Spatio-Temporal Dynamics of Urban Blight; in the Case of Dibayu Sub City Bishoftu City,Ethiopia.

Mesfin Waktole Terefe

A Thesis Submitted to the Department of Architecture

School of Civil Engineering and Architecture

Presented in Partial Fulfilment of the Requirement for the Degree of Master's in Urban Planning and Design

Office of Graduate Studies

Adama Science and Technology University

June, 2024

Adama, Ethiopia

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DECLARATION

I declare here by this research thesis entitled Spatio-Temporal Dynamics of Urban Blight, in the Case of Dibayu Sub city, Bishoftu City." is my own work and has not been submitted to any university for similar purpose. The reference used in this thesis is dully recognized by proper citations.

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RECOMMENDATION OF ADVISORS

I, the major advisor of this thesis, here by certify that I have read the revised version of the thesis entitled "**Spatio-Temporal Dynamics of Urban Blight; in the case of Dibayu Sub City Bishoftu City.**" prepared under my guidance by Mesfin Waktole. Therefore, I recommend the submission of the revised version of the thesis to the department following the applicable procedures.

Yared Girma (PhD)	___________	____________________
Major Advisor/Supervisor	Signature	Date
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I/we, here by certify that the recommendation and suggestion given by the thesies review committee are appropriately incorporated into final thesis/dissertation proposal entitled "Spatio-Temporal Dynamics of Urban Blight; in the case of Dibayu Sub City Bishoftu City." by **Mesfin Waktole Terefe**.

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We, the undersigned, members of the Board of Examiners of the thesis by **Mesfin Waktole Terefe** have read and evaluated the thesis entitled "**Spatio-Temporal Dynamics of Urban Blight; in the case of Dibayu Sub City Bishoftu City**" and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfilment of the requirement of the degree of Master of Science in Urban Planning.

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ACRONYMS

ANOVA	Analysis of variance
CSA	Central statistical authority
CD	Change detection
DEM	Digital Elevation Model
ERDAS	Environmental Resource Data Analysis System
FGD	Focused Group Discussion
GIS	Geographical information system
IBM	International Business Machines Corporation
LULC	Land use/land cover
LULCC	Land use/ land cover change
MLC	Maximum Likelihood Classification
SPSS	Statistical Package for the Social Sciences
SVM	Support Vector Machine
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

ABSTRACT

Urban areas frequently experience deterioration characterized by vacant lots, abandoned buildings, and graffiti, collectively referred to as "Blight." Given its complex nature and wide-ranging implications, addressing blight requires integrated decision-making at both individual and community levels. The impact of blight extends beyond physical deterioration, directly influencing residents' quality of life, values, and behaviours. This research aims to comprehensively assess urban blight and map the spatiotemporal patterns of decay in Bishoftu City, Dibayu Sub City. The study employed a combination of qualitative and quantitative methods to understand the community's and office workers' perspectives on the factors causing urban blight in the city's inner parts. Primary data were gathered through questionnaires, interviews, and observations, and then rigorously analyzed using SPSS, GIS, and remote sensing software. A pivotal component of the evaluation involved image classification utilizing the Maximum Likelihood algorithm and change analysis of Land Use and Land Cover (LULC) dynamics from 2003 to 2023. The study findings indicate that a lack of social cohesion among residents and their inability to repair homes and infrastructure contributed to the residential area's failure to maintain its prior positive reputation. Additionally, inadequate maintenance of drainage and sewage systems, along with improper solid waste management, led to sanitation issues and a decline in the quality of the living environment for locals. Overall, the results reveal extensive LULC changes over the study period, with almost all LULC categories changes except for built-up areas, which increased by 3,419.4 hectares, and bare land, which increased by 1,665.3 hectares. Agricultural land, mixed forest, and vegetation decreased by 11.38%, 7.71%, and 1.42%, respectively. The physical composite blight index score of 0.844 suggests that the town is dealing with a comparatively high level of physical blight. Meanwhile, a socio-economic composite blight index score of 0.322 indicates that the area is experiencing a relatively high level of socio-economic blight, suggesting significant room for improvement. The Composite Blight Index, with an average score of 0.58, indicates a moderate level of blight in the study area. This knowledge can be used to inform policy decisions on urban renewal, rehabilitation, and redevelopment, ultimately creating more sustainable and habitable urban environments. The study suggests an integrated strategy for the city in general and study area in particular, emphasizing policies that support development.

Key words: Urban Blight; Spatio-Temporal; Economic Blight; Physical Blight; Bishoftu City.

CHAPTER 1: INTRODUCTION

1.1. Background of the Study

Urbanization, an inexorable global trend, brings with it a spectrum of challenges and opportunities for cities around the world (Haase et al., 2018). One pervasive challenge is the emergence and proliferation of urban blight, characterized by degraded areas, abandoned structures, and vacant plots (Kuddus et al., 2020). Blighted urban areas not only undermine the aesthetic appeal of cities but also pose substantial socio-economic and environmental challenge (Pinto et al., 2023).

The phenomenon of urban blight is multifaceted, encompassing social, economic, environmental, and institutional dimensions. Scholars such as (Nunes et al., 2013) emphasize the socio-economic implications, arguing that blighted areas often witness social decay and economic decline. The deterioration of physical and environmental conditions is equally crucial, as highlighted by (Buitelaar et al., 2021) who underscores the impact of blight on the quality of life in urban areas.

Numerous research studies have expounded on the multifaceted nature of "urban blight," a concept universally recognized for its detrimental impact on surrounding neighborhoods. Urban blight is indicative of disorder within a community, encompassing the deterioration of infrastructure elements such as roads and buildings (Mireku et al., 2021). This degradation can manifest in both social and physical dimensions. The social dimension involves anti-social behaviors exhibited by residents, as noted by (Alade & Ogunkan, 2021), including public verbal harassment, urination in public spaces, and solicitation for prostitution. The physical dimension is typified by visible signs such as broken windows or doors, abandoned vehicles, disorderly conditions, neglected areas, vacant properties, illegal parking, and various other forms of disarray, as highlighted by (Villach, 2021).

Urban blight, as defined by (Makinde, 2014) is characterized by the social devaluation of real property, surpassing a point at which its current condition or purpose is considered unacceptable by the community. This conceptualization underscores the intrinsic connection between the definition of urban decay and the standards of acceptability set by the community. The minimal acceptable standards within a community are shaped by its social values, demonstrating significant diversity owing to variations in cultural orientation, historical background, and notably, the income levels of the residents. The measurement and comparison of the functional depreciation of properties and neighborhood lots pose challenges when applied to diverse communities marked by distinct cultural values and housing stocks (Fabiyi, 2011).

The origins of urban blight can be traced back to cities in the global north, particularly in the aftermath of the industrial revolution in the 19th–20th centuries. Notably, countries such as the United States of America (USA), the United Kingdom (UK), and Germany witnessed the emergence of this phenomenon. The industrial revolution, marked by a surge in urban populations drawn to employment opportunities in manufacturing industries, had profound effects on these urban centers (Kwethemba et al., 2023).

Consequently, these cities grappled with both physical and functional stagnation, characterized by the obsolescence of residential and commercial real property, evident in high vacancy ratios and a decline in maintenance standards. While numerous studies have scrutinized the causes of urban blight in the global north, attributing it to factors like population loss, deindustrialization, economic decline, and sub-urbanization, there exists a notable scarcity of such investigations in the global south, particularly in Sub-Saharan Africa (Abubakari et al., 2019). This knowledge gap underscores the need for a comprehensive exploration of the specific dynamics and root causes of urban blight in the context of the global south, offering valuable insights for targeted urban planning interventions.

In the context of Ethiopia, a country experiencing rapid urbanization, the dynamics of urban blight reflect the interplay of cultural, economic, and historical factors. Cities in Ethiopia, including Bishoftu, face the dual challenge of accommodating urban growth while mitigating the adverse effects of blight (Benti et al., 2022).

Taking a closer look at Bishoftu town, the complexities of spatiotemporal dynamics in urban blight become more apparent. As a burgeoning urban center in Ethiopia, Bishoftu grapples with distinctive challenges and prospects associated with its ongoing urban development. The local determinants influencing urban blight in Bishoftu are intricately tied to the city's cultural legacy, economic undertakings, and historical progression. A thorough exploration of the spatiotemporal dynamics of urban blight in Bishoftu City is imperative to devise targeted interventions that align with the city's specific needs and inherent characteristics (Koroso, 2022).

Several studies underscore the efficacy of Geospatial technology in assessing and mapping urban blight. Brindley and Rykiel (2009) highlight the use of GIS and remote sensing for urban analysis, emphasizing the potential for spatial analysis in understanding urban phenomena. Furthermore, the work of demonstrates the applicability of Geospatial technology in monitoring land use changes, offering insights into the spatiotemporal dynamics of urban areas.

This research, titled "Spatiotemporal Dynamics of Urban Blight in Bishoftu town," is positioned at the intersection of global urbanization challenges and the local dynamics of an Ethiopian urban center. By investigating the evolving patterns of urban blight over time, this study aims to contribute not only to the scholarly discourse surrounding urban decay but also to provide evidence-based recommendations for urban planning and revitalization efforts in Bishoftu town.

1.2. Statement of the Problem

Bishoftu town, Ethiopia, like many urban centers worldwide, grapples with the pervasive challenge of urban blight. This manifests in pockets of physical and social decay, characterized by abandoned and dilapidated buildings, vacant plots, and crumbling infrastructure. These blighted areas not only detract from the city's aesthetics but also create significant social, economic, and environmental consequences.

Residents within blighted areas face a daily struggle. Their quality of life is directly impacted by the degraded environment, with concerns for safety, health, and well-being. Property values decline, economic opportunities dwindle, and a sense of hopelessness permeates the community. This contributes to a cycle of neglect, further exacerbating the blight and its negative consequences.

The consequences for residents are even direr. They contend with compromised health and safety due to poor sanitation, increased crime rates, and limited access to essential services. Social disorganization and a sense of hopelessness thrive in these neglected spaces, perpetuating a cycle of decline.

Despite its evident detrimental impact, a comprehensive understanding of urban blight's dynamics and its specific footprint in Bishoftu town remains elusive. While some studies have examined urban blight in other Ethiopian cities, they often lack a spatiotemporal lens, failing to capture the evolving nature of the problem and its localized nuances. Despite the global acknowledgment of urban decay as a pervasive issue, there exists a significant gap in the understanding of the unique factors contributing to blight in Bishoftu town and its social, economic and environmental impact.

This research aims to bridge this critical knowledge gap by investigating into the spatiotemporal dynamics of urban blight in Bishoftu town. By employing advanced tools like GIS and remote sensing, the study has mapped the spatial extent and severity of blight over time, identifying hotspots and charting its evolution. Alongside this, the study has conduct in-depth social and economic surveys to understand the lived experiences of residents within blighted areas, capturing their perceptions, concerns, and coping mechanisms.

1.3. Objectives of the study

1.3.1. General objective

The general objective of this study is to comprehensively analyze the spatiotemporal dynamics of urban blight in Bishoftu town, Ethiopia, and understand its impacts on the social, economic, and environmental well-being of residents.

1.3.2. Specific Objectives

The specific objectives of the study are to:

1. Analyze the temporal changes in the extent and severity of urban blight in study area from 2003 to 2023
2. Determine the blight level index of the study area based on the urban blight indicators
3. Assess the social, economic, and environmental impacts of urban blight in the study area.

1.4. Research Question

On the basis of the stated specific objectives, the following research questions are developed in the study.

1. How have the extent and severity of urban blight in the study area changed over the temporal period from 2003 to 2023?
2. What is the blight level index of the study area?
3. What are the social, economic, and environmental impacts of urban blight in the study area?

1.5. Significance of the study

The significance of this research was its contribution to both academic understanding and practical implications related to the spatiotemporal dynamics of urban blight in Bishoftu town, Ethiopia. Academically, the study also addresses a crucial gap in existing literature by offering a comprehensive analysis of the temporal changes in the extent and severity of urban blight over a two-decade period, from 2003 to 2023. This temporal analysis will provide valuable insights into the evolving patterns and trends of urban blight, enhancing our understanding of the dynamics influencing the urban landscape over time.

Furthermore, the examination of the spatial distribution of urban blight within the study area will be significant for academic purposes as it will add a nuanced layer to the understanding of blight patterns. By mapping and analyzing the distribution of blighted areas across different districts, the research will contribute to the spatial sociology literature and urban studies, offering a detailed perspective on how urban blight manifests in specific geographical contexts.

The determination of the blight level index, based on a comprehensive set of urban blight indicators, will not only advance academic research methodologies but will also provide a practical tool for policymakers, urban planners, and researchers. This index can serve as a quantitative measure to assess the severity and characteristics of urban blight, aiding in the formulation of targeted interventions and policy recommendations for sustainable urban development.

The practical significance of this research will be evident in its assessment of the social, economic, and environmental impacts of urban blight on the residents of Bishoftu town. By understanding the multifaceted consequences of blight, the study will contribute valuable information for policymakers and urban planners to formulate effective strategies aimed at mitigating the negative effects on residents' well-being. This holistic approach will align with the broader goals of sustainable urban development, emphasizing the importance of addressing blight not only as a physical concern but also as a social and economic challenge.

In summary, this research will be academically significant for its contributions to the understanding of urban blight dynamics, and it will hold practical relevance by providing insights and tools that can inform policymaking and urban planning initiatives for the improvement of residents' quality of life in Bishoftu town, Ethiopia.

1.6. Scope of the study

The study titled "Spatio-temporal Dynamics of Urban Blight in Bishoftu Town, Ethiopia" is spatially confined to Bishoftu town. The scope of this research has been delimited to a specific area within Bishoftu town, Dhibayu sub city. The administrative boundary of Bishoftu town as of 2023 will serve as the spatial restriction for the study, ensuring a focused examination of urban blight dynamics within this defined area.

The thematic scope of this research encompasses a comprehensive analysis of the spatiotemporal dynamics of urban blight in Bishoftu town, Dhibayu sub city Ethiopia. The study aims to understand the multifaceted impacts of urban blight on the social, economic, and environmental well-being of residents. The thematic focus includes temporal changes in the extent and severity of urban blight, spatial distribution patterns, determination of a blight level index, identification of contributing factors, and an assessment of the broader implications on the study area's socio-economic and environmental fabric.

1.7. Limitation of the Study

All research studies face limitations throughout their lifecycle. This study also had some limitations during its conduct. The first limitation was a lack of secondary data sources, specifically the inefficient provision of information by the urban municipality. In addition, the researcher faced some other challenges related to respondent behavior during interviews and questionnaire completion. These challenges included respondents failing to answer questions fully and correctly.

1.8. Operational definitions

Urban blight: Urban blight is marked by deteriorating and abandoned homes and buildings, as well as vacant lots with trash, high weeds and grass and/or abandoned and vandalized cars.

Urban decay: is the sociological process by which a previously functioning city, or part of a city, falls into disrepair and decrepitude.

Blighted property: A blighted property is a physical space or structure that is no longer in acceptable or beneficial condition to its community. A property that is blighted has lost its value as a social good or economic commodity or its functional status as a livable space.

Blight Level Index: A quantitative measure indicating the overall severity and characteristics of urban blight, derived from a comprehensive set of urban blight indicators.

Urban Blight Indicators: Specific criteria, including socio-cultural factors, economic drivers, and property use practices, used to assess and categorize blighted areas.

Social Impacts: The effects of urban blight on the well-being, lifestyles, and community dynamics of residents.

Economic Impacts: The consequences of urban blight on property values, investment patterns, and economic activities within the study area.

Environmental Impacts: The effects of urban blight on the natural environment, including changes in green spaces, air quality, and overall ecological health.

1.9. Thesis Organization

The purpose of this study is to assess the Spatiotemporal Dynamics of Urban Blight in Bishoftu City. It is organized into five chapters. Chapter one provides the introductory part of the research covering the background of the study, statement of the problem, objectives of the study that embraces the general and specific objectives followed by research questions, Scope and limitations of the study, and the significance of the study Chapter two reviews the related literature on Urban Blight in Ethiopia and international experiences (theoretical and empirical). The third chapter start with description of the study next part presents research methodology, research approach, research design, population & Sampling technique, data source and types, data collection tools, procedures, sample size and data analysis. Chapter four provides data presentation, analysis and interpretations. The final chapter end with Chapter five contains summary of findings, conclusion and end with recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1. Theoretical Review of Related Literature

The term "Urban Blight" has been defined by many authors in different ways. This may be attributed to their focus on its characteristics and effects, rather than establishing a standard definition for the term (Hu et al., 2020). In their Atlantic Monthly article, "Broken Windows" used the term "urban decay". This term is synonymous to "urban blight".

Generally, researchers differentiate between social and physical urban blight. Social urban blight is mostly used as a broad term to denote behaviors which are considered anti-social and may be perpetrated by unpredictable or unstable people in society. These may include open solicitation for prostitution, urination or sleeping in public places, open verbal harassment, school truancy and nuisance neighbors (Mireku, 2020). On the other hand, physical urban blight, which is the focus of this research, is used to denote deterioration or disorderliness of urban areas.

A more recent definition of urban blight b (Weldearegay et al., 2021) depicts this form of urban blight; "abandoned or poorly maintained real properties, often characterized by overgrowth, litter, abandoned vehicles, junk, and dumping". Other examples of physical urban blight include abandoned or burned cars, graffiti, broken windows, and broken streetlights, etc. Although social urban blight occurs more habitually than physical urban blight, the damage of the former is not as glaring as that of the latter (Alade et al., 2021).

2.1.1. Social Decay

The declining housing stock may make housing more affordable for low-income minorities, studies across the fields of political science, sociology, and economics show that the negative social outcomes outweigh affordable housing prices. In the words of (Massey et al 2003), "residential segregation, by relegating disadvantaged minorities to areas with fewer opportunities and amenities, exacerbates the existing social distance between them and the high income."

Some study shows how places that are blighted have low levels of employment opportunities (Rahimi, 2016). Youth violence, too, persists at high rates in blighted neighborhoods South. This critical yet small body of research also includes analyses of social network strength in neighborhoods described as blighted. Educational gap between the poor and the rich is another social problem. This is also referred to as the academic disparity between students from low-income and well-off families. The achievement gap shows up in grades, standardized-test scores, course selection, dropout rates, and college-completion rates.

Another social effect of neighborhood decay is changing family structure. Many studies find that blighted areas have a higher incidence of single parent households. This may be due to both a higher rate of teenage pregnancy and incarceration rates (Shi et al., 2022). The literature finds that single parent households tend to have very negative effects on children, exponentially so for children in low-income areas. Many studies show that children of single parent families tend to perform worse in school and have more behavioral problems. These problems are attributed to the fact that single parents, under economic pressures, have less time to devote to their children (Sun et al., n.d.).

2.1.2. Economic Decline/Degeneration

It is important to note that abandonment and vacancy are not homogenous (Mutuli, 2016). The variables associated with economic decline include unemployment, property values and investment levels. When it comes to unemployment, many studies show that as a community declines and affluent consumers leave, so do retailers and industry. Thus, the demand for labour shifts away from declining neighborhoods in favors of high-growth higher income areas. Adding to the problem, discrimination in the housing market and housing prices make it difficult for minority workers to move to these high-growth areas.

In regard to housing market, increase in the minority population negatively affect property values. Values do respond negatively to increase in poor population. (Mutuli, 2016) Housing loses at least 16% of its value when located in neighbourhoods that are more than 10% poor. The price of decline necessary to bring a dwelling unit within reach of an income group lower than that of the original group results in a policy of under-maintenance. Rapid deterioration of the housing stock is the cost to the community of rapid depreciation in the price of existing housing.

Although lower housing values may make housing more affordable to lower income residents, the decline in housing values also decreases the tax base and creates many economic and social problems.

2.1.3. Physical Decay and Environmental Degradation

The increasing pace of urbanization and growing scale of urban industrial activity is exacerbating environmental degradation in developing country cities, and increasing the vulnerability of urban dwellers to both natural and technological disasters (Mutuli, 2016). In addition to intensifying the problems of the urban poor, such disasters result in a loss of productivity resulting from collapsed infrastructure and damage to industry. This has a secondary effect on the national economy, as investment often declines due to concerns about such losses. The resultant decline in growth and increase in poverty leads to a further strain on resources, thereby raising the vulnerability to future environmental disasters.

2.2. Causes of Urban Blight

(Mireku et al., 2021) argue that the emphasis and concepts of urban blight are developed from diverse contexts. Also, emphasis that such differences may be due to the diverse historical, social, and cultural values of a country. Therefore, urban blight should be grounded in contextual urban geography peculiar to that city (Mireku, 2020). In sum, causes of urban blight mentioned in literature are mainly deindustrialization, economic decline, and population loss in the urban areas as a result of suburbanization. The driving forces of urban blight indicated in most of central cites in Ethiopia are social factors, yet no in-depth studies in that regards.

2.3. Effect of urban Blight

This section considers the positive and negative effect of urban blight to help understand the impact of urban blight on the land use and development of an area.

2.3.1. Positive effect

Blighted properties in the form of indigenous settlements ensure cultural continuity or preservation of heritage. The preservation of culture provides the rootedness, ancestral, and cultural connection between the living and the dead. According to (Abubakari et al., 2019) in their study on inheritance of land properties discovered that possession of land exceeds the physical property but a rather spiritual and cultural identity for the landholders.

(Mireku et al., 2021b) community bonds and social networks are established within blighted areas. Urban scholars assert that people usually get attached to places where they were born and grew up. According to (Mireku, 2020) the elderly who have lived in the neighborhood for a long time, tend to have stronger social networks and interpersonal interactions with other households while the younger ones have community bonds due to friendship and mutual dependency on others in the neighborhood.

2.3.2. Negative effect

The negative effect of urban blight is the high incidence of crime (Mireku, 2020). As emphasized by most researchers, blighted properties are characterized by unlawful acts such as vandalism, graffiti, drug and alcohol dealings and other antisocial behaviors (Uka et al., 2012). Urban Blight could lead to conflicts and insecurity. (Kleinhans et al., 2007) sited in (Mireku, 2020) argue that a deteriorated neighborhood can pose a threat to the social interactions between resident especially when there is no trust or there disagreeing claims on the same space. This can lead to conflicts among residents resulting in the absence of peace and safety.

In addition, one negative effect of urban blight is stigmatization. Affluent residents do not want to associate with people in deteriorated neighborhoods because they are regarded as poor or they lose their prestige. Sometimes they lack the respect and interest of people especially by the local government when an entire neighborhood was constructed through a large scale and all the necessary services and provisions have been made but are not being maintained properly.

2.4. Empirical review of related literature

The study conducted by (Sun et al., n.d.) examine the impacts of blight on neighborhoods in Memphis, TN and present cost-effective blight abatement solutions. Using the blight survey and a logit model, they construct a blight index for each neighborhood. Neighborhood blight indices ranging between 1 and 5 facilitates to the understanding of blight problem costs by measuring the impact of neighborhood blight on property sales prices indicating that prices are significantly negatively related to both the neighborhood index and individual property blight score. Further, by applying factor analysis and Shapley-Owen Value decomposition methodologies, they further define the blight drivers and economic factors associated neighborhood blight further clarifying approaches for addressing neighborhood blight and providing alternative resolution for blight problems.

Breger sited in (C.-P. Hu et al., 2020) is one of the first to identify and analyze causes of blight. He defines blight as the critical stage in the functional or social depreciation of real property beyond which its existing condition or use is unacceptable to the community. He divided vacant land into three categories: structurally unemployed land for which the cost needed to make it productive is greater than the present value of the yield from any productive use; frictionally unemployed land which arises in the absence of perfect and costless information about present and future prices, quantities and qualities; and land held in reserve for the future use.

More recent studies addressing blight also endeavor to define the significant elements driving blight. Hu et al., 2020) investigate blight determinants of vacant urban land in Santiago Chile, concluding that variables impacting the probability of land being vacant are: the distance to nearest underground subway station, the surface area that could be recovered, whether the site is in a conservation area or surrounded by listed houses, the block's population density, the quality of edification, the neighborhood criminality level, and the site's area (width and length).

(Vougat et al., 2019) investigated the result of standardized, reproducible interventions aimed at restoring blighted vacant land on crime, violence and people's perception of fear and safety. To achieve this, they employed a mixed-methods approach including quantitative and ethnographic analyses. The results obtained after analyzing data showed that for those who resided near restored vacant lots, there were significant reductions in the perceptions of crime, vandalism and safety concerns when moving outside of their homes.

In addition, their use of public spaces for socializing and relaxation, increased significantly.

2.5. Methods and criteria to identify urban blight

This component of the literature review assesses the requirement and methods for identifying blighted properties. They include regulatory standards, forms of urban blight, and the methods which comprise spatial and non-spatial approaches. The characteristics of urban blight are determined by government through land use planning regulations and policies. Land use planning is system of controlling and regulating the use activities on land for the present while still considering future land development.

According to (Yiran et al., 2020) they set specific criteria for determining blighted properties by the district assemblies irrespective of the land tenure system, either customer or saturator. Therefore, these criteria set the basis and measures in identifying blighted properties like for the study. They include:

- Irregularity of plots or parcels
- Inadequate of streets in the vicinity
- Lack access to plots or habitable dwelling within the area
- Diversity of existing use which makes
- Incompatibility with
  - ✓ The existing or proposed uses
  - ✓ The spatial development framework and
  - ✓ The structure or local plan
- Adverse impact on the environment
- Overcrowding leading to unhealthy population density
- Lak of situation, drainage or appropriate service
- High incidence of crime which has been confirmed to the type of development and
- Safety or restriction to the other authorized users.

The Methods for identifying blighted properties are grouped in to two; spatial and non-spatial. The spatial methods are usually associated with the quantification of the blighted properties (Weaver, 2013). For developed economies, the firmly established land information infrastructure provides a database of every place inclusive of property owners, property values, vacancy ratio and household income (Uka et al., 2012).

Weaver & Bagchisen (2013) in their study they use the non-compliance of housing codes as the basis in correlation with socioeconomic status data. Property addresses were generated which were then code into Esri ArcGIS. Subsequently, a spatial clustering analysis was performed to determine the hotspots of blighted areas that would inform policy intervention such as the compliance of housing and building codes and urban renewal.

Particularly for the detection of deteriorated areas in the global south, urban scholars apply a Remote sensing technique using very high-resolution image (Uka et al., 2012).

2.5.1. Urban Renewal Approaches

Urban Renewal is a very powerful force for urban change. The complexity of the process may not be satisfactorily embodied in a simple definition. Nevertheless, it is defined as being the redevelopment or rehabilitation of the older parts of urban centres predominantly incorporating the improvement of housing and environmental conditions, and for the poor, their social services and infrastructure needs including economic regeneration and employment provision through state and local authority intervention, increasingly, with the participation of residents.

However, (Wei Sun, 2017) gives a different definition of urban renewal by stating it as the physical change, or change in the use or intensity of use of land and buildings, that is the inevitable outcome of the action of economic and social forces upon urban areas. This renewal entails reorganization and restructuring of the physical fabric of an urban centre.

2.5.2. Land Use and Land Cover Change Detection

The Earth's surface is experiencing rapid LULC changes as a result of numerous socio-economic activities and natural phenomena (Kanth & Hassan, 2010). Nowadays the rapid growth and expansion of urban areas, rapid population growth, land scarcity, increasing production demands and growing technology are some of the drivers of LULC change (Nunes et al., 2013). Changes in Land Use Land Cover (LULC) can also affect biological diversity, alter ecosystem services, lead to soil erosion, disrupt socio-cultural practices and increase natural disasters, like flooding. LULC change needs global attention for continuous monitoring of the changes. Up-to-date datasets on land use land cover change provide critical inputs to evaluate complex causes and responses in order to project future trends. They are also prerequisites for making development plans. However, according to (Dessu et al., 2020) the magnitude of LULC change differs with the time period being examined, geographical location, slope gradient and elevation range.

2.5.3. Geospatial Technologies role in Urban Decay

Geospatial technologies consist of methods that are used to store, acquire, analyse, model and visualize spatial data. They include Geographic Information Systems (GIS), Remote sensing (RS) is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft). photogrammetry, remote sensing, Global Navigation Satellite Systems (GNSS), traditional survey methods and laser scanning, etc. These advanced methods are applicable in a wide range of location-based services. However, they pose certain limitations. For example, satellites are unable to capture vertical surfaces in an efficient manner due to their perspective.

2.6. Conceptual framework

This framework is based on the analysis of urban blight in Bishoftu city. The causes of urban decay in Bishoftu city are identified to be both external and internal. The external causes of urban decay include inadequate capacity of service provider, land tenure and ownership, poor capacity to implementation of renewal plans, poor application of policies and guidelines and high rate of poverty while the internal causes are poor management and maintenance, poor community cohesion and sense of ownership, poverty and unemployment, old age of the estate, vandalism and abandonment by residents. These causes have led to the urban Blight in Bishoftu city.

The study also seeks to understand how through urban renewal, it can address the urban decay. This can be achieved by planning and addressing the issues of study area with respect to its decayed environment. The aim of the study is to investigate urban blight problems in bishoftu in selected district and to propose plausible approaches and policy options towards its renewal for it to meet both current and future demands.

From the empirical literature reviewed, certain principles and concepts for urban renewal of sustainable neighborhoods emerged. The principles included connectivity, mixed land use and diversity quality architecture and urban design, increased density, sustainability as well as quality of life. The concepts on the other hand included: well designed and built forms, environmental sensitivity, well connected and economic thrive. Moreover, important lessons were deduced from the case studies reviewed. These included: incorporation of a participatory planning approach in any development process, erection of high-rise high-density developments to replace low density developments, incorporation of a mixed land use structure in current developments as well as incorporation of the above principles, concepts and lessons from the reviewed studies in the renewal of study area can help in ensuring its sustainability. Thus, guided by the principles and lessons from the literature reviewed above and the case studies, the conceptual framework is presented by figure 2.1. Below.

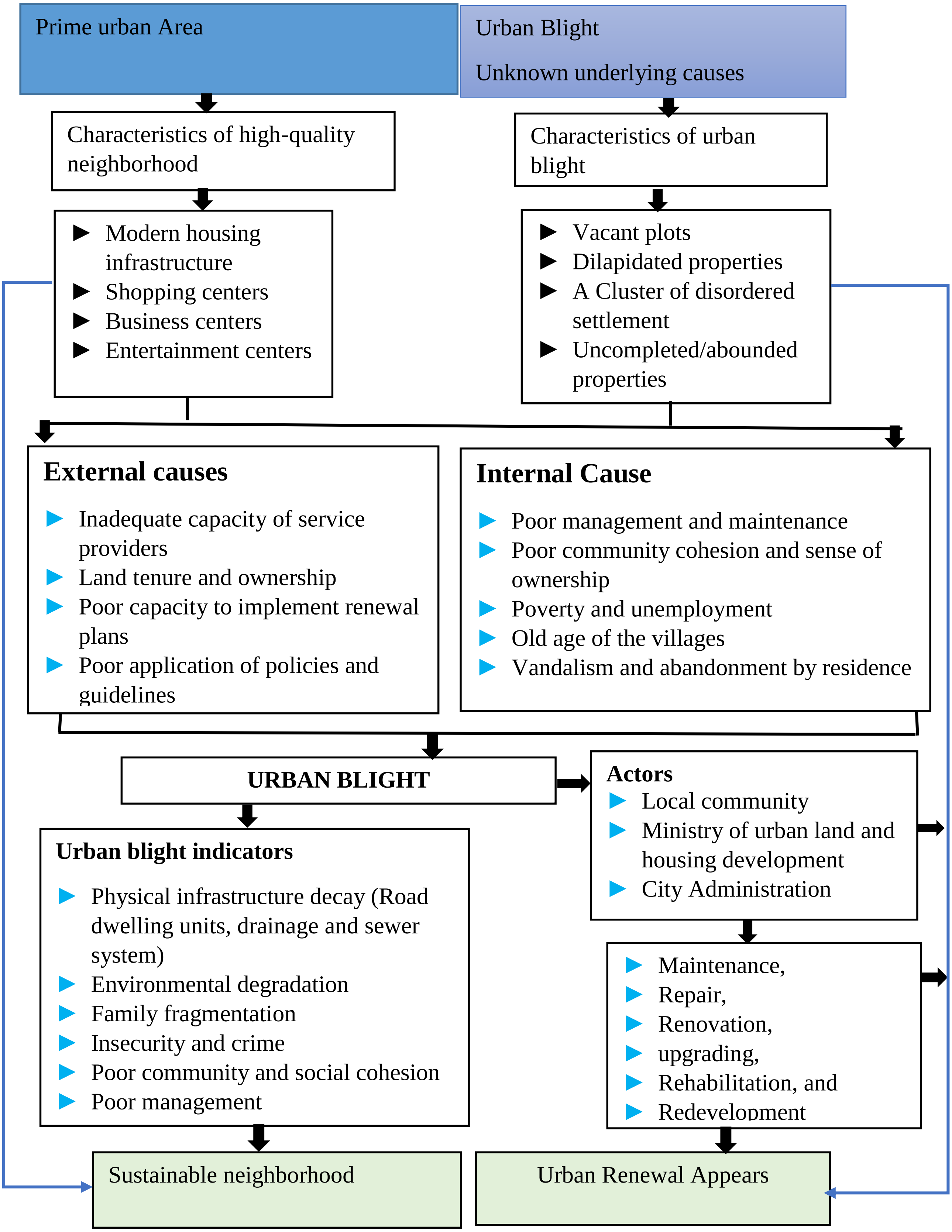

Figure 2.1: conceptual framework

Sources: Adopted from (Mutuli, 2016) and modified by the author, 2023)

2.7. Research and knowledge Gaps in Related literature

However, the above reviewed studies provided a good insight into the Analysis of Urban Blight. They are not sufficient, and various significant issues emerge in response to existing and future Urban Blight problems. Among existing scholars' approach/methods they applied in study, their contribution and finally research limitations are stated as follows; (C. Hu et al., 2021) conduct methods of Quantitative approach using Lagrange equations, mathematical conditions, and Cobb-Douglas production functions. Defined the relationship between urban sprawl and blight and corrective policies to combat urban sprawl, such as "congestion price, open-space amenity tax and impact fees", which can have a positive impact on the prevention of blight. This study only considered one aspect of a complex phenomenon (i.e., market failures affecting urban real estate markets), ignoring poverty and neighborhood externalities that are also significant causes of urban blight.

Leland and Read (2013) apply the Quantitative approach using ordinal logistic regression models. Their contributions provided a fuller understanding of how urban planners' demographic characteristics (i.e., age, gender, race, political ideology, and education) tend to influence their willingness to support specific development projects, most notably those that prevent and eliminate blight, as well as encouraging diversity in this profession to take varied interests into account. The study limited with the range of people involved was limited specifically regarding the number and type of professionals. The study also did not consider the individuals' level of authority in the workplace.

Sun et al. (2019) researcher conduct Quantitative approach using an ordered logit model, ordinary least squares, hedonic model, factor analysis, and Shapley-Owen value. The Author Created a blight index for specific neighborhoods based on data from a previous study that assessed the individual blight score of each property in the city of Memphis in the US, using a scale of 1 (i.e., neighborhood without or with little evidence of blight) to 5 (i.e., neighborhood significantly affected by blight) in order to facilitate the prevention of and fight against blight. The calculation of blight levels was limited because the index is an average of the individual scores for each property, which may not correctly reflect reality. Finally, the initial data were restricted, and the dataset needs to be updated constantly so that the neighborhood index is as accurate as possible.

Generally, all prior studies have limitations. However, these investigations serve as catalysts for future research, and expand existing knowledge. The limitations listed above has also knowledge gap. First, there is a lack of clarity and rationality in the definition of preventive measures to combat blight (Hosseini et al., 2017). A second area limitation is the absence of analyses of the causal relationships between the variables (GALADIMA, 2021). The final and third area limitation is the formation of specific indices. Urban blight is a complex problem with multiple interrelated variables and players.

Therefore, urban blight analyses must consider multiple interrelationships and perspectives rather than merely correlating variables or using only one specific type of approach (i.e., qualitative or quantitative). However, the Analysis of Urban Blight with spatial data has not been carefully studied. Therefore, this study aims at filling this critical knowledge gap through assessing the urban blight condition and map Spatio-temporal pattern of urban decay for selected District in Dhibayu Subcity using Geospatial technology.

CHAPTER 3: MATERIALS AND METHODS

3.1. Description of study area

Bishoftu town is located between 8° 45' and 8° 47' north latitude and 38° 56' and 39° 00' east longitude, covering approximately 226.17 km² in the Oromia Region within the East Shewa Zone and Ada’a Wereda. Positioned 47 kilometers southeast of Addis Ababa and 52 kilometers from Adama, the town is surrounded by various kebeles Erer Selassie to the north, Ude and Giche Garababo to the south, Hidi and Dembalo to the east, Dire town peasant association to the west, and Dukam Subcity Administration to the northwest.

Bishoftu comprises 13 kebeles and has an estimated total population of 200,000, with 95,600 men and 104,400 women. The city's topography is marked by natural and manmade features, including Mount Yerer and eight lakes; Lake Kuriftu, Babogaya, Bishoftu, Hora-arsedi, Green, Kilole, Chalalaqa, and Balabala.

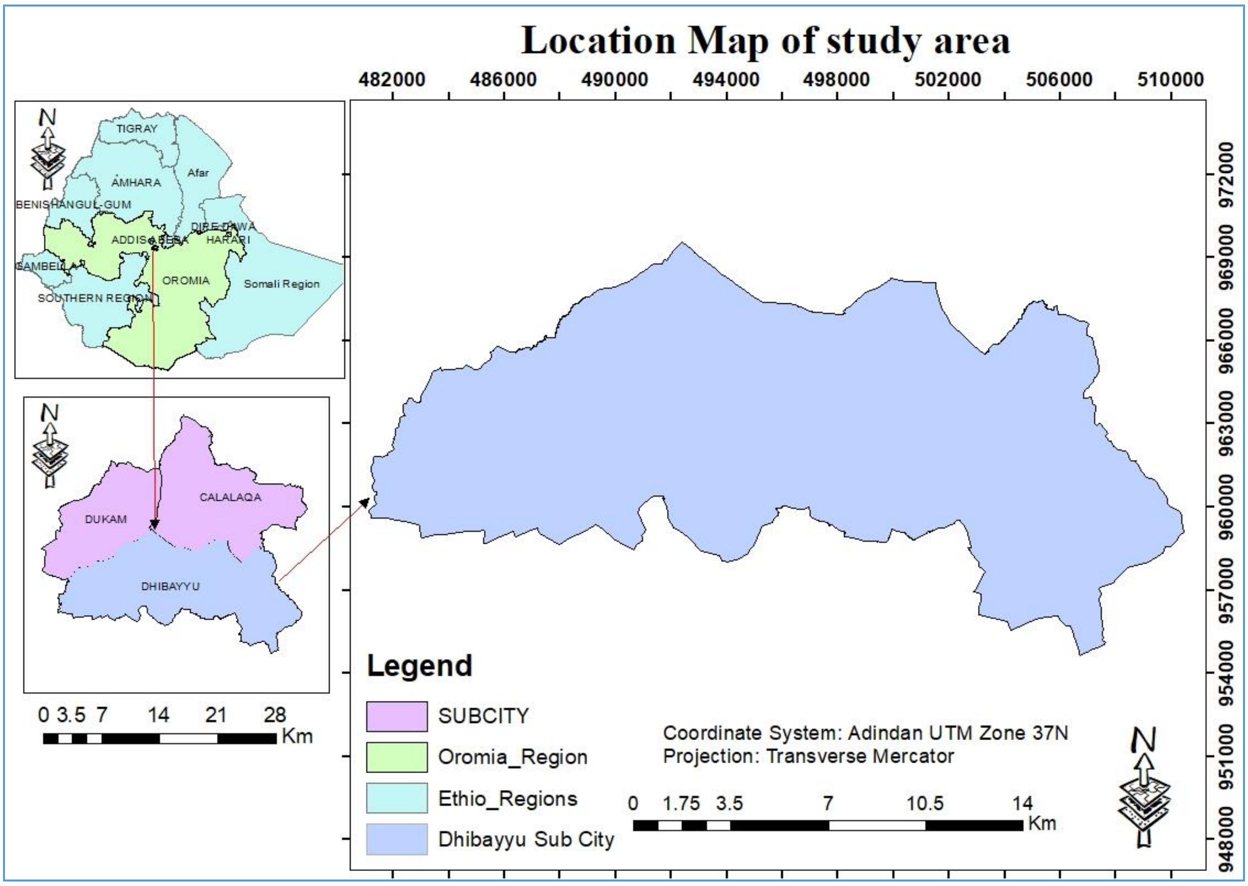

Figure 3.1: Location map of Dibayu Sub City, Bishoftu, Ethiopia.

(Sources Ethio GIS, Bishoftu city Administration, 2024)

The natural topography of Bishoftu city with buffer zones is characterized in the north and east by flat land, broken by swampy areas, express roads, railways, and lakes. See figure 3.2. High altitude and low.

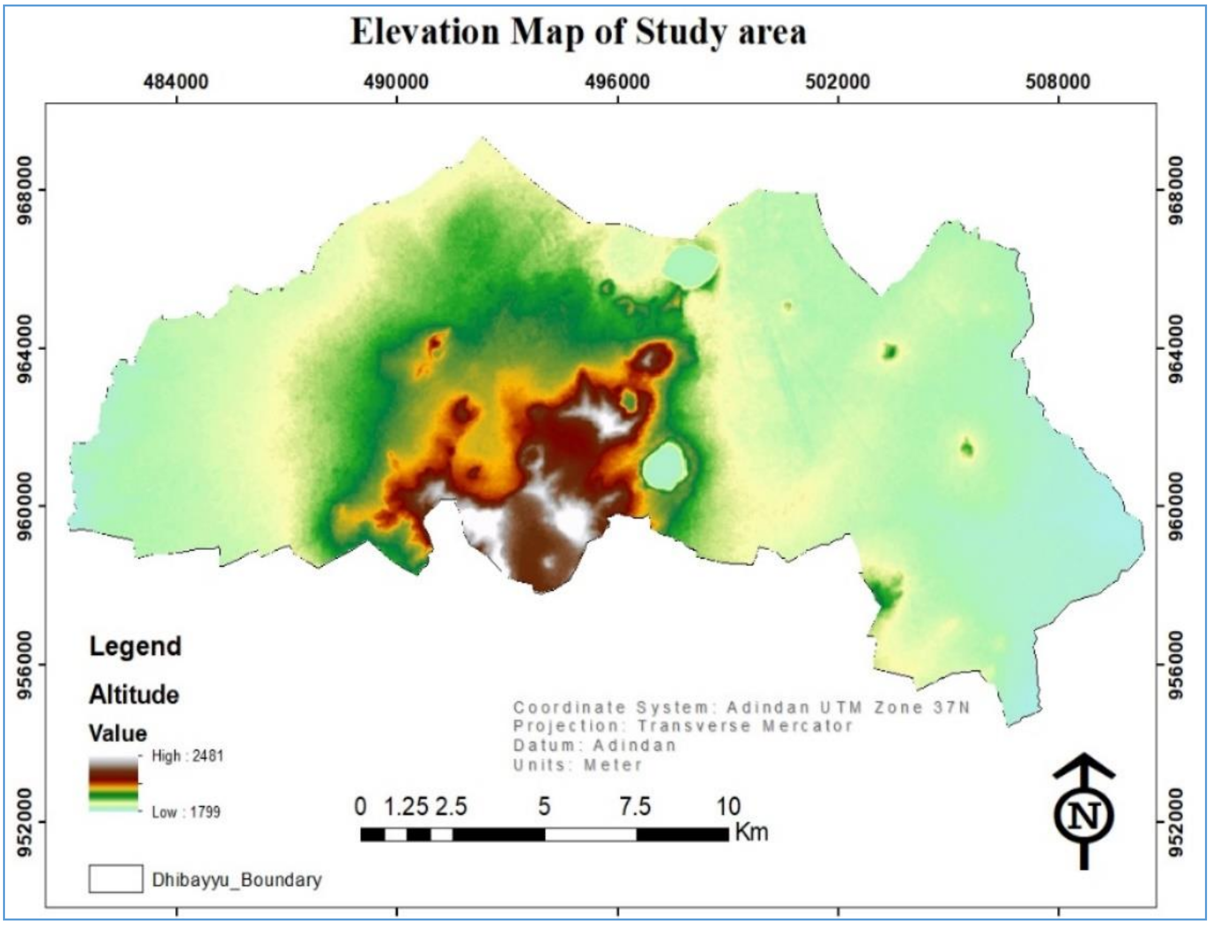

Figure 3.2: High and low altitude of study area (Dibayu Sub city)

The south features undulating land dominated by hills. Overall, the topography of the city is undulating, characterized by hills and part of the Rift Valley see fig 3.3 show range of elevation classified into five class range from 1799 to 2481m.

The general elevation of the town ranges from 1799m to 2481m. The altitude is generally higher in the southwestern part, gradually declining eastwards for a short distance, then increasing again in the same direction.

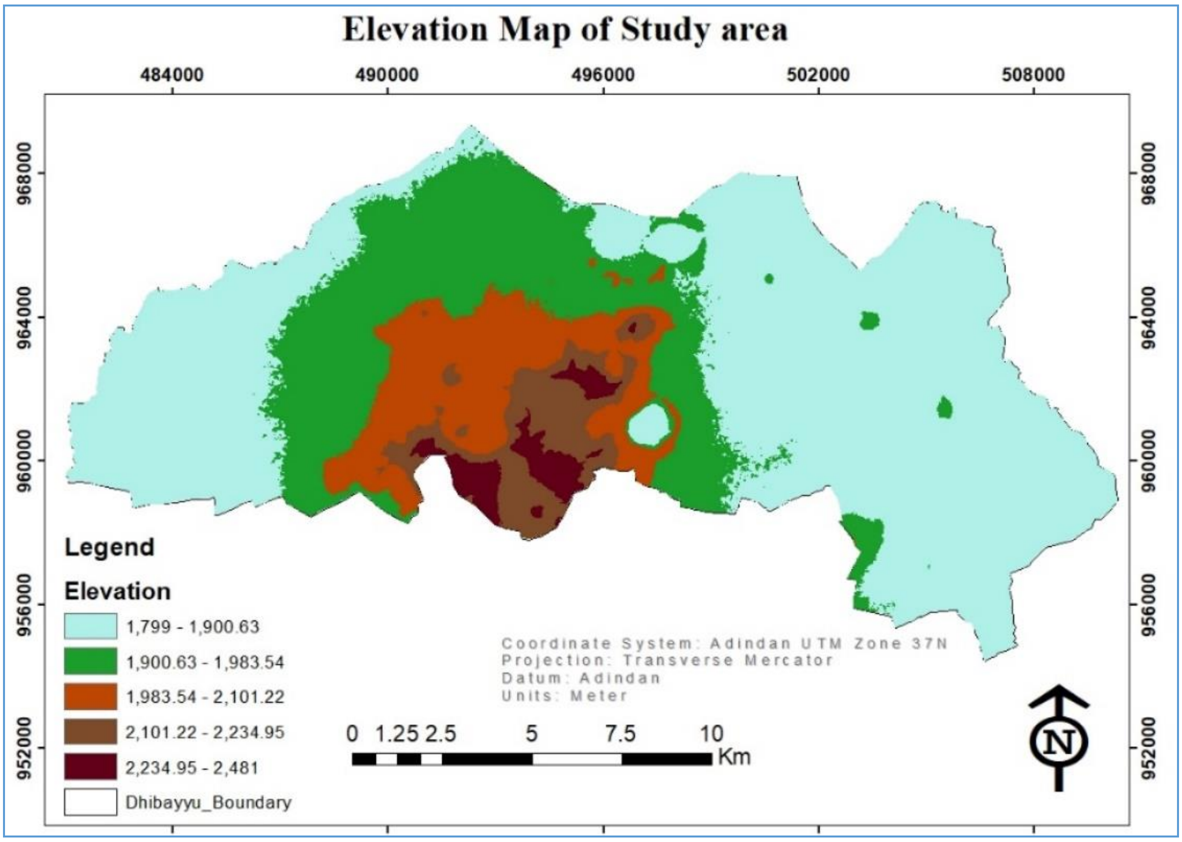

Figure 3.3: Classified Elevation map of Study area

In the whole city of Bishoftu Altitude declines gradually from north to south for a short distance, then increases again from north to south. The greatest proportion of the altitude ranges between 1799-2481 meters, covering the western, northern, and southwestern parts of the town. The central part, where the lakes are found, is surrounded by higher elevations ranging from 1893 to 1930 meter with a few lower altitudes to access the lakes.

The climate of the city belongs to the woina dega (Agro-climatic zone). The maximum annual temperature is 29.8°C, and the minimum is 4.9°C. The annual average rainfall is 797.2 mm. April is the hottest month (29.3°C), December is the coldest month (4.9°C), and July is the rainiest month (225.3 mm) of the year. The highest wind speed is registered in May (2.91m/s), and the most common wind direction is easterlies.

3.2. Case Study Area Selection Criteria

From the three sub-cities found in Bishoftu Town, Dibayu Sub City was specifically chosen for this study for several compelling reasons. Firstly, this Dibayu Sub city is strategically located at the heart of the town serving as the primary nucleus for commercial activities. The centrality of this area makes it a vital hub for economic and social interactions within Bishoftu. Moreover, Dibayu Sub city, encompasses the majority of commercial activities, making it a key focal point for the study. This concentration of economic endeavours positions the sub city as a critical zone where the impacts of urban decay are prominently observed. The physical condition of buildings and infrastructure in this sub city has experienced deterioration over time, providing a tangible and representative case for studying urban blight.

The selection of Dibayu Sub city, is further justified by the presence of socio-economic factors known to contribute to urban blight. Issues such as poverty, unemployment, and limited access to basic services are prevalent within this sub city. These socio-economic challenges are crucial elements to consider in understanding the dynamics of urban blight and its broader implications on the residents' well-being.

By focusing on Dibayu Sub city, the research aims to gain insights into the spatiotemporal dynamics of urban blight in a central and economically significant area of Bishoftu city. The findings from this sub city are expected to be representative of broader trends within the town, offering valuable information for addressing urban decay and formulating effective strategies for sustainable urban development.

3.3. Research Design

In order to comprehensively analyze the spatiotemporal dynamics of urban blight in Bishoftu town and understand its impacts on the social, economic, and environmental well-being of residents, a carefully structured research design was implemented. The primary aim of the research design was to efficiently gather and analyze data relevant to the research objectives while maintaining methodological economy. Following the principles outlined by Loru (2020), a descriptive research design was chosen as the most suitable framework for this study.

The research employed a combination of qualitative and quantitative research approaches to achieve its specific objectives. Qualitative methods were utilized to identify and understand the impact of urban blight on the residential area and the environment surrounding the study area. Additionally, qualitative techniques were applied to assess the initiatives undertaken by municipalities and other governmental organizations to promote sustainable urban development.

On the other hand, quantitative approaches, developed since the late 1970s with advancements in computer technology, were harnessed to assess and predict the dynamics of urban blight in the study area. This quantitative aspect of the research involved the analysis of temporal changes in the extent and severity of urban blight from 2003 to 2023, the spatial distribution of urban blight within the study area, the determination of a blight level index based on urban blight indicators, and the assessment of social, economic, and environmental impacts.

By combining both qualitative and quantitative research methodologies, this research design ensured a comprehensive investigation into the multifaceted dimensions of urban blight in Bishoftu town. The qualitative component added depth to the understanding of community impacts and mitigation efforts, while the quantitative component provided a rigorous analysis of the spatiotemporal patterns of urban blight. This balanced approach aimed at yielding maximum information with minimal expenditure of effort, time, and resources, aligning with the overarching objectives of the study.

3.4. Data Type and Sources

To achieve the major objective, the study used hybrid data from secondary and primary sources. Primary data was collected from urban communities in the study area, as well as from sub-city and Wereda experts. The primary data collection methods included field surveys, structured questionnaires, in-depth interviews with key informants, and focus group discussions. Secondary data was collected from books, journals, official reports, websites, legal documents, aerial photographs, structural plans of the sub-city, Landsat imagery, and previous study documents.

Specifically, to assess temporal changes in the extent and severity of urban blight and spatial distribution of urban blight in the study area, Landsat imagery of 2003, 2013, and 2023 was acquired from the United States Geological Survey (USGS). The years were selected based on significant events such as changes in policy, structural plan formulation, urban reforms, and the quality and availability of Landsat images.

Table 3.1: Landsat data used for this study

Landsat type/SENSOR_ID	**Date of acquisition**	**Map projection**	**Projection units**	**Datum**	**UTM zone**	**WRS Path & row**	**Resolution/pixel size (m)**	**Source/ origin**
LANDSAT_7/ETM	2003	UTM	Meters	WGS84	37	168 / 054	30m x 30m	Image courtesy of the USGS
LANDSAT_8/ OLI_TIRS	2013	UTM	Meters	WGS84	37	168 / 054	30m x 30m	Image courtesy of the USGS
LANDSAT_8/ OLI_TIRS	2023	UTM	Meters	WGS84	37	168 / 054	30m x 30m	Image courtesy of the USGS

3.5. Software and Materials Used

The following materials and software were used for the accomplishment of this study:

Materials used:

- GPS: GPS was used for collecting different points, which were utilized for ground truthing.
- Photo camera: A photo camera was used to take pictures during the field observation.

The software used for this study included:

- ArcGIS 10.8: This was used to analyze all the GIS work in the thematic layers.
- ERDAS software: This was used for the classification of the satellite images.
- MS Access and MS Excel: These were used to create the attribute databases and import or export data to the GIS environment for further implementation.
- SPSS: This was used to compute statistical tests.
- MS Word: This was used to write the entire research work and for printing.

3.6. Sampling Techniques and Sample Size Determination

To achieve the intended objective of the study, both stratified random sampling and purposive sampling methods were employed. A purposive sampling technique was used to obtain information from the experts. Purposive sampling relies on the researcher's judgment regarding who can provide the needed and required data for a study (Rahi, 2017). For this study, the purposive sampling method was also used to select the sub city that were highly blighted. Accordingly, Dibayu Sub city, was selected from the three sub cites in Bishoftu town. Dibayu Sub city was chosen for its strategic location at the heart of Bishoftu, serving as a vital hub for commercial activities. With a concentration of economic endeavors, the sub city offered a representative case for studying urban blight, evident in the deteriorating physical condition of buildings and infrastructure. The selection was further justified by prevalent socio-economic challenges like poverty and unemployment, making it a crucial area for understanding urban decay dynamics. The selection of the sub city was done in consultation with experts from the Municipality and Sub City Administration.

The sampling frame to identify respondents was the list of 4560 households living in Dibayu Sub city. Therefore, 4560 was used as the total population to calculate the sample size for the study. Accordingly, the sample size of the respondents was determined using a formula (Eq.1) developed by Yamane (1967).

$$n = \frac{N}{1+N(\alpha)^2} \quad \text{...eq (1)}$$

Where: n= sample size of the study population

N=Number of households=4560

α=the margin of error, and=5%

1=constant

Thus, actual sample size was calculated as follows:

Substitute these values into Yamane's formula to determine the sample size required:

n = (4,560)/ (1 + 4,560(0.05) ^2)

n = (4,560)/ (1 + 4,560(0.0025))

$n = (4{,}560)/ (1 + 11.4)$

$n = (4{,}560)/ (12.4)$

$n \approx 367.74$

Therefore, according to Yamane's formula, the estimated sample size required for a population of 4,560 households with a margin of error of 5 was 367 in total. Accordingly, out of 4560 households, 367 sample informants were selected for household surveys. In order to increase the accuracy of the research results, the research operated at a 95% level of confidence with a margin of error of 5%. Stratified random sampling was used for dividing the population into subgroups or strata based on certain characteristics, such as socio-economic status, land use or building characteristics. A sample selected from each stratum to ensure that the sample was representative of the population. It is important to ensure that the sample is representative of the population to ensure that the study findings are valid and reliable.

The study included also interviews with 15 key informants from different offices in the Town's and sub-city Administration and community elders, and two focus group discussion (FGD) in the study site with a minimum of six participants each. The key informants were interviewed to get their perspectives on the impact of urban blight on socio-economic and environmental impact and factors leading to urban, while the focus group discussions was discussed with local community to explore the issues of urban blight in the study in more detail and to identify common themes and challenges.

3.7. Methods of Data collection

3.7.1. Questionnaires

This consisted of a series of structured questions, some closed while others were open-ended, and other prompts for the purpose of gathering information from the household respondents. The questionnaires were presented to the respondents and answered in written form. The questionnaire focused on assessing the understanding of how residents perceived and defined urban blight, the socio-economic and environmental impact of urban blight, and how such dynamics influenced the overall attitude toward property management and development within the study context.

3.7.2. Key Informant Interview

An interview is fundamentally a conversation involving a face-to-face verbal exchange between two or more people, in which the interviewer attempts to draw information or expressions of opinions and beliefs from the interviewee(s). This method was important for obtaining additional information with a greater possibility of flexibility. Therefore, the researcher conducted face-to-face structured personal interviews with 15 purposively selected officials and community elders.

3.7.3. Field Observation

This involved the systematic selection, observation, and recording of the characteristics depicted on site. The checklist was used as a tool to aid in the observation, complementing other aspects by facilitating the observation of key elements, including the social structure, physical structure, land and economic structure, and institutional structure of the study area.

3.7.4. Focus Group Discussion

Focus group discussions were a type of collective interview where the researcher encouraged discussion among participants to generate rich data. Focus group discussions typically consisted of a researcher and two groups of 6-8 participants each. Focus groups were one of the most important techniques for gathering participants' opinions, attitudes, values, and expectations on a particular topic.

Focus groups were used in this study to collect data on the spatiotemporal analysis of urban blight in the town and how it affected the communities' way of life and the environment. Two separate focus groups were conducted, each with 6-8 participants. Participants included representatives of the communities, leaders of social institutions, officials from various administrative tiers, those in charge of managing the land, and experts with experience in the field of the study.

3.7.5. Mapping, Photography and Sketching

Maps were employed to establish the spatial distribution of land uses in study area. Photographs and sketches of the area was taken to facilitate the analysis of the physical layout of the houses and other structures within the study area.

3.8. Data Analysis Methods

Concerning the data gathered from a household survey, the pre-coded questionnaires were processed, managed, and analyzed using the Statistical Package for Social Sciences (SPSS) software and Microsoft Excel program. The land use and land cover of the study area were analyzed using maximum likelihood classification algorithms to examine the temporal changes in the extent and severity of urban blight in the study area from 2003 to 2023. The maximum classification algorithm assumed that the statistics for each class in each band were normally distributed and calculated the probability that a given pixel belonged to a specific class. Each pixel was assigned to the class with the highest probability (i.e., the maximum likelihood).

Maximum Likelihood Supervised Classification: In remote sensing, a pixel with the MLC was classified into the matching classes/categories. It is a statistical decision measure to assist in the classification of overlapping signatures; pixels were assigned to the class (categories) with the highest probability. However, it was slower to extract computations. The MLC tool considered both the variances of the class signatures when assigning each cell to one of the classes represented in the signature file. In supervised classification, the user or image analyst supervised the pixel classification process. To classify land covers, many researchers showed greater interest in supervised rather than unsupervised methods. The general workflow of the study is illustrated in figure 3.4.

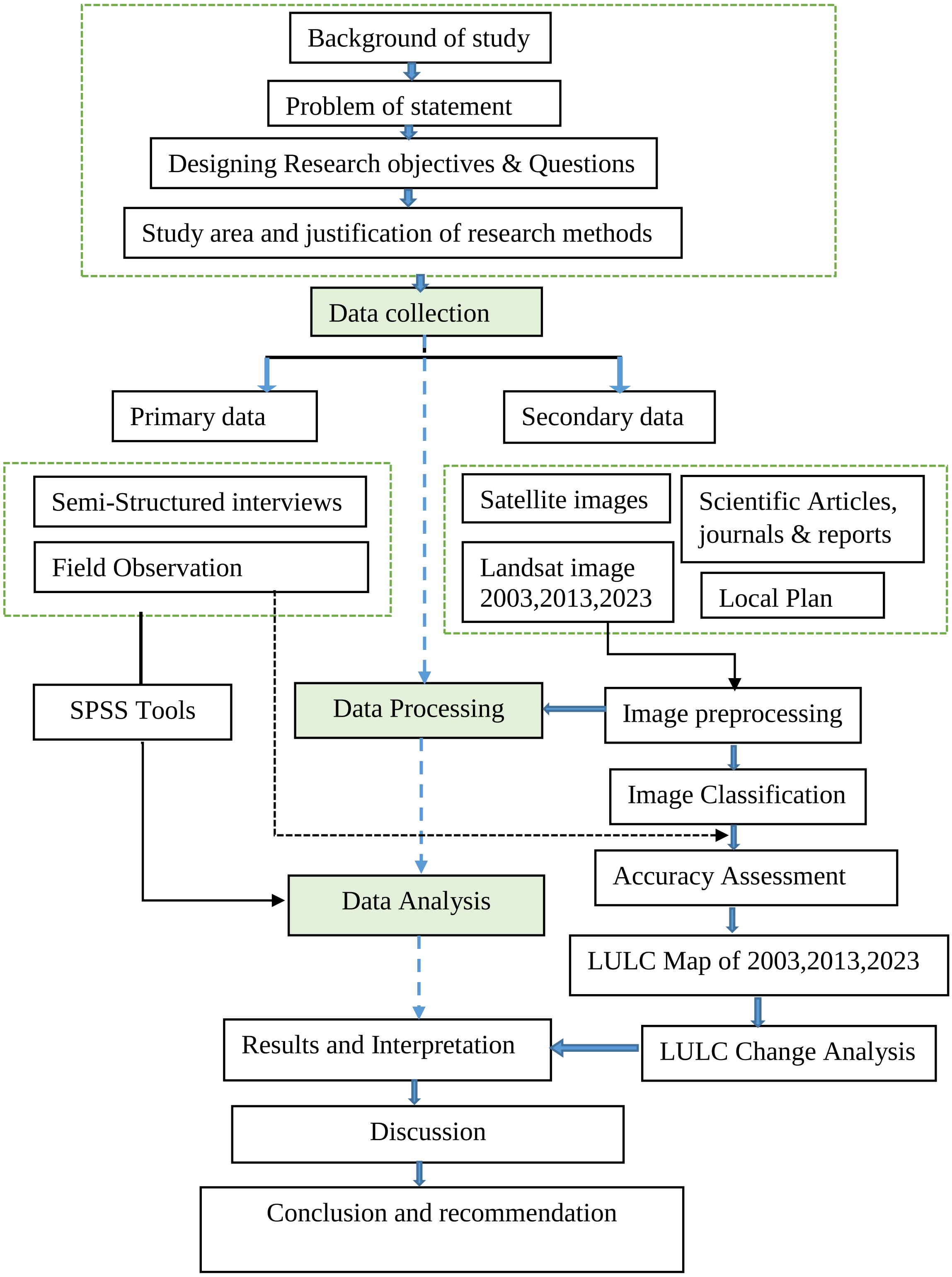

Figure: 3.4. Methodological flow chart of the study

(Sources Author design, 2023)

3.8.1. Data Image Pre-Processing and Analysis methods

Data pre-processing consisted of steps that had to be completed before the primary data analysis and information extraction. To meet the research objectives, multi-temporal satellite images such as Enhanced Thematic Mapper (L7-ETM) for 2003 and Operational Land Image, Landsat 8, Thermal Infrared Sensor, or Precision and Terrain Correction (L1TP) for 2013 and 2023, with a path of 168 and row 054, were used. A map (i.e., Topographic) with a scale of 1:100,000 was used to produce data patterns for nearly two decades (20 years). Finally, for further processing, the raw data were georeferenced and clipped with the study area's boundaries.

A) Data Image Geometric Correction

Geometric corrections attempt to correct for positional errors and to transform the original image into a new image that has the geometric characteristics of a map. For this particular research paper, the processing of these Landsat images was geometrically rectified with street and stream junctions on the satellite images, as well as a 1:100,000 scaled topographic map of the research area. After being georeferenced, the raw data was clipped using the study area's boundaries for further processing using Arc GIS software.

B) Data Image Enhancement

Image enhancement is used to improve visual analysis by improving the apparent contrast between scene components this is done. When an image is enhanced, the distinctive characteristics become more visible, allowing for better image analysis, categorization, and interpretation. Image enhancement is also used to improve the image's details by assigning the image's min and max brightness levels to min and max display values, which is done on image pixels, making the interpretation of the visual simpler and helping the researcher in analysis quality. In this case, the image's low dynamic range is stretched to the entire dynamic range, which is 0 to 256, using histogram equalization. Furthermore, on the satellite images of the corresponding years, spatial improvement of Kernel 5 by 5 of high pass filtering was performed.

3.8.2. Image Classification

Before data analysis, the raw image data is routinely processed to adjust for any distortion caused by the imaging system’s characteristics and imaging settings. In image analysis, preprocessing techniques such as layer stacking and sub setting, geometric correction, radiometric correction, and enhancement techniques were used to turn the data into a format that could be more simply and effectively handled. The images were downloaded, layer stacked and projected onto a land-use and land-cover map that was shown in the Earth Resource Data Analysis System (ERDAS) software interface. To identify LULC classes in the study area, the maximum likelihood classification (MLC) algorithm of the supervised classification method was used for mapping and land use transition assessment. Each spectral class can be characterized by a multivariate normal distribution, according to the MLC algorithm approach (Edosa & Nagasa, 2024). Multi-temporal Landsat data from 2003, 2013, and 2023 were used to detect Spatial-Temporal LULC in the study area. Confusion matrix was developed relying to the comparison of selected samples of classified imagery with respective ground sampling. In this process overall accuracy, producer and user accuracies and kappa coefficient were calculated for the time series of classification results.

Table: 3.2. Land cover Classification Scheme

LULC classes	Descriptions
Bare land	Areas covered by open spaces with little or no vegetation, sands, rocky areas and fenced land for investment purpose i.e., not built
Mixed Forests	Lands dominated by trees with a percent cover >60% and height exceeding 2 meters, Deciduous forest land and evergreen forest land
Built-up area	Areas covered by include all developed areas roads, buildings, housing units, commercial and resident areas, under construction areas, industries and manufacturing
Agriculture land	Areas covered by include all areas employed for agricultural activities farmland and crop
Vegetation	Areas covered by vegetation of any type, including vegetation and other pockets of green areas
Waterbodies	Lakes, reservoirs, stream, rivers, swamps

3.8.3. Evaluation of accuracy and Error matrix

The reference data of ground truth points from different sources was used to train and assess the accuracy of land use and land cover (LULC) maps for each reference year. The real difference between our classification and the reference data is shown in the accuracy rating (Disperati and Virdis, 2015). An assessment may imply that classification results are poor if the reference data is substantially incorrect. The kappa statistic value is a measure of agreement between classification and reference data (Mishra et al., 2019). The kappa values, ranging from - 1 to 1, into three groups: (1) values greater than 0.80 represented strong agreement; (2) values between 0.40 and 0.80 represented moderate agreement; and (3) values less than 0.40 represented poor agreement between the classification and reference data.

A minimum of 50 samples per class is recommended for maps smaller than 4000 km² and with fewer than 12 classes (Feyisa, 2015). Dibayu sub city has an area of 226.17km² and 6 LULC classes, so at least more 50 random ground points was collected per class. The following sources was used to collect ground truth points for the years 2003, and 2013:

- Google Earth high-resolution images
- Researcher's personal experience
- Local community knowledge

For the 2023 reference year, ground truth points was collected through field visits and visual interpretation of Google Earth high-resolution images.

It is impossible to create a digitally generated land cover map of remote sensing imagery without errors. These errors can happen during data collection or image processing. Therefore, it is important to assess the accuracy of the classification to ensure that the results are reliable. Accuracy assessment is an essential part of studying image classification and land use/land cover detection. It helps us to understand and estimate changes accurately. It also shows how well the classification results match the real world. In this study, the accuracy of the land cover maps for 2003, 2013, and 2023 was assessed using a method called error matrix. This method compares information from reference sites to the information from the classified image for a number of sample areas. Overall accuracy, producer's and user's accuracies, and Kappa statistic was calculated from the error matrix for each year.

According to Wongpakaran et al. (2013), the kappa coefficient is normally in the range of 0 to 1.00, with the latter indicating high agreement, and is often multiplied by 100 to produce a percentage measure of classification accuracy. A Kappa statistic of greater than 0.80 (80 %) indicates strong agreement, whereas a value of 0.60 to 0.80 indicates substantial agreement (Mishra et al., 2019). To better understand the quality and dependability of image classification, an accuracy assessment is frequently necessary. Overall classification accuracy and the kappa coefficient are frequently used to evaluate a classification's overall performance, whereas producer's accuracy and user's accuracy are used to evaluate the performance of each LULC class.

The producer's accuracy is the map of accuracy from the point of view of the map maker (the producer). It was computed as follows:

$$P = \frac{X}{R} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, P= producer's accuracy

X= total number of correct pixels in a category

R=Total no of pixels derived from the reference data (i.e., Row total)

The User's accuracy is the accuracy from the point of view of a map user, not the map maker, and calculated as follows:

$$\boldsymbol{U} = \frac{X}{C} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, *U*=user's Accuracy *X*= total number of correct pixels in a category C = total no of pixels derived from the reference data (i.e., Column total)

Overall accuracy was calculated for the entire image across all classes in the classified image.

$$O = \frac{X}{Y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where, *O*= overall accuracy

X= total number of correct pixels in a category

Y= total number of accuracy sites (Column Total)

Kappa coefficient (K) is a measure of the agreement between two maps considering all elements of the error matrix. It is defined in terms of an error matrix as given below:

$$K = \frac{\text{Obs-Exp}}{1 - \text{Exp}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where Obs = Observed correct, it represents accuracy reported in the error matrix (overall accuracy)

Exp = Expected correct, it represents correct classification (correctly classified)

Observed correct = $\frac{\text{Total correct}}{\text{Grand Total}}$, *Expected* correct = $\frac{\text{Total correct}}{\text{Grand Total}}$

Total = Sum of rows and columns, Total correct = Sum of the diagonal elements

3.8.4. Temporal Analysis of Urban Blight

To determine the temporal changes in the extent and severity of urban blight in study area from 2003 to 2023 land use and land cover (LULC) classification types for each reference a pixel-based supervised image classification with the maximum likelihood classification algorithm was applied (Feyisa, 2015). Analysis of temporal changes of urban blight in study area from 2003 to 2023 LULC for the periods 2003-2013, and 2013-2023 was quantified using post-classification analysis.

Post-classification change detection comparison methods were utilized to perform land use and land cover change analyses. The LULC classes with mixed pixels were re-examined to increase classification accuracy. Change detection was carried out using a technique called post-classification image comparison, in which images from different reference years were classified separately.

In ArcGIS analysis tools, the vector data were rasterized and intersected, and they were used to overlay and compare the change in land use and land cover between the two years, as well as to compute the change in area by cross-tabulating pairs of time intervals. In addition, field calculator tools in ArcGIS were used to analyze the change detection matrix of transitions between different LULC classes to quantify the area converted between the different LULC classes (Minta et al., 2018; Edosa & Nagasa, 2024). For statistical analysis, quantified values of conversion between the four and five LULC classes were utilized to show the level of change in the site. The percentage of LULC change was computed by the following formula that was set by Kindu et al. (2013).

$$\text{LULCC}(\%)=\frac{\text{Q2-Q1}}{Q1} * 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

To compute the rate of land use and land cover changes, the following equation was performed for computing the rate of change:

$$\text{R}=\frac{\text{Q2-Q1}}{T} * 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where, *R*= Rate of change

Q2= Recent year of LULC in hectares

Q1= Initial year of LULC in hectares

T= Interval year between initial and recent year.

General work flow of spatial analysis for image classification and change detection illustrated below (Figure 3.5).

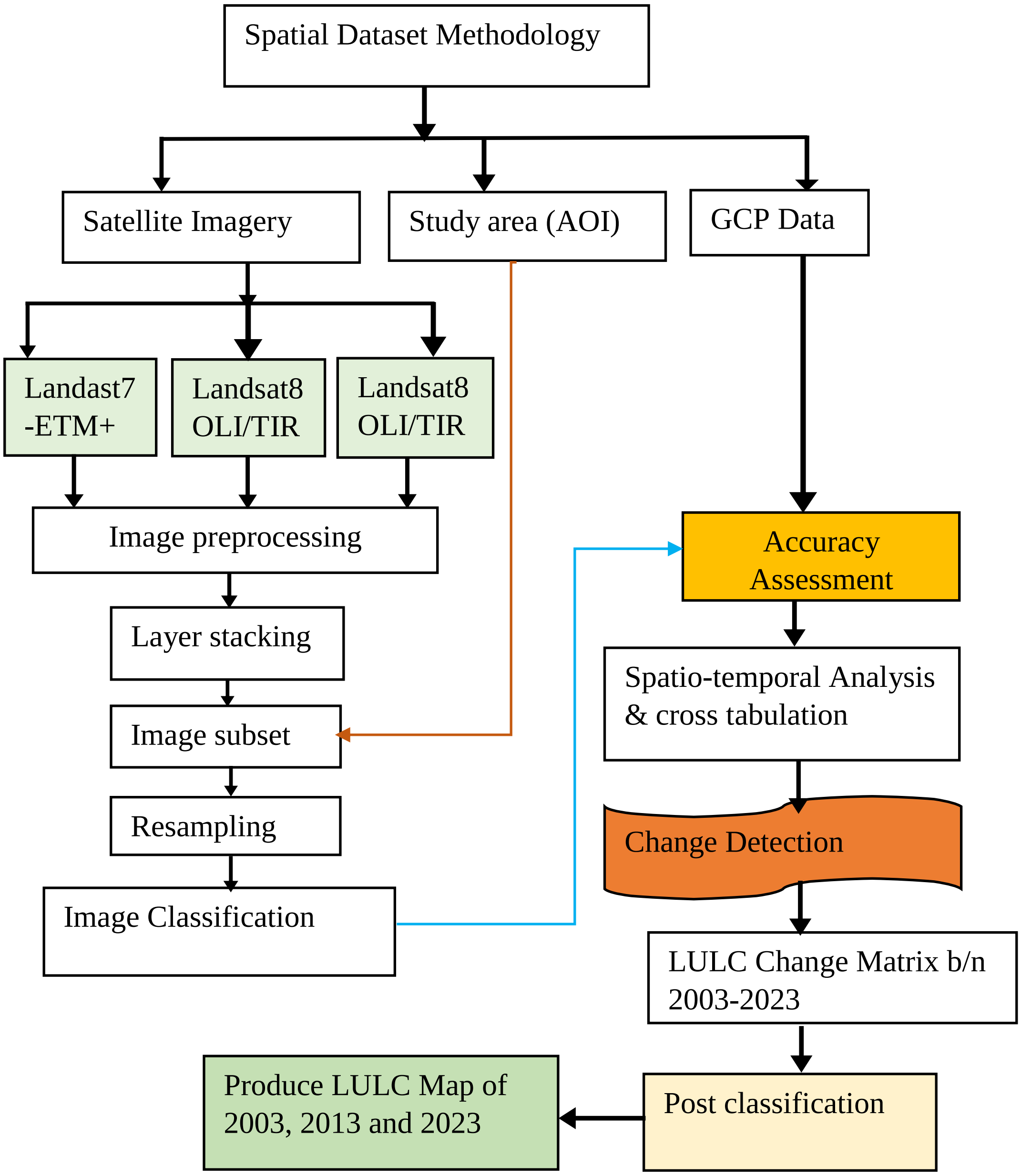

Figure 3.5. Methodology followed in spatial analysis (work flow)

3.8.5. Analysis of spatial distribution of urban blight

The spatial distribution analysis of urban blight in Bishoftu town was conducted through a multi-faceted methodology that integrated geographic information systems (GIS), remote sensing techniques, and Ground-truthing processes. Initially, high-resolution satellite imagery, including Landsat imagery from various years, was procured to capture the town's evolving landscape. GIS software was employed to process and analyze these images, facilitating the identification and mapping of blighted areas within the study region.

The delineation of spatial boundaries and the classification of land use types were carried out, providing a foundational understanding of the distribution of urban blight. Ground-truthing, involving on-site visits and observations, was instrumental in validating the accuracy of the remotely sensed data and refining the spatial analysis. This fieldwork component also served to identify specific characteristics contributing to urban blight, such as deteriorating infrastructure or vacant properties.

To quantify the spatial distribution of urban blight, a grid-based approach was applied, dividing the study area into manageable units for analysis. Each grid cell was assessed for blight severity based on predefined indicators, allowing for a comprehensive examination of blight patterns across the entire town. This method facilitated the creation of detailed maps illustrating the concentration and dispersion of blighted areas over time.

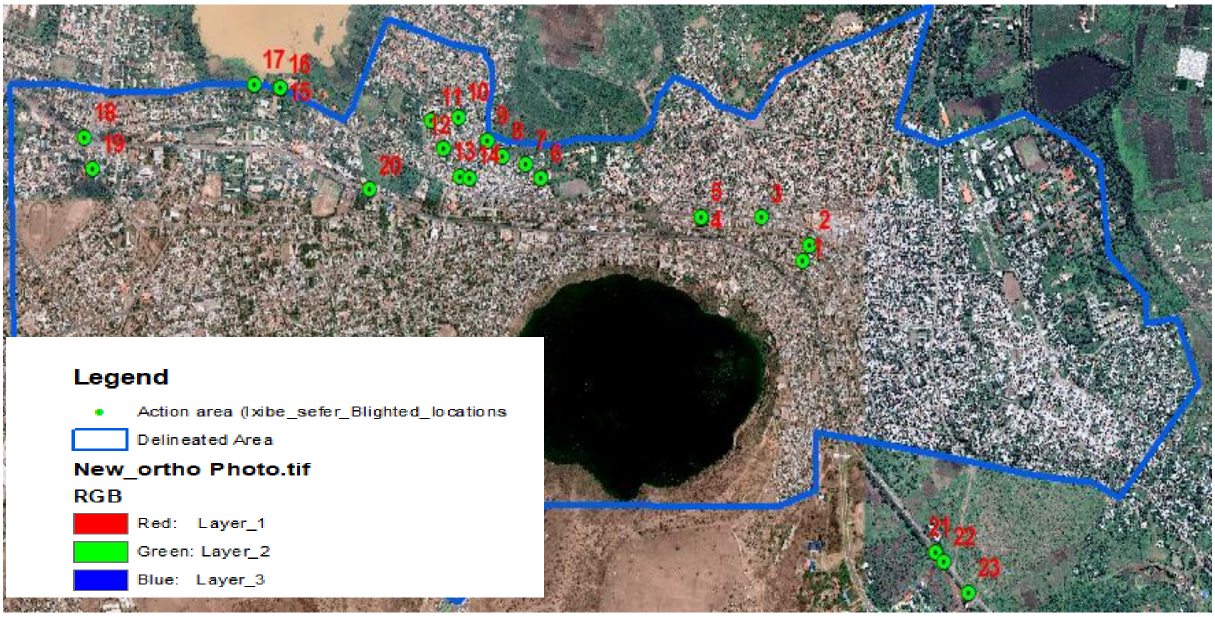

Figure 3.6. Distribution of blighted properties in study area.

Source: Land Use and Spatial Planning Authority, Orthophoto 2022/2013 and Google image 2024.

Additionally, spatial statistical techniques were employed to identify any clustering or dispersion trends within the urban fabric, providing valuable insights into the spatial dynamics of urban blight. The secondary data obtained from the land-use plan (local plan) and the aerial images were used to generate maps using ArcGIS software, as illustrated in above Figures 3.6.

3.8.6. Urban blight Index

The urban blight index provides evidence about the definition of blight as a whole. This means that it is determined, how many blight indicators within an area have to be present to conclude that the area can be considered as blighted. Populations and block groups are chosen as appropriate area within the scope of this study in order to determine the level of blight. The intensity of urban blight indicators is standardized utilizing a classification scheme depending on the severity of blight indicators within an area.

To achieve the objectives outlined in the research, a customized Urban Decay Index (UDI) was employed. The UDI serves as a comprehensive metric, systematically evaluating the deterioration and blight within the urban area of Bishoftu, Ethiopia. The following indicators, tailored to the specific context and goals of this study, were used to the calculation of the UDI:

1. **Physical indicators Infrastructure Assessment:**

Physical indicator such; Condition of buildings and structures, Presence of vacant or abandoned properties, Quality of roads and sidewalks, Maintenance of public spaces and graffiti, or broken windows.

2. **Social Indicators Examination:**

Socio economic indicators include; Crime rates and public safety, Population density and demographics and Community engagement and social cohesion.

3. **Economic Factors Analysis:**
    - Employment rates and economic activity
    - Property values and real estate market trends
    - Business vitality and commercial activity
4. **Environmental Quality Evaluation:**
    - Green space and environmental amenities
    - Pollution levels and environmental hazards

The calculation of the Blight Level Index involves assigning appropriate weights to each indicator, reflecting their significance in influencing urban decay. These weighted indicators will be amalgamated into a unified numerical value, offering a precise representation of the overall level of urban blight in Bishoftu.

3.8.7. Urban decay classification schemes and indexing

Urban decay is a process in which a previously functioning city, or city area, falls into disrepair and disuse. Common indications of urban decay are abandoned buildings and empty plots, high unemployment levels, high crime rates, and an urban landscape that is generally decrepit and desolate. The city programme addressed the following components as basic for intercomparing of urban settlements. These include: Socio-economic background, Housing conditions, Health condition, Natural conditions, Natural environment, Land use, Urban transport, Energy use, Air pollution, Water and sanitation, Solid and Hazardous wastes.

Most of these elements are not measurable physically nor are they discriminated from the visual assessment of urban condition. These make them subjective and thus difficult to use as basis for inter comparison of physical quality of urban area. The following parameters were used in the interpretation and classification of the remote sensing data into different urban qualities score. Each of these parameters was given a threshold score through which all the zones were classified into good urban neighbourhood and blighted neighbourhoods. The threshold serves as a value through which the city is measured on a monothetic Boolean scale of good (1) and bad (0).

The parameters above were used in the interpretation and classification of the remote sensing data into urban decay and good areas. A grid of cells with dimension 40 X 40 meters was placed on the scenes. When the value of a grid cell falls below the city threshold; such area is classified as **0** while a score of 1 is assigned to areas that score above the city standard threshold. The total number of cells in each zone that score 0 and 1 were enumerated to find the percentage 0 score in each zone to measure percentage decay areas in the zone. When the percentage of **0** scores is higher than **50** in a zone**,** the zone is classified as urban decay, in the case that percentage score **0** is less than **50** we classify the area as good urban environment i.e ***not poor***

The total number of zones classified as urban decay using a particular parameter is used to compute percentage urban decay on the basis of that parameter. For instance, the following parameters were eventually used to measure urban decay in Bishoftu city:

(a) ***Urban accessibility***: Accessibility relate to ease or difficulty to move around different components of urban area. This is largely a function of urban highway corridors and connectivity levels and the road conditions.

UA = percentage urban decay by urban accessibility is computed as:

$$Ua = \sum_{i=0}^{n} 1\, Uai\, X \frac{100}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{eq.7}$$

(b) ***Urban density and congestion***: This relate to the level of clustering of building and urban land uses in the city. This relates to the number of buildings per unit area. It can be calculated as follows;

UD = percentage urban decay by urban density is computed as:

$$Ud = \sum_{i=0}^{n} 1\, Udi\, X \frac{100}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{eq.8}$$

(c) ***Building materials quality***: The roof quality was used as a means of measuring urban building quality based on the age differentials of the buildings in the city.

UB = percentage urban decay by building materials is computed as:

$$Ub = \sum_{i=0}^{n} 1\, Ubi\, X \frac{100}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{eq.9}$$

(d) ***Vegetal – impervious surface dichotomy***. The level of greenness in urban neighbourhood indicates some forms of planning and organized space which is used as a measure of urban quality.

VGS = percentage urban decay by vegetation/impervious surface computed as:

$$UVGS = \sum_{i=0}^{n} 1\, Uvgsi\, X \frac{100}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{eq.10}$$

To calculate the percentage of urban blight by accessibility (UA), percentage of urban blight by density (UD), and percentage of urban blight by building roof condition (UB), the percentage of zones in the city with a value of 0 for each parameter was retrieved. as well as the proportion of vegetation to impermeable surface mix (VGS). CBI, the composite index for the city-wide city blight index, can be calculated in the manner described below:

$$CBI = \sum_{i=0}^{n} 1\, (UA + UD + UB + UVGS) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textbf{eq.11}$$

The composite city blight index (CBI) for the whole research area is calculated by adding up all of the percentages of blight using all of the factors (M). M is the total number of criteria or variables used to gauge the city's level of urban deterioration. M in this instance equals 4. Since the parameters were given in percentages, the purpose of M* 100 is to eliminate the percentages and allow the result to be expressed as an index instead of percentages.

When the CBI value is less than 0.5, the city is considered a non-deterioration area where urban decay is localised and less severe. If the value is larger than 0.5, the city is considered heavily blighted and primarily slum-like. CBI = 0 denotes a city without any slums, while CBI = 1 denotes a fully developed slum. Over a twenty-year period, from 2003 to 2023, this method was used to categorise and quantify urban deterioration in Bishoftu city both spatially and temporally.

3.9. Ethical Consideration

The following ethical considerations had been made during the entire investigation: All references used had been cited, information would only be shared with permission, and any information gathered about them would remain confidential. There would be no inaccurate or biased reporting in the theory.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Background of the Respondent

Demographic information includes details such as the respondent's gender, age, marital status, level of education, income, and size of family. In this study, descriptive statistics, specifically frequency analysis, were employed to examine the demographic characteristics of the participants. Out of 367 respondents, only 276 questionnaires, representing 75.2% of the total, were returned valid for analysis. Various literature sources suggest different acceptable levels of response rates for face-to-face surveys. For instance, Babbie (1990) considers a return rate of 50% adequate, while Bailey (1987) and Singleton and Straits (2005) set the bar at 75% and 70%, respectively. Schutt (1999) cautions that a response rate below 60% is problematic, as it becomes challenging to justify the representativeness of the sample if more than a third fail to respond. Given these benchmarks, a response rate of 75.2% falls within the acceptable range for further analysis.

4.1.1. Age, Gender and Marital Status of the Respondent

According to the data presented in figure (4.1), the majority of respondents fell within the age range of 30 to 40, comprising 48.2% of the total. Additionally, 12.7% of respondents were between the ages of 18 and 29, 19.2% were aged 41 to 55, and 20% were older than 56. These findings indicate a significant portion of respondents in the active workforce age group of 30 to 40, as well as a notable representation of older individuals aged over 56.

This highlights the importance of effective land policies in urban areas to address the needs of residents in different age brackets. Specifically, there is a need for formal affordable land and housing supply across various income levels to mitigate the prevalence of blighted areas.

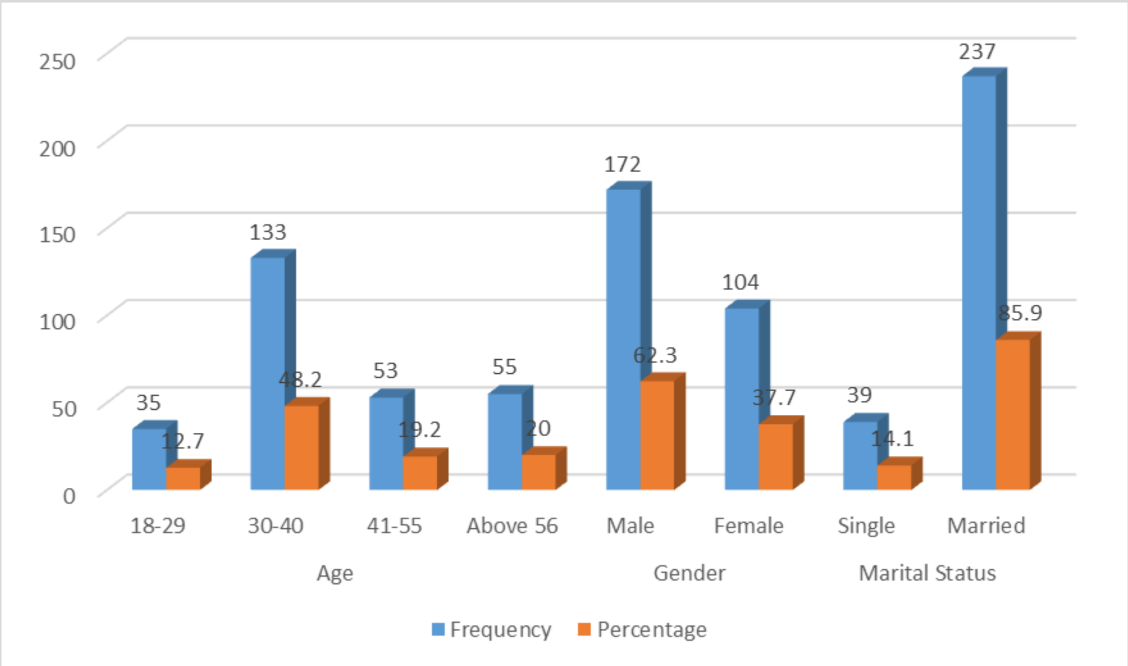

Figure 4.1 Demographic variable of HH respondent.

As depicted in Figure 4.1, out of the total 276 sample household heads interviewed, 172 (62.3%) were males, while the remaining 104 (37.7%) were females. This indicates that the majority of household heads were males, suggesting that most of the households owned property under the name of male heads. Additionally, from the graph in Figure 4.1, it can be observed that 85.9% of the total household heads surveyed were married, whereas 14.1% were single.

4.1.2. Family Size of the Respondents

As per Table 4.1 below, it is observed that 20.7% of families had fewer than three members, while 30.8% had three to five members. Family sizes of six to eight, nine to eleven, and more than twelve accounted for 25%, 13%, and 10.5% of members respectively. In general, detailed observation of household sizes indicates that over 75% of households had a size ranging from three to eight members.

Table 4.1 Family size of the Respondents

Variable	Category	Frequency	Percentage
Family Size	Less than three	57	20.7
	Three - five	85	30.8
	Six - eight	69	25.0
	Nine - Eleven	36	13.0
	Twelve and above	29	10.5
	Total	276	100.0

Source: Own survey and computation, 2024

4.1.3. Education Background of Respondents

In terms of the educational backgrounds of respondents, the data presented in table 4.2 indicates that over half of the total household heads surveyed had completed high school or attained higher education levels. Among them, 18.5 percent held a first degree or higher qualification, while 17.8 percent had completed 12 years of education or held certificates. Only 6.9 percent of the total household heads interviewed had no formal education. This suggests that low education levels may not be a significant contributing factor to urban blight. For further details on the demographic characteristics of the households surveyed, please refer to table 4.2 provided below.

Table: 4.2. Education Background of the sample HH respondents

Variable	Category	Frequency	Percentage
Respondents Level of Education	Illiterate	19	6.9
	Primary School	86	31.2
	Secondary School	71	25.7
	12+ and Certificate	49	17.8
	First Degree and Above	51	18.5
	Total	276	100.0

Source: (Own survey and computation, 2023)

4.1.4. Employment Conditions of the Respondents

Based on the findings presented in Table 4.3, it is evident that 82.2% of the surveyed respondents reported being employed, indicating a majority of them are engaged in some form of employment. Conversely, 17.8% of the remaining individuals indicated they did not have a job. It is worth noting that all respondents have the opportunity to pursue both formal and informal employment to generate income.

Furthermore, the table indicates that out of the total household heads interviewed, 50.4% or 139 household heads are engaged in formal employment, while the remaining 31.9% or 88 household heads are involved in informal employment. This suggests that the increasing urban degradation in the study area cannot be solely attributed to a lack of employment opportunities.

Table 4.3. Employment situation of the respondents

Variable	Category	Frequency	Percentage
Employment Status	Employed	227	82.2
	Unemployed	49	17.8
	Total	276	100.0
Employment Condition	Formal	139	50.4
	Informal	88	31.9
	Total	227	100

Source: (Own survey and computation, 2024)

4.2. Spatial Analysis of Spatio-temporal change of the study area from 2003-2023

4.2.1. Land Use Land Cover Classification Results

An intensive pre-processing such as geo-referencing, and layer- stacking were carried out in order to Ortho-rectify the satellite images. The image was then processed in ERDAS IMAGINE 2015 software. The satellite image of each band was stacked in ERDAS Hexagon within interpreter main icon utilities with layer stacked function. Then, from the stacked satellite image the study area image was extracted by clipping the study area using ArcGIS 10.8 software.

The supervised classification was applied after defined area of interest (AOI) which is called training classes. More than five training area was used to represent a particular class. The training sites were selected in agreement with the Landsat Image, Google Earth and Google Map (Figure 4.2). The basic sequence operation followed on supervised classification was;

- ***Defining of Training Sites:*** The first step in undertaking a supervised classification is to define the areas that will be used as training sites for each land cover class. This is usually done by using the on-screen digitized features. The created features are called Area of Interest (AOI). The selection of the training sites was based on those areas clearly identified in all sources of images. In this study, more than fifty (50) training sites where been identified.
- ***Extraction of Signatures:*** After the training site (AOI) being digitized, the next step was to create statistical characterizations of each information. These are called Signatures editors in ERDAS Imagine 2015. In this step, the goal was to create a signal (SIG) file for every informational class. The SIG files contain a variety of information about the land cover classes described. After the entire signature have been created, then the SIG file saved as dialog in (figure 4.2).
- ***Classification of the Image (Supervised classification):*** The supervised classification has been applied after defined training classes. Five or more than one training area was used to represent a particular class. During the supervised classification process, the entire Signature editor was selected in order to be used on the classification process. Then the classify was selected from the Editor Menu bar, classify/supervised. Non-Parametric Rule and Maximum likelihood Algorithm was used in this classification. The Image was classified into six classes illustrated in (Table 4.5).

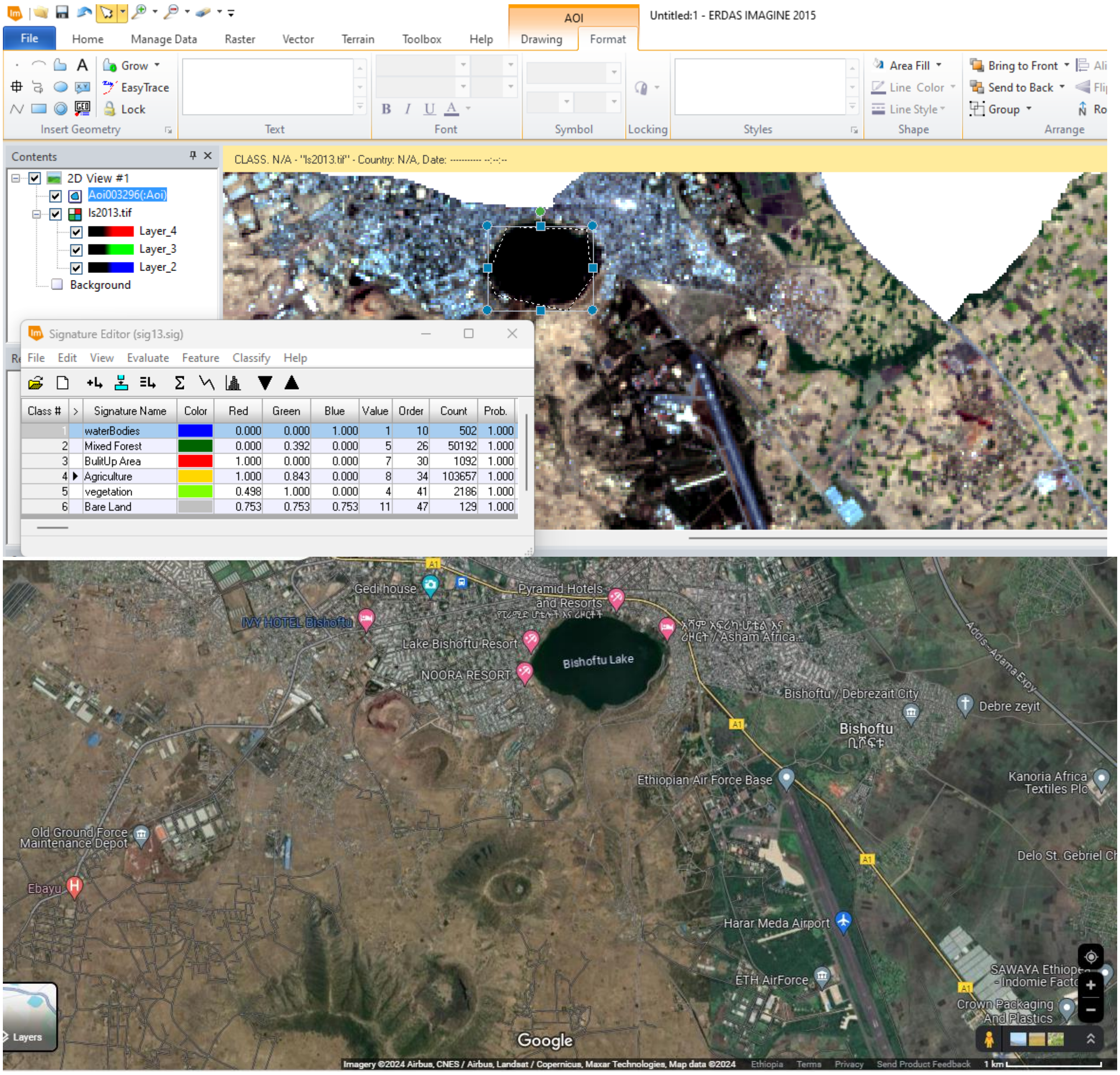

Figure 4.2. Identification of training sites using Landsat image (Erdas Imagine 2015), Google earth and Google map.

(sources: Landsat of USGS, Google earth, Author screen digitization, 2024)

Supervised classification was carried out at study area. The area of each class was calculated considering the pixel count and total area (study area). Thus, allocations of each classified area, (percentage) are tabulated in Table 4. Accordingly, the classified image of Landsat 7 ETM and the land sat8 OLI image are classified into six major classes (Agricultural land, barren land, built-up area, Vegetation, Mixed forests and water bodies) based on the major class land cover of study area. Every image's accuracy evaluation was computed, and all LULC results fell within a reasonable range. (Figure 4.3 to 4.5) show land us land cover map of Dibayyu sub city from 2003 to 2023.

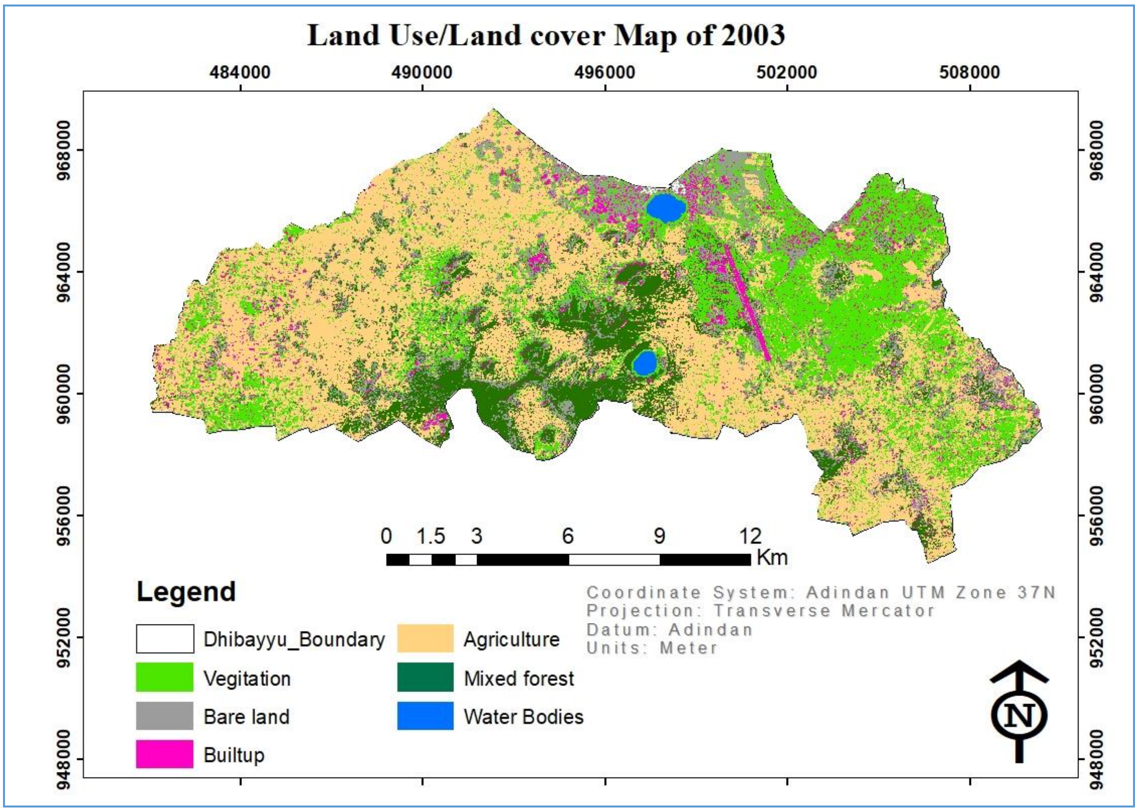

Figure 4.3. LULC Classified map of study area in 2003

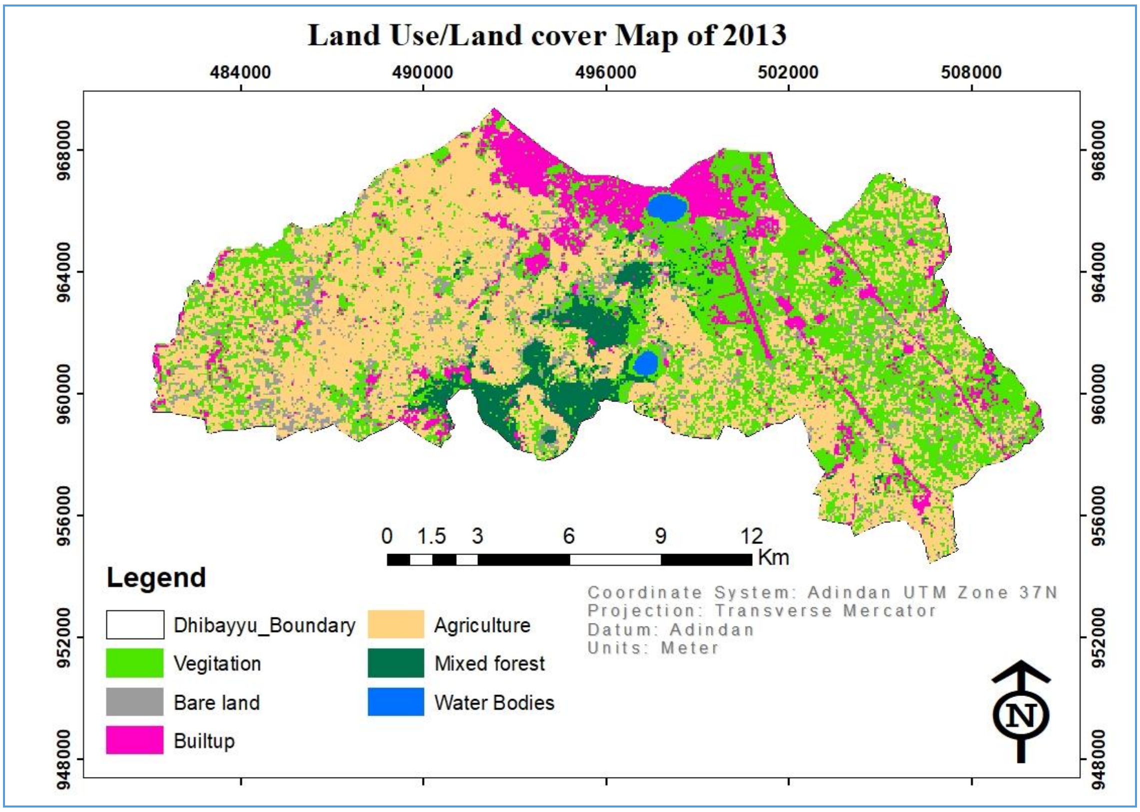

Figure 4.4. LULC Classified map of study area in 2013

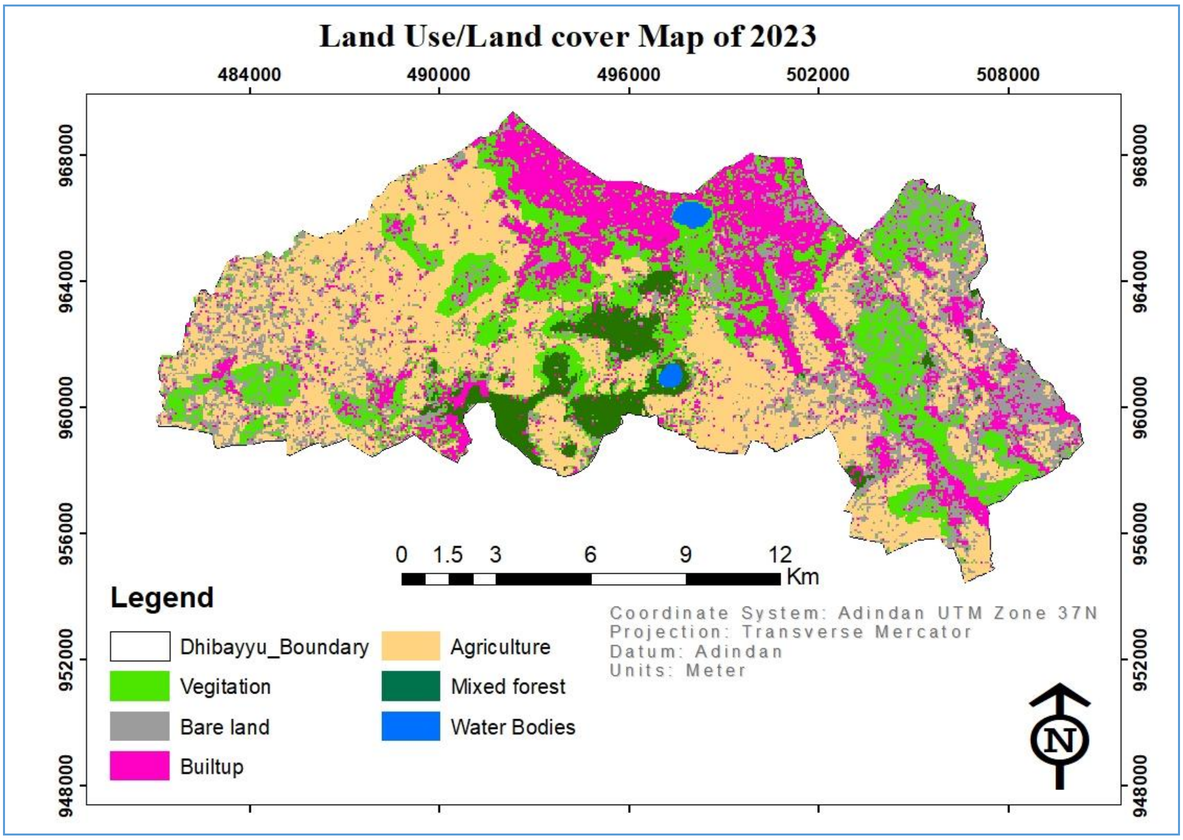

Figure 4.5. LULC Classified map of study area in 2023

According to Table 4.5 results show that data on the area and percentage of land use and land cover classes for the years 2003, 2013 and 2023. In 2003, Agriculture was the dominant land cover class, covering 46.02% of the total area, followed by vegetation at 24.4%. another classes Mixed forests/bush land cover 13.14%, Bare land 10.32% coverage. While 5.4% only covered by built-up areas and the least 0.6% account for water bodies.

In 2013 revealed a dynamic and diverse landscape within the study area. Agriculture emerged as the dominant land cover class covered 42.97%. vegetation land cover 29.53%, area covered by Built-up areas accounted for 11.14%, reflecting the ongoing process of urbanization and human settlement. The other land cover bare land 9.6%, mixed forests 6.05% and water bodies 0.6%. This show the decreasing of agriculture land while urban settlement is increase in year 2013.

Table 4.4: Area and percentage of LULC Classes in the year 2003, 2013 and 2013

LULC_ Class Name	2003		2013		2023	
	Area(ha)	Percentage (%)	Area(ha)	Percentage (%)	Area(ha)	Percentage (%)
Agriculture	10408.9	46.022	9718.91	42.971	7835.126	34.642
Bare land	2334.73	10.323	2186.98	9.670	4000.068	17.686
Built-up	1235.65	5.463	2519.83	11.141	4655.018	20.582
Mixed Forest	2973.63	13.148	1370.29	6.059	1229.253	5.435
Vegetation	5527.01	24.437	6680.36	29.537	4776.610	21.119
Water Bodies	137.125	0.606	140.795	0.623	121.208	0.536
Total	22617	100.000	22617.2	100	22617.3	100

Source: (Own survey and computation, 2024)

In 2023, Agriculture covered an area of 7835.12 ha (34.64%) of the total land cover area. 21.1% of area covered by vegetation, 4655 ha (20.58%) covered by Built-up areas and Bare land occupied 17.6%, mixed forest accounting for 5.4% of the total area. (See figure 4.5.)

4.2.2. Accuracy Assessment for Land Use / Land Cover

One of the most important final steps at classification process is accuracy assessment. The aim of accuracy assessment is to quantitatively assess how effectively the pixels were sampled into the correct land cover classes. Moreover, the key emphasis for accuracy assessment pixel selection was on areas that could be clearly identified on both Landsat high resolution image, Google earth and Google Map. A total of 100 points (locations) were created in the classified image of the study area. The Accuracy Assessment Cell Array Reference column was filled according to the best guess of each reference point.

Using the formulae furnished on previous chapter (3) equations, various accuracy evaluating parameters were computed and tabulated in Table 4.6 and Error matrix computed in Appendix of this research.

Table 4.5. Category wise accuracy assessment statistical parameters.

Classified data	2003		2013		2023	
	Producer Accuracy	User Accuracy	Producer Accuracy	User Accuracy	Producer Accuracy	User Accuracy
Agriculture	0.975	0.867	0.952	0.955	0.971	0.919
Bare land	0.889	0.727	0.778	0.700	0.947	1.000
Built-up	0.750	0.900	0.727	0.800	0.947	0.900
Mixed Forest	0.846	0.846	0.778	0.700	0.800	0.800
Vegetation	0.833	1.000	0.906	0.935	0.864	0.950
Water Bodies	0.900	0.900	0.800	0.700	0.800	0.800
Overall kappa statistics		0.851		0.837		0.891
Overall accuracy		88.61%		87.82%		91.30%

Source: (Own survey and computation, 2024)

The results from accuracy assessment showed an overall accuracy obtained from the random sampling process for the image of 2003 is 88.61%. User's accuracy ranged from 0.727 to 0.971 while producer's accuracy ranged from 0.750 to 0.975. The broad range of accuracy indicates a severe confusion of water bodies with other land cover classes. Moreover, the measure of producer's accuracy (Sensitivity) reflects the accuracy of prediction of the particular category. The User's accuracy reflects the reliability of the classification to the user. User's accuracy is the more relevant measure of the classification's actual utility in the field. Agriculture was found to be more reliable with 97.5% of user accuracy. Overall kappa statistics 0.851 and Overall Accuracy assessment account for 88.61percent in 2003.

In the year of 2013, there was a notable improvement in accuracy compared to 2003. The Agriculture land class showed significant progress, with a producer accuracy of 95.2% and a user accuracy of 95.5%. The overall accuracy 87.82%, indicating an improvement in the classification process. The overall kappa value also increased to 0.837, suggesting a higher level of agreement between the classified and reference data. By 2023, the accuracy of land cover classification further improved. The Agriculture class achieved high producer accuracy (97.1%) and a user accuracy of 91.9%. The overall accuracy increased to 91.30%, demonstrating a higher level of accuracy in the land cover classification process. The overall kappa value reached 0.891, indicating a strong level of agreement beyond chance.

Overall, the accuracy assessment results show a positive trend of improvement in the accuracy of land cover classification over time. The overall accuracy and kappa values consistently indicated a high level of agreement between the classified and reference data, suggesting the reliability and effectiveness of the classification process.

4.2.3. Change Analysis

Following the creation of maps showing land use and cover, changes in each land cover that took place during the examined periods were identified. While agricultural land displayed a variable pattern during the previous few decades, other land covers in the studied areas, such as, Vegetation, and barren land, have been continuously declining.

In 2003 the study area was dominated by Agriculture covering 46.02% followed by Vegetation covering 24.4% of the study area. Mixed Forest, bare land, built-up area, and waterbody shared 13.14%, 10.32%, 5.46%, and 0.60% of the total area respectively. Those areas, which are close to the built-up areas and urban centers, were subjected to a significant loss in the last three decades.

Table 4.6: Area coverage and percentage of land use land cover change (2003 - 2013)

LULC_ Class Name	2003		2013		Change 2003-2013	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area △ (ha)	Percentage (%)
Agriculture	10408.9	46.02	9718.91	42.97	-689.99	-3.05
Bare land	2334.73	10.32	2186.98	9.67	-147.75	-0.65
Built-up	1235.65	5.46	2519.83	11.14	1284.18	5.68
Mixed Forest	2973.63	13.15	1370.29	6.06	-1603.34	-7.09
Vegetation	5527.01	24.44	6680.36	29.54	1153.35	5.10
Water Bodies	137.125	0.61	140.80	0.62	3.67	0.02
Total	22617	100.00	22617.17	100.00	0.0	0.00

According to classification results provided table 4.6. presents the change detection of Classification of image between the years 2003 and 2023. The main types of land use and land cover have changed noticeably across the studied time periods. From 2003 to 2013, there was a decrease in the area of agriculture by 689.9 hectares, representing a 3.05% reduction. This decline indicates a shift away from agricultural activities during that period. The built-up environment increased by approximately 1284.18 ha (5.68 %), while Mixed forest area decreased by 1603.34 ha (7.09%), water bodies increased by 3.67 ha (0.02%), and barren land decreased by 147.75 ha between 2003 to 2013.

Similarly, from 2013 to 2023, agriculture experienced a further decreased by 1883.78 hectares, indicating an ongoing trend away from agricultural land. During the second period Built-up areas, an increased by 2135.19 hectares, while mixed forest (bush land) area decreased by 141.04 ha, vegetation continuously converted and decreased by 1903.75 ha see (Table 4.8).

Table 4.7: Area coverage and percentage of land use land cover change (2013 - 2023)

LULC_ Class Name	2013		2023		Change 2013-2023	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area △ (ha)	Percentage (%)
Agriculture	9718.91	42.97	7835.13	34.64	-1883.78	-8.33
Bare land	2186.98	9.67	4000.07	17.69	1813.09	8.02
Built-up	2519.83	11.14	4655.02	20.58	2135.19	9.44
Mixed Forest	1370.29	6.06	1229.25	5.44	-141.04	-0.62
Vegetation	6680.36	29.54	4776.61	21.12	-1903.75	-8.42
Water Bodies	140.795	0.62	121.21	0.54	-19.59	-0.09
Total	22617.2	100.000	22617.28	100	0.	0.000

Source: (Own survey and computation, 2024)

Table 4.8: Area coverage and percentage of land use land cover change (2003 - 2023)

LULC_ Class Name	2003		2023		Change 2003-2013	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area △ (ha)	Percentage (%)
Agriculture	10408.9	46.02	7835.13	34.64	-2573.8	-11.38
Bare land	2334.73	10.32	4000.07	17.69	1665.3	7.36
Built-up	1235.65	5.46	4655.02	20.58	3419.4	15.12
Mixed Forest	2973.63	13.15	1229.25	5.44	-1744.4	-7.71
Vegetation	5527.01	24.44	4776.61	21.12	-750.4	-3.32
Water Bodies	137.125	0.61	121.21	0.54	-15.9	-0.07
Total	22617.05	100.00	22617.28	100	0.2	0.00

Source: (Own survey and computation, 2024)

Table 4.8. show that during the overall period, 2003 – 2023, all LULC decreased except the buildup area and bare land. Buildup area increased by 3419.4 ha, and bare land 1665.3 ha. while agriculture land, mixed forest, vegetation and water bodies decreased by 11.38%, 7.71%, 1.42%, 9.85%, 3.32% and 0.07 %, respectively.

4.2.4. Change Extent and rate of and use lad cover (2003 to 2023)

From the below Table 4.9 rate of change for each class were analyzed; agricultural 0.01 rate of change and area reveal decrement from 2003 to 2013. Built-up increases throughout the entire study period. Vegetation, mixed Forest and bare land continuously decreases from 2003 to 2023. Bare land and water body also decrease throughout the all study period.

Table 4.9: Overall amount, extent, and rate of land cover change (2003 - 2023)

LULC_ Class Name	change 2003-2013			change 2013-2023		
	change △/ha	Change Extent %	Rate of change △%	change △/ha	Change Extent %	Rate of change △%
Agriculture	-690	-6.629	0.01	-1884	-19.383	0.01
Bare land	-147.8	-6.328	0.04	1813	82.904	0.05
Built-up	1284	103.927	0.08	2135	84.735	0.04
Mixed Forest	-1603	-53.919	0.03	-141	-10.292	0.07
Vegetation	1153	20.868	0.02	-1904	-28.498	0.01
Water Bodies	3.67	2.676	0.73	-19.59	-13.912	0.71

Source: (Own survey and computation, 2024)

Over the past years (2003–2023), the magnitude and directions of LULC change have become more dynamic. The net change for Agriculture, mixed forest, vegetation and water bodies are negative, with varying levels of deforestation and removal of vegetation during the first and second distinct study periods. This shows a heightened level of deforestation during these periods due to the expansion of built-up areas and agricultural land. Due to its small size, the water body did not show significant change, but the second and third periods marked a decline compared to the first period. Figure 4.6 below show change detection between 2003, 2013 and 2023 in study area.

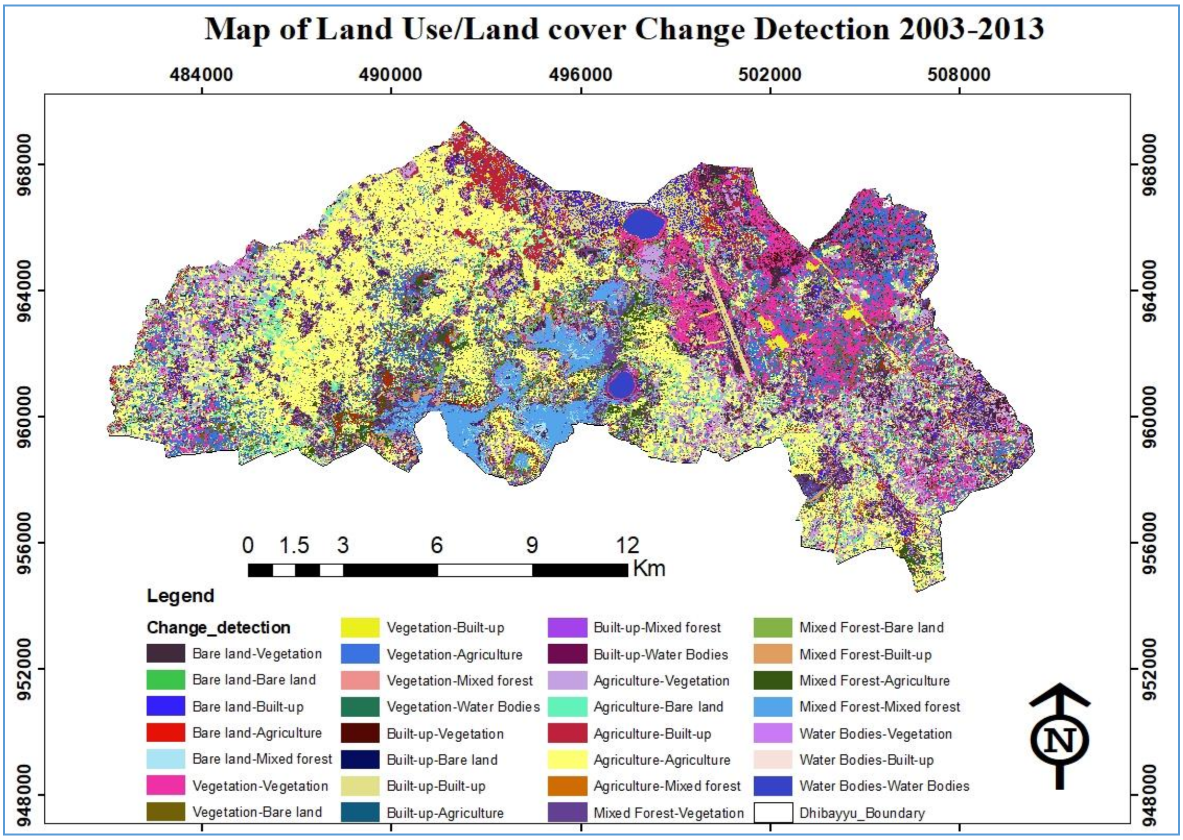

Figure 4.6: Magnitude and directions of LULC change each class changed to other land cover during 2003-2013

Rates and magnitudes of the LULC changes of Dibayu sub city were quantified based on results (areas) from the GIS and Landsat images-based classification of six (6) LULC classes during the three periods (2003, 2013 and 2023) accounted in by the study. The computation involved assessing the rate of Land Use and Land Cover (LULC) change for the intervals 2003-2013, 2013-2023, and 2003–2022. To illustrate the extent of changes during specified intervals, the magnitude of change was determined using the calculation outlined in Equation in previous chapter results illustrated in figure (from 4.6 to 4.9).

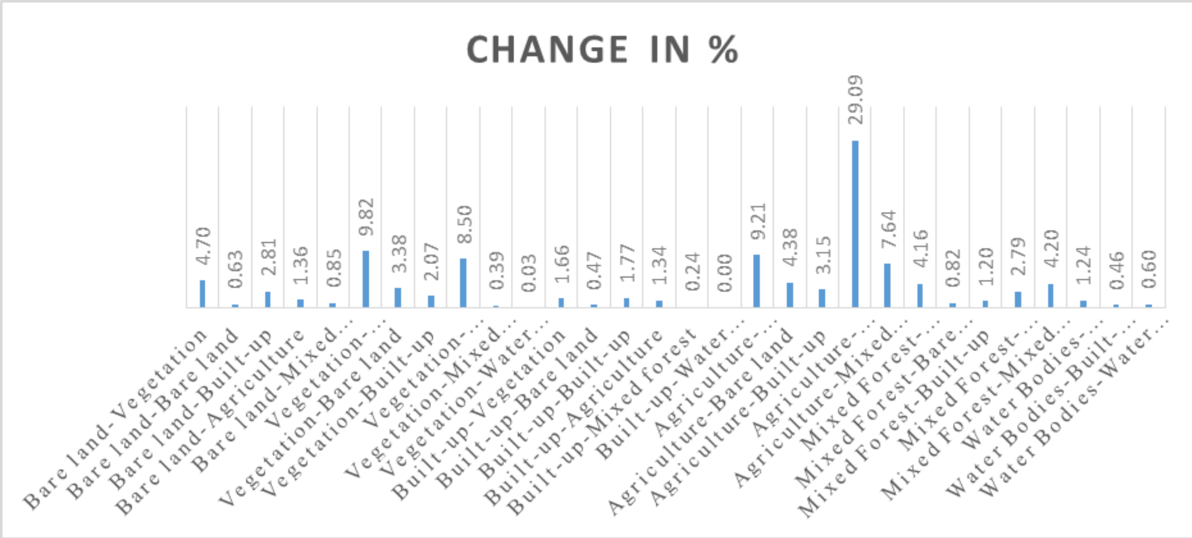

Figure 4.7: The percentage of Land use land cover change each class changed to other land cover during 2003-2013

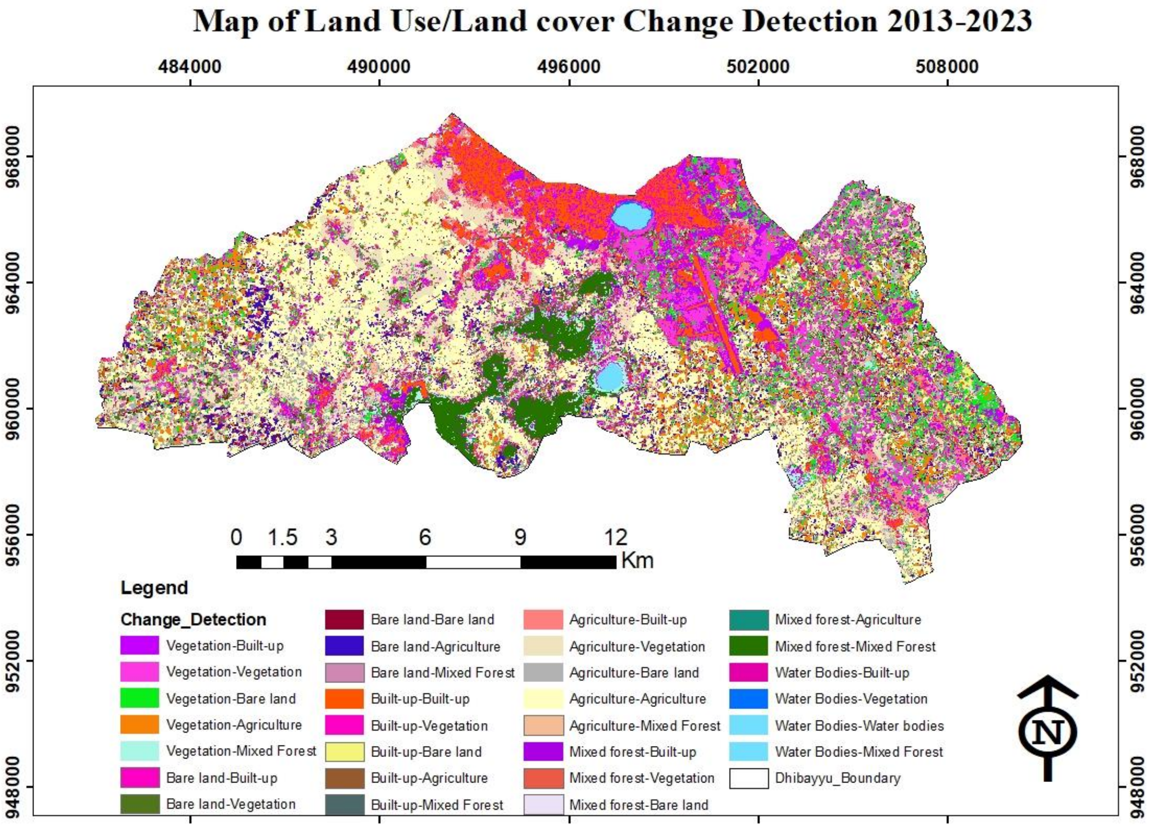

Figure 4.8: Magnitude and directions of LULC change each class changed to other land cover during 2013-2023

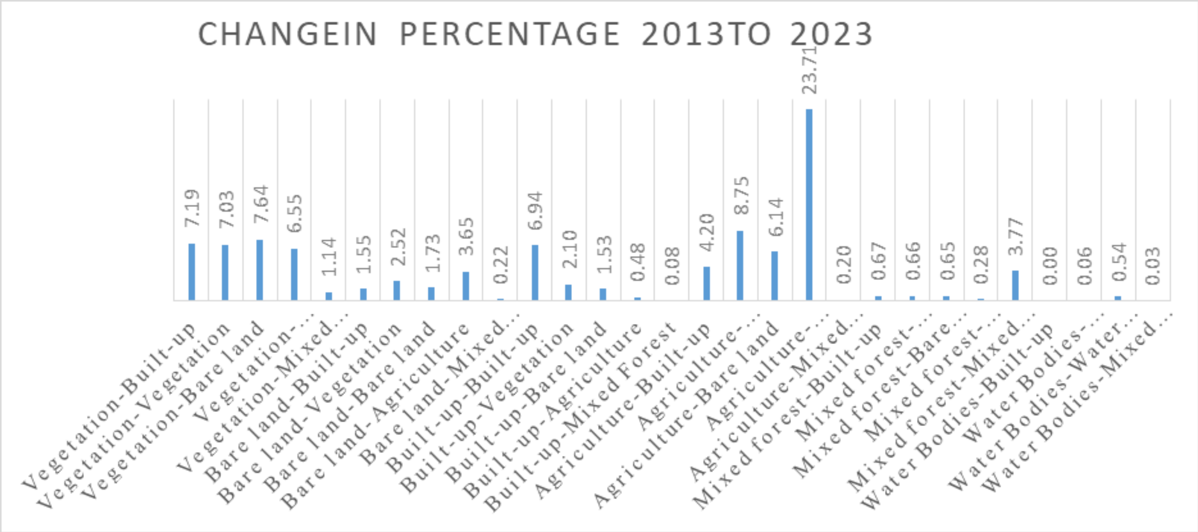

Figure 4.9: The percentage of Land use land cover change each class changed to other land cover during 2013-2023

Over the past years spatio-temporal of LULC of (2003-2023) the magnitude and directions of LULC change have become more dynamic. The net change for Agriculture and Vegetation is negative, with varying levels of deforestation and removal of vegetation during the first and second distinct study periods. This shows a heightened level of deforestation during these periods due to the expansion of settlements.

4.3. The Physical Manifestations of Urban Blight in the study area

Focusing on the most visible signs of urban blight, the study area clearly has numerous slums and deteriorating structures and infrastructure, which are evident indicators of urban decay. The general land use of the study area includes residential areas (both pure and mixed-use), commercial and business districts, administrative and service areas, environmental zones, manufacturing and storage facilities, and a network of roads and transportation infrastructure.

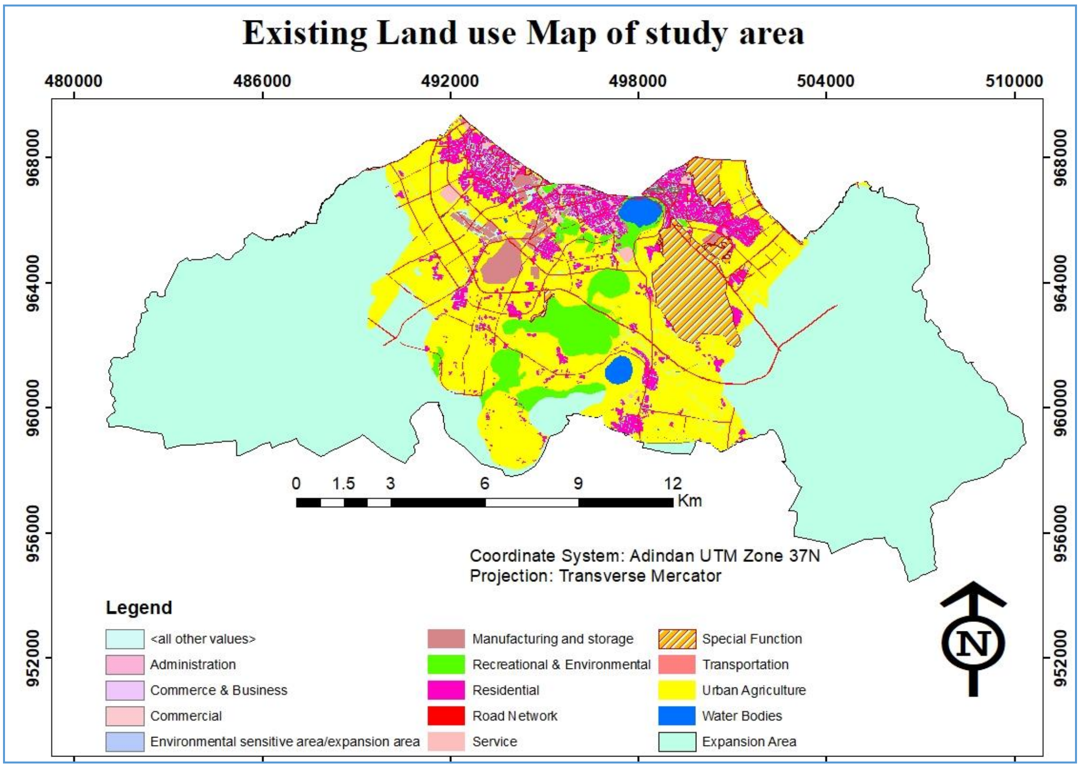

Figure 4.10: Existing land use map of Dibayu sub city and with newly merged expansion area.
Sources: Bishoftu City Administration, author analysis, 2024

Table 4.10: Area Coverage and percentage of land use occupied each class.

Existing land use	Area_ha	Area_sqm	Percentage %
Administration	30.995	309954	0.33
Commerce & Business	39.474	394744	0.42
Environmental sensitive area	3.271	32707.9	0.03
Manufacturing and storage	311.712	3117120	3.31
Residential	1179.390	11793900	12.51
Recreational & Environmental	893.493	8934930	9.48
Service	125.139	1251390	1.33
Special Function	885.391	8853910	9.39
Transportation	3.863	38631.1	0.04
Urban Agriculture	5266.610	52666100	55.86
Water Bodies	165.088	1650880	1.75
Road Network	524.005	5240050	5.56
Total	9428.432	94284317	100

Sources: Bishoftu City Administration, author analysis, 2024

4.3.1. Administration Blight Indicator

Table 4.10 it is approximately 30.99 hectares, or 0.33% of all land uses. This land use category's specifics include offices belonging to the government, nongovernmental organisations, law enforcement, correctional facilities, political parties, and courts. The special requirements for the establishment of governmental and non-governmental institutions should be examined on an individual basis, considering the unique characteristics of each institution. One of the general lands uses that should be identified during the assessment of the current land use situation in the city or town is administration. Workshops and industries shouldn't be situated close to or inside the grounds of administrative operations.

4.3.2. Commerce & Business Blight Indicator

The analysis of the commercial area includes centers, corridors, and residential zones. The land use survey results indicate two primary types of commercial sectors present in both the central business district and the outskirts. Table 4.10 reveals that commerce and business occupy 39.47 hectares, accounting for 0.42% of the total area. The commercial area is categorized into shops and supermarkets, hotels, bars, restaurants, banks and insurance, business centers, and general markets.

Current trends show that boulevards and corridors are the main hubs for business activity, even within the study area center. This suggests that more conveniently accessible locations might experience a surge in commercial activity. Such business development contributes to a vibrant street scene but also requires parking spaces, which are currently limited or non-existent.

4.3.3. Manufacture & Storage Blight Indicator

Two recognized current land uses are manufacturing and storage. According to Table 4.10, these uses occupy approximately 38.817 hectares, which constitutes about 0.47% of the town's land area. Scattered throughout the residential neighbourhood are several gypsum companies and warehouses, creating incompatible land uses. This indicates that the study.

4.3.4. Recreational & Environmental Blight Indicators

One of the recognized land use categories is environmental land use, which constitutes approximately 9.48% of all existing land use (Table 4.10). The predominant category within this is "green area," encompassing buffers, roadside greenery, nurseries, and mountain green frames. This category has significantly greater coverage compared to other environmental land use types. During the site investigation, note the presence of natural greenery, a nursery, and median trees, but the absence of roadside vegetation.

4.3.5. Residential Blight Indicator of the study area

Based on Table 4.10, residential land use in the city constitutes about 12.5% of the study area. This is significantly below the standard, which suggests that 40%–50% of the total land use area should be residential. Squatter settlements, characterized by dispersed housing units, inner-city slum houses, inadequate infrastructure, inaccessibility, and a lack of open spaces, have been identified at the periphery of several residential areas. Additionally, the review of the town's current land use revealed several incompatible uses. Furthermore, many residential areas are situated in environmentally sensitive locations, such as gorges and quarry sites, with insufficient open spaces, playgrounds, social services, and accessibility.

4.3.6. Social Service Blight Indicators

To provide essential services to both residents and non-residents, this sector includes a broad range of social, cultural, and municipal facilities and services, established at various levels across different locations within metropolitan areas. According to Figure 4.10 and Table 4.10, the land use category for social services covers 125.139 hectares, which constitutes approximately 1.33% of the study area's total land use. This allocation falls short of the established standard for social service land use. While most of these services are evenly distributed throughout the city, there are areas with incompatible land use.

4.3.7. Road Network, Transportation & Utilities Blight Indicators

The study areas lack arterial streets within its boundaries, resulting in an absence of primary thoroughfares to facilitate major traffic movement. Instead, the town relies on alternative connecting roadways that function as both collectors and distributors of traffic from various locations. Additionally, there are dirt roads that extend to rural areas. These dirt roads are composed of soil and are accessible only by foot.

The current road network suffers from several significant limitations. The standards and quality of the roads are poor, which severely restricts their capacity. Furthermore, there is a notable absence of pedestrian walkways, compromising safety and accessibility for those on foot. The situation is exacerbated by the encroachment upon and exploitation of the existing road space. These factors collectively hinder the efficiency and functionality of the town's road infrastructure. Refer to the figure below for a visual representation.

Figure:4.11: Different image show a Narrow road width less than 2m in the village

(Sources Photo taken by Aouthor, 2024)

4.4. An overview of the study area's current land use analysis

4.4.1. Drainage facility and status of study area.

The primary cause of the drainage issue in Dibayu sub-city of Bishoftu City is urbanization. This process alters the surface characteristics of the area without adequately integrating proper drainage systems. Urbanization leads to the modification of land surfaces, which significantly impacts the natural drainage patterns. The result is that many surfaces, such as roadways, rooftops, and compacted grounds, do not allow for proper water absorption, leading to increased surface runoff.

In Dibayu sub-city, the current drainage infrastructure is insufficient to manage this runoff effectively. Wastewater from inflow and distribution lines is directed into outflow sewers, which helps mitigate flood risks and prevents water stagnation in nearby stormwater catchment areas. This redirection generates a significant portion of the city's steam and sewage flows. However, the increased water velocity and volume from stormwater, which flows rapidly over impervious surfaces like roads and rooftops, pose a threat to local habitats by increasing erosion and other forms of environmental degradation.

One of the critical challenges facing Dibayu sub-city is the shortage of adequate drainage facilities. Most of the town's road networks lack proper drainage systems. Even the existing drainage lines do not meet the required standards for the area. This inadequacy leads to frequent flooding and waterlogging, as shown in Figure 4.12 below. This figure illustrates the substandard drainage infrastructure contributing to the city's drainage problems.

Figure 4.12 (a) village lack of drainage without /no drainage line used road as drainage. (b)drainage line blighted area(c) Partially Ditches filled with silt and solid wastes and rain water collected. (Source: photo by the author, 2024)

The current drainage system is significantly impaired, with many of the drainage lines clogged by solid debris or obstructed by various impediments. Consequently, these blockages cause water to accumulate and form stagnant ponds along the roadsides. These pools of standing water pose serious health risks to the residents who walk, work, and live in the vicinity, as they can become breeding grounds for disease-carrying insects and contribute to unsanitary conditions.

4.4.2. Waste Disposal and Urban Environment

Over the years, the urban landscape of the study area has witnessed a steady rise in population, a trend that has unfortunately led to a decline in its environmental quality. One noticeable aspect of this degradation is the sporadic functioning of vehicles designated for solid waste collection and disposal, primarily due to the inadequate state of the road infrastructure. Compounding this issue is the absence of trash bins at designated collection points within the village's municipality.

Figure:4.13. Solid Waste Disposed around road side and near residence.

(Source: photo by the author, 2024)

Consequently, residents are compelled to personally manage their waste disposal by gathering their garbage in bags or baskets, which they then transport to designated collection areas such as kebele 05 and 03, as illustrated in Figure 4:13. Failure to adhere to this system risks the municipality resorting to incinerating the waste independently.

This reliance on individual households to manage their waste, coupled with the absence of proper infrastructure and centralized waste disposal mechanisms, exacerbates the environmental challenges faced by our urban community.
Several issues have been pinpointed regarding the disposal of solid waste within the town. A prevalent concern is the scattered disposal practices adopted by the community, with waste being deposited haphazardly in various locations throughout the area. This erratic disposal pattern results in the accumulation of significant volumes of solid waste within the study area, posing critical environmental and health hazards.

Upon observation, it is evident that a substantial portion of the solid waste remains uncollected, as depicted in the image above. The lack of proper collection infrastructure exacerbates the problem, allowing waste to accumulate unchecked. Notably, the responsibility for waste disposal management primarily falls upon the municipality, with no active involvement from private sectors or other organizations.

This scenario underscores the urgent need for comprehensive waste management strategies and improved infrastructure to address the growing solid waste problem effectively. Collaboration between governmental bodies, private sectors, and community stakeholders is imperative to implement sustainable waste management practices and mitigate the adverse impacts of improper waste disposal on the environment and public health.

4.5. Environmental Condition of Study Area

4.5.1. Availability of Infrastructural Facilities in the Study Area.

Table 4.10 showcases the state of accessible infrastructure within the study area. According to feedback gathered from interviews, a significant portion, constituting 56.2% of total households, reported lacking access to improved sanitation facilities. However, a notable 43.8% of households indicated that they did have access to improved sanitation services within their vicinity. The presence of an urban drainage system is often indicative of the quality of roads. Analysis of Table 4.10 reveals that 55.1% of interviewed household heads reported the absence of drainage lines in their settlements, leaving them vulnerable to severe flooding. Additionally, 37.7% of homes lacked access to electricity, relying on alternative sources such as solar power or generators. Conversely, the majority, accounting for 62.3% of homes, had reliable access to electricity.

Regarding water facilities, 30.8% of households relied on wells, water merchants, or the water board for their water supply, whereas 69.2% had access to piped water. Waste management practices often fell short, with a significant number of residents resorting to roadside dumping and clogging drainages. Furthermore, a considerable 65.9% of houses faced accessibility issues due to poor road conditions, hindering waste management efforts. Only 34.1% of homes had accessible waste management services in the study area.

Notably, many homes with drainage systems were situated near busy roadways, leading to blockages in the drainage systems. Despite the apparent presence of infrastructure, observations suggest that 58% of sampled communities within the research area lack adequate neighborhood security measures. Moreover, a substantial portion of the areas surveyed lacked recreational amenities, as highlighted in Table 4.10. Specifically, 65.9% of respondents reported no access to recreational facilities, with only 31% enjoying access to open spaces or other recreational amenities within their vicinity.

This detailed analysis underscores the complex interplay between infrastructure accessibility, sanitation, drainage, electricity, water supply, waste management, road conditions, neighborhood security, and recreational amenities within the study area.

Table 4.11. Availability of Infrastructural Facilities in the Study Area.

	Available		Not Available	
Variable/ Infrastructure Facilities	Frequency	Percentage	Frequency	Percentage
Access to improved sanitation	121	43.8%	155	56.2%
Drainage, Sewer system	124	44.9%	152	55.1%
Electricity	172	62.3%	104	37.7%
Health services	110	39.9%	166	60.1%
Neighbourhood security	116	42.0%	160	58.0%
Recreational facilities/Open space	94	34.1%	182	65.9%
Road street, Pedestrian	75	27.2%	201	72.8%
Solid waste management	94	34.1%	182	65.9%
Water Facilities	85	30.8%	191	69.2%

(Source: own calculation in SPSS and organized by the author, 2024)

4.5.2. Conditions of Infrastructural Facilities in the Study Area.

In Table 4.11, a comprehensive overview of the physical infrastructural conditions is presented, revealing a spectrum ranging from fair to poor. The scale of "very good" denotes facilities in an exemplary state, exhibiting minimal wear or deterioration. Notably, various aspects such as roads, streets, pedestrian lanes, electricity, and nearby health services fall within this category, with percentages of 35.5%, 23.9%, and 20.7%, respectively. These elements are characterized by their excellent condition, ensuring efficient functionality and displaying few signs of wear.

Conversely, facilities categorized as "Good" indicate a satisfactory condition, albeit with minor issues that do not significantly impair their functionality or appearance. However, it is noteworthy that a portion of these facilities either function inadequately or are non-operational altogether. Among the most prominent challenges observed are the accessibility to improved sanitation, road facilities, drainage lines, and water facilities. These infrastructural components represent critical areas of concern, indicating the pressing need for improvement and addressing the associated challenges effectively.

Table 4.12. Conditions of Infrastructural Facilities in the Study Area

	Facilities Conditions by Percent %)				
Variables/Facility	Very Good	Good	Bad	Very Bad	Total
Access to improved sanitation	17.8	18.5	31.5	32.2	100.0
Drainage, Sewer system	14.5	25.0	31.5	29.0	100.0
Electricity	23.9	14.9	34.1	27.2	100.0
Health services	20.7	17.4	32.6	29.3	100.0
Neighbourhood security	26.8	12.3	29.0	31.9	100.0
Recreational facilities/Open space	19.1	29.0	28.3	23.6	100.0
Road street, Pedestrian lane	35.5	27.2	17.0	20.3	100.0
Solid waste management	21.4	24.3	33.7	20.7	100.0
Water Facilities	18.5	16.3	32.6	32.6	100.0

(Source: own calculation in SPSS and organized by the author, 2024)

4.5.3. Safety Perception of social cohesion and community resilience in addressing urban challenges.

The data depicted in graph figure 4.12 delineates the distribution of safety ratings among the surveyed individuals, reflecting their assessments of safety within their environments. The ratings span across a spectrum from "Very Safe" to "Very Unsafe."

Starting with the positive end of the spectrum, 12% of respondents regarded their surroundings as "Very Safe," indicating a segment of the population perceiving exceptionally high levels of safety. In contrast, only 11% rated their environment as "Safe."

Moving towards the middle ground, a substantial 25% of participants categorized their safety perception as "Moderate," suggesting a balanced perspective on safety conditions.

The average safety perception score, calculated from responses to interview questions, stands at 3.42, indicating a moderately positive overall outlook on safety among the respondents.

However, there are concerns raised by the combined 28% of individuals who rated their safety as "Unsafe" and the 21% who deemed it "Very Unsafe." These figures underscore potential safety hazards or risks within the assessed areas. It's noteworthy that a significant proportion of respondents expressed lower safety ratings, indicating areas that might necessitate attention in terms of security enhancements, infrastructure upgrades, or community policing efforts. This data signals areas of potential vulnerability that warrant proactive measures to ensure the safety and well-being of resident.

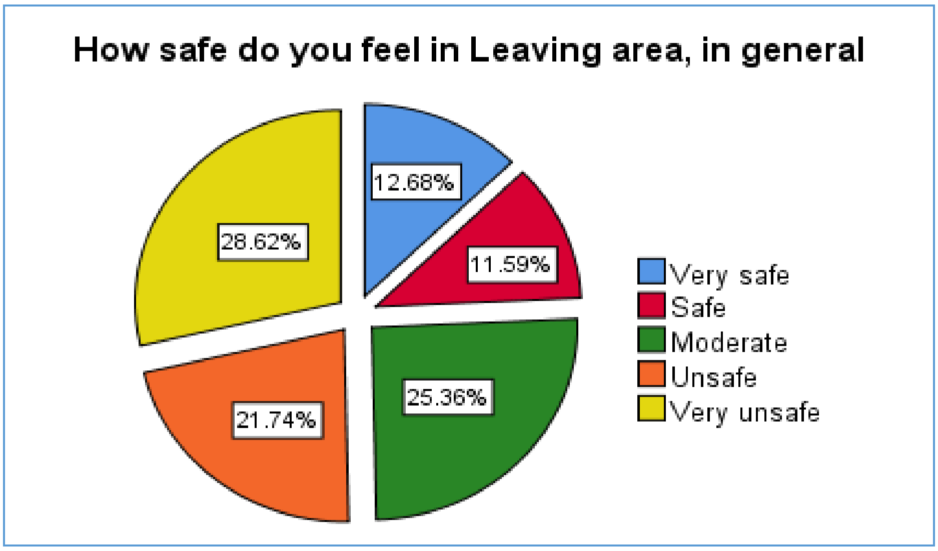

Figure 4.14. Safety perception of neighbourhood in study area.

Source (Source: own calculation in SPSS and organized by the author, 2024)

The examination of safety ratings presents a comprehensive spectrum of safety perceptions, spanning from very safe to very unsafe. This spectrum signifies a range of positive evaluations alongside areas of significant concern regarding safety conditions. Within the study area, employing data-driven methodologies, engaging the community in safety endeavors, and implementing targeted measures based on these findings can facilitate the establishment of environments that prioritize safety and security for all involved parties.

In analyzing the responses of participants who expressed feeling less safe within the city, Figure 4.15 visually depicts the distribution. The findings suggest that certain locales within the study area evoke heightened feelings of insecurity. Specifically, respondents identified areas such as under bridges or underpasses (23.6%), convenience stores (22.1%), and locations within construction zones (17.8%) as notably less safe. Conversely, places perceived as safer within the study area include public parks and greens (13.4%), sidewalks (8.3%), and alleys (9.1%).

Moreover, additional responses highlighted other locations within the study area deemed to be safe havens. These include libraries, fire stations, public buses, various businesses, and social service facilities. By acknowledging these insights and actively addressing the concerns raised, stakeholders can collaboratively work towards fostering safer environments that enhance the well-being and security of all community members

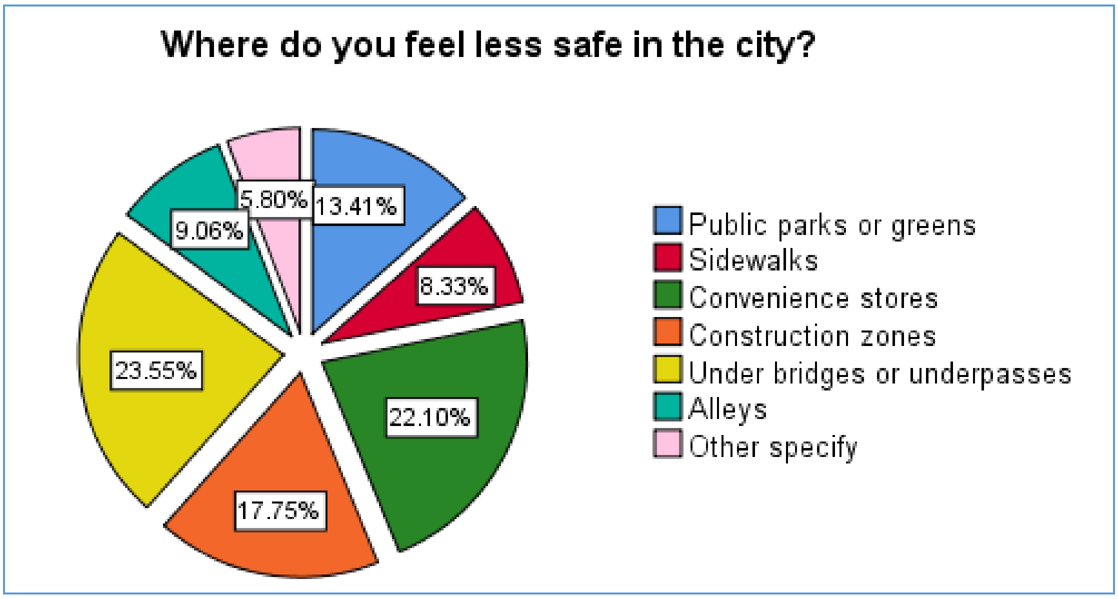

Figure 4.15. a place where less feeling for safety perception of neighbourhood.

Source (Source: own calculation in SPSS and organized by the author, 2024)

4.5.4. Measurement taken to improve safety in areas affected by urban blight

Enhancing safety in urban blight-affected areas necessitates a comprehensive strategy that tackles the myriad factors influencing both the physical environment and social dynamics. Delving into the question, "What measures could be implemented to enhance safety in areas grappling with urban blight?" reveals insightful analysis.

One prominent approach involves bolstering law enforcement presence and fostering community policing initiatives to combat crime and address safety apprehensions proactively. This entails deploying more police personnel and encouraging collaborative efforts between law enforcement agencies and local communities to address safety concerns effectively.

Findings from the analysis underscore the significance of increased community involvement and the establishment of neighbourhood watch programs, with a notable 24.6% of respondents advocating for these measures. Such initiatives empower residents to actively participate in safeguarding their communities, fostering a sense of ownership and collective responsibility for safety.

Conversely, measures aimed at improving street lighting received relatively less support, garnering only 11.5% agreement among respondents. While enhanced illumination can undoubtedly contribute to improved safety by deterring criminal activities and enhancing visibility, its perceived efficacy might be overshadowed by other pressing concerns or perceived barriers.

These insights are visually represented in Figure 4.16, where the distribution of responses underscores the varying degrees of support for different safety enhancement measures. By understanding the preferences and priorities of stakeholders, policymakers and urban planners can devise targeted interventions tailored to the specific needs and circumstances of blight-affected areas, thereby fostering safer and more resilient communities.

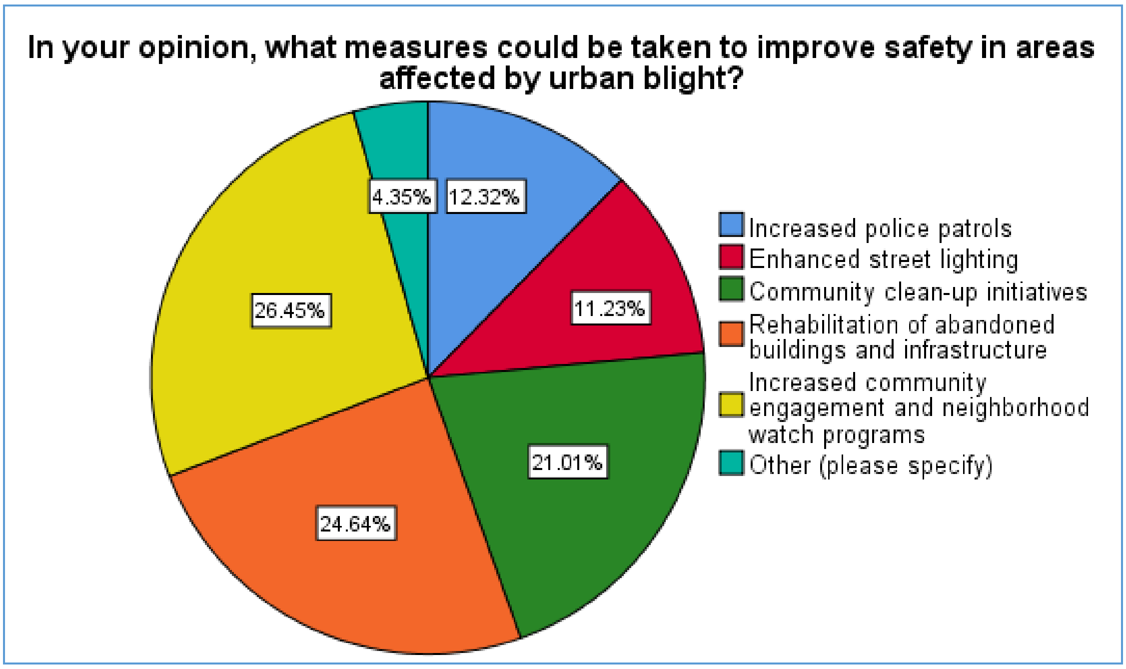

Figure 4.16. safety perception measurements take to improve safety in area affected.

Source (Source: own calculation in SPSS and organized by the author, 2024)

4.5.5. City and neighbourhood

A hallmark of an exceptional neighborhood is the vibrant tapestry of community spirit interwoven among its residents. Imagine residing in a locale where warm interactions with neighbors, frequent community gatherings, and shared public spaces are the norm. Such an engaged community fosters a profound sense of belonging, making every individual feel valued and connected.

When evaluating the appeal of a city or neighborhood, various criteria come into play. Safety, affluence, aesthetics, livability, and the availability of amenities like cycling infrastructure and public transportation are among the factors considered. These metrics shape perceptions of the urban environment and influence residents' quality of life.

In a recent survey depicted in Figure 4.17, participants rated different attributes of their city on a scale from 1 to 5, with 1 indicating minimal satisfaction and 5 representing complete fulfillment. Notably, a significant portion of respondents expressed confidence in the safety of their city, with 22.83% giving it the highest rating. Conversely, only 3.99% of respondents deemed the city adequately cycling-friendly, signaling a deficiency in infrastructure tailored to cyclists' needs.

The disparity in ratings underscores the importance of accommodating alternative modes of transportation, such as cycling, within urban landscapes. Dedicated cycling lanes and amenities play a pivotal role in promoting sustainable mobility and enhancing public transit accessibility for individuals of all ages and abilities.

In essence, the provision of cyclist-friendly infrastructure not only facilitates safe and convenient travel but also contributes to the overall livability and inclusivity of a community. By prioritizing the development of such amenities, cities can cultivate environments where residents thrive and feel truly at home

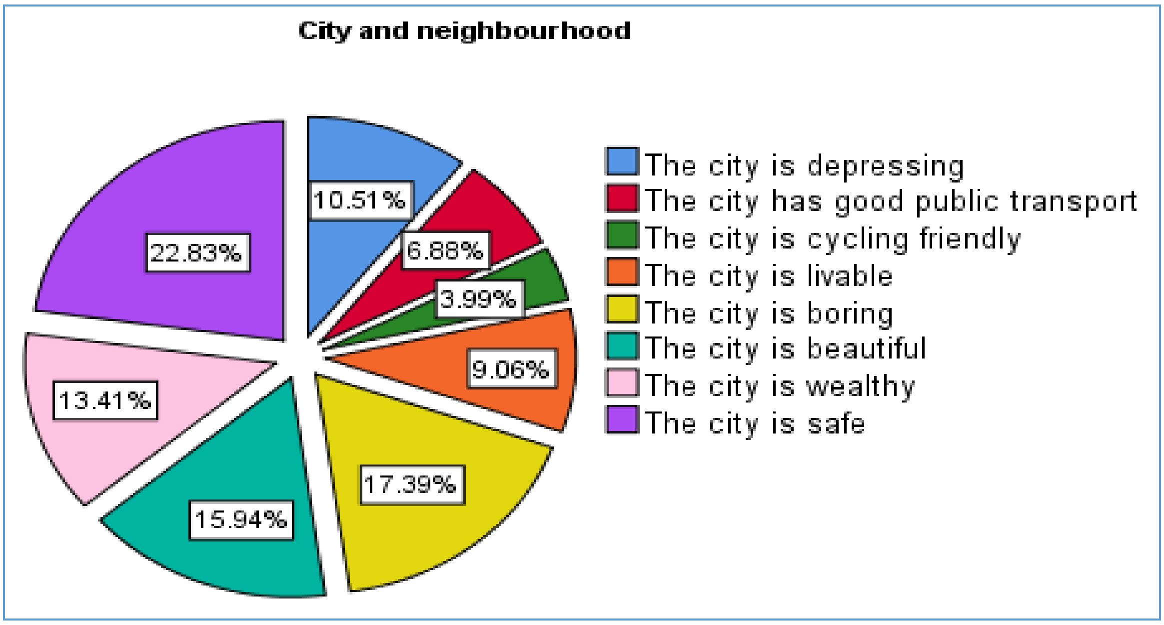

Figure 4.17. The evaluation criteria of city and neighborhood.

Source (Source: own calculation in SPSS and organized by the author, 2024)

4.6. Socio-economic blight indicators

4.6.1. Tenure status in the study area

Table 4.13. provides a comprehensive overview of the tenure status of houses occupied within the study area, offering insights into the housing preferences of the respondents.

Table 4.13. Tenure Status on the House occupied

Tenure status	Frequency	Percentage
Private	45	16.3
kebele house	48	17.4
Landlord	53	19.2
leasehold	61	22.1
Tenant	69	25.0
Total	276	100.0

Source: Author's Fieldwork and computation, 2024

Private tenure, constituting 16.3% of the respondents, signifies individuals who possess outright ownership of their homes. Meanwhile, the category of Kebele house tenure representing 17.4% of respondents, indicates those residing in government-owned or subsidized housing units. Additionally, Landlord tenure encompassing 19.2% of respondents denotes individuals renting their homes from a landlord, while Leasehold tenure, accounting for 22.1% of respondents, signifies those holding lease agreements for their residences.

Remarkably, Tenant tenure emerges as the most prevalent category, comprising 25.0% of respondents, indicating individuals who rent their homes from a private entity or organization.

In summary, the data underscores the diverse tenure arrangements within the study area, with a notable emphasis on tenant arrangements, followed closely by leasehold and landlord tenures.

4.6.2. Type of building occupied

The findings from the field survey, as illustrated in Table 4.14, reveal significant insights into the housing landscape of the study area. According to the data, a substantial portion of respondents, constituting 26.8%, reside in bungalows. Additionally, 25.4% of participants reported living in multiple row housing, low rise buildings, and semidetached structures, with 18.8% and 20.3% distributed among these categories, respectively. Moreover, a noteworthy 8.7% of respondents inhabit alternative housing arrangements, such as small size dwelling units.

Table 4.14. Type of Building Occupied by Respondents

	Type of Building	Frequency	Percentage
Valid	Bungalow	74	26.80%
	Low-rise	70	25.40%
	Multiple row	52	18.80%
	Semi-detached	56	20.30%
	Other specify	24	8.70%
	Total	276	100

Source: Author's Fieldwork and computation, 2024

These statistics underscore the prevalent architectural preference within the examined study area, highlighting the bungalow as the dominant housing type.

4.7. Condition of Housing

Only the chosen dwelling components were taken into consideration while evaluating the state of the structures in the study area. These are covered in the next subsection.

4.7.1. Age of building

Table 4.15 provides a comprehensive depiction of how the housing conditions of specific residents are influenced by the age of the structures they inhabit. Within the research area, a diverse range of building ages was observed. Notably, structures aged between 40 to 50 years constituted a significant portion, encompassing 33.3% of the population. Conversely, newer constructions, less than a decade old, represented a smaller proportion, accounting for merely 11.6% of the total populace.

Furthermore, it was revealed that a substantial portion, totalling 39.10% of the respondents, resided in buildings classified as older, falling within the age bracket of 20 to 30 years. Additionally, 15.9% of the participants inhabited structures aged 50 years or older. These statistics indicate a prevailing prevalence of older buildings within the study area, suggesting potential implications for housing quality and infrastructure.

The predominance of older structures raises concerns regarding the overall condition and adequacy of housing within the community. It underscores the likelihood of encountering issues related to maintenance, safety, and modern amenities. This data highlights the pressing need for interventions aimed at improving housing standards and addressing the challenges associated with aging infrastructure in the study area.

Table 4.15. Age of Buildings in the study area

	Age of buildings	Frequency	Percent
Valid	Below 10 years	32	11.60%
	20-30 years	108	39.10%
	40 -50 years	92	33.30%
	50 years and above	44	15.90%
	Total	276	100.00

Source: Author's Fieldwork and computation, 2024

The overall conditions and overall age categorized of residential in study area are illustrated in figure 4.18 below.

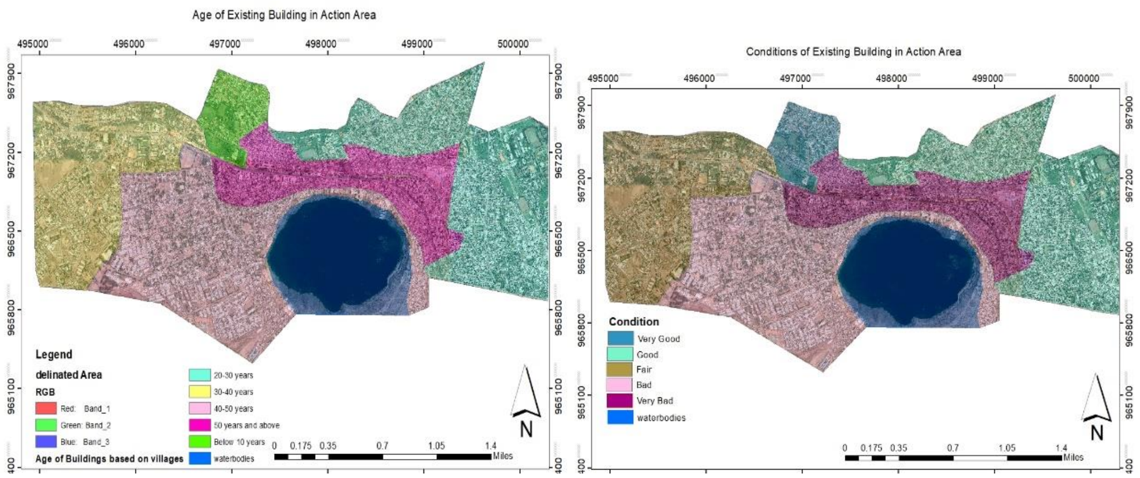

Figure 4.18: Overall Existing building condition residence in study area.

4.7.2. Types and condition of wall

The findings presented in Table 4.17 provide detailed insights into the composition of building walls within the study area. Notably, 31% of the total building walls surveyed were constructed using painted bricks—a time-tested method for enhancing a home's exterior without the need for masonry replacement. This approach has remained enduringly popular, as certain brick styles have proven to be timeless, while others have fallen out of fashion more swiftly.

Interestingly, a significant portion of homeowners opted for a solid field color for their residences, preferring this uniform aesthetic over the natural variations inherent in brick construction. Stone walls accounted for another substantial portion, comprising 28.6% of the total. However, it's crucial to note the vast disparity in the quality of building stone, ranging from its durability against weathering and water penetration to its amenability to shaping during construction.

Moreover, the data reveals that 25.7% and 14.1% of the building walls were constructed using tiles and marble, respectively, showcasing the diverse range of materials utilized in the study area. Despite these options, some walls, particularly those painted and plastered, exhibited signs of aging and roughness, detracting from the overall aesthetics of the housing landscape. Consequently, there's a clear imperative for modernization efforts to address these visual concerns and maintain the appeal of residential properties within the community.

Tale 4.16: Condition (types) of wall in study area

	Type of wall	Frequency	Percentage (%)
Valid	Stone	79	28.6
	Brick	87	31.5
	Tile	71	25.7
	Marble	39	14.1
	Total	276	100.0

Source: Author's Fieldwork and computation, 2024

4.7.3. Type of floor and its condition

The findings outlined in Table 4.17 illuminate the predominant materials utilized for flooring, with concrete emerging as the most prevalent, constituting 47.8% of floors surveyed. In contrast, marble accounted for the lowest percentage at 14.5%. Tiled flooring represented 22.5% of the sampled floors, while a mere 15.2% opted for bare flooring.

However, despite the prevalence of certain materials, it's crucial to acknowledge that some floors exhibited deficiencies, notably in terms of structural integrity, resilience to environmental factors like weather and moisture, and overall durability. Instances of cracking were observed in certain buildings, compromising their functional adequacy.

Undoubtedly, floors play a pivotal role in the integrity of a building, serving as the foundation upon which occupants, furniture, and various equipment are supported. Therefore, it's imperative that floors are not only robust but also devoid of maintenance issues, ensuring a stable and safe environment for building occupants and assets alike..

Table 4.17. Types of floor and conditions

	Type of floor	Frequency	Percentage (%)
Valid	Bear floor	42	15.2
	Concrete	132	47.8
	Marble	40	14.5
	Tiled	62	22.5
	Total	276	100.0

Source: Author's Fieldwork and computation, 2024

4.7.4. Condition of windows

The research findings unveiled a comprehensive picture of the window conditions within the study area. Among the surveyed windows, it was observed that a significant proportion, specifically 59.4%, remained intact, showcasing the durability and maintenance of a considerable portion of the housing infrastructure. However, a notable 29% of the windows exhibited signs of damage, either being cracked or broken, suggesting potential issues in structural integrity or maintenance neglect.

Moreover, an intriguing aspect highlighted by the study was the absence of windows in a noteworthy 11.6% of the surveyed properties. This absence not only signifies a deficiency in the basic architectural elements crucial for ventilation, natural light, and overall comfort but also hints at underlying socioeconomic challenges that may hinder proper housing conditions.

The absence of windows in these homes led inhabitants to resort to makeshift alternatives such as mats, sacks, or even sheets of corrugated iron to fill the void. This makeshift solution not only reflects the resourcefulness of the residents but also underscores the pressing need for improved housing infrastructure and support systems to address such deficiencies effectively.

Table 4.18: Conditions of windows

	Condition of Window	Frequency	Percentage (%)
Valid	Cracked/Broken	80	29.0
	Intact	164	59.4
	Removed	32	11.6
	Total	276	100.0

Source: Author's Fieldwork and computation, 2024

4.7.5. Condition of housing facilities

The findings of the study highlight significant issues pertaining to the accessibility and condition of buildings within the study area. Analysis revealed that a concerning 28.6% of the buildings suffered from poor access to open space, indicative of their deteriorated state. Conversely, a mere 15.9% exhibited satisfactory access. This stark contrast suggests a glaring deficiency in the provision of open or airy spaces between structures, with nearly half (41.7%) of the buildings lacking adequate structural integrity.

Further examination of the buildings' conditions, as depicted in Table 4.18, unveiled a prevalent trend of fair to poor states. Notably, the state of toilets and kitchens within these buildings emerged as particularly dire, with many found to be in critical condition. Interestingly, despite being situated within the compounds, these essential facilities often presented significant maintenance challenges.

The mean value, as illustrated in Table 4.19 , indicates an overall average mean of 2.85, with individual mean values ranging between 2.65 and 3.17. This collective assessment underscores the prevailing poor housing circumstances experienced by the majority of participants, spanning from bad to fair, as depicted in the accompanying table.

Table 4.19. Housing facility in study area

Housing Facility	Conditions by %				Statistics	
	Very Good	Good	Fair	Bad	Mean	Std. Deviation
Structure	21.0	8.0	29.3	41.7	2.92	1.155
Finishing	17.8	13.0	23.9	45.3	2.97	1.139
Aesthetics	19.2	19.9	30.1	30.8	2.72	1.097
Open space	15.9	28.3	27.2	28.6	2.68	1.054
Toilet	10.5	17.8	28.6	43.1	3.04	1.015
Kitchen	12.3	15.9	14.1	57.6	3.17	1.097
Water supply	13.4	22.8	26.4	37.3	2.88	1.061
Electricity	24.6	23.2	9.8	42.4	2.70	1.248
Material used	14.1	34.1	24.6	27.2	2.65	1.029
				Mean Average	***2.85***	

Source: Author's Fieldwork and computation, 2024

The depicted sample area serves as a stark illustration of the substandard conditions prevalent within its premises. The state of the toilets is particularly distressing, exhibiting signs of neglect and disrepair. The building itself is in dire need of attention, with evident deficiencies in its infrastructure. Furthermore, the absence of adequate electricity supply compounds the challenges faced by the inhabitants, while the inadequacies in the road infrastructure further exacerbate their plight. These issues, among others, are graphically depicted in Figure 4.20, highlighting the pressing need for comprehensive intervention and improvement initiatives within the area.

Figure: 4.19. Bad housing condition in different site of study area.

4.8. Causes of Urban Blight

The investigation into the causes of urban blight in the study area employed mean score analysis as its primary method of evaluation. This analytical approach aimed to delve into the underlying factors contributing to the deterioration of urban areas. Nine distinct criteria were meticulously selected to assess these causes comprehensively. These criteria encompassed a wide spectrum of issues, ranging from migration patterns to governmental policies and societal challenges. The criteria included high incidences of rural or urban-urban migration, lack of planning or development plan, inadequate neighborhood facilities and services, lack of affordable housing, housing shortages, eviction and poor resettlement programs by the government, poor enforcement of planning laws, high incidences of urban poverty, and high density of development and overcrowding.

Through the application of mean score analysis, the investigation revealed intriguing insights into the hierarchy of factors contributing to urban blight. Notably, high incidences of rural or urban-urban migration emerged as the most significant contributor, garnering the highest mean score of 3.855. This underscores the pivotal role migration dynamics play in shaping urban landscapes and their subsequent decay. Following closely behind was the lack of planning or development plan, which obtained a mean score of 3.580, shedding light on the repercussions of inadequate urban planning strategies. Conversely, factors such as high density of development and overcrowding were deemed less influential, occupying the lower end of the spectrum with a mean score of 2.761.

Table 4.20. served as a visual representation of these findings, offering a concise summary of the ranked criteria and their corresponding mean scores. The tabulated data not only facilitated a clearer understanding of the relative importance of each factor but also provided a basis for informed decision-making in urban planning and policy formulation. Furthermore, the average mean score for all identified causes of urban blight amounted to 2.844, signifying a statistically significant impact. This collective assessment underscores the multifaceted nature of urban blight and the imperative need for holistic interventions to address its root causes effectively.

Table 4.20. Causes of urban blight significant levels

Causes of urban Blight	N	MS	VS	S	IS	VIS	Statistics		
		5	4	3	2	1	Mean	Std. Deviation	Rank
High incidences of Rural or Urban-Urban Migration	276	46.0	25.7	6.5	11.2	10.5	3.855	1.381	1
Lack of planning /development plan	276	38.0	26.4	6.5	13.4	15.6	3.580	1.488	2
Inadequate neighbourhood facilities and services	276	33.0	20.7	10.9	22.1	13.4	3.377	1.466	3
Lack of affordable housing	276	29.0	17.8	12.3	22.1	18.8	3.159	1.515	4
Housing shortage	276	25.7	18.8	10.5	23.9	21.0	3.043	1.518	5
Eviction and poor resettlement program by the government	276	23.9	12.7	11.2	31.9	20.3	2.880	1.486	6
Poor enforcement of planning law	276	25.0	13.4	9.8	27.5	24.3	2.873	1.540	7
High incidences of urban poverty	276	23.9	14.1	8.7	25.0	28.3	2.804	1.565	8
High density of development and overcrowding	276	22.5	12.0	10.1	30.1	25.4	2.761	1.511	9
Valid N (listwise)	276					***Mean Average***	***2.844***		

Source: Author's Fieldwork and computation, 2024

In conclusion, the utilization of mean score analysis provided a robust framework for evaluating the complexities of urban blight within the study area. By systematically assessing nine key criteria, ranging from migration patterns to housing dynamics, the investigation delineated the intricate web of factors contributing to urban decay. Through meticulous analysis and interpretation of the data, policymakers and urban planners can devise targeted interventions aimed at mitigating the adverse effects of urban blight and fostering sustainable urban development.

4.8.1. Overall Main problems, cause and effect on infrastructure and natural environment

The main problems, causes and effects on infrastructure and natural environment selected. Those are; road networks and pedestrian path, drainage system, water supply, sewer, system, solid waste management and Natural, environment and vegetation are summarized below table 4.21.

Table 4.21: Main problems, cause and effect on Infrastructure and natural environment

Service /infrastructure	Main problems	Causes	Effects
Road networks and Pedestrian path	Potholes (road imperfection) and Inadequate for the population	Lack of maintenance and Increased population	Traffic congestion
Drainage system	Stagnant water Dirty environment	Blockage of the drainage system -Poor maintenance -Population pressure	Breeding of disease-causing organisms -Air and soil pollution -Loss of aesthetic value
Water supply	Inadequate water supply	Vandalism of water pipes -Increased population	Poor sanitation -Unnecessary expenses buying water
Sewer system	Blockage of sewer system -Bursting of sewer pipes	Population pressure -Poor maintenance	Diseases -Air pollution -Loss of aesthetic value
Solid waste management	Dumping of solid waste anywhere and everywhere	No regulations concerning solid waste management Increased population	-Loss of the aesthetic value of the area -Attracting birds and rats -Can lead to diseases
Natural, environment and vegetation	Long shrubs and grasses	Lack of maintenance	Increased insecurity -Loss of aesthetic value

Sources own filed survey and site observation (respondents' response),2024

4.8.2. Community and social facilities

The research findings reveal a concerning trend regarding the state of community facilities and services, suggesting that a significant portion are currently in subpar conditions, while some are entirely absent within local communities. A detailed examination showcases deteriorating conditions across various sectors, including schools, healthcare facilities, recreational spaces, social and sporting venues, and religious institutions. This degradation is attributed to several factors, notably inadequate maintenance efforts from both the City County Government and the community itself. Additionally, the strain on these facilities intensifies due to the burgeoning population, insufficient human resources in administrative roles, and the rising cost of living.

The decline in the condition of these community assets is not static but rather demonstrates a negative trajectory over time. This progressive deterioration is particularly evident in the realms of academia, where poor facility conditions translate into compromised educational outcomes. Moreover, the aesthetic appeal of the environment suffers as a consequence of neglected infrastructure, impacting the overall quality of life for residents. The interconnectedness of these issues amplifies the challenges faced by individuals within these communities, leading to a cycle of underperformance and diminished living standards.

At the heart of these challenges lies a pressing need for comprehensive intervention strategies to address the root causes of facility degradation. Efforts must be directed towards enhancing maintenance practices, bolstering administrative capacities, and mitigating the strains imposed by population growth and economic factors. By fostering collaboration between local authorities, community stakeholders, and relevant institutions, it becomes possible to formulate sustainable solutions that not only arrest the decline of community facilities but also cultivate environments conducive to learning, recreation, and social cohesion.

Furthermore, addressing the systemic issues contributing to facility deterioration requires a multifaceted approach that integrates policy reforms, resource allocation adjustments, and community engagement initiatives. Investing in the upkeep and expansion of essential amenities not only safeguards the well-being of current residents but also lays the groundwork for future generations to thrive. Through concerted action and collective responsibility, communities can reclaim the vitality of their shared spaces, fostering resilience, and prosperity for all members.

4.9. The reaction of residents to urban decay

4.9.1. Reactions of residents to control blight

In the past, urban blight served a rational and hierarchical purpose within urban landscapes. However, contemporary urban blight is characterized by structural and functional deficiencies. In the city of Bishoftu, this decay typically stems from social or political deterioration, as well as a lack of interest and neglect in certain areas.

Research findings indicate that residents of the studied areas perceive various strategies to address urban blight. The majority (29%) believe that maintaining infrastructure services is crucial, while 7.2% suggest engaging in urban agriculture to supplement household incomes. Additionally, 23.6% advocate for implementing city initiatives, and 28.3% emphasize the importance of household-level solid waste management. Surprisingly, only 5.4% of residents believe that unity among residents would effectively combat urban decay. Conversely, reporting to the City County Government reflects a lower emphasis (6.5% of the total) on addressing urban blight. These findings are summarized in Table 4.22 below

Table 4.22: Reaction of residents to control Urban Decay

Reaction of residents to control Urban blight		Frequency	Percentage
Valid	Undertake maintenance of the infrastructure facilities	80	29.0
	City initiative for security purposes	65	23.6
	Managing solid waste at household level	78	28.3
	Urban agriculture to supplement House hold budget	20	7.2
	Unity among the residents	15	5.4
	Reporting to the City County Government	18	6.5
	Total	276	100.0

Sources own filed survey and site observation, 2024

Based on the data presented in the table above, it becomes evident that a significant portion of residents tend to respond solely to issues directly affecting their own living space, rather than engaging with broader neighborhood concerns. Furthermore, a compelling inference can be drawn from this observation: a considerable number of individuals appear to perceive their residence as a necessity borne out of limited alternatives, likely due to their lower income levels, coupled with a diminished sense of attachment to the community.

4.9.2. Urban plan Solutions of urban decay according to the resident's social cohesion, and promotes local economy

Table 4.23 provides an overview of respondents' suggestions for combating urban decay in a specific study area. The table outlines four main solutions: redevelopment, upgrading, comprehensive renovation, and rehabilitation. Among these, redevelopment was recommended by 29 respondents, constituting 10.5% of the total responses. Upgrading emerged as the most popular choice, with 114 respondents, representing 41.3% of the total, advocating for it. Comprehensive renovation garnered support from 67 respondents, making up 24.3% of the total responses, while rehabilitation was endorsed by 66 respondents, comprising 23.9% of the total. In total, 276 responses were recorded, reflecting the collective input from the respondents. A primary purpose of urban renewal is to restore economic viability to a given area by attracting external private and public investment and by encouraging business start-ups and survival. It is controversial for its frequent use of slum clearance.

The main goals of urban Upgrading (renewal) are economic, social, and environmental revival. It is important to start with large projects as they have a significant impact on subsequent projects. Some of the major renovation projects include foundation fix, roof replacement or repair, siding and window repair, and stopping water infiltration. The rehabilitation of city areas by renovating or replacing dilapidated buildings with new housing, public buildings, parks, roadways, industrial areas, etc., often in accordance with comprehensive plans. Public building type of construction includes extensions, demolitions and building constructions. Some residents of the study area buildings felt that upgrading of drainage, sewer system and the dwelling units would solve the decay. Others wished that the area would be redeveloped completely while some residents felt that comprehensive renovation should be carried out.

Table 4.23: Suggested solutions to urban decay in study area by respondents

Suggested solutions to urban blight		Frequency	Percent
Valid	Redevelopment	29	10.5
	Upgrading	114	41.3
	comprehensive renovation	67	24.3
	Rehabilitation	66	23.9
	Total	276	100.0

Sources own filed survey and site observation, 2024

4.10. Urban Blight index

The urban blight index serves as a key tool in understanding the comprehensive definition of blight. It establishes the criteria by which an area can be classified as blighted, based on the presence of specific indicators. In this context, the study focuses on census block groups as the suitable geographical unit for assessing the extent of blight. By analyzing these block groups, researchers aim to ascertain the threshold of blight indicators necessary to classify an area as blighted. This approach enables a thorough examination of the level of blight within the study area, providing valuable insights into the broader phenomenon of urban decay.

4.10.1. Physical Urban Blight indicators

Physical markers of urban blight, encompassing degradation, abandonment, and underinvestment in urban areas, pose significant challenges to community well-being and quality of life. The data utilized for analysis was sourced from various online public platforms, including publicly available databases and news reports, supplemented by face-to-face interactions with key personnel from governmental entities such as the city municipality office. Crucially, extensive data acquisition efforts were made through numerous Open Records requests. A comprehensive physical index was devised, involving the aggregation of physical indicators across each census tract within the study area, which were subsequently mapped for visual representation. Table 4.24 delineates the selected physical indicators, encompassing high-density development and overcrowding, drainage and sewage issues, residential and commercial blight indicators, disparities in administration distribution, social service deficiencies, environmental blight in open spaces, and blight associated with manufacturing and storage facilities. This meticulous data collection and mapping process provide a detailed understanding of the multifaceted dimensions of urban blight, facilitating targeted interventions and policy decisions aimed at revitalizing and improving affected communities.

Table 4.24 The list of physical indicators

Types of physical blight indicators	Percentage %	standard	Gap
Unfair distribution of Administration	0.33	20-30	19.67
Commerce & Business Blight Indicator	0.42	(8-10)	7.58
open space and environment blight indicators	0.03	15-20	14.97
Manufacturing and storage	3.31	(10-15)	6.69
Residential Blight Indicator	12.51	40-50	27.49
Social Service Blight Indicator	1.33	(10-20)	8.67
Poor Accessibility Zones	18.87		68.87
Drainage and sewage (bad condition)	0.75	2m	1.25
High density development and overcrowded	41.3	150per/ha	41.3
Road, Transport, Utilities and Infrastructure	5.6	(15-20)	9.4

Sources own filed survey and site observation, 2024

Using equation nine in previous chapter the calculated Physical blighted indicators was 0.844. If the value of CBI is greater than 0.5, the city is classified as highly blighted, which is mostly slum, when the value is lower than 0.5, the city is a non-decay area, which is urban decay that is localized and less significant. A value of CBI = 1 represents a complete slum city, while CBI = 0 represents a slum-less city. The physical composite blight index is a measure that is often used to assess the physical condition of a given area or town. It calculates an overall score based on a range of physical indicators, such as the condition of buildings, streets, and public spaces. A score of 0.844 for the physical composite blight index of study area would indicate that the town is experiencing a relatively high level of physical blight.

4.10.2. Socio-economic Blight indicators

Table 4.25 provides a comprehensive inventory of socio-economic measures selected for examination, encompassing various facets influencing the study area's socio-economic landscape. These measures include the scarcity of affordable housing, unemployment rates, tenure status of residents, the age and condition of buildings, absence or inadequacy of planning or development plans, instances of government-mandated evictions and shortcomings in resettlement programs, insufficient neighborhood and service provisions, deficiencies in recreational facilities, elevated levels of urban poverty, and notable rates of rural or urban migration. Each measure offers insight into different dimensions of the socio-economic challenges faced within the study area, providing a nuanced understanding of the multifaceted factors contributing to urban decay and socio-economic disparities.

Table 4.25 socio-economic indicators and percentage of decay.

List of variables of socio-economic indicators	Percentage of Decay
High incidences of Rural or Urban-Urban Migration	17.23
Lack of planning /development plan	14.25
Inadequate neighbourhood facilities and services	12.35
Lack of affordable housing	30.85
Housing shortage	49.63
Eviction and poor resettlement program by the government	68.96
Poor enforcement of planning law	9.36
High incidences of urban poverty	8.96
High density of development and overcrowding	48.41
Unemployment	17.8
Tenure status	45
Age of buildings	39.1
Condition of buildings	57.6

Sources own filed survey and site observation, 2024

Utilising the aforementioned UBI table above (socio economic indicators) and the formula from Chapter three equation, the computed the research region's socio-economic composite blight index was therefore 0.322. This index is frequently used to evaluate the socio-economic circumstances of a certain town or area. It determines an overall score by utilising a variety of socio-economic indices, including rates of poverty, unemployment, building condition, and accessibility to essential services. With a socio-economic composite blight index score of 0.322, Dhibayyu Sub city is considered to be experiencing a rather high level of socio-economic blight.

4.10.3. Composite blight index Map of study area

In assessing the overall level of blight within Dhibayyu Sub city, a commonly used metric is the composite blight index. This index takes into account numerous factors, such as the physical condition of infrastructure and buildings, the socioeconomic landscape of the area, and the prevailing political and governance environment. By amalgamating these diverse indicators into a singular numerical value, the composite blight index offers a comprehensive perspective on the overall health and well-being of the community. CBI Illustrated in Figure 4.22, this index provides a visual representation of the blighted level within the study area, based on the composite indicators of the city. Through this holistic approach, stakeholders gain valuable insights into the multifaceted nature of urban blight, enabling informed decision-making and targeted interventions to improve the quality of life for residents.

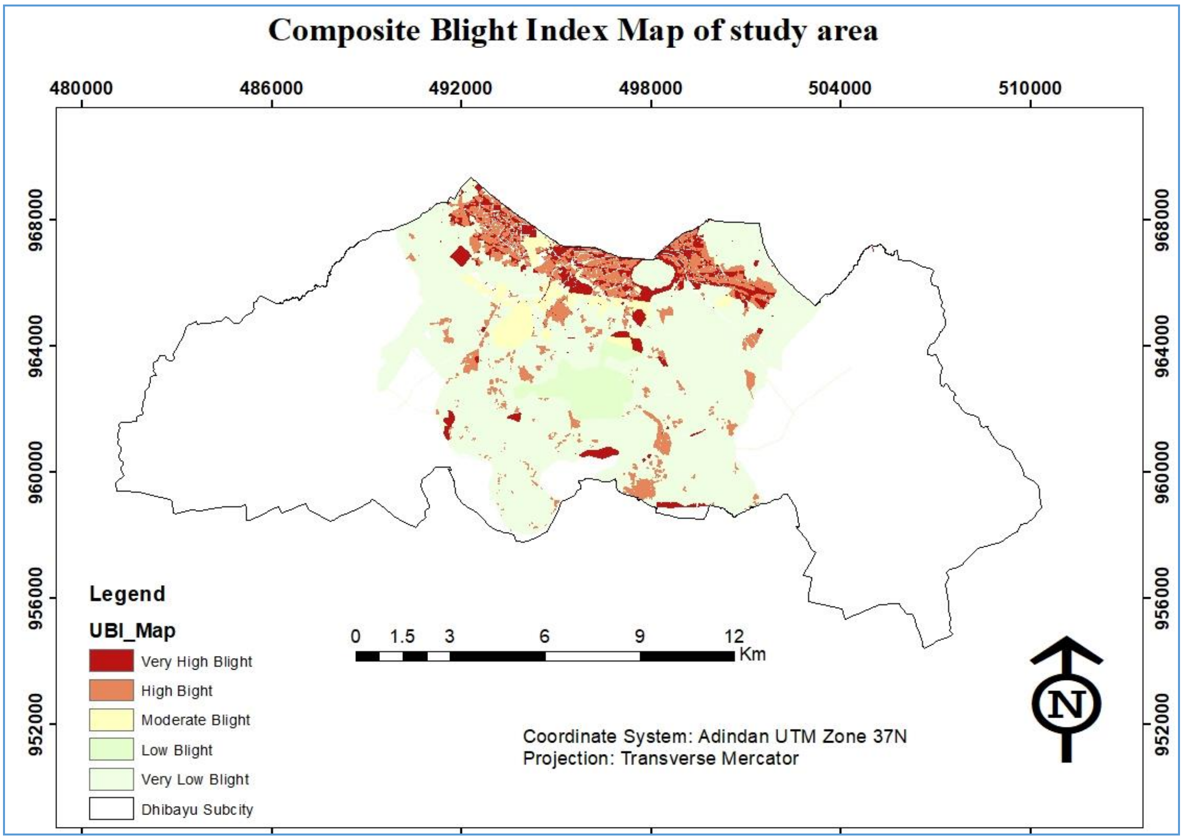

Figure 4.20: composite blight index map show level of blighted region in study area.

The degree of blight within the depicted region is visually represented in the figure, employing a color gradient ranging from white to dark red. Areas appearing white indicate extremely low levels of blight, almost devoid of any blight, while those in dark red signify very high levels of blight. To enhance the understanding and comparison of blighted neighborhoods across the study area at the census tract level, a composite blight index map was developed. This map amalgamated various physical and socio-economic indicators, providing a comprehensive view of the blight situation. Finally, a decision was made to incorporate all metrics to derive a holistic measure of town blight, ensuring a thorough assessment of the blight situation throughout the area.

4.11. Discussion

The findings of the research show that inadequate maintenance of the previous good status and image of the estate could be attributed to the inadequate social cohesion among the residents, inadequate capacity of the residents to maintain and repair their houses and other infrastructure services. The research also revealed that poor solid waste management and maintenance of the sewerage and drainage system led to sanitation problems and hence to a deteriorated healthy environment for residents to live in.

The study also showed that residents in the study area had extraordinarily high rates of poverty, which may be partially explained by neighbourhood deterioration. The residents of study area disclosed this information by stating that they lacked any surplus funds left over for renovating their homes and other structures. The research further indicated that poverty and unemployment status among the residents resulted to crime and insecurity issues in Bishoftu specifically Dibayu Sub city.

In addition, the findings indicated that age had come with exceeded capacity of the infrastructure due to the growth of the area. The findings of the research demonstrated that the decaying condition of residential area could be attributed to lack of maintenance of the houses by the tenants. The tenants claimed that they could not afford to spend money on maintenance since their incomes are low and again they are ready to leave the area anytime their incomes improve.

From the findings therefore, the following urban renewal approaches are considered to be applicable in solving the urban decay Bishoftu city.

The urban blight of Bishoftu's inner city was analysed using subjective dimensions. Male household heads make up 62.3 percent of the 276 respondents (172), while female household heads make up the remaining 37.7 percent (104). 14.1% of the household heads surveyed were unmarried, while 85.9% of them were married. Concerning age of respondents from the total 133 (48.2%) of the respondents were between the ages of 30 and 40, and 35 (12.7%) of the respondents were between the ages of 18 and 29. From the total respondents, 53 (19.2%) were between the ages of 41 and 55, while 55 (20%) were older than 56. According to this particular finding, the majority of respondents were between the ages of 30 and 40 and older than 56 years old, respectively.

The classified image demonstrates overall classification accuracies of 88.61%, 87.82%, and 91.30 for the years 2003, 2013, and 2023, respectively. The values of Kappa statistics for classified images are greater than 0.8, indicating strong agreement between the classified LULC classes and ground truth; hence, the maps satisfied the accuracy criteria for LULC change detection analysis. The information summarized in Table shows the spatial extents, percentage changes over time, and annual average growth of the six-land use/land cover classes (Agriculture land, bare land, build-up area, mixed forest, Vegetation, and water bodies) in Bishoftu Dhibayu sub city between 2003 and 2023.

Overall, the results show extensive LULC changes in study period. During the investigation periods, distinct changes have occurred in the major land use and land cover types. From 2003 to 2013, the built-up environment increased by approximately 1284.18 ha (5.68 %), while Mixed forest area decreased by 1603.34 ha (7.09%), water bodies increased by 3.67 ha (0.02%), and barren land decreased by 147.75 ha between 2003 to 2013. Similarly, from 2013 to 2023, agriculture experienced a further decreased by 1883.78 hectares, indicating an ongoing trend away from agricultural land. During the second period Built-up areas, an increased by 2135.19 hectares, while mixed forest area decreased by 141.04 ha, vegetation continuously converted and decreased by 1903.75 ha (Table 4.7). The overall period, 2003 to 2023, all LULC decreased except the build-up area and bare land. Build-up area increased by 3419.4 ha, and bare land 1665.3 ha. While agriculture land, mixed forest, vegetation and water bodies decreased by 11.38%, 7.71%, 1.42%, and 0.07 %, respectively (Table 4.8).

The Sub city current general land use covers 1179.39 hectares and includes both pure and mixed residential, business and commerce, administration, services, environment, manufacturing and storage, road network and transportation, and other uses (such as gorges, water bodies, and under-construction projects). The typical land use of the city is currently residential, making up about 12.51% of the study area.

It is evidently considered to be below the threshold when compared to the standards, which comprise between forty percent and fifty percent of the entire existing land use area. Workshops and industries shouldn't be situated close to or inside the grounds of administrative operations. It is approximately 30.99 hectares, or 0.33% of all land uses now in use that do not meet the national standards already established for this land use class. This land use category's specifics include offices belonging to the government, nongovernmental organisations, law enforcement, correctional facilities, political parties, and courts.

The social service land use category covers 125.14 hectares, or about 1.33% of the total existing land use of the study area. This land use is said to be below the standard when compared to the standard set, particularly for the social service land use category. Most of these services are fairly distributed over all parts of the city, and some incompatible land uses are observed, especially in the cases of lower-level education and religious services. General problems of the street network in the sub city: some roads have bottleneck connections closed road less than 1m are t in the inner of the city was major problem.

From the study, 56.2% of the houses had no access to improved sanitation facilities in the study area, while 43.8% of the houses had access because the houses were situated along major roads and waste. Most of the resident's dump refuse by the near residential, roadside and inside drainages. Results of physical composite blight index score of 0.844 suggests that the town is dealing with a comparatively high level of physical blight.

The socio-economic composite blight index is a measure that is often used to assess the socio- economic conditions of a given area or town. It calculates an overall score based on a range of socio-economic indicators, such as poverty rates, unemployment rates, educational attainment levels, and access to basic services. A score of 0.322 for the socio-economic composite blight index of study area would indicate that the area is experiencing a relatively high level of socio-economic blight or it's indicated that there is significant room for improvement in the socio- economic conditions of the city. It suggests that a significant portion of the town's population may be facing economic challenges and may not have access to the resources and services they need to thrive.

Legislators, urban planners, and community organisations can all benefit from using composite blight indices to pinpoint places that require funding and targeted actions. Policymakers and planners may create more effective plans to address the underlying causes of blight and enhance the general health and well-being of communities by having a better grasp of the elements that contribute to this problem.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

From the study conducted about Urban Blight in Dibayu Sub city, it is evident that the causes of Urban Decay are both Internal and External factors. The external factors include inadequate capacity of service provider in terms of resources, material, finance and staff, land tenure and ownership whereby the City Country Government are the current owners of the land in Bishoftu hence unwilling to work on the land compared to if the land was owned by private individuals, Poor capacity to implement renewal plans and poor application of policies and guidelines that can effectively respond to urban decay. Internal factors include high rate of poverty among the residents, poor management and maintenance by the locals, poor community cohesion and sense of ownership, unemployment, old age of the estate, vandalism and abandonment by residents. These all factors manifest Physical, Environmental, Social and Economic Decay.

In conclusion there is need to come up with a comprehensive approach to solve the housing and neighbourhood problems through urban planning approach. This Urban Planning Approach is expected to respond to the issues of Social decay, economic decay, environmental decay and Physical decay. A comprehensive urban renewal of the study area is considered to be the most appropriate approach to deal with all the above-mentioned forms of decay and of course this will require the involvement of the stakeholders in the neighbourhood development concept.

Urban blight is a complicated issue that can significantly lower urban residents' quality of life. GIS and remote sensing methods can offer important insights into the scope and severity of urban degradation. The application of these methods to the analysis of urban blight, as well as their possible advantages and disadvantages, will be discussed in this essay. The primary advantage of analysing urban blight with remote sensing and GIS techniques is the speed and accuracy with which data can be gathered from broad areas. Determining the intricate relationship between shifts and their causes Remote sensing and geographic information systems (GIS) offer essential and easily accessed data regarding potential changes in land cover over a certain period of time.

In general, our knowledge of the spatial distribution and intensity of blight in urban areas might be significantly enhanced by the application of remote sensing and GIS techniques to analyse urban blight. In order to create more sustainable and habitable urban settings, policy decisions pertaining to urban renewal, rehabilitation, and redevelopment might be informed by this knowledge.

5.2. Recommendations

It has been determined that the usage of the land in the district is not sustainable after looking at the urban decay of this former institutional housing in the Dhibayyu Sub city. It consists of extensive tracts of undeveloped land that are left fallow and low-density, single-use developments. The city's policy makers and the owners of the residences should think about whether the home is ready for reconstruction.

Recommendation for urban renewal is that the region around the dwelling is perfect for decongestion of the city core because of its closeness to it. For that reason, this study suggests a comprehensive strategy that involves complete urban renovation of the study region in order to address the aforementioned issues. The following is a synopsis of the succeeding suggestions.

- ***Provision of a Mixed Land Use Structure:*** Mixed land uses within the study area will facilitate both residential and economic use with the establishment of different housing types, office spaces and social functions all in one. The spatial integration of housing, transportation and commercial land uses in mixed-use developments will also economically regenerate the estate. This will largely address the creation of employment opportunities for the unemployed proportion of the population and in turn address the problem of haphazard sprouting of commercial facilities.
- ***Construction of High Rise, High Density Developments***: The problem of low-density developments in the sub city is the main cause of inefficient land use in the estate as the existing structures inhibit further development. The returns from the existing structures do not correspond to the current land value either. There is therefore need to construct high rise, high density developments just like the neighbouring residential for example the newly constructed area and expansion area both for All sub city in the Bihoftu city. This will address the problems of inefficiency of space use and inadequate housing facilities as a larger population will be accommodated per unit area. Construction of high-density developments will also ensure that the vertical space has been optimally utilized leaving part of the horizontal space for greenery and quality open spaces.

- ***Provision of a Range of Housing Types and Choices:*** The housing typologies to be established should additionally allow for flexibility and variety in their planning and design dimensions to accommodate subletting (by designing houses with servant quarters which can be rented out by the main occupant), elasticity of household sizes and home-based economic enterprises. This will reflect the dynamic social, cultural backgrounds and economic demands of the circumstances of low-middle-income households.
- **Improvement and Upgrading of Infrastructure and Service Facilities:** The existing infrastructural and service facilities require some improvement to transform their conditions to reasonable standards. The vehicular roads need some widening for them to be able to accommodate the high traffic flow that will be generated by the high density as well as paving to improve their conditions. The capacity of the sewer and drainage channels need to be expanded and need to be constructed for them to meet both the current and future demands.
- **Provision of Street Lights within the Estate to Enhance Security at Night**
  As the study area specifically in Dhibayyu Sub city awaits redevelopment, street lights should be installed along the roads to ensure security at night.
- ***Proper Maintenance of the Housing, Infrastructural Facilities and the Physical Environment:*** The area residents should adopt an initiative of upgrading the individual dwelling units by re-painting the walls, windows and doors to make them more appealing.

- This study recommends further study on the urban decay in lakeside neighbourhoods, City of Bishoftu commercial centres, the main industrial area, the transportation land use and in other middle-income residential areas such as Dibayu Sub city. Some parts of study area low-income residential neighbourhoods have undergone urban renewal in part or in whole. The impacts of urban renewal on the residents of study area and in virtually all planned and unplanned low-income residential neighbourhoods in Dibayu Sub city would be useful in order to propose the requisite mitigation plans. The sustainability of urban renewal policy options in various spatial areas of Bishoftu City such as the seaside, the housing units, the community facilities, the transportation system, the infrastructure services and the institutional system in general could be useful as a further area of research.

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APPENDICES

Appendix A:

► QUESTIONNAIRE SURVEY

QUESTIONNAIRE SURVEY OF THE RESEARCH ON SPATIO-TEMPORAL DYNAMICS OF URBAN BLIGHT IN THE CASE OF DIBAYU SUBCITY,BISHOFTU CITY, ETHIOPIA".

This questionnaire is intended to collect data on the research Topic "Spatio-Temporal Dynamics of Urban Blight in Bishoftu City". You have been identified as a potential respondent. Therefore, you are kindly requested to complete the questionnaire honestly and responsibly. The study is purely academic so that all the information will be kept confidential.

Thank you in advance to your kind cooperation!

General direction

- No need to write your name on the paper.
- Please read all instruction of the questionnaire
- To give your own answer put a tick "✓" or "X" mark on space provided in the box.

Questionnaire No:								
Date:								
Location/kebele:								

A) <u>Demographic information of Respondent (personal details)</u>

1. Age: ○ [18- 29] ○[30 – 50] ○ [51 – 70] ○71 and above
2. Gender: ○Male ○Female
3. Marital status: ○Single ○ Married
4. Education level: ○ illiterate ○ Primary school ○ secondary ○ 12+ and Certificate ○ First Degree and Above ○ others
5. Family size: ○ less than 3 ○ [3-5] ○ [6-8] ○ 9-11 ○ 12 and above
6. Employment Status: ○ Employed ○ unemployed ○other (specify)………………
7. Employment Condition: ○ Formal ○ Informal
8. Average Monthly income in (ETB): ○ less than 2000 ○[2001-5000] ○[5001-8000] ○[8001-10000] ○10001 and above

B) Socio-Economic Blight Indicators

i. Housing condition/characteristic of study area

1. Tenure Status on the House occupied

(a) ◯Tenant (***b)***◯Landlord ***(c)***◯Private

(***d)***◯leasehold ***(e)***◯kebele house ***(f)***◯other specify…

2. Age of building (a)◯below 10 years (b)◯ 20-30 years (c) ◯ 40 -50 years (d) ◯ 50 years and above

3. Type of building occupied *(a)*◯ Semi-detached *(b)*◯ Multiple row *(c)*◯ Bungalow (d)◯ Low-rise *(e)*◯Others (Specify)……………………………………………….

4. What is the total number of rooms in your house? ....

5. Are the number of rooms enough for your household needs? ***(1)*** Yes ***(2)*** No

If NO, how many rooms do you think could be enough for your household needs?

6. How can you describe the condition of your house and how can you also describe the changing condition?

....

ii) Conditions of the Building.

Thick ✓or mark **X** in your choice

Building	**Very good**	**Good**	**Fair**	**Bad**
Structure				
Finishing				
Aesthetics				
Open space				
Toilet				
Kitchen				
Water supply				
Electricity				
Material used				
Type of wall	Stone [ ]	Brick [ ]	Tile [ ]	Marble [ ]
Type of floor	Bear floor [ ]	Concrete [ ]	Tiled [ ]	Marble [ ]

#These interview questions aim to explore the particulars of social cohesion, community resilience, and collective efforts in addressing urban challenges.

- ***Questions Related to Social Cohesion and Community Ties***

1. How would you define social cohesion, and why do you think it is essential for building strong and resilient communities?

2. In your opinion, what role do community traditions, cultural practices, and shared values play in enhancing social cohesion and fostering collaboration among residents?

- ***Questions Related to Urban Challenges and Collective Action***

1. What urban challenges do you believe are most pressing for our community, and how can social cohesion and community ties help address these challenges effectively?

2. How can local government agencies, community organizations, and residents collaborate to address urban challenges collectively and promote sustainable urban development?

C) Safety Perception

1. How safe do you feel in Leaving area, in general?

☐ very safe ☐ safe ☐ moderate ☐ unsafe ☐ very unsafe

2. Where do you feel less safe in the city? (please check more than one box, if needed)

☐ Public parks or greens ☐ Sidewalks ☐ Convenience stores

☐ Construction zones ☐ Under bridges or underpasses ☐ Alleys ☐ Other:

3. In your opinion, what measures could be taken to improve safety in areas affected by urban blight?

- Increased police patrols
- Enhanced street lighting
- Community clean-up initiatives
- Rehabilitation of abandoned buildings and infrastructure
- Increased community engagement and neighborhood watch programs
- Other (please specify): ____________________

D) City and neighbourhood

#Enter your perceived score from 1 to 5 for each one of the following attributes for the **entire city** of Bishoftu kebele 05, where 1 means “not at all” and 5 means “completely”:

- ➢ The city is safe ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- ➢ The city is wealthy ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- ➢ The city is beautiful ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- ➢ The city is boring ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5

- The city is livable ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- The city is cycling friendly ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- The city has good public transport ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5
- The city is depressing ☐1 ☐ 2 ☐ 3 ☐ 4 ☐5

E) Environmental Condition

#Availability of Infrastructural Facilities and Conditions of Infrastructural Facilities in the Study Area. How can you rank the conditions of the following services in Study Area and the main problem associated by their condition?

Mark tick ✓or write your choice on provided box.

Availability rank: **[1]** for available **[2]** for not Available

Condition Facilities: **[1]** very Bad **[2]** Bad **[3]** Good **[4]** Very good

Facilities	Availability		Condition and states of the services			
	[1]	[2]	[1]	[2]	[3]	[4]
Health services						
Electricity						
Water Facilities						
Access to improved sanitation						
Neighborhood security						
Recreational facilities/Open space						
Road street, Pedestrian lane						
Drainage, Sewer system						
Solid waste management						
Others (optional)						

#Interview Questions Related to Noise Pollution

1. How do you define noise pollution, and what are the primary sources of noise in urban environments?

___

___

___

2. In your experience, how do community perceptions of noise pollution align with objective measurements, and how can public opinion influence noise management policies?

___

___

#Interview Questions Related to Visual Blight:

1. What factors contribute to visual blight in urban or rural landscapes, and how do you prioritize visual quality in planning and development decisions?____
____.

2. In your opinion, how does visual blight affect property values, community pride, and overall quality of life, and what strategies have you employed to address visual blight in your area? ____

F) <u>Questionnaire related to Causes of Urban Blight</u>

- Causes of Urban Blight in the Study Area. Below are the probable causes of urban blight. Please rate according to their significance: where 5 = Most Significant, 4 = Very Significant, 3= Significant, 2= Insignificant and 1= Very Insignificant

Causes of Urban Blight	**(MS) 5**	**(VS) 4**	**(S) 3**	**(IS) 2**	**(VIS) 1**
Housing shortage					
Lack of affordable housing					
High incidences of urban poverty					
High incidences of Rural or Urban-Urban Migration					
Poor enforcement of planning law					
Lack of planning /development plan					
Eviction and poor resettlement program by the government					
High density of development and overcrowding					
Inadequate neighborhood facilities and services					
Specify other___________________________					

- How would you define urban blight and what are the visual indicators that characterize blighted areas?
  ____.
- What do you perceive as the primary causes of urban blight in the context of community deterioration and disinvestment?

  ____

#These interview questions aim to uncover the profound consequences of urban blight on social, economic, environmental, and governance dimensions.

#Interview Questions related to Social Impacts and Economic Consequences:

1. How does urban blight affect the quality of life and well-being of residents living in deteriorating neighbourhoods, and what social challenges arise from blighted environments?

____

2. What strategies or interventions have you seen successfully address social disparities and promote social inclusion in neighbourhoods suffering from urban blight?

3. How does urban blight impact local economies in terms of property values, business opportunities, job creation, and municipal revenue generation? ________________

4. Can you provide examples of the economic challenges faced by businesses operating in or near blighted areas, and how do these factors contribute to disinvestment and economic decline? ____

#Interview Questions related to Environmental Effects, reaction and solution forwarded:

1. How does urban blight contribute to environmental degradation, waste accumulation, pollution exposure, and lack of green spaces in urban settings? ____________________

____.

2. What environmental injustices or health disparities emerge from living in proximity to blighted areas, and how can environmental remediation efforts mitigate these effects?

____

____.

3. Reaction of residents to control Urban blight (tick or make circle your choice.)

S/N	Reactions of the residents to the decaying conditions	Low [1]	Moderate [2]	High [3]	Very high [4]
1	Undertake maintenance of the infrastructure facilities				
2	Urban agriculture to supplement House hold budget				
3	City initiative for security purposes				
4	Reporting to the City County Government				
5	Unity among the residents				
6	Managing solid waste at household level				

4. What do think regarding Solutions of urban decay according to the residents? ____.

____.

#Select the Suggested solutions to urban blight

[1] Redevelopment [2] Upgrading [3] comprehensive renovation [4] Rehabilitation

5. Any final comments?

____

____

____

____

____

____

____

____

Thanks, you for your cooperation!

Appendix B:

- **Maps, Location and tables outputs analysed**

Location of blighted area and coordinate distribution during site visitation.

Delineated area for building and infrastructure too identify problem in specific area.

Table below show details descriptions of coordinate taken during site visitation in study area.

Point:	E: (m.)	N: (m.)	Height (MSL): (m.)	location descriptions
1	498983.819	966858.767	1900.03	ixibbe old sefer (gebaya)
2	499014.673	966927.286	1899.92	ixibbe old sefer (gebaya)
3	498773.089	967051.279	1898.37	Blighted area on circle to gebaya road
4	498466.002	967045.043	1906.39	High rise building blighted nearby slums
5	498465.397	967051.445	1907.76	High rise building blighted nearby slums
6	497649.186	967229.537	1921.6	villages in Kebele 05 blighted area
7	497567.154	967286.641	1928.66	villages in Kebele 05 blighted area
8	497447.858	967324.061	1934.33	villages in Kebele 05 blighted area
9	497374.48	967396.344	1935.99	Building Age more than 50 years
10	497225.784	967501.658	1923.67	Blighted road and drainage near School on steep slope
11	497085.756	967484.415	1910.21	Waste disposal from home near fences
12	497148.721	967355.804	1909.75	Waste disposal from home near fences
13	497234.192	967235.669	1905.06	Ixibe narrow road and residences with steep slope without any precondition.
14	497280.234	967222.8	1909.35	very poor road facility and almost no road between residence in blocks
15	496316.72	967629.746	1892.23	very poor road facility and almost no road between residence in blocks
16	496316.72	967629.746	1892.23	culverts detoured and need maintenance
17	496183.268	967646.365	1896.38	Poor drainage structure near lake calalaka
18	495319.772	967408.474	1915.39	Blighted urban center (gebeya), filled by informal settlements
19	495362.868	967270.592	1913.64	informal temporary greenery area in blighted village
20	496775.439	967175.314	1898.19	Blighted road and por side walk
21	499662.448	965550.011	1898.86	Blighted area and poor settlement in front of

				Harar meda airport.
22	499702.661	965508.869	1898.46	Blighted area and poor settlement in front of harar meda airport.
23	499830.352	965367.308	1891.84	Blighted area and poor settlement in front of harar meda airport.

Sources own survey site visitations ,2024

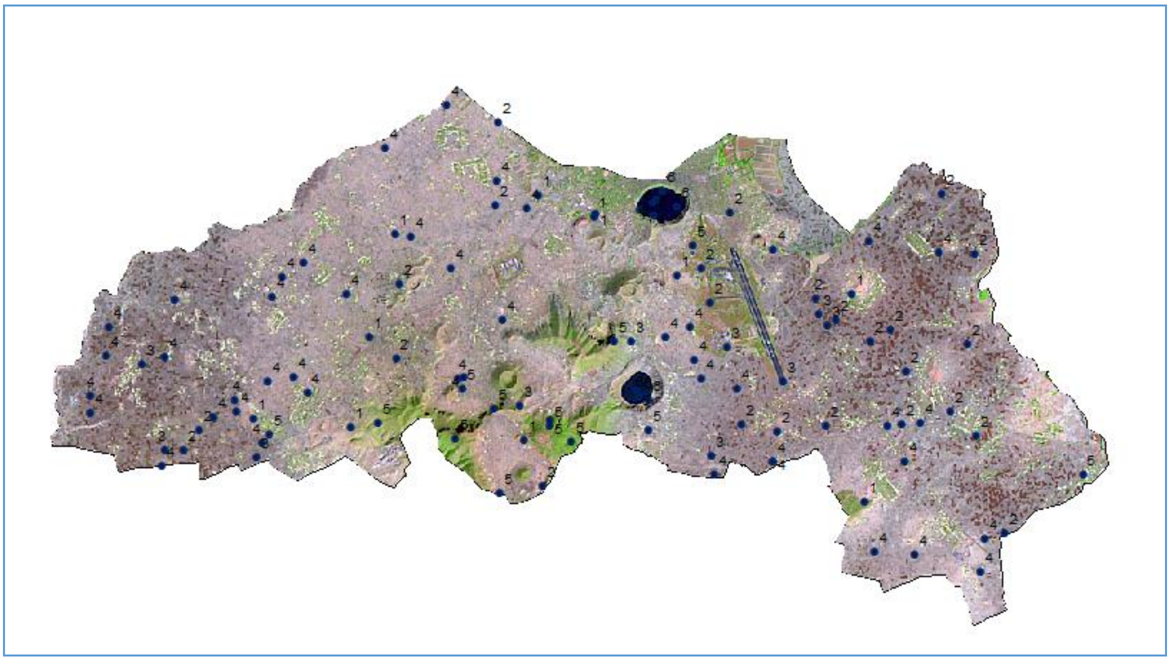

figure show point distributed for random accuracy assessment during classification of 2003

Table show Confusion Error matrix for image 2003

Class Value	Bare land	Vegetation	Built-up	Agriculture	Mixed Forest	Water Bodies	Total	User Accuracy	Kappa
Bare land	8	1	0	1	1	0	11	0.73	0.000
Vegetation	0	25	0	0	0	0	25	1.00	0.000
Built-up	0	0	9	0	1	0	10	0.90	0.000
Agriculture	1	3	2	39	0	0	45	0.87	0.000
Mixed Forest	0	0	1	0	11	1	13	0.85	0.000
Water Bodies	0	1	0	0	0	9	10	0.90	0.000
Total	9	30	12	40	13	10	114	0.00	0.000
P_Accuracy	0.89	0.83	0.75	0.98	0.85	0.9	0	0.89	0.000
Kappa	0	0	0	0	0	0	0	0.00	0.851

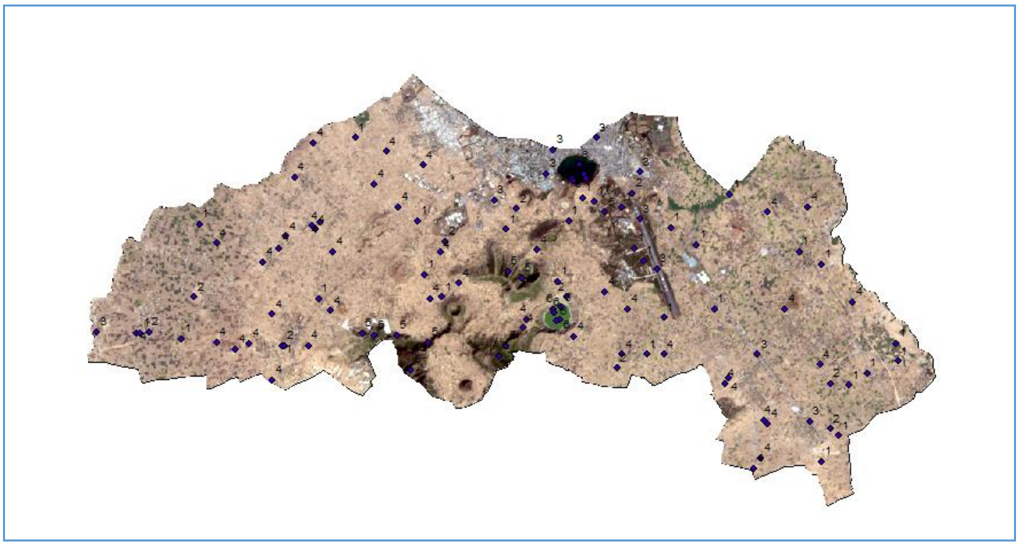

figure show point distributed for random accuracy assessment during classification of 2013

Table show Confusion Error matrix for image 2013

Class Value	Vegetation	Bare land	Built-up	Agriculture	Mixed forest	Water Bodies	Total	U_Accuracy	Kappa
Vegetation	29	0	0	1	1	0	31	0.935	0
Bare land	0	7	2	0	1	0	10	0.700	0
Built-up	1	1	8	0	0	0	10	0.800	0
Agriculture	0	1	1	42	0	0	44	0.955	0
Mixed forest	1	0	0	0	7	2	10	0.700	0
Water Bodies	1	0	0	1	0	8	10	0.800	0
Total	32	9	11	44	9	10	115	0.000	0
P_Accuracy	0.906	0.778	0.727	0.955	0.778	0.800	0.000	0.878	0
Kappa	0	0	0	0	0	0	0	0	0.837

figure show point distributed for random accuracy assessment during classification of 2023

Table show Confusion Error matrix for image 2023

Class Value	Built-up	Vegetation	Bare land	Agriculture	Water bodies	Mixed Forest	Total	User _Accuracy	Kappa
Built-up	18	1	1	0	0	0	20	0.900	0
Vegetation	0	19	0	1	0	0	20	0.950	0
Bare land	0	0	18	0	0	0	18	1.000	0
Agriculture	1	1	0	34	1	0	37	0.919	0
Water bodies	0	0	0	0	8	2	10	0.800	0
Mixed Forest	0	1	0	0	1	8	10	0.800	0
Total	19	22	19	35	10	10	115	0.000	0
P_Accuracy	0.947	0.864	0.947	0.971	0.800	0.800		0.913	0
Kappa	0	0	0	0	0	0	0	0	0.891