


Figure 4.16: Displaying the rankings of the household respondent’s expansion factors

The household respondents indicated that the drivers for the LULC are instability issues (31%), topographical problems (21%), informal access to land (19%), housing preference (13%), the increase in population (12%), plans of the city (4%) and need in employment opportunities is nearly negligible.

#### 4.4.3. Driving Factors Analysis

Five Likert ratings from strongly agree to strongly disagree and semi-structured interviews were utilised to gather information on the key determinants behind Dessie city land use/ land cover changes between 2016 and 2022. Because the information gathered was dependent on individual perception, which differed according to one's attitude towards the circumstances and actors that greatly influenced the shift in the land use and cover of the city.

##### 4.4.3.1. Instability issues

Researches state that both domestic and foreign migration is mostly influenced by the same variables. People work to improve both their own and their dependents' well-being. The quest's objective is to fulfil a number of conditions, including having access to social security, food, clean drinking water, recreation, education, decision-making, freedom of speech, and religion. Most significant, though, is having a job and a sufficient salary (Stoner, 2017).

From the instability issues, conflict is one which affects migration by lowering economic possibilities at home (Poole, 2021). Even if individuals will also need resources to be able to migrate safely. War has repercussions that go well beyond the evident death toll. In addition to casualties on the battlefield, armed conflict frequently causes infrastructure destruction, forced migration, refugee movements, financial flight, and forced migration (Jason, 2010).

According to data from IOM, millions of Ethiopians were forcibly displaced within the country in regions recently in 2018, 2019, and 2020/21. As IOM study indicated, in cycle 22 (June–July 2020), the total number of IDPs increased to 1.82 million. The number of IDPs increased slightly in cycle 23 (August–September 2020), reaching 1.84 million. IDP numbers increased to 2.1 million during cycle 24 (December 2020–January 2021) mostly as a result of the Northern Ethiopia Crisis.

Table 4.8: Number of persons displaced due to different factors in Amhara Region

Region	Displacement reason	Displacement Period			
		During 2018	During 2019	During 2020 & 2021	Total
Amhara	Conflict	48,839	388,684	106,154	543,687
	Climate	8,809	712	5,139	14,660
	Other	952	-	-	952

**Source:** (Displacement Tracking Matrix, round 09 to 24 data, from January 2018 to January 2021)

From the above data of IOM Displacement Tracking Matrix, as well as from the data's collected from the sectors working on IDP's in Dessie city during the survey, the number of displaced peoples to Dessie were compiled in the table below (Table 4.13).

Table 4.9: Number of persons displaced due to different factors in Dessie City

City	Displacement reason	Displacement Period			
		During 2018	During 2019	During 2020 & 2021	Total
Dessie/ Dessie zuria	Conflict	5,675	14,931	20,311	40,917
	Climate	-	-	-	0
	Other (economic/development projects, protracted displacements...etc.)	103	-	56	159

**Source:** (Displacement Tracking Matrix Report and sectors working on IDP's in Dessie city)

#### 4.4.3.2. Increase in employment opportunity

As stated on the “Final Report on Investment Status and Climate Analysis of Dessie City 2021”, In seven separate subsectors of the municipal government between the years 2002 and 2011E.C., 423 private investment projects totalling 8,357,455,661 Birr in projected capital were authorised. Urban agriculture, social services, manufacturing, real estate, rental of services (such as construction equipment), construction, and hotel and tourist are among the authorised investment activities. The manufacturing sub-sector, accounted about 46.6% of authorised projects, is followed by service rental (24.1%), construction (9.9%), hotel and tourist (8%), and social services (6.9%), as shown in figure 4.17. The private investors in the municipal government, however, had a lower preference for urban agriculture and real estate investment regions.

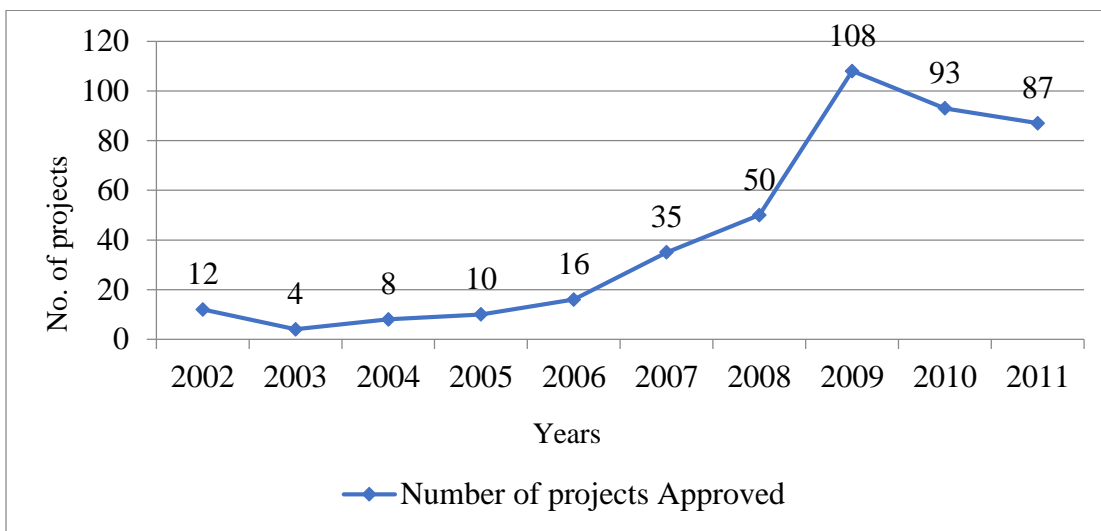


Figure 4.17: Trends in the Number of Projects Approved (2002-11E.C)

**Source:** (10 years Investment Data from Dessie City Investment Office)

As the report stated, it was anticipated that 43,122 labour forces will have employment opportunities after the licenced projects had fully commenced operations. Manufacturing was responsible for 59.6 percent of the total employment (43122), followed by construction (14.2 percent), real estate (10 percent), hotel and tourism (6.3 percent), social services (3.9 percent), and the other two subsectors (3 percent). As it can be seen in the chart below, 83.5% of the capacity of the authorised projects was predicted to be employed in the job opportunities that were expected to be generated at full capacity for 2009, 2010 and 2011E.C. Following the service sector (22.2%) in terms of employment opportunities created by the licenced investment projects, the industry sector had the highest share at 73.8%.

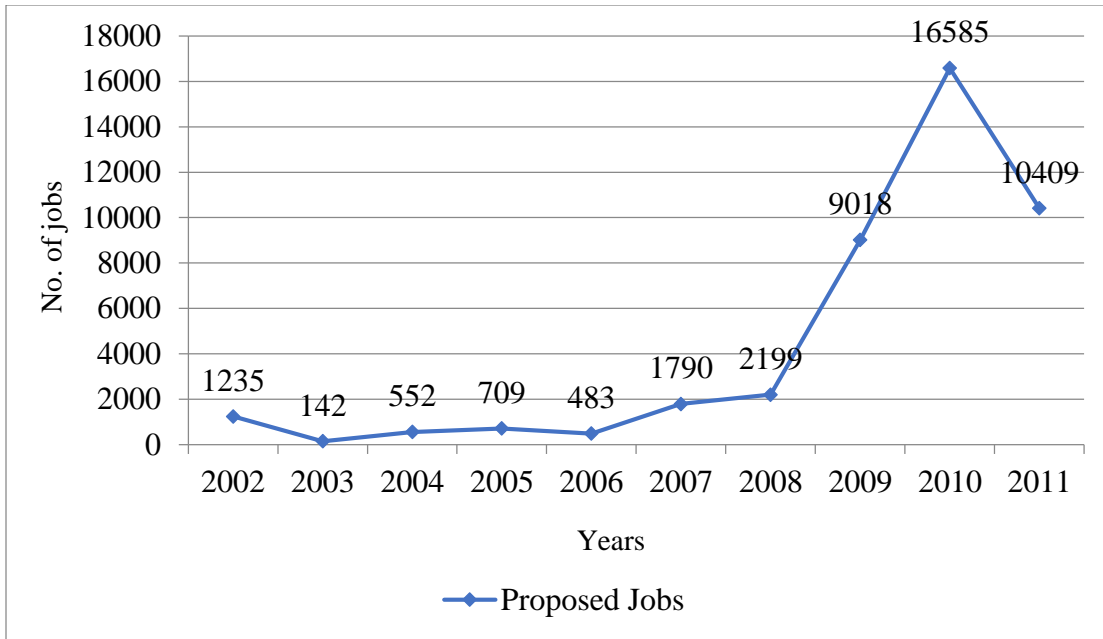


Figure 4.18: Trends in the number of Jobs to be created (2002-11E.C)

Source: (10 years Investment Data from Dessie City Investment Office)

These data indicated that the job opportunity increases throughout the consecutive years (2006-2010) and there was a slight decrease in the years 2003 and 2011. But as the results have high rankings on the years from 2006, it acts as a pulling factor of the adjacent cities and towns of those seeking for job.

#### 4.4.3.3. Increase in population size

The population growth rate, stated as a percentage of the beginning population, is the rate at which the total number of people in a population rises during a specific period of time. In particular, population growth rate refers to the change in population over a unit of time, sometimes given as a percentage of the population's size at the beginning of that period (Lahiri, 2018).

Table 4.10: Population size of Dessie city

Dessie city population size				
Year	1984	1994	2007	2020
Population size	71565	97314	151174	281636

Source: (Computed from Ethiopian CSA)

Table 4.11: Growth rate of Dessie city

Growth Rate				
Year	1984	1994	2007	2020
Rate	-	3.1	3.4	4.8

Source: (Computed from Ethiopian CSA)

Based on these census findings, the Dessie City's average annual growth rate between 1984 and 1994- 2020 is increasing. When compared to the national average growth rate of urban population, the Dessie city's inter-censal growth rates during the first (1984–1994) and second (1994–2007) periods were quite low, at 4.1 and 3.7, respectively. But were nearly equal between 2007 and the projection year 2020.

#### **4.4.3.4. Plans of the city**

The fourth structure plan of Dessie City, which was prepared in 2010, was a 10-year plan that is being phased out about two years. The 10 most urgent and persistent city-wide and kebele-level concerns were properly identified and prioritised via the input of several community and stakeholder groups. More than 70% of the 10 primary planning problems were non-spatial in nature. However, efforts were undertaken to evaluate current issues with the water supply, drainage, and roads. Even though the plan devised oblique and very ambitious plans, several implementation techniques/studies, such as those on building height, site grading, and zoning laws, were carried out and reports were initially prepared together with proposal documents and maps.

An existing analysis of this plan covered 3711.14ha built-up &13088.88 ha unbuilt-up areas. This structure plan proposed the city to be expanded to 16,800 ha, from this the built-up constituted 8128.12 ha &the rest 8671.88 ha to be unbuilt-up.

This SP plan did not recognise or use the concepts of 30, 30, and 40 proportion when assigning land for road and infrastructure, urban greenery, and built-up area (building and construction category), respectively. Instead, their respective shares were 15%, 16%, and 69%. Additionally, just two broad land use categories-social & municipal service and special land use categories-out of the total area allotted for building and construction adhered to the authorised allowable standard limitations, accounting for about 20% of the total. Additionally, the core urban planning concepts of encouraging mixed-use and compact developments in the city were not guaranteed. As a result, the previous land use plan failed to allot enough space for the various land use purposes. To satisfy any expected future demand, careful consideration should be given from the beginning of the present planning process to the proportionate allocation of land for each land use category.

But in the new proposed structure plan of Dessie city which was prepared by Dessie city structure plan preparation Bureau which is finally approved in 2022, there are modifications and proposals given on different land use sectors.

#### 4.4.3.5. Topography of the city

As secondary data stated, one can descend from roughly 300 metres above sea level to 2300 metres above sea level by passing a slot of hills and valleys, according to the northwest to southeast topographic profile of Dessie City. Tossa mountain, which is located in the centre of the city and extends from 2100 metres above sea level to 3000 metres above sea level, is also part of the west-east direction of the city. Similar to this, the North-South topographic profile reveals 800-metre elevation variation within a 20 km horizontal span. Above all, crossing the metropolis from the west to the east or from the northwest to the southeast involves several ups and downs.

Generally, the topographic profile of Dessie city shows that it is characterized by undulating surface which requires special considerations while designing and constructing infrastructures and any other human-made facilities. And this makes the city hard to dwell and drives the settlers to change the use of other land uses to residential.

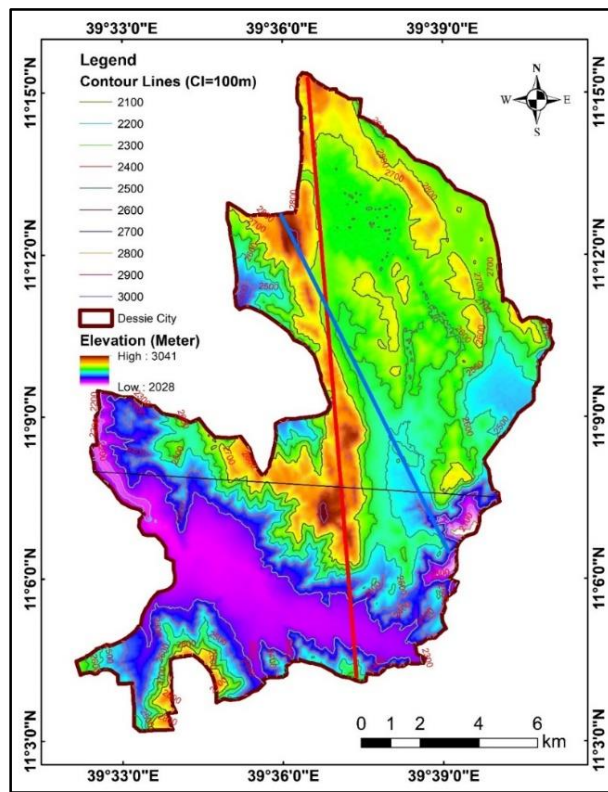


Figure 4.19: Topographic profile of Dessie city

Source: (Physical and geographical study of Dessie city, 2021)

#### 4.4.3.6. Informal access to land

Dessie city land development and management office administration registered about 20,311 HH of informal housing units due to migration from the year 2016-2022. The informal access to land

also indicated during the survey as major factor that contributed a lot for the change of land use/ land cover between the year 2016 and 2022 by office employees and communities.

Table 4.12: Settlement and access of land

No.	Overall Settlement from the year 2016-2022	Formal settlement from the year 2016-2022	Informal settlement from the year 2016-2022	Informal settlement from the year 2016-2022 due to migration
1	112,453 HH	67,182 HH	45,271 HH	20,311 HH

Source: (Dessie City administration Office)

On the outskirts of the town, large settlers with unplanned structure, were seen in the field observation. Some informants who participated in the study agreed, Tita, Kelina, and Kurkur kebeles in particular had an illegal land market where farmers were selling their agricultural property. The informal land market in Dessie City attracts a lot of speculative purchasers. The trade often occurs inside personal networks and is a straightforward sales transaction between the town's inhabitants, brokers, and local farmers. Those who purchase the land are gaining unauthorised access to it. When they are ready to be regularised in the future and build the primary residence or sell it for a profit, they build a tiny hut on the property.

#### 4.4.3.7. Housing preference

The demand for dwelling purposes was significantly high in Dessie city. Living in apartments and multi-family high rise buildings makes it unaffordable that expanded a large single-family home in the city.

Office workers have a neutral attitude and the majority of the elements are viewed as "agreed" by them, whereas communities have views that are firmly agreed upon, agreeable, and neutral about the housing choice factor, which greatly influenced the city's shift in land use and cover between 2016 and 2022.

#### 4.5. The Driving Actors

When examining the motivating forces behind land use/ land cover (LULC), it is important to consider the roles played by the government, farmers who donated their land, investors or communities who purchased land, and real estate agents who primarily deal in the land market. The driving players that were taken into account in this study, include land brokers, regional farmers, city residents, experts, public officials, and private investors.

#### 4.5.1. Perceptions of Office Employee’s on Key Actors

The survey's findings revealed that the majority of respondents (office workers) agreed that Local farmers, Land brokers, Government officials, Community of the city, Experts and Private investors were the driving actors for land use and cover change. These percentages were nearly 32%, 29%, 21%, 9%, 7% and 2%, respectively.

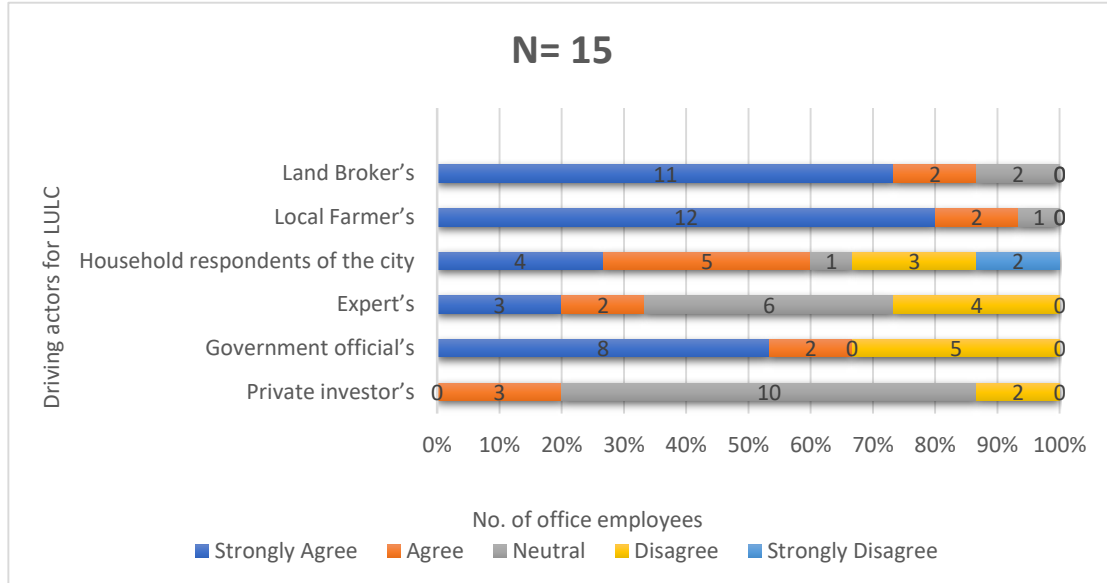


Figure 4.20: Showing land use change actors assessment according to office employees

#### 4.5.2. Perceptions of Household Respondents on Key Actors

Household respondents were given the opportunity to share their own perceptions on the key actors for the LULC for the city. And the following results are obtained in (Figure 4.21).

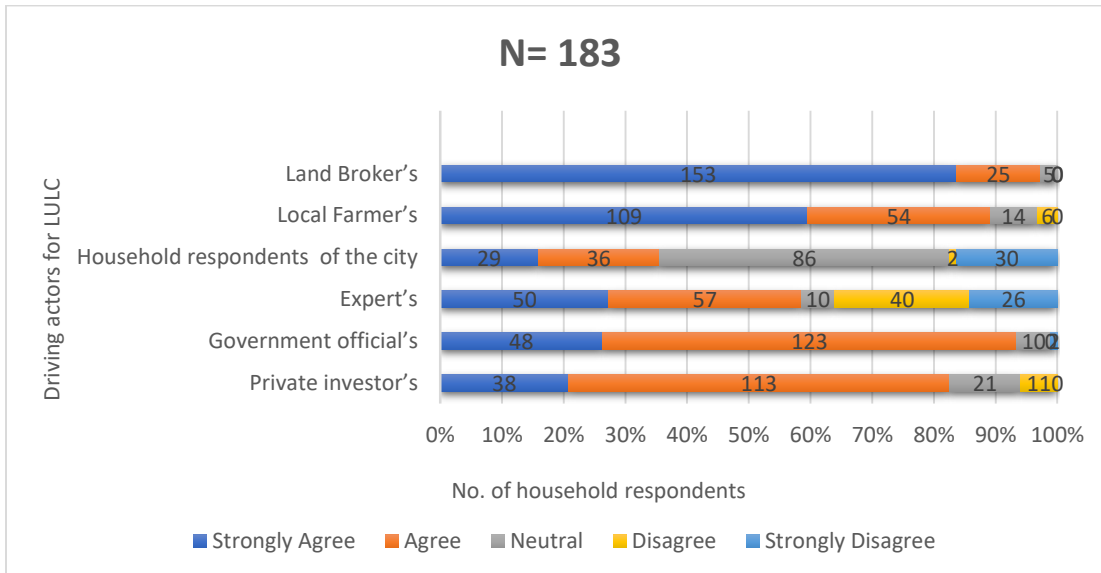


Figure 4.21: Showing land use change actors assessment according to the household respondents

Therefore, the survey's findings indicated the Land brokers contributed 36%, Local farmers 25%, community of the city 7%, Experts 12%, Government officials 11% and private investment 9%.

### **4.5.3. Driving Actors Analysis**

#### **4.5.3.1. Land Brokers**

According to some information obtained from survey respondents who worked in offices and local communities, brokers, local governments, and citizens or communities in the area work together to persuade farmers to sell their property to them on an informal basis.

According to office workers and household respondents, "land brokers" had a role in the shift in the land use/ land cover in Dessie City. 29% of office workers and 36% of communities thought that land brokers had a substantial role in the increment of the informal settlement and changes to land use/ land cover that took place between 2016 and 2022.

#### **4.5.3.2. Local Farmers**

In Tita, Kurkur, Kelina, Tesfa nechero, Endod ber, Boru selassie, and Boru meda kebeles, farmers were parcelling and selling their agricultural land. These information is obtained from household respondents and office personnel field study. In this process, substantial areas of agricultural land are converted to non-agricultural purposes, primarily to residential development.

About 32% of office workers and 25% of household respondents convinced that local farmers had a substantial role in the increment of informal settlement and land use/ land cover changes that took place between 2016 and 2022.

#### **4.5.3.3. Community (Household respondents) of the city**

Since the conflict broke out in Ethiopia's northern region, many have opted to dwell in Dessie city in quest of a safe place to live, which has resulted in an increase in demand for housing in the city over time. The information gathered from office employees and household respondents indicate, the city dwellers obtain property either from farmers informally or through a formal lease arrangement before legally constructing a home.

10% of office employees and 7% of household respondents convinced that residents of the city had a substantial role in the informal settlement and changes to land use and land cover that took place between 2016 and 2022.

#### **4.5.3.4. Experts**

Many notional customers operate inside the city's unlawful land market in collaboration with experts or workers. Experts at the Dessie City Land Development and Management Office, as well as local kebele administration authorities and kebele level, certify sales agreements.

According to the findings of a study of office workers and communities, "Experts" had a role in the shift in the land use and land cover in Dessie City and about 8% of office workers and 12% of household respondents agreed for the changes that took place between 2016 and 2022.

#### **4.5.3.5. Government officials**

The regulation of project development, appraisal, and approval, as well as the implementation of the developed policies, developed development schemes, and overall choices, were the responsibility of government officials or authorities (Hudson, 2019). During the survey, some informants stated that the interests of the authorities varied not only in accordance with their roles as government institutions but also frequently reflected their individual interests, depending on many personal programmes which ultimately opened the door for powerful informal actors to act by influencing the administration of the government.

According to the office workers and household respondents, "Government officials" had a role in the shift in the land use and land cover in Dessie City by which 21% of office workers and 11% of household respondents agreed on the actors.

#### **4.5.3.6. Private investors**

"Private investors" had a slight role in the shift in the land use and land cover in Dessie City. From the office workers almost 2% gave positive feedback and only 9% of the household respondents.

### **4.6. Discussions and Results**

#### **4.6.1. Land use land cover (LULC) Change and Trend of Expansion**

According to the trend analysis of the study, the city extends from its centre to Haik in the north and to Kombolcha in the south-east.

Due to the serious conflict in Ethiopia's northern region, built-up areas of the city have expanded and the city has altered significantly since 2018. Similar to this, the results of land use and land cover (LULC) change analyses indicated a surge in built-up areas and uncontrolled land cover changes characterised by horizontal physical development, which changed productive agricultural land and reserved forestry regions. According to this study, the built-up area increased from 3,467.8 ha (17%) in 2016 to 7937.5 ha (40%) in 2022, indicating that built-up areas consume a significant

amount of other LULC types. In contrast, agricultural land drastically decreased in all years from 6,428.9 ha (33%) in 2016 to 4462.7 ha (22%) in 2022, mostly that it contributes to built-up areas.



Figure 4.22; Informal settlements and land use changes

Source; Taken by the author, 2023

The other land use/ land cover types which shown a significant change with-in the given intervals of the study years is grazing land and open spaces, that decline from 3,517.6 hectares (18%) in 2016 to 2,296.4 hectares (12%) in 2022. The same is true for areas covered by forest, where the area declines from 6,032.4 hectares (30%) in 2016 to 4865.1 hectares (25%) in 2022. Whereas green space (grazing land) did not significantly change.

#### **4.6.2. Driving Factors and Actors for the land use/ land cover change of Dessie city**

Seven factors that drive land use/ land cover change were included in the survey questionnaire for professionals that include: housing preferences, unrestricted access to land, the topography of the city, the city's plans, an increase in population, an increase in employment opportunities, and instability issues. It was intended to know how office workers perceived these factors between 2016 and 2022.

Office employees identified seven land use/ land cover change driving factors, including instability issues (31%), an increase in work opportunities (10%), an increase in population (15%), its plans (1%), the topography of the city (23%), informal access to land (19%) and housing preferences (1%) between the years 2016 and 2022.

As a result, the survey's results revealed that instability issues account for about 31% of all problems, topographical issues for 21%, informal land access for about 19% of cases, housing preferences for 13% of cases, population growth for 12% of cases, city planning for 4% of cases, and employment opportunities for nearly negligible growth.

Six drivers of land use and cover change were included in the survey questionnaire distributed to respondents (office employees) which include private investors, public officials, experts, members of the local community, local farmers, and land brokers. The purpose of the survey was to determine how respondents (office employees) viewed these drivers between 2016 and 2022.

Accordingly, local farmers, land brokers, government officials, the community of the city, experts, and private investors were the forces behind changes in land use/ land cover and contributed nearly 32%, 29%, 21%, 9%, 7%, and 2% percentages, respectively.

In addition, the survey's results from household respondents showed that land brokers account for about 36% of respondents, local farmers for 25%, the community for 7%, experts for 12%, government employees for 11%, and private investment for 9%.

## CHAPTER FIVE

### 5. CONCLUSION AND RECOMMENDATIONS

#### 5.1. Conclusion

This study concluded that, the built-up area increased from 3,467.8 ha in 2016 to 7937.5 ha in 2022, demonstrating significantly outcompete other land use/ land cover. Contrarily, agricultural land significantly decreased from 6,428.9 ha in 2016 to 4462.7 ha in 2022, demonstrating that it is the land use which largely affected by the expansion of urban areas. Additionally, the land use categorized as grazing land and open space decreased about 1,221.2 hectares, while forestland decreased by ,167.3 hectares between 2016-2022.

The study also identified that, population increment, employment prospects, problems with instability, unrestricted access to property, housing preferences, urban topography, and city plans, derived the land use and cover change between 2016-2022. Based on the findings instability problems make up about 31% of all the driving forces contributed for the land use/ land cover change especially after 2018. It is largely because of the political instability in the Northern part of Ethiopia that caused large migration to the Dessie city from neighbouring cities and towns located adjacent to Dessie city. While topographical problems made the second score, about 21%, in which the majority of Dessie city's topography is not suitable for life. Thus, people would rather choose to settle on the plain agricultural areas mostly through informal land access 19% of cases, whereas housing preferences, population growth, city planning and employment opportunities make up 13%, 12% and 4% respectively.

The most facilitators and mediators for the increment of informal settlements are land brokers, local farmers, experts in land management and other officials. Whereas household respondents and private investors have almost insignificant contributions.

In the long run, Dessie City would not be able to accommodate the increasing population growth if continued at the same rate due to its unsuitable topography to habit. And the city's primary growth direction will be towards its lowest valleys that contain agricultural areas and ground water potentials. This could pose a serious problem in the coming 10 to 20 years as it potential deplete the city's primary water supply, specifically around Boru Meda and Gerado regions. Thus, the city's anticipated future growth should be led by appropriate policy and planning decisions.

## **5.2. Recommendations**

The following planning, policy and management related recommendations are forwarded to curb migration and human settlement including un precedent land use and/ land cover changes.

### **Resource management**

The focus to ecological impacts of LULC and proactive land use management should be a priority for both governmental and non-governmental organisations. Because, it helps to monitor land related resources and environmental dynamics.

### **Improving policy controls and managements**

Unplanned migration of people to urban areas and its effects on natural resources could eventually result in food shortages and environmental degradation. In order to address these issues, the government of Dessie city must formulate a policy that control internal migration of people and improve the management of natural resources for the benefit of local communities. The policy should be set in a way enhancing local community participation in the conservation and management of natural resources.

### **Implementing redevelopment and infill developments**

Redevelopment and infill opportunities must be taken into account when calculating the quantity of land that is needed for developments. This mean that, in the city's development process, the core downtown areas need to be redeveloped, vacant and underutilised spaces should be identified as part of potential development areas. Additionally, in order to identify suitable sites for redevelopment, ownership type, physical condition, and market worth of that land should be taken into account.

### **Encouraging sustainable and balanced urbanization**

Urban areas in Ethiopia particularly the Dessie City is rapidly expanding and change in land use/ land cover increasing. There are also poor implementations of plans that aimed to guide development activities, which is also a case for Dessie city. So that, government representatives, specialists, and communities are expected to plan ahead for sustainable resource use and reduce the negative effects of land use and land cover change in order to bring about the necessary balanced development. Another element that must be included for cities to be able to implement sustainable development projects is the use of participatory procedures to encourage social engagement. The engagement of the entire population and the full recognition of each person's rights are prerequisites for sustainable urbanisation.

### **Employing effective land management and monitoring tools**

Strong and effective land management and monitoring tools are required to keep track of changes in land use and cover and ensure that they are carried out correctly in line with a planned strategy. These process need updated software such as GIS and satellite images that is helpful for technical procedures and to investigate urban development dynamics.

### **Advancing the city's economic importance within its strategic location**

The Dessie city should form partnerships with other industries. On the route from Addis Ababa to Mekele, Dessie City is about 400 km from Addis Ababa. The city is also located about 25 km from Kombolcha city, which is hub of manufacturing and industrial economic activity, its proximity to Kombolcha also greatly aids for economic integration. Due to this, several urban functions, particularly industrial and residential ones, gained economic and population importance.

### **Plan with response to the regional development**

A regional development plan needs to be created with the help of the neighbouring and adjacent cities in order to organise and improve the phases of activities involving various stakeholders for the purpose of utilising and allocating the available resources in order to increase social welfare in a regional environment within a set of time.

### **Amending structure plan policies**

When preparing a structure plan and formulating policies, it is important to include some special features that will be useful in an emergency. These should include disaster recovery plans as well as spaces and plans that could be used to help the community in the event of such uncontrollable issues like forced migration by war.

### **Formalizing participations, accountability and transparency**

The issue of land grabbing or informal holding should be dealt with the Anti-Corruption Commission with the improvement of community participation and other stakeholders in order to reduce issue, which is common in Ethiopia.

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## Annexes

### Annex I: Questionnaires for Government officials, Kebele administrators and Experts

Survey Place \_\_\_\_\_ Survey date \_\_\_\_\_ Survey collected by \_\_\_\_\_

Dear Respondent:

The main aim of this questionnaire is to collect data as input for a research titled “**Assessing the impact of Internal migration and human settlement on the land use land cover change in the case of Dessie city: Southern Wollo Region: Ethiopia**”. The purpose is to qualify the requirement for the Master of Science (MSc.) in Urban Planning at EiABC Addis Ababa University. You are thus kindly required to give true and correct information on the variables that greatly influenced the migration and change in the usage of land in Dessie city.

Thank you!

#### Part I: Background of Respondents

1. **Address (Kebele):** 01  02  03  04  05  06  07  08  09  10
2. **Gender:**  Male (1)  Female (2)
3. **Age:**  18-30 (1)  31-40 (2)  41-50 (3)  51-60 (4)  61-70 (5)  Above 70 (6)
4. **Level of educations:**  Elementary (1-8) (1)  Secondary school (9-10) (2)  
 Preparatory school (11-12) (3)  TVET (4)  Higher educational Diploma (5)  First Degree (6)  Masters (7)
5. **Qualification background:**  Urban Planner (1)  Urban land development and management (2)  Urban land administration (3)  Management (4)  Geographer (5)  Surveyor (6)  Engineer (7)  Economist (8)  Sociologist (9)  Geologist (10)  Other \_\_\_\_\_
6. **Work place:**  Manager  Deputy manager  Kebele administration  Site supervisor  
 Other \_\_\_\_\_

#### Part II: Factors that contributed for the land use land cover change of Dessie city

7. What do you think about the following variables that significantly influenced the change in land use and cover in Dessie city between 2016 and 2023?
  - a. **Housing preference:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  
 Strongly disagree (4)

- b. **Informal access to land:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - c. **Topography of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - d. **Plans of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - e. **Increase in population size:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - f. **Increase in work opportunity:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - g. **Un stability issues:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
8. What do you think about the following important players who made a significant contribution to the quick shift in land use and land cover in Dessie city between 2016 and 2023?
- 

**Part III: Key Actors who contributed for the change of land use land cover of Dessie city**

9. What do you think about the following main players, who between 2016 and 2023 significantly influenced the fast shift in land use and cover in Dessie city?
- a. **Private investor's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - b. **Government official's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - c. **Expert's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - d. **Community of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - e. **Local farmer's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - f. **Land broker's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
10. Do you have any more thoughts on the major players who significantly influenced the quick shift in land use and cover in Dessie city between 2016 and 2023?

## Annex II: Questionnaires for Community

Survey Place \_\_\_\_\_ Survey date \_\_\_\_\_ Survey collected by \_\_\_\_\_

Dear Respondent:

The main aim of this questionnaire is to collect data as input for a research titled “**Assessing the impact of Internal migration and human settlement on the land use land cover change in the case of Dessie city: Southern Wollo Region: Ethiopia**”. The purpose is to qualify the requirement for the Master of Science (MSc.) in Urban Planning at EiABC Addis Ababa University. You are thus kindly required to give true and correct information on the variables that greatly influenced the migration and change in the usage of land in Dessie city.

Thank you!

### Part I: Background of Respondents

1. **Address (Kebele):** 01  02  03  04  05  06  07  08  09  10
2. **Gender:**  Male (1)  Female (2)
3. **Age:**  18-30 (1)  31-40 (2)  41-50 (3)  51-60 (4)  61-70 (5)  Above 70 (6)
4. **Place of birth:**  In Dessie (1)  Out of Dessie (2)
5. **Level of educations:**  Illiterate (1)  Read and write (2)  Elementary (1-8) (3)  Secondary school (9-10) (4)  Preparatory school (11-12) (5)  TVET (6)  Higher educational Diploma (7)  First Degree (8)  Masters (9)
6. **Occupation:**  Private (1)  government employee (2)  NGO employee (3)  Unemployed (4)  Farmer (5)  Other \_\_\_\_\_

### Part II: Factors that contributed for the land use land cover change of Dessie city

7. What do you think about the following variables that significantly influenced the change in land use and cover in Dessie city between 2016 and 2023?
  - a. **Housing preference:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - b. **Informal access to land:**  Strongly agrees (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - c. **Topography of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

- d. **Plans of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- e. **Increase in population size:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- f. **Increase in work opportunity:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- g. **Un stability issues:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

8. What do you think about the following important players who made a significant contribution to the quick shift in land use and land cover in Dessie city between 2016 and 2023?

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**Part III: Key Actors who contributed for the change of land use land cover of Dessie city**

9. What do you think about the following main players, who between 2016 and 2023 significantly influenced the fast shift in land use and cover in Dessie city?
- a. **Private investor's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - b. **Government official's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - c. **Expert's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - d. **Community of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - e. **Local farmer's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - f. **Land broker's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

10. Do you have any more thoughts on the major players who significantly influenced the quick shift in land use and cover in Dessie city between 2016 and 2023?

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**Annex III: Questionnaires for Communities in Amharic language**

**ለከተማው ነዋሪዎች የተዘጋጁ መጠይቆች**

መጠይቁ የተሰበሰበበት ቦታ \_\_\_\_\_ መጠይቁ የተሰበሰበበት ቀን \_\_\_\_\_ የሰበሰበው ሰዓት ስም \_\_\_\_\_

**ለተከበራችሁ ሀሳብ ሰጪዎች በሙሉ፡**

የዚህ ቃለ መጠይቅ ዋና አላማ ለጥናታዊ ጽሁፍ የሚረዳ ሀሳብ ለመሰብሰብ ታስቦ የተዘጋጀ ሲሆን የጥናታዊ ፅሁፉ ርዕስም “Assessing the impact of Internal migration and human settlement on the land use land cover change in the case of Dessie city: Southern Wollo Region: Ethiopia” የሚል ይሆናል። ይህ ጥናታዊ ጽሁፍ ያስፈለገበት ዋና ምክንያት የድህረ ምረቃ ትምህርት ማስተርስ በከተማ ጥላን የት/ክፍል በአዲስ አበባ ዩኒቨርሲቲ ለመስራት ነው። ስለዚህም የምትሰጡት ሀሳብ ለትምህርት የተፈለገ መሆኑን ተረድታችሁ በደሴ ከተማ የመሬት አጠቃቀም ላይ ከፍተኛ ተጽዕኖ ያሳደረባቸውን ተለዋዋጮች እውነተኛ እና ትክክለኛ ምክንያት ናቸው የምትሏቸውን ሀሳቦች በቅንነትና በታማኝነት ተገቢ ምላሽ እንድትሰጡን ስንል በትህትና እንጠይቃለን።

እናመሰግናለን!!

**መመሪያ አንድ፤ የ ምላሽ ሰጪዎች መረጃ**

1. አድራሻ (ቀበሌ):  01  02  03  04  05  06  07  08  09  10
2. ያታ:  ወንድ  ሴት
3. እድሜ:  18-30  31-40  41-50  51-60  61-70  ከ70 ዓመት በላይ
4. የትወልድ ቦታ:  ደሴ ከተማ  ሌላ ቦታ
5. የትምህርት ደረጃ:  ያልተማረ  ማንበብና መጻፍ  የመጀመሪያ ደረጃ(1-8)  ሁለተኛ ደረጃ (9-10)  መሰናዶ (11-12)  ቴክኒክና ሙያ  የከፍተኛ ትምህርት ዲፕሎማ  የከፍተኛ ትምህርት ድግሪ  ድህረ ምረቃ ትምህርት ማስተርስ
6. ስራ:  የግል ስራተኛ  የመንግስት ስራተኛ  የቤት እመቤት  ስራ አጥ  ጡረተኛ ከላይ ከተጠቀሱት የተለየ \_\_\_\_\_

**መመሪያ ሁለት: ለደሴ ከተማ የመሬት አጠቃቀም ለውጥ አስተዋጽኦ ያደረጉ ምክንያቶች/ካርኖች**

7 በደሴ ከተማ ከ2016 እስከ 2023 (2015 ዓፄ ም) ባለው ጊዜ ውስጥ በተደረገው የመሬት አጠቃቀምና ሽፋን ለውጥ ላይ ተፅዕኖ ስላደረጉት የሚከተሉት ተለዋዋጮች ምን ያስባሉ?

- 1 አማራጭ የመኖሪያ ስፍራ፤  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም
- 2 ህገ ወጥ የመሬት ወረራ:  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

3 የከተማዉ መሬት አቀማመጥ፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

4 የከተማዉ ጥላን፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

5 የህዝብ ቁጥር መጨመር፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

6 አዲስ የሥራ ዕድል መፈጠር፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

7 የመረጋጋት ችግሮች፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

8 በደሴ ከተማ ከ2016 እስከ 2023 ባለው ጊዜ ውስጥ ለተመዘገበው የመሬት አጠቃቀም እና የመሬት ሽፋን ለውጥ ከፍተኛ አስተዋፅኦ ስላደረጉት የሚከተሉት ወሳኝ ተጫዋቾች ምን ያስባሉ?

**መመሪያ ሶስት፡ ለደሴ ከተማ የመሬት አጠቃቀም ሽፋን ለውጥ አስተዋጽኦ ያደረጉ ቁልፍ ተዋናዮች**

9 ከ2016 እስከ 2023 በደሴ ከተማ ፈጣን የመሬት አጠቃቀምና ሽፋን ለውጥ ላይ ከፍተኛ ተጽዕኖ ያሳደረባቸው ስለሚከተሉት ዋና ዋና ተጫዋቾች ምን ያስባሉ?

1 ባለ ሀብት፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

2 የመንግስት አካላት፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

3 ባለ ሙያው፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

4 የከተማ ነዋሪ ማህበረሰብ፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

5 አርሶ አደሩ፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

6 የመሬት ደላላ፡  እጅግ በጣም እስማማለሁ  በጣም እስማማለሁ  በጥቂቱ እስማማለሁ  በጥቂቱ እስማማለሁ  ያንያህል አልስማማም  ፈጽሞ አልስማማም

ii. ተጨማሪ ሀሳብ ካሎዎት ከታች ባለዉ ባዶ ቦታ ላይ ያስፍሩ? \_\_\_\_\_

## Annex IV: Kebeles of Dessie city

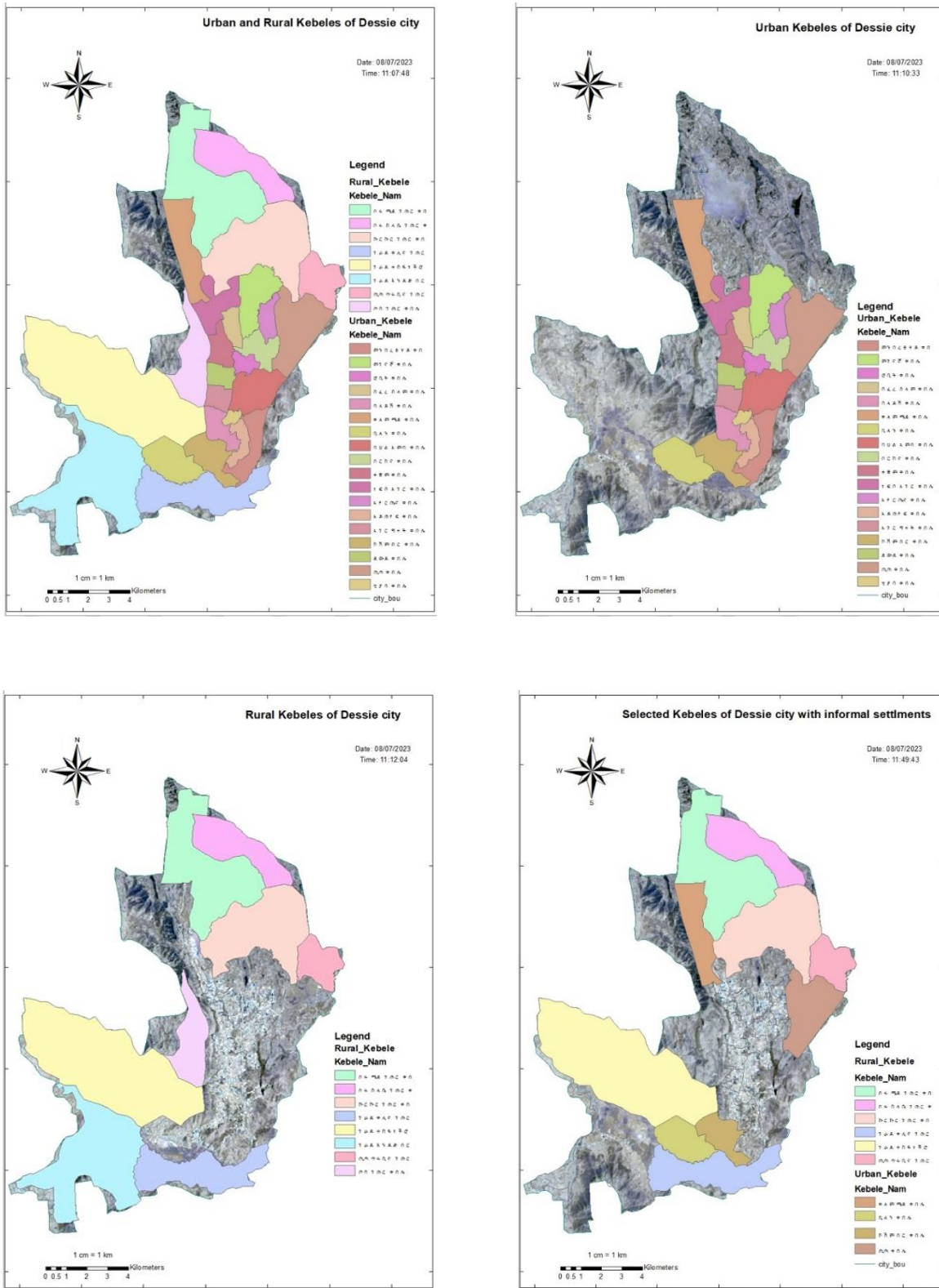
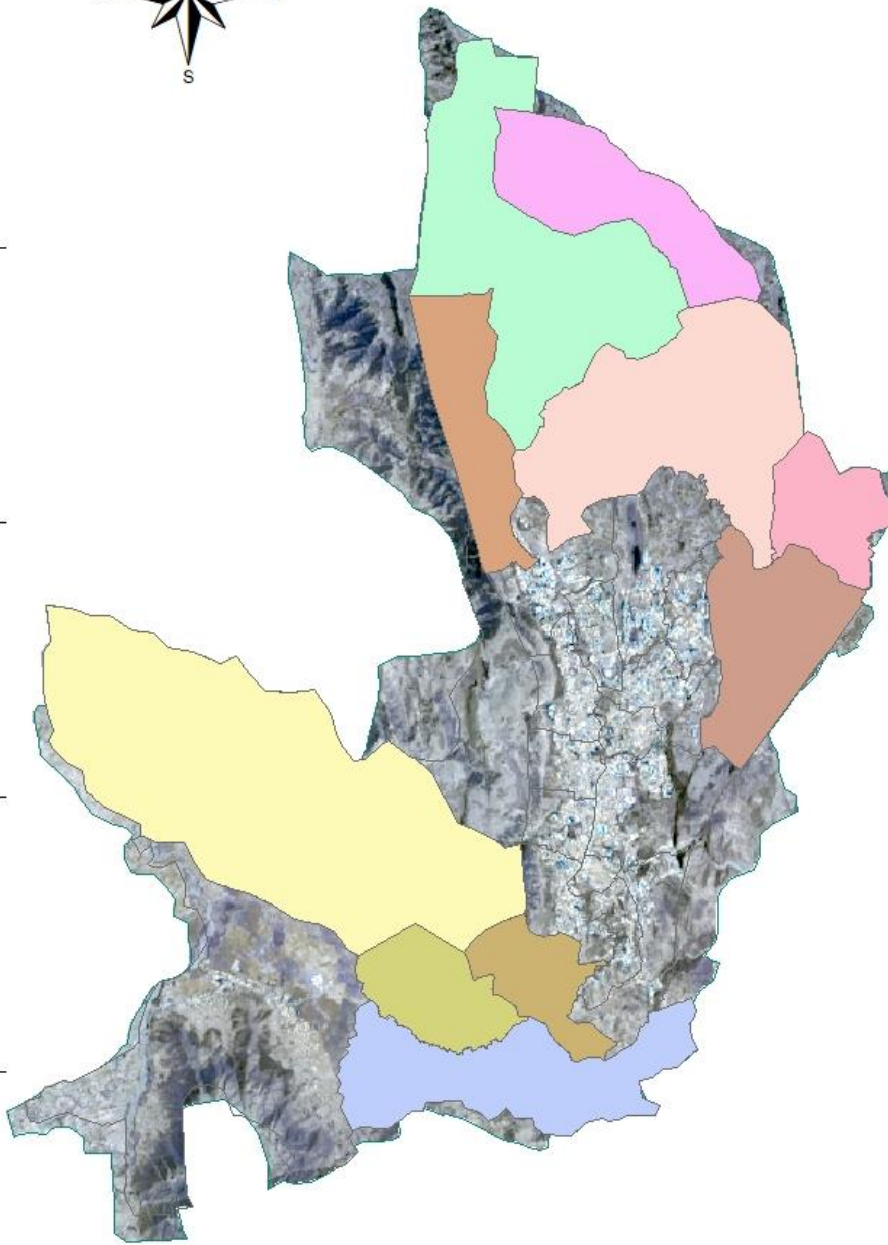


Figure: Selected kebeles of Dessie city, Source: (Organized by the author 2023)

### Selected Kebeles of Dessie city with informal settlements

Date: 08/07/2023  
Time: 11:49:43



#### Legend

##### Rural\_Kebele

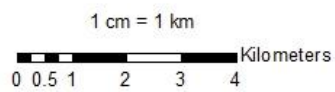
##### Kebele\_Nam

- በፍጥራት ገጠር ቀበሌ
- በፍለጋ ገጠር ቀበሌ
- ኮርኮር ገጠር ቀበሌ
- ገሬዳ ቀለፍ ገጠር
- ገሬዳ ተበፋጎች ቀበሌ
- ሲኮ ስፍራ ገጠር

##### Urban\_Kebele

##### Kebele\_Nam

- ዋላ ቀጥታ ቀበሌ
- ቢላን ቀበሌ
- ኮሻ ቀበሌ
- ሲኮ ቀበሌ
- city\_bou



## Annex V: Sample of responded questioners

### Questionnaires for Government officials, Kebele administrators and Experts

Survey Place Dessie Survey date 3/09/11 Survey collected by Fekem. S.

Dear Respondent:

The main aim of this questionnaire is to collect data as input for the study titled "Assessing the impact of Internal migration and human settlement on the land use land cover change in the case of Dessie city: Southern Wollo Region: Ethiopia". The purpose is to qualify the requirement for awarding the Master of Science (MSc.) in Urban Planning at EiABC Addis Ababa University. You are thus required to give true and correct information on the variables that greatly influenced the migration and change in the usage of land in Dessie town.

Thank you!

#### Part I: Background of Respondents

1. Address (Kebele): 01  02  03  04  05  06  07  08  09  10
2. Gender:  Male (1)  Female (2)
3. Age:  18-30 (1)  31-40 (2)  41-50 (3)  51-60 (4)  61-70 (5)  Above 70 (6)
4. Level of educations:  Elementary (1-8) (1)  Secondary school (9-10) (2)  
 Preparatory school (11-12) (3)  TVET (4)  Higher educational Diploma (5)   
First Degree (6)  Masters (7)
5. Qualification background:  Urban Planner (1)  Urban land development and management (2)  Urban land administration (3)  Management (4)  Geographer (5)  
 Surveyor (6)  Engineer (7)  Economist (8)  Sociologist (9)  Geologist (10)  
 Other Architect
6. Work place:  Manager  Deputy manager  Kebele administration  Site supervisor  Other \_\_\_\_\_

#### Part II: Factors that contributed for the land use land cover change of Dessie Town

7. What do you think about the following variables that significantly influenced the change in land use and cover in Dessie town between 2016 and 2023?
  - a. Housing preference:  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - b. Informal access to land:  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
  - c. Topography of the town:  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

- d. **Plans of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- e. **Increase in population size:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- f. **Increase in work opportunity:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- g. **Un stability issues:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

8. What do you think about the following important players who made a significant contribution to the quick shift in land use and land cover in Dessie town between 2016 and 2023?

*There is a high migration rate especially during & after the war which leads to informal settlements.*

**Part III: Key Actors who contributed for the change of land use land cover of Dessie Town**

9. What do you think about the following main players, who between 2016 and 2023 significantly influenced the fast shift in land use and cover in Dessie Town?

- a. **Private investor's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- b. **Government official's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- c. **Expert's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- d. **Community of the town:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- e. **Local farmer's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)
- f. **Land broker's:**  Strongly agree (1)  Agree (2)  Neutral (3)  Disagree  Strongly disagree (4)

10. Do you have any more thoughts on the major players who significantly influenced the quick shift in land use and cover in Dessie town between 2016 and 2023?

*Land broker's are the major ones followed by the local farmers and the government official and the experts who are participating in the informal settings by using wrong documentations.*

ለከተማው ነዋሪዎች የተዘጋጁ መጠይቆች

መጠይቁ የተሰበሰበበት ቦታ ቦሌ መጠይቁ የተሰበሰበበት ቀን 15/09/15 የሰበሰበው ሰዓት ጆ.ፊ.፳

ለተከበራችሁ ሀሳብ ሰጪዎች በሙሉ:

የዚህ ቃለ መጠይቅ ዋና አላማ ለጥናታዊ ጽሁፍ የሚረዳ ሀሳብ ለመሰብሰብ ታስቦ የተዘጋጀ ሲሆን የጥናታዊ ፅሁፍ ርዕስም "Assessing the impact of Internal migration and human settlement on the land use land cover change in the case of Dessie city: Southern Wollo Region: Ethiopia" የሚል ይሆናል። ይህ ጥናታዊ ጽሁፍ ያስፈልገበት ዋና ምክንያት የድህረ ምረቃ ትምህርት ማስተርስ በከተማ ጥላን የት/ከፍል በአዲስ አበባ ዩኒቨርሲቲ ለመስራት ነው። ስለዚህም የምትሰጡት ሀሳብ ለትምህርት የተፈለገ መሆኑን ተረድታችሁ በይሴ ከተማ የመሬት አጠቃቀም ላይ ከፍተኛ ተጽዕኖ ያላደረገባቸውን ተለዋዋጮች አውነተኛ እና ትክክለኛ ምክንያት ናቸው የምትሟቁን ሀሳቦች በትንንትና በታማኝነት ተገቢ ምላሽ እንድትሰጡን ስንል በትህትና እንጠይቃለን።

አናመሰግናለን!!

መመሪያ አንድ፤ የ ምላሽ ሰጪዎች መረጃ

1. አድራሻ (ቀበሌ):  01  02  03  04  05  06  07  08  09  10
2. የታ:  ወንድ  ሴት
3. አድሜ:  18-30  31-40  41-50  51-60  61-70  ከ70 ዓመት በላይ
4. የትወልድ ቦታ:  ደሴ ከተማ  ሌላ ቦታ - ነገ ወወልደ
5. የትምህርት ደረጃ:  ያልተማረ  ማንበብና መጻፍ  የመጀመሪያ ደረጃ(1-8)  ሁለተኛ ደረጃ (9-10)  መሰናዶ (11-12)  ቴክኒክና ሙያ  የከፍተኛ ትምህርት ዲፕሎማ  የከፍተኛ ትምህርት ድግሪ  ድህረ ምረቃ ትምህርት ማስተርስ
6. ስራ:  የግል ስራተኛ  የመንግስት ስራተኛ  የቤት አመቤት  ስራ አጥ  ጡረተኛ ከላይ ከተጠቀሱት የተለየ \_\_\_\_\_

መመሪያ ሁለት: ለደሴ ከተማ የመሬት አጠቃቀም ለውጥ አስተዋጽኦ ያደረጉ ምክንያቶች/ነገሮች

7 በደሴ ከተማ ከ2016 እስከ 2023 (2015 ዓፄ) ባለው ጊዜ ውስጥ በተደረገው የመሬት አጠቃቀምና ሽፋን ለውጥ ላይ ተፅዕኖ ስላደረጉት የሚከተሉት ተለዋዋጮች ምን ያሰባሉ?

- 1 አማራጭ የመኖሪያ ስፍራ፤  አጅግ በጣም አስማማለሁ  በጣም አስማማለሁ  በጥቂቱ አስማማለሁ  በጥቂቱ አስማማለሁ  ያንያህል አልሰማማም  ፊጽሞ አልሰማማም
- 2 ህገ ወጥ የመሬት ወረራ:  አጅግ በጣም አስማማለሁ  በጣም አስማማለሁ  በጥቂቱ አስማማለሁ  በጥቂቱ አስማማለሁ  ያንያህል አልሰማማም  ፊጽሞ አልሰማማም
- 3 የከተማዉ መሬት አቀማመጥ:  አጅግ በጣም አስማማለሁ  በጣም አስማማለሁ  በጥቂቱ አስማማለሁ  በጥቂቱ አስማማለሁ  ያንያህል አልሰማማም  ፊጽሞ አልሰማማም
- 4 የከተማዉ ጥላን:  አጅግ በጣም አስማማለሁ  በጣም አስማማለሁ  በጥቂቱ አስማማለሁ  በጥቂቱ አስማማለሁ  ያንያህል አልሰማማም  ፊጽሞ አልሰማማም

