MEKELLE UNIVERSITY

INSTITUTE OF PALEO–ENVIRONMENT AND HERITAGE CONSERVATION

DEPARTMENT OF HERITAGE CONSERVATION AND MANAGEMENT

A THESIS SUBMITTED TO THE DEPARTMENT OF HERITAGE CONSERVATION AND MANAGEMENT POSTGRADUATE PROGRAM IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MSc. IN ARCHITECTURAL HERITAGE CONSERVATION AND MANAGEMENT

Investigating and Documenting the Vernacular Architecture of Tigray: A Case of Selected Hidmo House Sites in Mekelle City

By:

Yared Zekarias G/Mariam

Advisor: Mr. Tadesse Girmay (MA)

Co-Advisor: Mr. Tsige Berhe (MSc.)

Aug,19, 2025 G.C

Mekelle, Tigray, Ethiopia

APPROVAL SHEET

MEKELLE UNIVERSITY INSTITUTE OF PALEO-ENVIRONMENT AND HERITAGE CONSERVATION

DEPARTMENT OF HERITAGE CONSERVATION AND MANAGEMENT

This is to endorse that this thesis entitled **"Investigating and Documenting the Vernacular Architecture of Tigray: A Case of Selected Hidmo House Sites in Mekelle City"** submitted in partial fulfillment of the requirements for the award of Masters of Science (MSc.) In Architectural Heritage Conservation and Management, Mekelle University, through the Department of Heritage Conservation by Mr. Yared Zekarias, ID No. IPHC/PR159629/11 is an authentic work carried out by him under our guidance. The matter embodied in this thesis work has not been submitted earlier for an award of any degree or diploma to the best of our knowledge and belief.

SIGNED BY THE EXAMINING COMMITTEE

Approved by:	Signature	Date
Tadesse Girmay Advisor		May 24, 2025
Tsige Berhe Co-Advisor		May 29, 2025
Zelalem Testay Internal examiner		May Dep. 02/09/25
Dr. Alemayehu Kiros External examiner		02/9/25
Kahsi Hagos Chairman, Graduate program		08/13/2017 E.C

DECLARATION OF THE RESEARCHER

I declare that this Thesis entitled ***"Investigating and Documenting the Vernacular Architecture of Tigray: A Case of Selected Hidmo House Sites in Mekelle City"*** is my original work. I have not included any material or data from other researchers or sources, which are not acknowledged and identified in the prescribed manner. I have read the section in the exam regulations on plagiarism and understand that such offenses may lead the Examinations Board to withhold or withdraw the award of Master of Science in Architectural heritage Conservation and Management.

Approved by:	**Signature**	**Date**
Yared Zekarias G/Mariam Researcher		May 24, 2025
Tadesse Girmay (MA) Principal Advisor		May 24, 2025

Table of Contents

LIST OF PICTURES

LIST OF FIGURES

LIST OF MAPS

LIST OF TABLES

LIST OF DIAGRAMS

LIST OF CHARTS AND GRAPHS

LIST OF ACRONYMS

Category	Acronym	Definition
Software/Tools	**AP**	Adobe Premiere Pro (Version 2020)
	Ai	Adobe Illustrator (CS5.1)
	DOCX	Microsoft Word Document Format (2013/2019)
	XLSX	Microsoft Excel Worksheet Format (2013+)
Research Methods	**FGD**	Focus Group Discussion
	KI1	Key Informant 1
	DI1	Documentation Informant 1
Statistical Analysis	**SPSS**	Statistical Package for the Social Sciences
	M	Mean
	SD	Standard Deviation

Category	Acronym	Definition
International Organizations	**ICOMOS**	International Council on Monuments and Sites
	ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
	IUCN	International Union for Conservation of Nature
	UNESCO	United Nations Educational, Scientific and Cultural Organization
	WHC	World Heritage Centre
	WHS	World Heritage Site
	WTO	World Tourism Organization
Ethiopian Institutions	**MoCT**	Ministry of Culture and Tourism (Ethiopia)
	TTCB	Tigray Tourism and Culture Bureau
Hidmo Architectural Terms	**HVA**	Hidmo Vernacular Architecture
	HH	Hidmo House
	TVA	Tigrayan Vernacular Architecture
	LBM	Local Building Materials
	DSW	Dry Stone Wall
	MW	Mortared Wall
	QS	Qetsela (slate roof system)
	QT	Qetse’re (courtyard/fence)
	DB	Debri (G+1 storage room)
	DG	Dogol (Fence/boundary)

Category	Acronym	Definition
	DJ	Dejeselam (entrance porch)
	DM	Dembe (cattle enclosure)
	MR	Mereba (central courtyard)
	CRM	Coursed rubble masonry
	CSM	Coursed square masonry

OPERATIONAL DEFINITION OF KEY TERMS

"Hidmo" refers to a traditional flat, lumped earthen roof, and the term is derived from the Ge'ez word **"ሃደ'መ" (Hade'me)**, which denotes the act of building or constructing. It characterizes a vernacular architectural process used in the construction of **Hidmo houses**, which are typically roofed with compacted earth supported by timber beams. (DI16)

"Investigation" Carries out a systematic or formal inquiry into (an incident or allegation) of the vernacular Hidmo houses to establish the truth. (Oxford Dictionary).

"Documentation" Preparing or organized data and information, through recording, arranging, in a set manner to protect and preserve. (Definition, Oxford Dictionary). The documents required in the provision of information or evidence or written specifications or instructions.in addition, the process of classifying and annotating texts, photographs. (Ethiopian Cultural Tourism of Heritage Registry Legislation. 9/2006, No, 14).

"Preservation practices" in the process of maintaining and managing change to a heritage asset in a way that sustains and where appropriate enhances its significance or reinforce those values for present and future generations and extending its physical life. (ICCROM, 2014)

"Prevention of the deterioration" involves keeping an object from destruction and seeing to it that the object is not irredeemably altered or changed and retarding deterioration. (IUCN, 2006)

"Immovable Cultural Heritage" means Cultural Heritage attached to the ground with a foundation' and which can be moved only by dismantling. *(The Federal Democratic Republic Of Ethiopia, Proclamation No. 209/2000, Page, 1345)*

"Cultural Heritage" means anything tangible or intangible which is the product of creativity and labor of man in the pre-history and history times, that describes and witnesses to the evolution of nature and which has a major value in its scientific, historical, cultural, artistic and handicraft content; (UNESCO, 1972)

"Cultural Heritage Registration" means registration in the form prepared to collect wide information of Cultural Heritage, which shall include photographing, recording in film or video, as appropriate, to put in place the means to catalog, inspect, study, protect and conserve cultural heritage and facilitate utilization of same for recreation and education; **(**ICOMOS, 2003**)**

"Sustainable" refers to the capability of meeting present needs without compromising the ability to meet future needs. It means something able to be carried out without damaging the long-term health and integrity of environments while providing for the present and future economic and social wellbeing. (WHS, 2014)

"Conservation" means a general protection and preservation activity carried on a Cultural Heritage without changing its antique content; *(Federal Negarit Gazeta- No. 39 27th June 2000-Page 1346).* It is a process of directing, coordinating, and integrating all of the activities needed to care for the heritage, including work such as maintenance, repair, and restoration. Conservation management can include other activities such as interpretation, creating new facilities, managing visitors, providing access, setting aside resources, and involving people. (UNESCO, 2007)

"Heritage" is the historical significance, natural or built beauty, valuable features of our environment which we seek to conserve from development or decay. Tourism usage often classifies it as natural and cultural heritage. (WTO, 2014).

"Museum" means a non-profitable organization that collects, preserves, and repairs Cultural Heritage renders service to the public by preparing and organizing collections for their use in research, study, education, and entertainment. *(Federal Negarit Gazeta- No. 39 27th June 2000-Page 1346)*

ACKNOWLEDGMENT

I am thankful to express my sincere gratitude to Almighty GOD and *Saint Mary* for their divine guidance throughout this research journey.

I am profoundly indebted to my principal advisor, Mr. Tadesse Girmay, for his expert supervision and constructive feedback, and to my co-advisor, Mr. Tsige Berhe, for his invaluable academic guidance, along with Prof. Fathi Bashir for his scholarly insights. My sincere appreciation extends to the Tigray Culture and Tourism Bureau experts for sharing their specialized knowledge on Hidmo architecture, and to Mekelle University's IPHC and Department of Heritage Conservation and Management, particularly Mr. Mehari Bidu and Mr. Kahasi Hagos, for their institutional support. I also thank the CSSL Senate, the Music and Visual Art Department, and all survey participants for their contributions, as well as my family and friends for their unwavering encouragement throughout this academic endeavor.

ABSTRACT

This study investigates the selected vernacular Hidmo houses of Mekelle, Ethiopia, specifically within the sub-cities of Kedamay Woyane (Tabia Zeselassie) and Hadnet (Tabia Aynalem), focusing on construction techniques, material usage, typological classifications, and preservation challenges in the context of rapid urbanization and cultural heritage decline. Employing a mixed-methods approach, the research integrates both descriptive and explanatory analyses through stratified sampling. Data collection involved Focus Group Discussions (FGDs) with TTCB experts, purposively selected key informants (KIs), and inventory documentation informants (DIs). Analytical tools such as Excel and SPSS v.21 were used to interpret data derived from FGDs, semi-structured interviews, questionnaires, direct observations, field surveys, and architectural measurements. The study identifies major threats to Hidmo preservation, including funding limitations, structural vulnerabilities, and damage caused by seasonal rainfall. A strong positive correlation was found between active preservation efforts and the continued survival of Hidmo houses. Findings reveal that both anthropogenic factors, particularly unregulated urban development, and environmental pressures accelerate the deterioration of these indigenous structures, thereby jeopardizing Mekelle's cultural identity, historical value, and tourism potential. The study concludes by recommending policy interventions that emphasize collaborative stakeholder engagement, increased financial fund, community participation, and adaptive reuse strategies to ensure the sustainable conservation of Hidmo architecture amidst ongoing urban transformation.

Keywords: *Tigray, Hidmo vernacular architecture, urban vernacular heritage preservation, Hidmo house, investigation and documentation, influential factors, material analysis, Hidmo typologies, construction methods, SPSS analysis, cultural sustainability, participatory conservation.*

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The term vernacular derives from the Latin verna, referring to indigenous or native traditions. In architecture, it describes localized built environments shaped by ecological, economic, material, political, and social factors (J. Lawrence, 2006). Vernacular houses emerge from collective knowledge, passed down through generations, with spatial and aesthetic qualities rooted in unwritten conventions rather than formal design (Garedew Mengesha Weldekidan, 2014). These structures prioritize functionality providing shelter, security, and storage while adapting to regional climates, materials, and cultural practices.

Globally, vernacular architecture varies due to geographical, climatic, and socio-cultural differences. In Africa, traditional architecture reflects millennia of unrecorded history, often misrepresented as primitive. Ethiopia's diverse landscapes and climates ranging from highlands (Dega) to lowlands (Weynadega) and arid zones (Qola) have fostered distinct construction methods, including piling, tying, and weaving. Unlike much of Ethiopia, where round thatched huts dominate, Tigray features rectangular with a flat earthy roof and stone houses (Hidmo), showcasing skilled masonry and historical ties to Axumite architecture. However, urbanization and modernization threaten these traditions, necessitating urgent documentation and preservation efforts.

Mekelle, Tigray's capital, exemplifies this heritage. Established as a political center in the 19th century, its urban fabric blends historic and colonial influences. Italian interventions (1935–1941) introduced grid layouts and modern materials, shifting perceptions of vernacular techniques as outdated. Despite their durability, Hidmo and Tukul (round mud-and-thatch huts) are disappearing, particularly in Kebele 14 and Aynalem, due to neglect and redevelopment. This study focuses on documenting and preserving Hidmo architecture as a cultural and architectural asset.

Vernacular architecture, constituting 95% of the global built environment, remains underrepresented in architectural discourse. Unlike elite architecture, it prioritizes function over aesthetics, employing local materials and craftsmanship. In Mekelle, the contrast between vernacular and colonial styles underscores a cultural divide, emphasizing the need to integrate traditional knowledge into contemporary practice. (2018 naturalhomes.org)

The city of Mekelle, situated in northern Ethiopia's Tigray Region, has served as the region's capital and previously held the title of national capital during the second half of the 19th century. Strategically located, the city's central palace has contributed to the expansion of its surrounding urbanized area, generating an exemplary model of spatial urbanism in Ethiopia. (Rumi Okazaki, 2009, P. 8). Tigray Region boasts an exceptional masonry architectural tradition, exhibited by Mekelle and its environs, which is characterized as a 'stone city'. Archaeological evidence suggests that Mekelle was initially inhabited by dispersed agrarian compounds in 1809 G.C. (Henry Salt, 1816, p.328).[1] However, following Emperor Atse Yohannes IV's decision to establish Mekelle as the central administrative hub in 1872, the city underwent significant development, transforming into a thriving commercial centre. A dichotomy was evident in the urban layout of Mekelle, with the new and old settlements coexisting in proximity, thereby exemplifying the city's historical segregation. The city's rich heritage is comprised of notable historical sites such as Yohannes Palace, Abraha Castle and Mengesha Seyoum Castle, in addition to the increased prominence of vernacular Hidmo architectural designs under the rule of Ras Gugusa Arayaselassie, grandson of Yohannes IV.

Picture 1: Emperor Yohannes IV (left) and Leul Ras Gugusa Arayaselassie (right). Sources: Alamy Photo.Com and Historical Photos From the Horn of Africa.Com.

This region, known as Qedamay Woyane, underwent substantial transformation in the mid-20th century. Following its redesign by the Italian colonial administration circa 1935, the area evolved into the driving force behind the growth of Mekelle city. The urban planning of Mekelle was grounded in a zoning scheme consisting of residential and commercial (market) sectors, with public infrastructure integrated into the residential zone. A straightforward grid system underpinned the

[1] (Henry Salt, 1816, p.328). "A Voyage to Abyssinia and Travels into the Interior of that Country".

layout, characterised by a lack of distortions. Historical evidence suggests that prior to the Italian intervention, the area was inhabited by a relatively loosely established village. Only a few public buildings were constructed such as schools, law courts, and so on. But the market square was so vast. No such market facility was established in other cities except in Addis Ababa." *(Rumi Okazaki, 2009, p, 82).*

With the ascension of Atse Hailessilasse during the country's imperial period, the market space underwent rebirth, reconceptualised within a 'Duf'o' architectural style (Tomb structure). This involved the deployment of a distinctive masonry construction technique, thereby facilitating the evolution of the space into a dynamic centre for commercial activities.

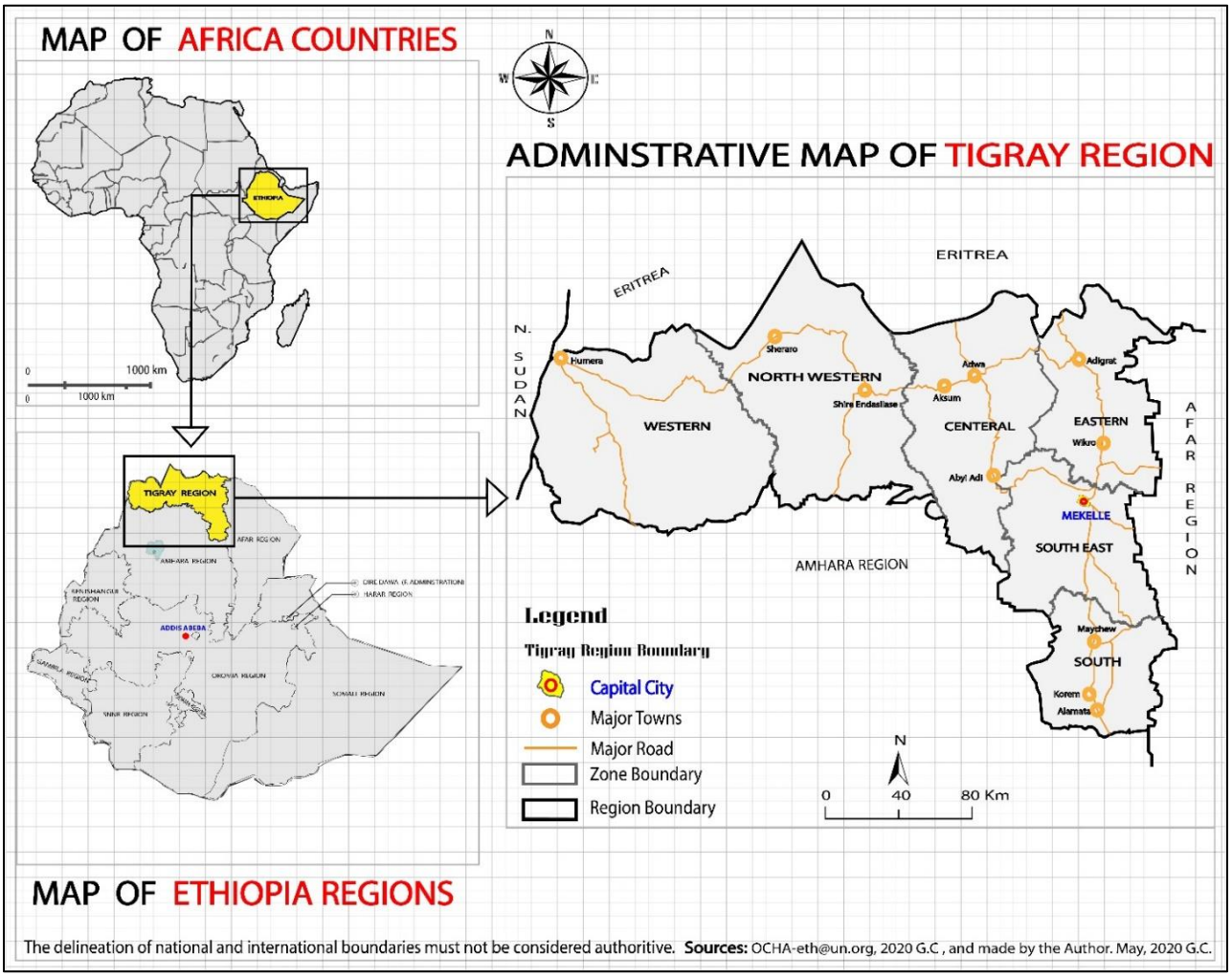
The metamorphosis of the Qedamay Woyane area did however threaten the continued presence of traditional vernacular architectural styles. Initially established in response to the expansion of regional trade with Italian-controlled territories, an assortment of dwellings, primarily the 'Tukul,' exemplified unique regional cultural characteristics. Furthermore, Hidmo-style dwellings, constructed using stone, came to prominence in pre-colonial Mekelle as an indicator of cultural evolution. Noteworthy is the enduring cultural divide perpetuated by the dichotomy of valuation attributed to traditional and modern methods of architectural construction. The resultant impact of these opposing constructs on the cultural heritage and urban fabric of Mekelle will necessitate continued evaluation and planning considerations.

In the antecedent periods of the 19th century, specifically dating back to the 1860s, the regions of Kebelle 14, 04, 05, 07, and 15 exhibited established residential settlements. The indigenous housing structures, encompassing those of the surrounding hinterlands, predominantly comprised the Tukul (Gujji or Seqella) and Hidmo architectural styles. The Tukul dwellings, characterized by thatched roofs and wooden and mud walls, contrasted with the Hidmos, which, prevalent prior to the Italian colonization in 1935, featured stone walls.

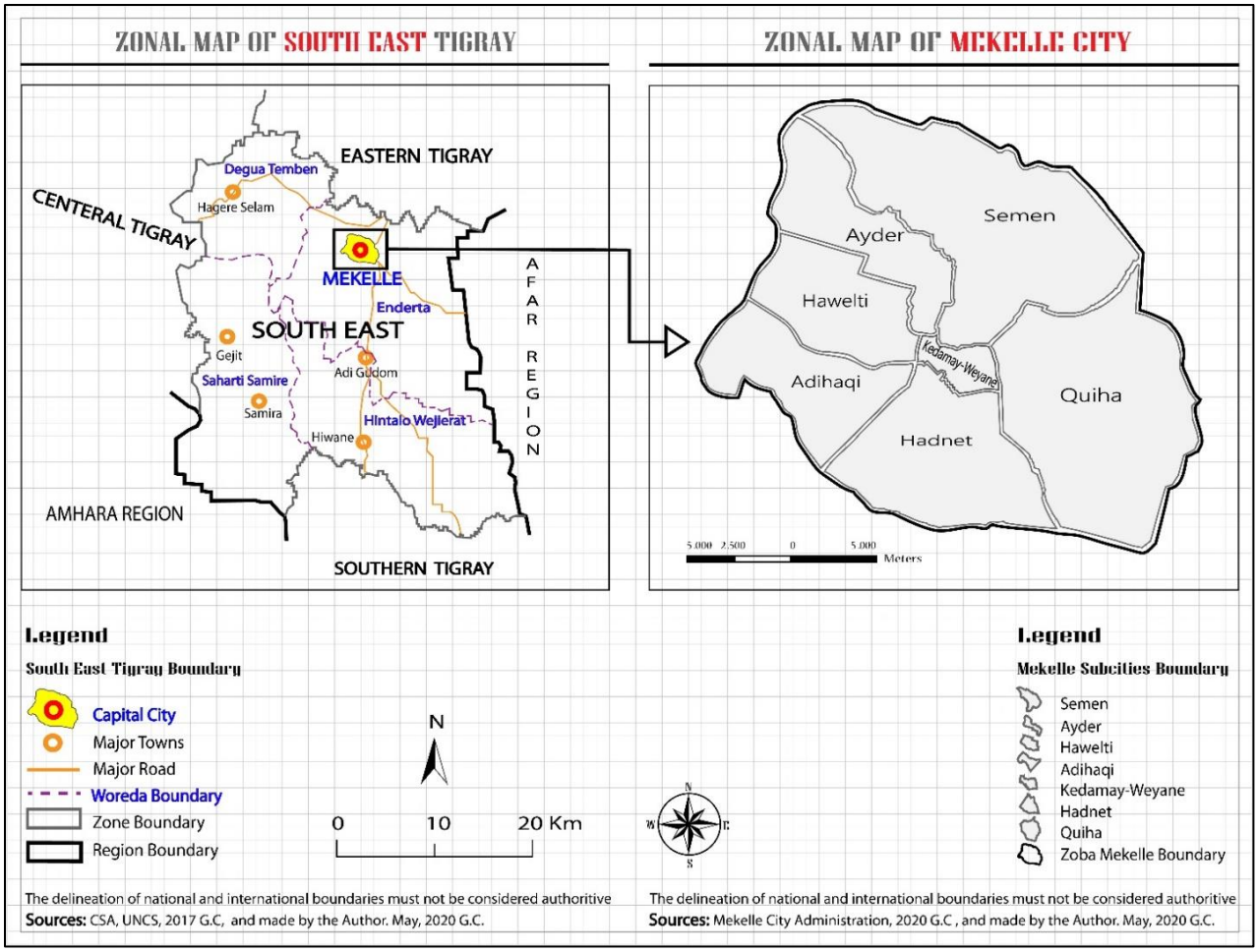
The advent of Italian Eritrea's trade facilitated the emergence of Hidmos equipped with corrugated iron roofs. Consequently, the Italians introduced construction techniques utilizing stones, cement, bricks, corrugated iron sheets, and wood. Subsequently, the populace and governing bodies began to perceive western materials and techniques as modern and emblematic of affluence, while venerating vernacular materials and techniques as outdated and traditional.

Notably, the Tukul and Hidmo dwellings exhibited exceptional durability, persisting to the present day. Following the Italian expulsion from the town, the prominence of Hidmo houses with zinc roofs endured. In contemporary Mekelle city, the preponderance of vernacular architecture is facing several

challenges, particularly in the degradation and disappearance of traditional vernacular houses in areas such as Kebele 14 and tabia Aynalem, ostensibly due to the ascendancy of new construction and a dearth of awareness regarding cultural heritage values. Consequently, the preservation and documentation of vernacular architectures necessitate urgent attention.



Map 1: Map of Africa, Ethiopia and Tigray. Made Using Adobe Illustrator, 2020.



Map 2: Zonal Map of Southeast Tigray and Zonal Map of Mekelle City. Made Using Adobe Illustrator, 2020.

1.2. Problem Statement of the Study

This issue stems from negligence and ignorance toward preserving the vernacular Hidmo houses, particularly their unique construction methods, as well as the mistreatment of the surviving Hidmo structures. These challenges are directly linked to the influence of the Industrial Revolution, technological advancements, rapid urbanization, population growth, improper use of natural resources, and the proliferation of modern architectural ideologies, techniques, and materials. Additionally, globalization has rendered certain cultures invisible while enabling others to flourish, exerting disproportionate influence over indigenous traditions including their impact on inherent Hidmo housing. In the main, "The absence of official recognition and public understanding regarding the heritage significance of vernacular architecture has impeded the advancement of local talents,

including crafts and cultural styles."[2] Ethiopia have the potential to utilize vernacular architecture at many levels but has not reaped the benefits due to insufficient emphasis on traditional building practices. Besides, the expansion of urbanization results in the demolition of these vernacular architectures without an imaginative and unprofessional plan, it drives to destroy the collective memory of the city also it will vanish in the future generation of its collective usage of social value, educational value, and aesthetic value. (Rumi Okazaki, 2009)

The topic of Vernacular architecture could be related to different issues. Nowadays, the key issue in the world is the increase in the amount of CO_2 in the earth's atmosphere, which has and is causing a change in climate and global warming. (Mazria, 2007). The vernacular architecture provides a solution for this, by using sustainable (natural) materials and sustainable construction methods. Generally, the problem that will be related to vernacular architecture is the minimum focus given to the sector and lack of official and public awareness. (Elsevier, 2011)

In the broadest sense, the effect of globalization on societies is manifested in the attrition of their value, identities, and cultural diversity as well as their tangible and intangible heritages. The relationship between development and heritage preservation has become controversial. The international council on monuments and sites (ICOMOS) called the 17th assembly held in Paris from 28, November to 01, December 2011, to adopt a declaration of principle and recommendations on the relationship between heritage preservation and development. The assembly examines the effect of globalization on the communities and heritage and the abilities of heritage and its inherent value and it is necessary to take up the challenges of conserving these fragile, crucial, and non-renewable resources for the benefit of current and future generations. (ICOMOS, 17th assembly)

Some studies are conducted on Urban Formation and Actuality of the Central District in Mekelle, (Rumi Okazaki, 2009), the others also on Appraisal of Vernacular Stone Housing Typology of Tigrai. (Samuel Bekele Jetie, 2019), However, the researcher was motivated to conduct this study as there was no effort made to investigate and document, specifically in the case of preservation practices, construction methods, forms, impacts, factors for the demolition of Hidmo houses, and retention mechanisms for preservation practices of Hidmo houses, is not yet studied.

[2] Alemayehu G/tinsae Tedla: A senior essay paper, A case of Kuriftu Resort and Spa in Debrezet

1.3. Research Questions of the Study

This study seeks to examine the preservation status of vernacular Hidmo houses in the specified area, encompassing their traditional construction techniques, materials, and architectural forms. It also endeavors to elucidate the primary factors contributing to the demolition of these heritage structures. Furthermore, the study aims to identify the core values and significance of vernacular Hidmo houses within the study area. Finally, the research seeks to determine effective strategies for documenting and preserving vernacular Hidmo houses in the study area. From this perspective, the following research questions are formulated in relation with the specific objectives of the study.

1. What is the situation of preservation practices, construction methods, materials, and forms of vernacular Hidmo houses in the study area?
2. What are the main causes of the demolition of vernacular Hidmo houses in the study area?
3. What are the major values of vernacular Hidmo houses in the study area?
4. How can vernacular Hidmo houses be documented and preserved?

1.4. Objective of the Study

1.4.1. General Objective of the Study

This research undertakes an examination and documentation of vernacular architectural practices, with particular attention focused upon the Hidmo dwelling typology within the urban locale of Mekelle city situated within the broader region of Tigray.

1.4.2. Specific Objectives of the Study

The investigation entails several specific objectives.

- It pertains to an examination of current preservation strategies, construction methodologies, materials, and architectural forms of vernacular Hidmo edifices within the specified study area.
- It focuses on identifying the primary factors contributing to the demolition of vernacular Hidmo structures in the study area.
- It involves a detailed description of the significant cultural, historical, and architectural values associated with vernacular Hidmo houses in the study area.
- It seeks to propose strategies for the sustained documentation and preservation of vernacular Hidmo houses within the study area.

1.5. Significance of the Study

This prospective study undertakes a comprehensive examination of vernacular architecture in Tigrai, focusing on the specific case of Hidmo houses in Mekelle city. The research aims to provide a robust foundation for officials, professionals, and stakeholders within both public and private sectors to inform preservation and documentation initiatives, as well as restoration endeavors. Furthermore, this study is designed to furnish in-depth information regarding the current physical state of vernacular Hidmo houses, whilst also highlighting preservation challenges and potential opportunities for conservation. Consequently, this research serves as a valuable resource, offering data for substantiating future investigations into vernacular Hidmo houses.

Moreover, involvement with local communities could stimulate economic benefits through job creation and income generation, fostering a tourism-oriented environment and encouraging the promotion of the site as a tourist destination. This initiative could also benefit various stakeholders, including schools, tour operators, film producers, musicians, and other related entities.

Through this study, architectural professionals will be empowered to design structures utilizing indigenous materials and traditional cultural construction methods, ultimately driving the development of nation-specific techniques and motivating governmental engagement as well as involvement from non-governmental organizations.

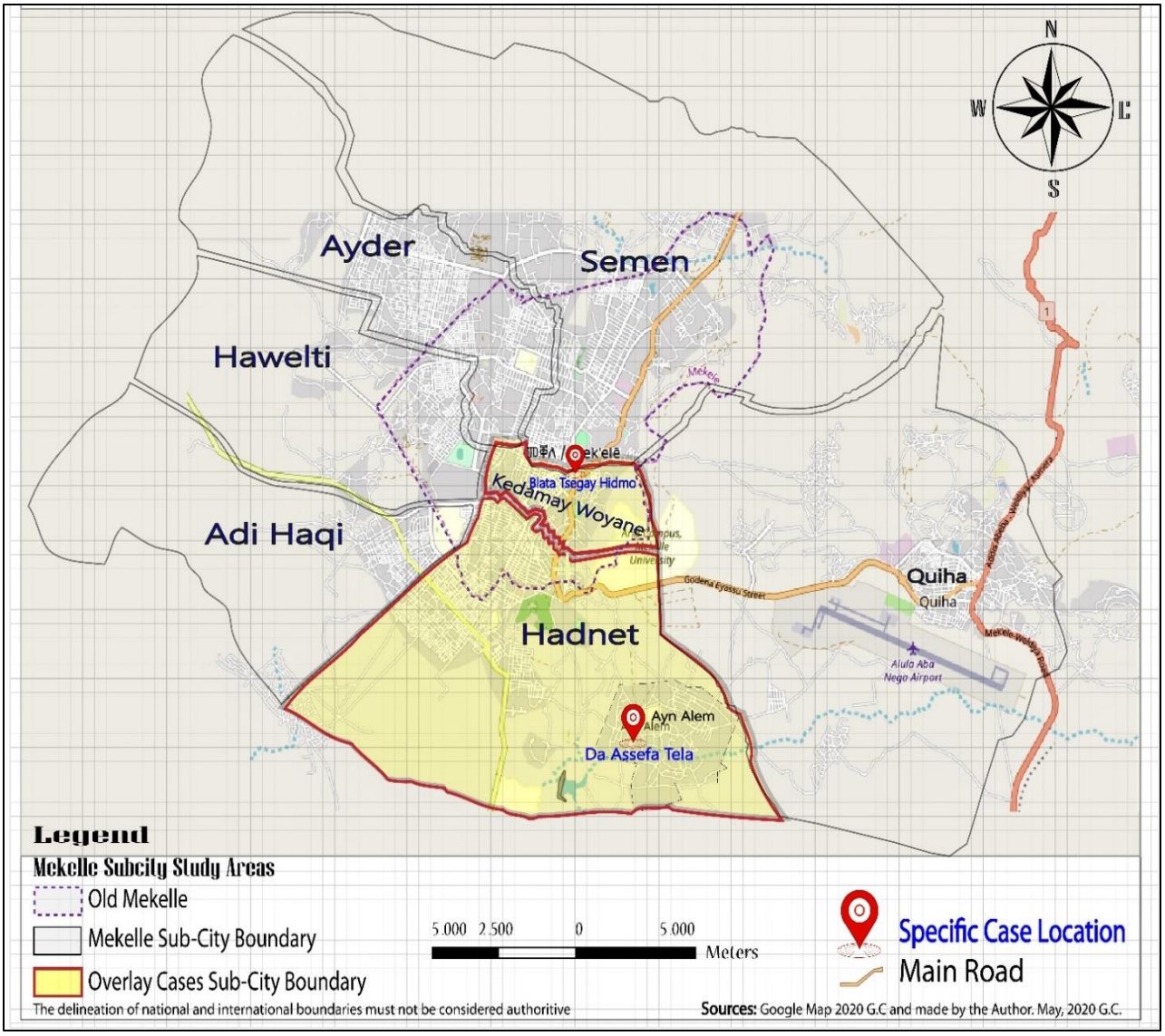
Ultimately, documentation, preservation, and promotion of Hidmo houses will contribute to minimizing destruction, transforming the site into a thriving tourist destination, and generating tourism revenue for the local community.

1.6. Scope of the Study

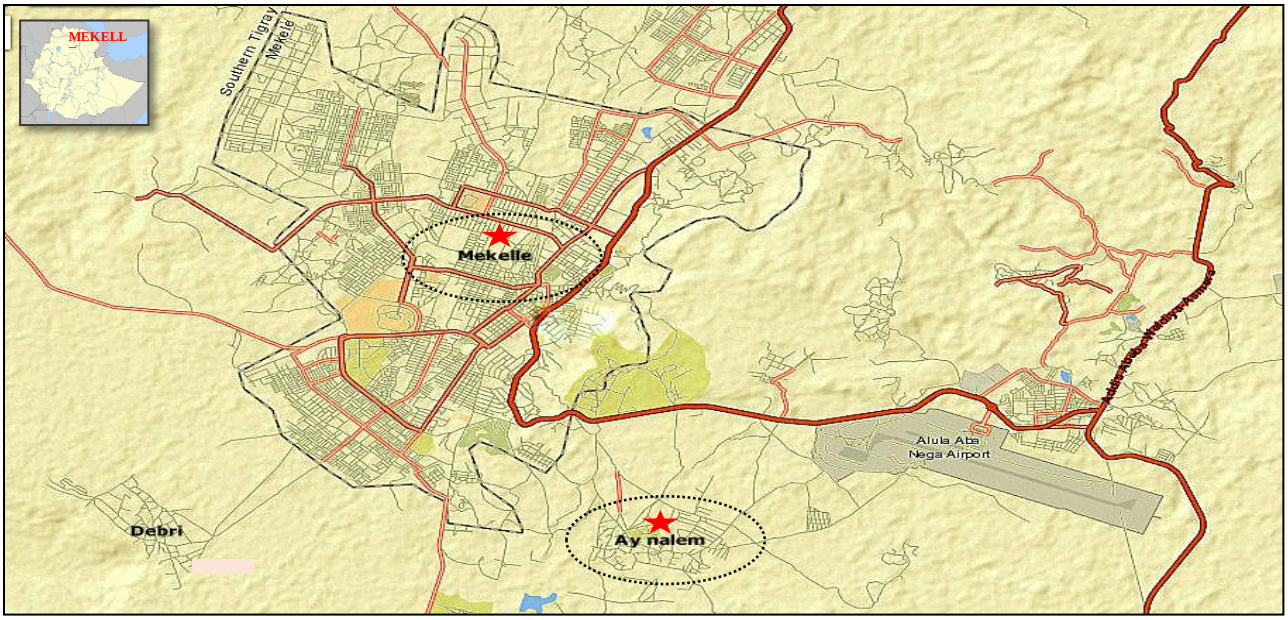
This investigation focuses on the traditional Hidmo houses of Mekelle city, particularly in the Kebele fourteen and Aynalem selected areas of Ethiopia’s Tigray region. Employing a qualitative and quantitative approach, the study entails an in-depth examination and documentation of the Hidmo houses preservation methods, construction techniques, materials, and morphological characteristics. It aims to provide a historical account of these vernacular structures, analyze the challenges threatening their preservation, and propose viable strategies for their continued documentation and conservation.

1.6.1. Description of the Study Area

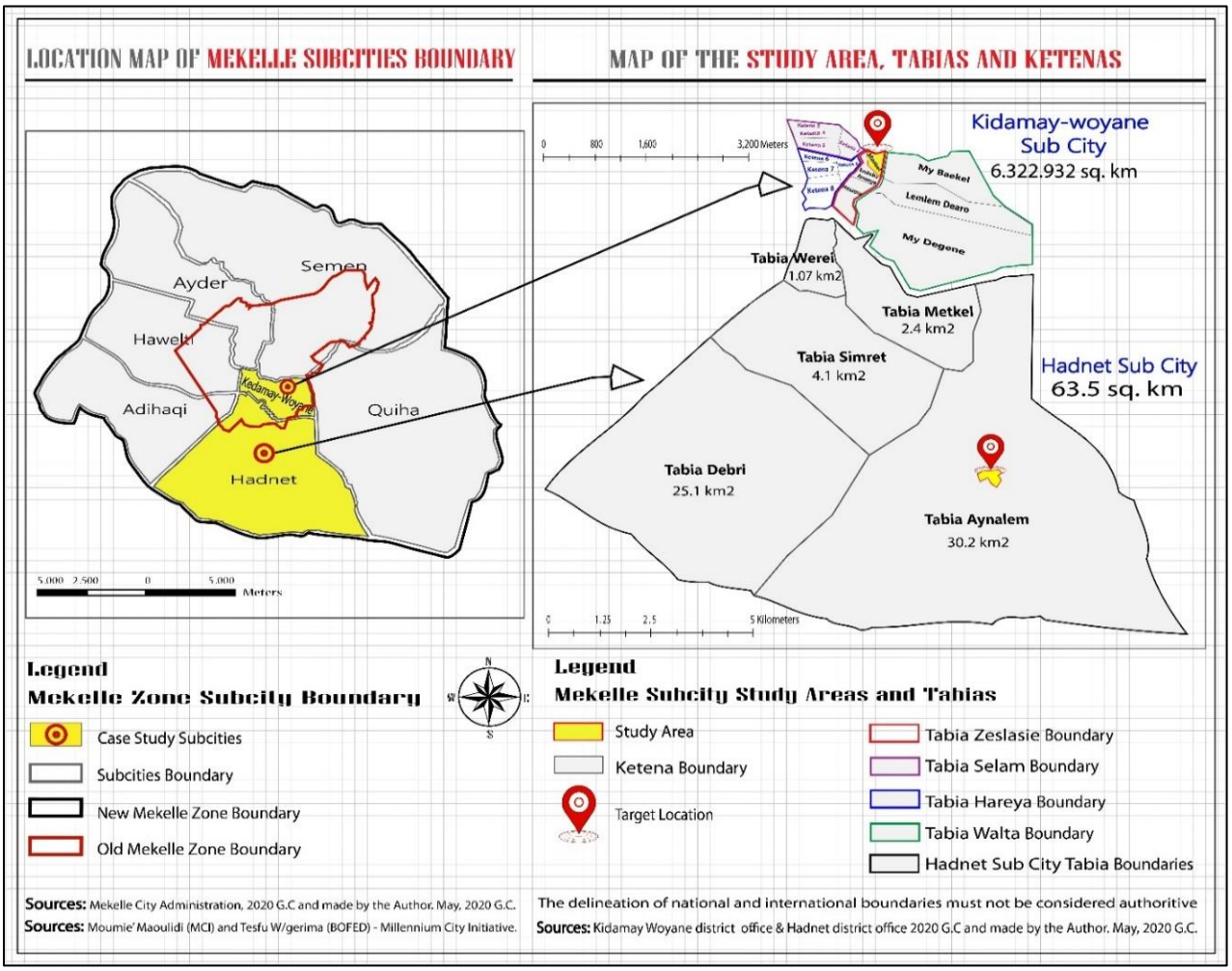
Mekelle is located 13°29'48.0"N and 39°28'31.0"E of the equator and it lies 783 km north of Addis Ababa, the country capital. The city is situated approximately 2.254m (7,395 ft.) above sea level and the population is in 2007 (CSA) Census results in 215,546 people, in 2018, become 310,436, and in 2020, become 537,822 population, numbers with a total area of 48,560 square kilometers. Administratively, Mekelle is considered a special Zone, which is divided into seven sub-cities. These are Adi Hak'i, Ayder, Hadnet, Hawelti, Kedamay Woyane, Quiha, and Semen districts. See map 3.



Map 3: GPS Map of Mekelle Sub-cities and the Study Areas, Adopted From DI5. Made Using Adobe Illustrator, 2020.



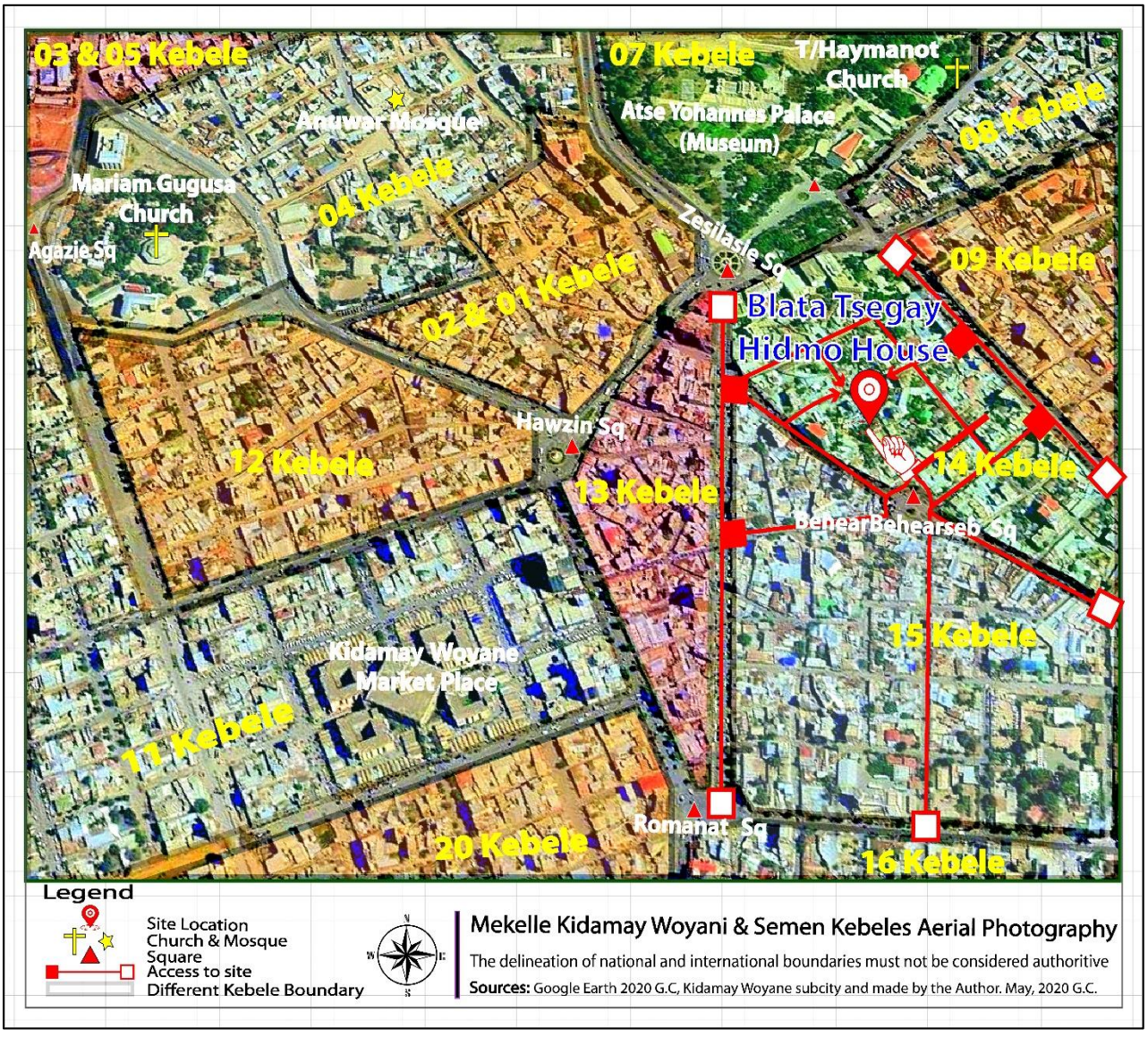
Map 4: Scope of the Study Areas: District of Kedamay Woyane and Tabia Aynalem. Sources: Gis, Satellite Image.



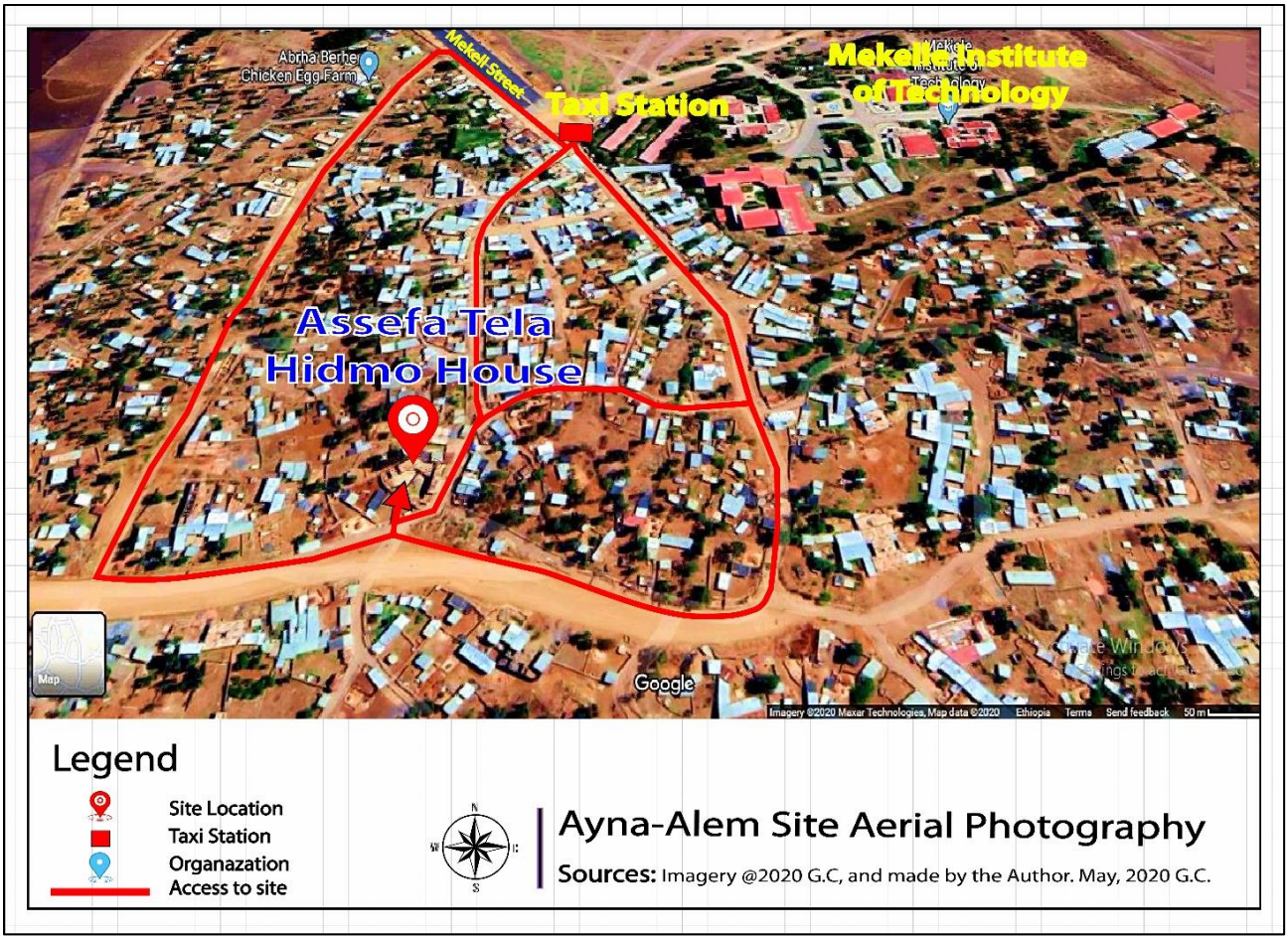
Map 5: Map of Mekelle City and the Study Areas. Made Using Adobe Illustrator, 2020.

1.6.2. Fabric Urban Expansion in the Study Area

Due to the rapid population growth, the city has experienced a dynamic change in the past few decades. As the population size of the city rise from time to time together with the demand for land is increased. At its establishment in 1872 G.C by Atse Yohannes IV, the city was relatively equivalent to a village. After 130 years, the city looks like a truly large city by surrounding many small villages and towns 15-20 KM adjacent to the center of the palace with large population size. See map below.



Map 6: Kedamay Woyane Case Study Aerial Photography. Own Survey, 2020.



Map 7: Aynalem Case Study Aerial Photography. Own Survey, 2020.

Today, the increasing speed of development is causing the demolition of houses in the historical district besides other infrastructure problems. The study on historical aspects of Hidmo houses and vernacular architecture issues is absolutely in need. To clarify these points on historical context, settlements in Mekelle city, Hadnet (Tabia Aynalem) and Kedamay Woyane (Tabia Zeselassie) sub-cities are the targets of this study, hence the Tabia Aynalem were inclusive in the new plan of Mekelle city. See the example of Map 3.

No	Sub-city	Tabias	The population of 2011 E.C			The population of 2012 E.C		
			M	F	Total	M	F	Total
1	K/Woyane	Zeslasse	3,594	4,562	8,156	4,007	5,006	9,013
		Walta	6167	6314	12481	6876	7040	13916
		Selam	4714	5949	10663	5256	6633	11889
		Haria	7583	3876	4064	7940	4531	8852
Total			18,351	20,889	39,240	20,460	23,210	43,670

No	Sub-city	Tabias	The population of 2012 E.C			The population of 2013 E.C		
			M	F	Total	M	F	Total
2	Hadnet	Aynalem	7,680.1	7,098	14,778	7,872	7,275	15,148
		Smret	13387	13886	27273	13722	14233	27955
		Werie	7593.9	8352.5	15946	7784	8561	16345
		Metkel	7722.1	7963.7	15686	7915	8163	16078
		Debri	6521.2	6016.9	12538	6684	6167	12852
Total			42,904	43,317	86,222	43,977	44,400	88,377

Table 1: Project Census of Mekelle Sub-City (Study Areas) Population Size, 2011-2013 E.C. Source: Bped; Bureau of Planning and Economic Development of Mekelle City, and Planning and Finance Office of Hadnet Sub-City Office.

1.6.3. Climate Situation in the Study Area

The climate in the study area is generally tropically followed by 150 consecutive days but moderated by altitude. Days are mostly sunny, but rarely warmer than 28º-30º C, while between November and January there can be frost at night. The main rainy season is between July and half of September. (TTCB magazine, 2014 G.C.).

The Climate Seasons				**Total D.**
Winter: Dry season	Spring: Newborn season	Summer: Rainy season	Autumn: Fall season	
From half Dec. - half May	From half May - June	From July - half Sept.	From half Sept – half Dec.	
150 days	45 days	75 days	90 days	360 Days

Table 2: Climate Situation of the Study Area. Own Survey, 2020.

1.7. Limitation of the Study

Notable limitations arose during this research. The primary challenge was the absence of secondary data, precluding the existence of analogous studies and hindered data collection efforts. Additionally, extensiveness of the study's scope presented difficulties, such as increased demand for elaborate visualization and extensive time requirements, while the abundance of vernacular Hidmo houses within the study area necessitated selective focus on designated areas, thereby rendering it infeasible to include all localities.

1.8. Conceptual Framework of the Study

The researcher developed a conceptual framework as a guideline during the study. It is outlined here to practice it as a trend for the effective attainment to investigate and document of vernacular architecture of Hidmo houses in Mekelle city. Assessing the situation of preservation practices, construction methods, materials, and forms of vernacular Hidmo houses in the study area. Then, Identifying the main causes or factors for the demolition of Hidmo houses in Mekelle city, as well as describing the major impacts or values of Hidmo houses and suggesting the retention mechanisms and creating documented Hidmo houses, as a result of this occurrence it generating a platform of sustainable vernacular Hidmos with attractive urban and rural fabrics, preserving heritage values of tangible and intangible assets of the Hidmo house, create a management plan, keeps historic memory of the city, create a tourist exposure, assist tourism development, promoting souvenir shops, creating employment opportunity. Mostly, it addresses the major problems of the demolition of Hidmo houses as well as proceeding the retention mechanisms as a benchmark for preservation practices in Mekelle city and localities.

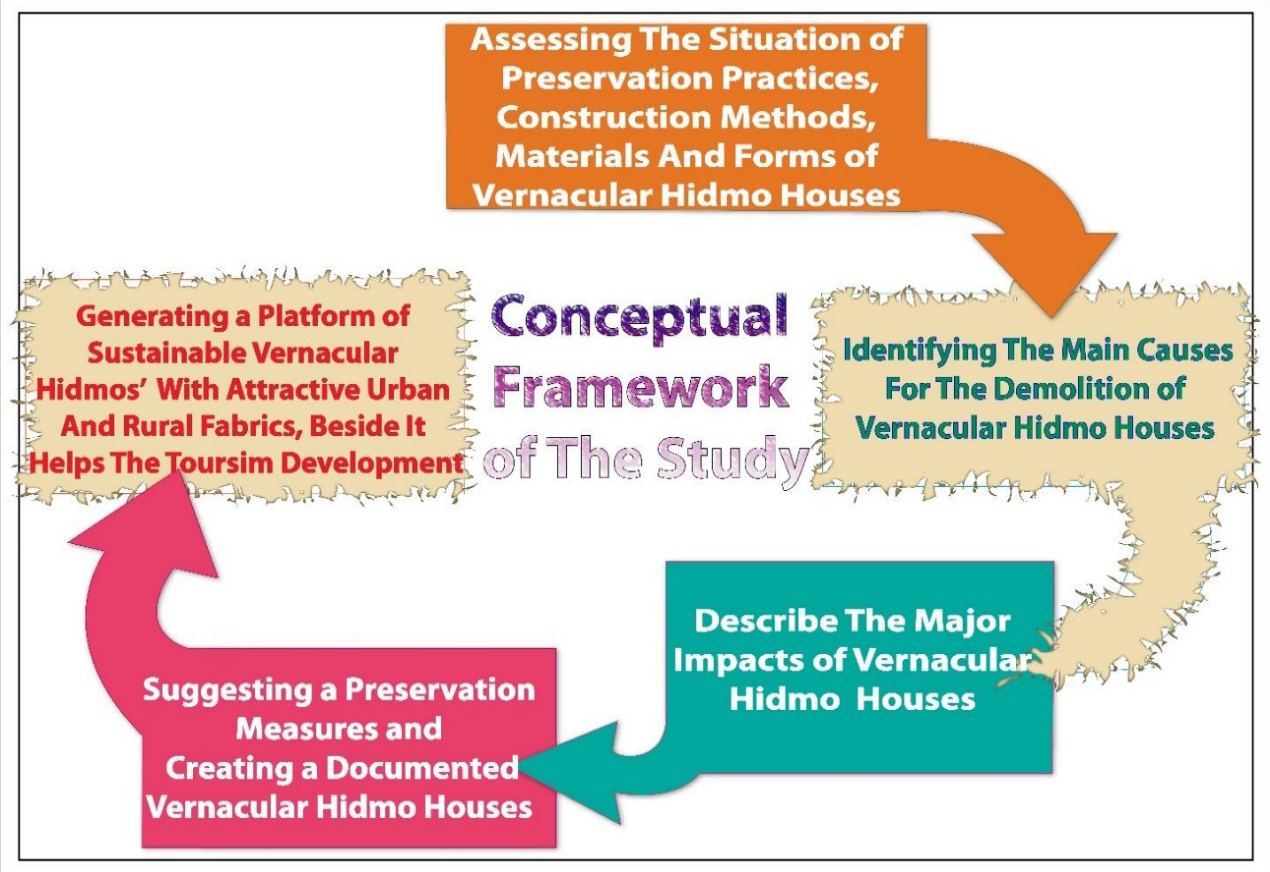


Diagram 1: Conceptual Frame Work of the Study. Own Survey, 2020.

1.9. Organization of the Paper

The organizational framework of this research paper comprises five distinct chapters. The preliminary chapter introduces the backdrop of the investigation, formulates the research query, outlines the study's objectives, specifies its significance and scope, and presents the conceptual framework and organizational structure of the paper. The second chapter involves a Literature Review: Critically examines relevant scholarly works, theories, and gaps in existing knowledge. The third chapter focuses on Methodology: a detailed description of the study area, incorporating discussions of data collection methodologies, research strategies and designs, data types and sources, sampling techniques, and data analysis and presentation procedures. The fourth chapter outlines the analysis and interpretation of the research findings, in addition to documenting the study area and its characteristics. The fifth chapter presents Conclusion and Recommendations: Summarizes key findings, offers actionable recommendations, and verifies the conclusions derived from the study's results. This framework ensures a logical progression from theoretical foundations to empirical analysis, culminating in practical insights.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter critically examines existing literature on vernacular architecture, focusing on its defining characteristics, preservation challenges and strategies, construction techniques and materials, morphological forms, and socio-cultural significance. The review integrates theoretical perspectives and empirical studies as well analysis to establish a foundation for understanding the threats to vernacular structures particularly *Hidmo* houses in Mekelle and strategies for their conservation.

2.2. Conceptualizing Vernacular Architecture

Vernacular architecture refers to indigenous building traditions shaped by local environmental, cultural, and socio-economic conditions (Oliver, 2006). Unlike formal architecture, it is characterized by adaptation to climate the structures respond to regional weather patterns (e.g., thick stone walls in Tigray for thermal regulation) (Rapoport, 1969). Use of local materials like mud, stone, timber, and thatch dominate, minimizing transportation costs and environmental impact (Asquith & Vellinga, 2006). Community driven construction the knowledge is transmitted orally, with minimal reliance on professional architects (Lawrence, 2006).

Likewise, Ethiopian *Tukul* huts use woven bamboo and thatch for ventilation, while *Hidmo* houses employ stone masonry and juniper tree for durability (Garedew, 2014).

2.3. Characteristics of Hidmo Vernacular Architecture

The vernacular Hidmo houses of Tigray represent a remarkable example of indigenous architecture that embodies the cultural identity, environmental adaptation, and sustainable building practices of the Tigrayan people. These structures are characterized by their distinctive construction techniques, material selection, and spatial organization, all of which have evolved over centuries to respond to local climatic conditions and socio-cultural needs (Asquith & Vellinga, 2006; Ferede, 2018).

One of the most notable characteristics of Hidmo houses is their construction method using locally available materials. The walls are typically built using stone masonry, either in dry-stone technique or with mud mortar, creating thick load-bearing structures that provide excellent thermal mass (Ayalew et al., 2020). The roofs consist of wooden beams, usually made from juniper or acacia trees, which support layers of compacted earth and straw for insulation (Ferede, 2018). This combination of materials results in buildings that maintain stable indoor temperatures, keeping interiors cool

during the day and warm at night - a crucial adaptation to Tigray's semi-arid climate with significant diurnal temperature variations (Asquith & Vellinga, 2006).

The spatial organization of Hidmo houses reflects the social and cultural values of Tigrayan communities. The houses often feature a central living space surrounded by smaller rooms, with the entire structure typically organized around a courtyard (Ferede, 2018). This layout not only facilitates natural ventilation but also supports the traditional way of life, where extended families live together and share communal spaces (Ayalew et al., 2020). The buildings frequently incorporate symbolic elements in their design, such as carved wooden columns and lintels, which serve as markers of cultural identity and social status (Asquith & Vellinga, 2006).

Another distinctive feature is the use of earth-based finishes. The walls are often plastered with mud mixed with straw or sometimes cow dung, creating a smooth, durable surface that is periodically maintained by the inhabitants (Ferede, 2018). Floors are typically made of compacted earth, sometimes finished with a polished mixture of clay and dung, which provides a hard-wearing and hygienic surface (Ayalew et al., 2020). These finishing techniques demonstrate the sophisticated understanding of local materials and their properties that has been developed over generations.

The architectural form of Hidmo houses also shows remarkable adaptation to the mountainous terrain of Tigray. The buildings are often constructed on terraced slopes, with their orientation and window placement carefully considered to maximize natural light while minimizing heat gain (Asquith & Vellinga, 2006). The thick stone walls not only provide thermal regulation but also structural stability in an earthquake-prone region (Ferede, 2018). These features collectively represent a sustainable building tradition that has successfully met the environmental and social needs of Tigrayan communities for centuries.

2.4. Preservation Challenges and Strategies of Vernacular Architecture

The Hidmo houses of Tigray, Ethiopia, exemplify indigenous architectural wisdom, combining local materials, climate-responsive design, and cultural symbolism. These structures are traditionally constructed using stone masonry, timber beams, and earth-based plasters, which provide excellent thermal mass and durability (Asquith & Vellinga, 2006). Walls are typically built with dry-stone or mud-mortared techniques, while roofs consist of wooden beams (often from juniper or acacia) covered with compacted earth and straw for insulation (Ferede, 2018). The use of mud plaster, sometimes reinforced with organic binders like dung, enhances weather resistance while maintaining

breathability, a key feature for regulating indoor temperatures in Tigray's semi-arid climate (Ayalew et al., 2020).

Despite their sustainability and cultural significance, Hidmo houses are increasingly replaced by modern materials such as concrete blocks and corrugated iron sheets (Asquith & Vellinga, 2006). Modern materials (e.g., concrete) often replace traditional techniques, eroding structural authenticity (Oliver, 2006). This shift is driven by perceptions of modernity, economic pressures, and the declining transmission of traditional building skills (Ferede, 2018). Unlike vernacular materials, modern alternatives often fail to provide adequate thermal comfort, leading to increased reliance on artificial cooling or heating (Ayalew et al., 2020). Furthermore, the lack of formal heritage protection policies means that many Hidmo houses are demolished or altered without documentation (Ferede, 2018).

To address these challenges, integrated preservation strategies are necessary. Community-based training programs could revive traditional masonry and carpentry skills, ensuring knowledge transfer to younger generations (Asquith & Vellinga, 2006). Hybrid construction techniques, such as combining stone walls with reinforced roofing, may improve durability while retaining cultural authenticity (Ayalew et al., 2020). Additionally, policy interventions, including heritage designation and incentives for traditional construction, are crucial for long-term conservation (Ferede, 2018). Cultural tourism could also play a role by generating economic incentives for preservation, as seen in other regions where vernacular architecture has been successfully marketed as a heritage attraction (Asquith & Vellinga, 2006).

Without urgent action, the Hidmo tradition risks disappearing, taking with its centuries of adaptive building knowledge and cultural identity. A balanced approach, one that respects modernization while safeguarding indigenous techniques, is essential to ensure that Tigray's architectural heritage endures for future generations.

2.5. Construction Techniques and Materials of Vernacular Architecture

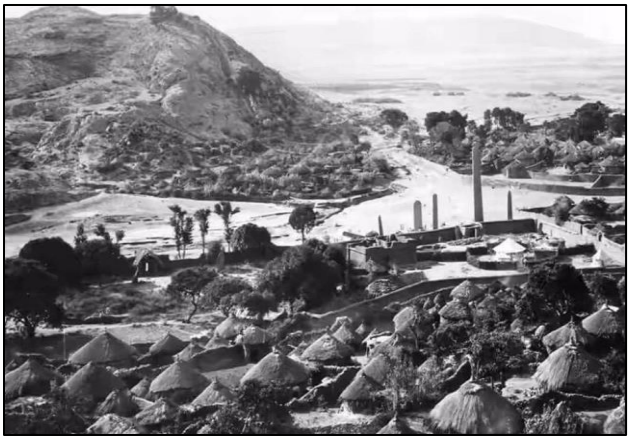
The vernacular Hidmo houses of Tigray showcase sophisticated indigenous construction techniques that have been refined over generations to optimize local materials and environmental conditions. These structures are primarily built using stone masonry, with walls constructed either through dry-stone techniques or using mud mortar as binding material (Ferede, 2018). Tigray's *Hidmo* houses use dry-stone or mortarless techniques, reflecting Axumite influences (Fattovich, 2010). The stone selection and placement demonstrate remarkable craftsmanship, with larger foundation stones

gradually giving way to smaller, carefully fitted stones as the wall rises (Ayalew et al., 2020). This method creates load-bearing walls of substantial thickness (typically 50-80 cm) that provide exceptional thermal mass and structural stability in Tigray's earthquake-prone highlands (Asquith & Vellinga, 2006).

The roofing system represents another exemplary adaptation to local conditions, utilizing wooden beams from indigenous juniper (Juniperus procera) or acacia (Acacia spp.) trees as primary support structures (Ferede, 2018). These horizontal beams, spaced approximately 40-60 cm apart, support secondary perpendicular poles that create a dense matrix for the earth roof covering (Ayalew et al., 2020). The roof assembly consists of multiple layers: first a thatch or brushwood layer, followed by a thick (15-25 cm) compacted mixture of clayey soil, straw, and sometimes animal dung, which provides both waterproofing and insulation (Asquith & Vellinga, 2006). This composition results in flat or slightly domed roofs that effectively shed water during rare rain events while maintaining interior comfort.

Earth-based materials play a crucial role in finishing and protecting Hidmo structures. Walls are typically plastered with a mixture of local clay soil, water, and organic additives like straw or animal dung, which improves cohesion and crack resistance (Ferede, 2018). The interior surfaces often receive multiple thin coats of finer clay plaster, sometimes mixed with crushed volcanic scoria to create smooth, decorative finishes (Ayalew et al., 2020). Floors are constructed using rammed earth techniques, with successive layers of selected soils compacted to create durable, well-drained surfaces that are periodically renewed with applications of clay-dung polish (Asquith & Vellinga, 2006).

The construction process itself follows traditional knowledge systems, with community participation being a hallmark of Hidmo building culture (Ferede, 2018). Skilled masons oversee the stonework while carpenters prepare and position the wooden elements, with family members and neighbors contributing labor during critical phases like roof construction (Ayalew et al., 2020). This collaborative approach not only facilitates construction but also serves as a mechanism for intergenerational knowledge transfer, ensuring the preservation of building traditions (Asquith & Vellinga, 2006). The entire process reflects a profound understanding of material properties, structural mechanics, and microclimate management developed through centuries of architectural evolution in the Tigrayan highlands.




Picture 2: Tigrai, Axum, Thatched Roof with Cylindrical Forms, Sources. (Theodor Von Lupke). To The Right, Tigrai, Debre Damo, Hidmo Masonry Houses, Field Survey, 2020.

"Tigrai vernacular housing is mainly characterized by a stone architecture called Hidmo, which is an astonishing feature of the country and the region. The Hidmo house does not only mean a flat-roofed vernacular house, but it is becoming an architectural style since thousands of years ago at the beginning of Axumites civilization. According to my literature review study, Tigrai vernacular housing has mainly three housing typologies namely, the Tigrai farmer house commonly called the Hidmo house, Tigrai chief house that is housed for the rich, clerks, and leaders and the third is Agudo dwelling unit a house for common people. In the Tigrai farmer house, we could have variations and labelings such as Merebae and Sekela house. All the housing typology have rectilinear shape, form and use the same building material that is a stone wall, mud and timber roof, but the Agudo dwelling unit and Tigrai chief house have a circular plan and conical thatched roof". (Samuel Bekele Jetie.)

The very nature of the Tigrai housing typology has the potential to respond to the sustainability of the climate and the availability of abundant materials, mainly stone and the 'Monkey head construction' system.

Picture 3: Gehrealta Lodge, Hawzin,Tigray Hidmo. Pic, Tigray Wonders.Com. 2020 G.C.

Picture 4: Tigrai, Debre Damo Monastery, Monkey Head Wall Construction Technique. Field Survey, 2020.

Houses in Tigrai are usually built from amazing stone masonry and they are rectangular. Sometimes they can be round but the round and rectangular houses have flat roofs of wood covered with mortar and wide overhanging eaves to protect the walls from rainwater. On the outside of the houses, they have beautifully built stone steps leading to the roof where the roof is used for many purposes. In some cases, the houses could double story buildings the upstairs would be used as a bedroom, leaving a room or guest room. (Samuel Bekele Jetie.)

The interior is painted with white or off-white color made from crashed local limestone, cow dung, and mud. The ceiling is stunning hand-carved wood arranged in artistic geometric patterns usually crosses. A good family house would have three free-standing buildings; the storage where the family crop is kept, the living room, the kitchen where the food cooked for the family. All the rooms can double as bedrooms. Tigrai houses have been overcome for thousands of years with not much change. The kitchen is almost always a round stone house with a conical roof covered with straws. It has a smoke escapes made from a broken water pot that serves as a chimney. More modern homes have tin roofs. (ibid)

Mekelle entertains people who still live-in old-fashioned houses called Hidmos. These houses are commonly square and circle in shape and are built of stones. The flat roofs are made of wood and covered with thatch and soil. Some of the Hidmo houses are one-storied. These types of houses are more common in rural areas of Tigray. But lately, they are being changed into different forms of buildings.

There are some good descriptions of the features of residential complexes of Mekelle city in the late 19th and early 20th centuries. Even though there are several types of traditional housing in Tigray, they are generally categorized into two, commonly known as Tukul and Hidmo. Tukul is built using a thatch roof and wooden and muddy walls. Mostly, it is circular. But Hidmo houses were constructed using stone walls and were very common. Compared to Tukul, Hidmos are stronger and last longer. (www.tigraywonders.com.)

Picture 5: Tukul (Guji) and Chika (Degde'ga) Types of Housing. Pic (Tigray Wonders.Com)

Traditional Beverage Houses in Mekelle: The Cultural Significance of Hidmo Establishments. Mekelle entertains people who still live-in old-fashioned houses called Hidmos. In Mekelle, several localities, including Aynalem, Edaga Bieray, and Jebruk are renowned for serving traditional beverages, particularly Swa (Tella). This fermented drink is brewed from toasted bread made of maize, sorghum, or millet, combined with water and flavored with *Gesho* (*Rhamnus prinoides*), a bittering and fermenting agent. Establishments offering Swa are often identifiable by their distinctive red banners, and the majority operate within Hidmo-style structures.

Hidmo houses dominate the local beverage-serving establishments, particularly in central Mekelle's fourteen kebeles and in Jebruk, where nearly all such venues adhere to this traditional architectural form. Even in Aynalem, Hidmos remain the preferred setting for Swa consumption. Patrons of this traditional beverage exhibit a strong cultural preference for Hidmo houses over modern alternatives, associating them with authenticity and heritage.

This preference underscores the enduring cultural significance of Hidmo architecture, which not only serves as a functional space but also reinforces the traditional identity of Tigrayan social and culinary practices.

Mekelle continues to preserve its cultural heritage through traditional Hidmo houses, which remain inhabited despite modernization trends. These vernacular structures typically feature either square or circular floor plans, constructed primarily from locally sourced stone. The roofing system consists of wooden beams overlaid with planks and compacted soil, forming characteristic flat roofs. While single-story Hidmos predominate, these traditional dwellings appear more frequently in rural Tigray than in urban settings.

However, contemporary architectural influences have led to the gradual transformation of many Hidmos, with traditional designs being modified or replaced by modern building styles. This shift reflects the tension between cultural preservation and modernization in the region.

In general, housing in Tigray predominantly utilizes locally sourced stone, reflecting an adaptive use of available natural resources. Given the region's abundant rocky terrain, stone serves as a primary construction material, not only for walls but also, in some cases, for ceilings when combined with supplementary materials. This reliance on stone underscores its critical role in the vernacular architecture of Tigray, shaping both structural durability and regional architectural identity. [3]

[3] www.tigraywonders.com.

Similar traditions appear across Africa, adapting to local conditions. In Morocco's Atlas Mountains, rammed earth (pisé) and adobe construction create thick-walled homes with excellent thermal properties, often featuring intricate clay decorations (Moughtin et al., 2004). West African savanna regions employ sun-dried mud bricks in distinctive Sudanese-style mosques, while thatched roofs provide ventilation in humid climates (Prussin, 1986).

East Africa's Swahili coast demonstrates coral stone construction with lime mortar, blending Arab and African techniques (Garlake, 2002). Southern Africa's Ndebele people developed vibrant painted earth-walled houses, while the Himba of Namibia build conical shelters from saplings and mud (Frescura, 1985). These diverse techniques share common sustainable principles: using local materials, passive climate control, and community-based construction processes (Oliver, 2006). However, many face threats from modern materials, despite their proven durability and environmental benefits (Asquith & Vellinga, 2006).

2.6. Morphological Forms and Aesthetic Features of Vernacular Architecture

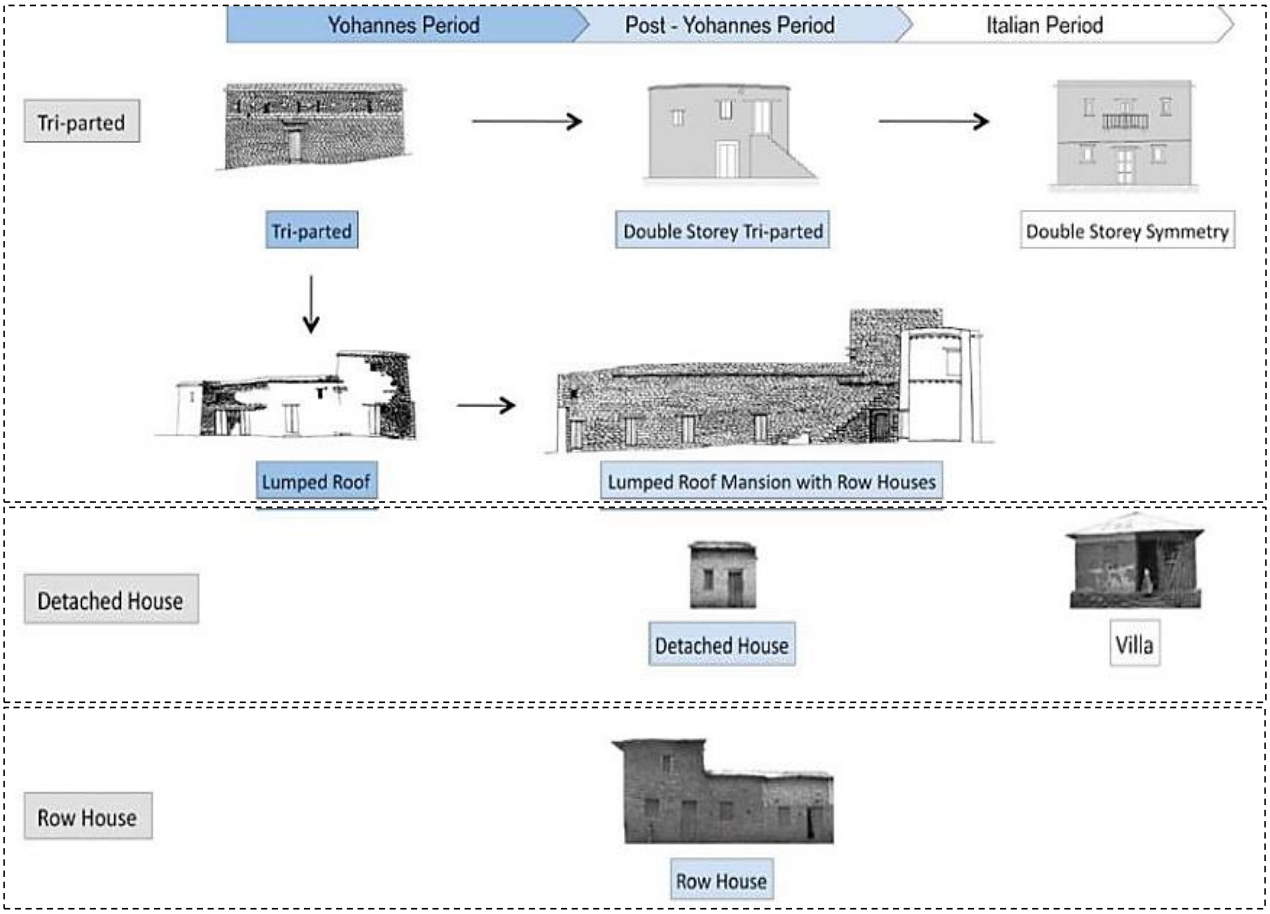
Vernacular forms prioritize function but exhibit cultural symbolism: *Hidmo* houses feature rectangular layouts with flat roofs for social and climatic adaptability (Rumi, 2009). Carved wooden doors and stone reliefs in Tigray denote social status (Phillipson, 2012). And, it exhibits distinct morphological patterns that reflect the region's cultural traditions, environmental adaptations, and social organization. These structures typically follow an agglomerated rectangular plan organized around a central courtyard, creating a clustered settlement pattern that maximizes land use in the rugged highland terrain (Ferede, 2018). The houses often demonstrate an additive growth pattern, where new rooms are appended to the initial core structure as family needs expand, resulting in organic, non-linear spatial configurations (Ayalew et al., 2020). This morphological development reflects the social importance of extended family living arrangements and the practical need for gradual construction in resource-limited contexts (Asquith & Vellinga, 2006).

The vertical morphology of Hidmo houses reveals a stratified functional organization, with the ground floor typically housing livestock and storage areas, while living and sleeping quarters occupy the upper levels (Ferede, 2018). This vertical zoning creates a thermal buffer system, where heat from animals rises to warm human living spaces during cold nights (Ayalew et al., 2020). The roofscape presents a distinctive morphological feature, with flat earthen roofs often interconnected to form continuous terraces that serve as additional living and working spaces (Asquith & Vellinga, 2006).

These morphological characteristics collectively create a compact, three-dimensional settlement pattern that optimizes limited arable land while providing defense against historical conflicts (Ferede, 2018).

2.6.1. Tigray's Historical Genealogy of Building Types: Forms, Evolution, and Socio-Cultural Significance

The architectural heritage of Tigray reflects a dynamic interplay of environmental adaptation, socio-cultural evolution, and historical influences. Among its diverse vernacular and transitional building types, several distinct forms have emerged, each with unique structural and functional characteristics. According to (Rumi Okazaki, 2009), it describes and discusses key typologies, including tripartite houses, lumped-roof structures, detached houses, row houses, double-story tripartite houses, double-story symmetrical houses, and villas, analyzing their historical development and cultural significance.



Picture 6: Historical Genealogy of Building Types. Sources, Rumi Okazaki, 2019 G.C.

1. Tripartite Houses

Tripartite houses are one of the oldest and most traditional forms in Tigray, characterized by a three-part division: a central living space flanked by two functional zones (e.g., storage and sleeping areas). This layout is deeply rooted in Axumite architectural traditions, emphasizing symmetry and spatial hierarchy. The tripartite division reflects social and ritual organization, where the central space often serves as a communal area for gatherings, while the side compartments provide privacy. The persistence of this form highlights its functional adaptability to both rural and urban settings.

2. Lumped-Roof Houses

These structures feature a distinctive single, rounded roof covering the entire dwelling, often constructed using timber and thatch or compacted earth. The design is particularly common in rural Tigray, where it provides thermal insulation and resistance to heavy rains. The lumped-roof form demonstrates indigenous engineering knowledge, optimizing material efficiency and climate responsiveness. However, its decline in urban areas reflects modernization pressures and the shift toward more durable (but less sustainable) materials like corrugated metal.

3. Detached Houses

Stand-alone residential units, often with a rectangular or square footprint, surrounded by open space. These became more prevalent with urban expansion and the influence of Western-style housing. Detached houses signify changing socio-economic dynamics, including land ownership patterns and a shift toward nuclear family living. Their proliferation in peri-urban Tigray illustrates globalization's impact on traditional settlement patterns.

4. Row Houses

Linear arrangements of attached dwellings, sharing side walls to maximize space in dense urban settings (e.g., Mekelle's historic quarters). Row houses reflect communal living traditions while adapting to urbanization. Their compact form is efficient but sometimes conflicts with modern demands for private outdoor space.

5. Double-Story Tripartite Houses

An evolution of the traditional tripartite house, now vertically expanded, with the ground floor often used for livestock or storage and the upper floor for living quarters. This typology illustrates adaptive reuse of tradition in response to land scarcity. It maintains cultural continuity while accommodating urban density, a key example of vernacular innovation.

6. Double-Story Symmetrical Houses

A more formalized, two-story structure with balanced façades, influenced by Italian colonial architecture (1930s–1940s) and post-20th-century urban design. The symmetry and ornamentation in these houses reflect hybrid identity formation, blending local and foreign aesthetics. Their presence in cities like Adigrat and Mekelle marks historical layers of cultural exchange.

7. Villas

Large, often freestanding residences with multiple rooms, gardens, and modern amenities, typically built for affluent families or foreign expatriates. Villas symbolize economic stratification and the influence of global architectural trends. Their spread raises questions about cultural homogenization and the erosion of traditional building practices.

Synthesis: Genealogy and Transitions

Tigray's building typologies reveal a chronological layering of indigenous, colonial, and contemporary influences. While early forms (tripartite, lumped-roof) emphasize community and sustainability, later introductions (villas, symmetrical houses) reflect globalization and socio-economic change.

Key Implications:

Cultural Preservation: Traditional forms like the tripartite house remain vital to Tigrayan identity but require documentation and adaptive reuse strategies.

Urbanization Pressures: The shift toward detached houses and villas risks eroding vernacular heritage, necessitating policy interventions.

Hybridity as Resilience: Double-story tripartite and symmetrical houses demonstrate how Tigrayan architecture absorbs external influences while retaining core principles. This genealogy underscores the need for ethno-architectural studies to inform sustainable development and heritage conservation in Tigray.

2.7. Socio-Cultural Significance of Hidmo Vernacular Architecture

The Hidmo houses of Tigray represent a profound architectural tradition that embodies both local cultural identity and universal human values shared across global vernacular architecture. Within Tigrayan society, these structures serve as living embodiments of indigenous knowledge, where spatial organization reflects social hierarchies through designated men's (enda hayl) and women's (enda set) spaces, while the central courtyard (demoz) hosts vital community rituals from coffee

ceremonies to conflict resolution gatherings (Ferede, 2018). This social patterning finds remarkable parallels in other African traditions - the compound houses of Ghana's Ashanti people similarly use architectural space to reinforce kinship structures, while Morocco's riad houses employ central courtyards as family gathering spaces, demonstrating pan-African architectural philosophies that privilege communal living (Prussin, 1986; Moughtin et al., 2004).

Globally, the Hidmo tradition shares fundamental principles with other ancient building cultures. Like the trulli houses of southern Italy or the tulou structures of China's Fujian province, Hidmo houses represent vernacular solutions to environmental challenges while encoding cultural memory in their physical form (Oliver, 2006). The sacred symbolism of Hidmo's central pillar (hijra) echoes the cosmic pillar concepts found in Indonesian rumah adat and Native American lodge designs, revealing universal human tendencies to imbue dwellings with spiritual meaning (Rapoport, 1969). However, the Hidmo's distinctive stone masonry and earth-roof construction remain unique to Tigray's highland context, where they continue to shape cultural identity despite modernization pressures (Ayalew et al., 2020). As with many vernacular traditions worldwide - from Yemen's tower houses to Peru's quincha structures - the preservation of Hidmo architecture represents not just conservation of buildings, but safeguarding of intangible cultural heritage and sustainable building wisdom increasingly valuable in our climate-conscious era (Asquith & Vellinga, 2006).

2.8. Major Values of Vernacular Architecture in Tigray and Global Contexts

Vernacular Hidmo houses in Tigray embody social, economic, political, and aesthetic values that extend beyond mere shelter, reflecting broader principles found in indigenous architectures worldwide.

2.8.1. Social Value

Hidmo houses reinforce community identity and intergenerational knowledge transfer. The construction process involves communal labor (*waffa*), strengthening social cohesion (Ferede, 2018). Spatial organization reflects Tigrayan social hierarchies, with designated areas for men (*enda hayl*), women (*enda set*), and guests, preserving cultural norms (Ayalew et al., 2020). Similar social structures appear in Ghana’s Ashanti compounds and Morocco’s riads, where architecture reinforces kinship and hospitality traditions (Prussin, 1986).

2.8.2. Economic Value

These houses utilize low-cost, locally sourced materials, reducing construction expenses and promoting sustainability (Oliver, 2006). Their thermal efficiency lowers energy costs, a principle shared by Yemen's mud-brick towers and Mali's adobe homes (UNESCO, 2021). However, the shift to modern materials disrupts this economy, as imported cement and steel increase financial burdens (Tesfay, 2021).

2.8.3. Political Value

Hidmo houses represent indigenous sovereignty and resistance to cultural homogenization. Their preservation (or demolition) reflects government policies on heritage conservation (Asquith & Vellinga, 2006). In Ethiopia, lack of legal protection contrasts with Morocco's efforts to safeguard ksour, showing how political will shapes vernacular survival (Moughtin et al., 2004).

2.8.4. Aesthetic Value

The organic forms, stone masonry, and earth plasters of Hidmo houses create a harmonious landscape integration (Ayalew et al., 2020). Their aesthetic parallels Japan's *minka* farms and Iran's windcatcher houses, where function and beauty merge (Oliver, 2006).

Value Category	Hidmo Houses (Tigray)	Global Examples	Key References
Social	Reinforces kinship, communal labor (*waffa*), gender-based spaces	Ashanti compounds (Ghana), riads (Morocco)	Ferede (2018), Prussin (1986)
Economic	Low-cost local materials, energy-efficient design	Yemeni mud towers, Malian adobe	Oliver (2006), UNESCO (2021)
Political	Symbol of cultural resistance; lack of policy protection	Moroccan ksour (protected), Yazd (Iran)	Asquith & Vellinga (2006), Moughtin (2004)
Aesthetic	Stone masonry, mud roof, earth plasters, landscape harmony	Japanese *minka*, Persian windcatchers	Ayalew (2020), Oliver (2006)

Table 3: Comparative Analysis of Hidmo House Values With Global Examples. Own Analysis.

Hidmo houses are multidimensional cultural assets, offering lessons in sustainability, community resilience, and aesthetic integrity. Their decline mirrors global threats to vernacular architecture, underscoring the need for integrated preservation strategies.

2.9. Threats or Challenges of Demolition of Hidmo Vernacular Architecture

The decline of Tigray's vernacular Hidmo houses results from human-made pressures, and insufficient retention mechanisms, reflecting broader global threats to indigenous architecture. "Vernacular is the traditional and natural way by which communities house themselves. It is a continuing process including necessary changes and continuous adaptation as a response to social and environmental constraints," **(**International Council on Monuments and Sites (ICOMOS)).

Due to the homogenization of culture, and global socioeconomic transformation, vernacular structures all around the world are very vulnerable nowadays, facing serious problems of obsolescence, internal equilibrium, and integration.

1. Unprecedented growth and change – i.e. more population concentrating in cities.
2. Pressure from competing for high-value activities – i.e. land prices.
3. Impact of major infrastructure programs – that means building more superhighways, connecting newly developed and urban centers.
4. Environmental pressures – i.e. uncontrolled carbon emission and polluted industrial waste.
5. Carry capacity – i.e. excessive use of rivers deforestation for human habitats.
6. Human Cause – i.e. such as war, theft, neglect, illegal trade, public works, and ignorance.
7. Natural Cause – i.e. earthquake, typhoon, flood, rain, tidal wave, humidity, and insects.

"Vernacular architecture evolves reflecting the characteristics of the local environment, climate, culture, natural materials, technology, and the experience of centuries of community building. (Natural homes.org/African-Vernacular.htm)

"Cultural Heritage" means anything tangible or intangible which is the product of creativity and labor of man in the pre-history and history times, that describes and witnesses to the evolution of nature and which has a major value in its scientific, historical, cultural, artistic and handicraft content; *(Federal Negarit Gazeta- No. 39 27th June 2000-Page 1346)*

"Immovable Cultural Heritage" means Cultural Heritage attached to the ground with a foundation' and which can be moved only by dismantling and shall include:

a. Sites where Cultural Heritage has been discovered, paleontological historic and prehistoric archeological places.
b. Buildings, memorial places, monuments, and palaces;
c. Remains of ancient towns, burial places, cave, paintings, and inscriptions;
d. Church, monastery, mosque, or any other places of worship;

Cultural Heritage constitutes the imprints of a people's age-old way of life, labor, and creativity; Whereas, Cultural Heritage constitutes an indispensable source of information for study and research regarding the origin and evolution of man and other forms of life and thereby for the better understanding of nature and environment.

It plays a major role in enabling the next generation to acquire profound and extensive awareness about its culture and history, which is the expression of its identity, and hence the protection and preservation of cultural heritage have been made the responsibility of each citizen, the society and the state. Whereas, it has become necessary to devise ways and means for the full protection and preservation of cultural heritage and to ensure that the research of Cultural Heritage at all stages is carried out in a way consonant with the national interest and the rights of the people; Cultural Heritage makes a major and universal contribution to the development of science and regarding the whole gamut of human knowledge generally; *(The Federal Democratic Republic Of Ethiopia, Proclamation No. 209/2000, Page, 1345)*

Key factors driving destruction include:

- Urbanization: Mekelle's expansion replaces *Hidmo* with modern buildings (Okazaki, 2009).
- Material shifts: Corrugated iron and concrete are perceived as "modern" (Garedew, 2014).
- Policy gaps: Lack of legal protection for vernacular heritage (UNESCO, 2011).

Research Gaps, Few studies address:

- The socio-economic drivers of Hidmo abandonment in Mekelle.
- Policy recommendations for integrating vernacular styles into urban planning.

In Kebele 14, 60% of *Hidmo* houses were demolished between 2000–2020 for new construction (Mekelle City Planning Office, 2021).

2.9.1. Natural Factors

Environmental degradation, including soil erosion and deforestation, has reduced access to traditional construction materials like timber and quality clay, forcing communities to opt for modern alternatives (Ayalew et al., 2020). Climate change exacerbates these challenges, with increased rainfall variability accelerating the deterioration of earthen roofs and mud plasters, making Hidmo houses more vulnerable than concrete structures (Ferede, 2018). Earthquakes, though infrequent, also threaten stone masonry buildings lacking modern reinforcement, further discouraging traditional construction (UNESCO, 2021). Similar natural pressures affect other earthen architectures, such as

Mali's adobe houses and Yemen's mud-brick towers, where extreme weather and seismic risks contribute to their decline (Oliver, 2006).

2.9.2. Human-Made Factors

The primary driver of demolition is urbanization, particularly in cities like Mekelle, where land value incentivizes replacing low-density Hidmo compounds with high-rise buildings (Tesfay, 2021). Government policies often favor modern materials through building codes, while neglecting heritage protections (Ferede, 2018). Economic shifts also play a role, younger generations migrate to cities, abandoning traditional construction skills, while returning migrants prefer "modern" homes as status symbols (Ayalew, 2022). Armed conflicts have further devastated historic settlements, eroding both physical structures and cultural knowledge (UNESCO, 2021). Similar pressures are documented in other African cities, such as Kumasi, Ghana, where historic Ashanti compounds are being replaced by modern apartments, and in Bamako, Mali, where adobe houses are disappearing under urbanization (Prussin, 1986; Asquith & Vellinga, 2006). Globally, these trends mirror the loss of Morocco's ksour and China's tulou, where urbanization and policy neglect override preservation efforts (Asquith & Vellinga, 2006).

2.9.3. Retention Mechanisms: Challenges and Opportunities

Current retention strategies remain weak, but potential solutions include: Policy Interventions: Legal recognition of Hidmo houses as cultural heritage, coupled with incentives for traditional repairs (Tesfay, 2021). Hybrid Construction: Integrating modern reinforcements (e.g., seismic-resistant foundations) while preserving traditional aesthetics (Ayalew et al., 2020).

Community Engagement: Revival of "waffa" (communal labor) systems to sustain craftsmanship (Ferede, 2018). Tourism & Education: Promoting Hidmo houses as cultural assets, similar to conservation models in Iran's Bam Citadel or Ghana's Ashanti compounds (Oliver, 2006). Without stronger retention mechanisms, Tigray risks losing not just buildings but an entire sustainable architectural legacy.

2.10. Documentation and Preservation of Vernacular Architecture: Global Best Practices and Conceptual Frameworks

The preservation of vernacular architecture requires a multidisciplinary approach that integrates systematic documentation, policy intervention, community participation, and technological innovation. Unlike monumental architecture, vernacular structures face unique

challenges due to their perceived "ordinariness," yet they embody indigenous knowledge, sustainable practices, and cultural identity. Cultural Landscape Theory (Sauer, 1925): Vernacular architecture as a product of human-environment interaction. Critical Conservation Theory (Vidler, 2008): Advocates for context-sensitive preservation. Yemen's Shibam ("Manhattan of the Desert"): Mud towers restored post-conflict with international aid (Damluji, 2018). Lalibela's rock-hewn churches, preserved through UNESCO-led initiatives (Fritsch, 2008). Effective preservation models worldwide demonstrate how traditional building systems, from Ethiopia's Hidmo houses to Yemen's Shibam mud towers, can be safeguarded through tailored strategies.

Effective approaches include:

- Documentation: Digital archiving of Hidmo construction techniques (Charter, 2003). Holistic Documentation, Combine digital tools (e.g., LiDAR) with ethnographic studies of *waffa* systems.
- Adaptive reuse: Converting historic houses into cultural centers (ICOMOS, 1999).
- Community engagement: Training locals in stone masonry (Wong, 2017).
- Policy Hybridization: Develop local heritage laws that incentivize traditional construction, inspired by Morocco's *ksour* protections.
- Climate Adaptation: Pilot projects testing stabilized earth techniques for Hidmo roofs, akin to Peru's quincha.
- Cultural Economics: Link preservation to tourism and craft markets, as in Shirakawa-go.

2.10.1. Comprehensive Documentation Methods: Beyond Physical Recording

Documentation must capture both tangible and intangible aspects of vernacular architecture. While 3D laser scanning (e.g., Gujarat's digital archive of *bhunga* houses (circular mud houses), India) uses photogrammetry to preserve physical form, ethnographic methods record construction rituals, oral histories, and socio-spatial practices (Desai, 2020). For Hidmo houses, this means documenting the *waffa* communal labor system alongside stone masonry techniques. Ethnographic Studies: UNESCO's "Atlas of Vernacular Architecture" records construction techniques, such as Iran's *qanat*-linked houses (Oliver, 2006).

Participatory mapping, as seen in Bali's *subak* rice terraces, locals document bamboo-building traditions through oral histories, and empowers communities to self-document their heritage (Prasad, 2016). Critically, documentation should feed into living archives that evolve with the culture, rather than static museum records.

2.10.2. Preservation Strategies Through Adaptive Continuity

Preservation is not about freezing buildings in time but enabling adaptive reuse and evolution. Morocco's ksour (fortified villages) exemplify this: restored as hotels and cultural centers, they remain economically viable while retaining authenticity are UNESCO-listed, ensuring restoration funding (Moughtin, 2004). Adaptive Reuse: China's Fujian tulou (earthen roundhouses) now function as hotels and museums (UNESCO, 2008). For Hidmo houses, hybrid adaptations, like integrating seismic reinforcements into traditional stone walls, could balance modernity and tradition (Ayalew, 2020). The "Critical Conservation" framework (Vellinga, 2007) argues for selective innovation, where new materials are introduced only where they enhance (rather than replace) vernacular systems.

2.10.3. Climate-Responsive Preservation

Vernacular architecture offers low-carbon alternatives to modern construction. Best-Preserved Example, Peru's Quincha (earth-and-bamboo) houses, revived post-earthquakes, demonstrate how traditional techniques can outperform concrete in seismic zones (García, 2020). Similarly, Hidmo houses' thermal mass could inspire contemporary sustainable design. Projects like CobBauge (UK/France) show how vernacular earth-building can meet modern codes through scientific validation, and trains builders in earth-construction revival (Keefe, 2021).

Concept/ Aspect	Hidmo Houses (Tigray)	Shibam (Yemen)	Fujian Tulou (China)	Shirakawa-go (Japan)
Material System	Stone masonry, earth roofs, timber	Mud brick with lime plaster, palm wood	Rammed earth, timber frames	Thatched roofs, timber joints
Threats	Urbanization, material substitution	War damage, climate erosion	Rural depopulation	Aging artisans, fire risk
Documentation	Limited academic studies	UNESCO-sponsored 3D scans	Detailed craft registries/3D modeling by universities	Intergenerational apprenticeship programs/ Ethnographic records
Preservation	Ad-hoc community efforts/ No formal policy	Post-conflict int'l funding/ Govt./UNESCO restoration	Tourism-driven adaptive reuse/ conservation	Community-managed tourism

Innovation	Potential for seismic retrofitting	Modern mud stabilization techniques	Eco-tourism integrations	Fire-resistant thatch treatments
Lessons	Needs legal protection	Post-conflict recovery model	Adaptive reuse success	Cultural tourism integration

Table 4: Comparative Analysis: Hidmo Houses Vs. Global Vernacular Preservation. Own Analysis.

This review underscores the urgency of preserving *Hidmo* architecture through documentation, policy intervention, and community participation. The next chapter details the study's methodology for assessing these challenges in Mekelle.

2.10.4. Policy and Community-Led Governance

Top-down legal protection (e.g., UNESCO designation) must be paired with bottom-up stewardship. Best-Preserved Examples: Japan's Shirakawa-go thatched *gassho-zukuri* village houses thrive because residents co-manage tourism revenue, ensuring preservation aligns with livelihoods (Jigyasu, 2016). Conversely, Ethiopia lacks robust heritage policies for Hidmo houses, leaving them vulnerable to demolition (Ferede, 2018). The "Ecomuseum" model, where entire landscapes are protected as living heritage (e.g., Italy's *Alberobello* trulli), could be adapted for Tigray's highland settlements.

2.11. Policies and Integrating Vernacular Architectural Styles into Urban Planning

To effectively integrate vernacular architectural styles into urban planning, policymakers should establish standardized guidelines and regulatory frameworks that recognize and protect indigenous design traditions. UNESCO's Recommendation on the Historic Urban Landscape (2011) provides a foundational approach by advocating for the inclusion of cultural heritage in urban development, emphasizing community participation and contextual design (UNESCO, 2011). Governments can adopt proclamations, such as India's National Mission on Sustainable Habitat (2010), which encourages climate-responsive vernacular techniques in urban housing policies (MoHUA, India, 2010). Additionally, building codes should be revised, following models like the International Vernacular Architecture and Urbanism (IVAU) Charter, to permit traditional materials and methods while meeting safety standards (IVAU Network, 2018). Local authorities can enforce compliance through design review boards, as seen in Morocco's Architectural Guidelines for Medinas, which mandate façade harmony in historic districts (Moroccan Ministry of Urbanism, 2015). Financial incentives, such as tax breaks for preserving vernacular elements (similar to Italy's Art Bonus

scheme), can further encourage adherence (Italian Ministry of Culture, 2014). By institutionalizing these measures, through national heritage acts, zoning laws, and municipal master plans, cities can ensure vernacular architecture's preservation while fostering sustainable, culturally rooted urban growth. For region-specific adaptations, case studies like China's Rural Revitalization Strategy (2018), which integrates vernacular tulou designs into modern rural planning, offer replicable models (State Council, China, 2018).

2.11.1. Enforcement Mechanisms

To effectively enforce policies that integrate vernacular architecture into urban planning, governments must adopt a combination of regulatory measures and financial incentives. A robust enforcement framework should include mandatory design review panels, such as those used in Singapore, where expert committees evaluate projects for cultural appropriateness before approval, and heritage impact assessments (HIAs), aligned with ICOMOS guidelines, to ensure new developments respect local architectural traditions. Conditional permitting systems, like Turkey's site management boards, can tie construction approvals to compliance with vernacular design standards, while penalties for non-compliance, similar to Mexico's Federal Monument Law, deter deviations from established guidelines. Public transparency platforms, such as France's Architectures de Patrimoine database, can further enhance accountability by allowing communities to monitor and report violations.

2.11.2. Funding Models

To incentivize compliance, policymakers should leverage targeted funding models, including grants like those offered under the EU's Creative Europe Program or India's HRIDAY Scheme, which support heritage-sensitive urban revitalization. Tax incentives, such as the U.S. Federal Historic Tax Credit (20% rebate for preserving historic structures) and Brazil's Lei Rouanet (tax-deductible donations for heritage projects), can encourage private investment in vernacular preservation. Public-private partnerships (PPPs), exemplified by Morocco's rehabilitation of Fez Medina, can unlock funding for large-scale restoration, while microfinance initiatives, like Thailand's Community-Based Tourism Fund, empower grassroots vernacular projects. Additionally, carbon credit programs, such as Kenya's Miti Alliance, could reward sustainable vernacular construction techniques like bamboo or rammed earth.

A proven model is Barcelona's Special Plan for Architectural Heritage, which mandates façade preservation in historic districts and funds restorations through 50% municipal subsidies, financed by

tourism revenues. By combining strict enforcement with strategic financing, cities can preserve cultural identity while promoting sustainable urban growth. For localized implementation, adapting these mechanisms to regional contexts, such as China's rural tulou revitalization or Mexico's Pueblos Mágicos program, can ensure policy relevance.

2.11.3. Step-By-Step Roadmap For Piloting Vernacular Architecture Integration in Urban Planning.

Phase 1: Research & Baseline Assessment (Months 1-6)

Document Local Vernacular Styles – Conduct surveys, interviews, and archival research to identify traditional materials, building techniques, and typologies (e.g., courtyard houses, thatched roofs).

Map Heritage Zones – Use GIS tools to designate areas where vernacular architecture is intact or at risk, prioritizing conservation.

Stakeholder Workshops – Engage local craftsmen, historians, and communities to define key design principles and challenges.

Phase 2: Policy & Regulatory Design (Months 6-12)

Draft Local Guidelines – Adapt international standards (e.g., UNESCO's Historic Urban Landscape approach) into enforceable design codes for roof forms, façades, and materials.

Revise Building Codes – Allow traditional techniques (e.g., adobe, timber lattices) with safety modifications, referencing models like New Zealand's Māori Built Heritage Guidelines.

Establish Incentive Schemes – Propose tax rebates for vernacular-compliant projects and penalties for non-compliance, mirroring Barcelona's subsidy model.

Phase 3: Pilot Implementation (Months 12-24)

Select Pilot Neighborhoods – Choose 1-2 historic or rapidly developing areas (e.g., a market district or riverfront) for testing.

Launch Design Competitions – Encourage architects to submit hybrid (vernacular + modern) designs for public buildings (e.g., schools, clinics).

Train Local Artisans – Partner with vocational schools to teach traditional craftsmanship, ensuring labor supply.

Phase 4: Monitoring & Scaling (Months 24-36)

Evaluate Impact – Assess cultural preservation, tourism growth, and resident satisfaction through surveys and economic data.

Refine Policies – Adjust guidelines based on feedback (e.g., relaxing height limits if needed).

City-Wide Rollout – Expand to other districts, integrating lessons into the urban master plan.

Key Tools for Success

Funding: Start with municipal budgets and grants (e.g., World Bank's Cultural Heritage Tourism Fund).

Enforcement: Assign a Vernacular Architecture Oversight Committee to review permits.

Community Buy-In: Host public exhibitions of pilot projects to build support.

Example: For a pilot in Jaipur, India, focus on restoring havelis (traditional mansions) with adaptive reuse for boutique hotels, funded by tourism revenue and enforced by the Heritage Development Authority.

2.11.4. Template For Policy Decree on Vernacular Architecture Integration

Title: [City/Region Name] Vernacular Architecture Preservation and Integration Act

Section 1: Purpose

To safeguard local architectural heritage, promote sustainable urban development, and ensure new construction harmonizes with traditional design principles.

Section 2: Definitions

Vernacular Architecture: Structures built using indigenous materials, techniques, and styles reflective of local culture and climate.

Heritage Zone: Designated areas where vernacular architecture is preserved or required in new developments.

Section 3: Design Guidelines

All new constructions/renovations in Heritage Zones must:

Use locally sourced materials (e.g., bamboo, lime plaster, stone) where feasible.

Incorporate passive cooling/heating strategies (e.g., shaded verandas, cross-ventilation).

Adopt roof forms, façade proportions, and spatial layouts aligned with regional traditions.

Section 4: Enforcement

Vernacular Design Review Panel: A committee of architects, historians, and community representatives will approve projects.

Penalties: Fines (e.g., 5–10% of project cost) for non-compliance; demolition orders for severe violations.

Section 5: Incentives

Tax Rebates: 15–25% property tax reduction for compliant projects.

Grants: Up to [X]% of restoration costs for heritage structures.

Fast-Track Permits: Priority processing for vernacular-aligned designs.

Section 6: Pilot Program

Implement in [Pilot Neighborhood Name] for 24 months, with biannual public progress reports.

Effective Date: [DD/MM/YYYY]

Signed: [Mayor/Governor Name]

Item	Estimated Cost (USD)	Funding Source
Heritage Surveys	$50,000	Municipal budget + UNESCO grants
Artisan Training	$30,000	National Culture Ministry
Public Workshops	$20,000	NGO partnerships (e.g., ICOMOS)
Pilot Building Grants	$200,000	Tourism revenue + private donors
Monitoring/Evaluation	$40,000	World Bank urban heritage fund
Total	**$340,000**	

Table 5: Sample Budget Breakdown For Pilot Program.

Adaptation Example: For Lamu, Kenya (a Swahili stone-town), the budget could prioritize coral stone restoration workshops and mangrove timber sourcing.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1. Research Design

The researcher utilized descriptive research type because it examines and documenting the current status of vernacular Hidmo houses in Mekelle city districts and its localities and permits the researcher to describe the situation that would be held in the span, consequence and its trends. (Kothari, 2004). Descriptive research type method that assists for the researcher to analyzes data/inputs/ using ratios, percentages, averages, variance, and standard deviations and besides the researcher also used Exploratory research is defined as the initial research or a preliminary stage this is where a researcher has an idea or has observed something, depth interview and effective focus group discussion and seeks to understand more about it. An exploratory research design is an attempt to lay the groundwork that will lead to future studies or to determine if what is being observed might be explained by a currently existing. Most often, exploratory research design helps the researcher to explain qualitative data/inputs/ (Kothari 2004).

3.2. Methods of Data Collection

Since this research is an extensive study on the investigation and documentation of vernacular Hidmo houses, the issue in the district of Mekelle city and its localities. Several methods to attain the objectives are implemented. To grasp the vernacular Hidmo houses of Mekelle and its districts, steps from documentation of building identification, visual inspection, observation, video documentation, photography, sketches, mappings, measuring inspection, in-depth interview, questionnaires, FGD, and technical drawings for the existing buildings were basic methods. Collected materials and measurements of the existing buildings were contributing much to the process of technical drawing. Following this process, field research was carried out. After measurement of historical buildings and analysis, interview with residents and those who concern is made. Finally, both heritage and historical research were integrated to abstract the hidden problem within deteriorated historical Hidmo houses. For further information. See diagram 2.

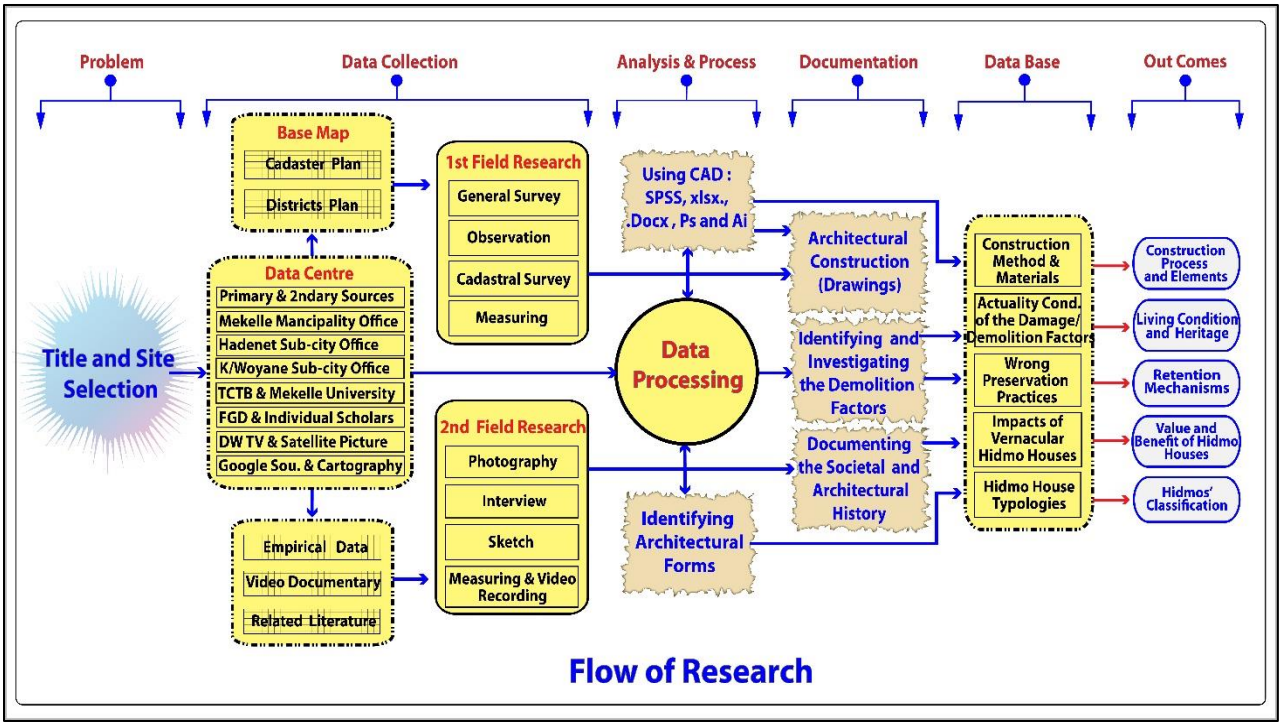


Diagram 2: Flow Chart of the Study. Own Survey, 2020.

Generally, the researcher was applied for this study, encompassing primary and secondary data. The primary data was collected through semi-structural interviews, extended personal observations, field surveys, focus group discussions, drawing and photographs.

Regarding the secondary data, the researcher was expected to use published and unpublished sources such as Books, Megazine, Internet data, documentary videos, researched papers, and photography.

3.2.1. Primary Data

3.2.1.1. In-Depth Interview

According to (Denscombe, 2007) indicates that in-depth interview enables researcher the collection straightforward information, their potential as a data collection method is better exploited when they are applied to the exploration of more complex and subtle phenomena. The researcher was interviewed key informants through semi-structural interviews of data collection instruments from local people. They were from masons man, community leaders, scholars, and government offices. They were chosen depending on their memory through inherited from their generation and the knowledge they have within the challenges of the selected study area. This kind of interview enables us to have sufficient information from the interviewees' opinions, feelings, emotions, and

experiences. Additionally, a semi-structured interview provides opportunities for both interviewer and interviewee to discuss the given topic in more detail.

The interview questionnaires form for documentation and inventory is open-ended questions and adopted from the "***State Historic Preservation Office of IOWA Site Inventory***". It contained questions about personal information, detailed history, factors, plan, location, elevations, and measurement for the selected study area. (For further detail see Annex 6).

3.2.1.2. Direct Observation

Observation also was made on the selected area and the sub-cities, Yin (Yin, 2009), states that the case study creates an opportunity for direct observation. Observational evidence is often useful in providing additional information about the topic to be studied. For this reason, the researcher employed observation as a data collection tool. I spend days with the target population during the data collection period. This allowed me to gather actual data through my observation. Direct observation is an ample data collection tool in that it enabled me to comparatively see the theoretical concepts studied in the course and what was practically taking place. Besides, it helps me to grasp the top important data for the study.

3.2.1.3. Questionnaires

The questionnaire was prepared in the form of both open and closed-ended questions to gather relevant data from respondents. It consists of two sections; the general background of the respondents and opinion scale questions. The open-ended questions that enabled me to classify the data and information required for documentation. The Close-ended questionnaires were developed through the adaptation and modification of a questionnaire from previous studies (Walton, 2005) and formulate a questionnaire for determinants of vernacular Hidmo house.

The questionnaires were prepared in the form of Likert-scale type (showing respondents agreement or disagreement) by constructing a five-point scale that is the lowest scale represent strongly disagree and the highest scale represents strongly agree. The questionnaires were being distributed to the respondents. The questionnaires were organized into two parts; the first part comprised the demographic questions regarding the respondents, and the second part contained variables relating to the preservation practices, its factors, and retention mechanisms. The rating recorded was assigned rating values ranging from five to one respectively as shown in table 6.

Attributes	Definition	Value assigned
Strongly agree	Very much supporting the case described	5
Agree	feeling alright with the case described	4
Neutral	uncertain with the case	3
Disagree	not satisfied with the case described	2
Strongly disagree	very much dissatisfied with the case described	1

Table 6: The Response Values For the Survey Questionnaire. Source: Rensis Likert (1975), Cited in (Armstrong, 2009)

Then by calculating the mean value for variables in interpreting the results the scales (mean scores of variables) were reassigned as follows to make the interpretation easy and clear.

Mean value of variable/score/	Definition
1.00 – 2.61	Weak agreement
2.62 – 3.41	Moderate agreement
3.42 – 5.00	Strong agreement

Table 7: Definition of Score Values Source: (Sekaran, 2003)

The core variables in the questionnaire were adopted and applied with little modification by including additional attributes in each for gauges, from the related studies measured using the 5-point Likert scale (1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree) for all five dimensions' attributes.

3.2.1.4. Focus Group Discussion (FGD)

The researcher also has been planned to use focus group discussions which have above 5 participants. Focus group members are from the TTCB, which are believed as expertise. This is to draw upon respondents' attitudes, feelings, beliefs, experiences, and reactions about the overall focus study of the researcher which are preservation challenges and documentation of the Hidmo houses in a way in which would not be feasible using other methods, for example, observation, one-to-one interviewing, or photographs. The researcher has collected information from 5 informants about the study area in different variables. Also, selecting the informants was depending on their professions, which are heritage management, architectural conservation, Museum, and tourism expertise.

3.2.2. Secondary Data

This study utilized diverse secondary sources to support primary research on HVA, including: (1) scholarly publications on Ethiopian vernacular architecture; (2) TTCB archival records and conservation reports; (3) historical photographs and documentaries; and (4) UNESCO and academic database resources. These materials provided comparative baseline data, validated field observations, and identified documentation gaps through triangulation with primary findings.

3.3. Method of Data Analysis

This study employed a mixed-methods approach combining field surveys, interviews, and archival research with SPSS/Excel analysis to examine Hidmo architecture's physical and cultural dimensions. Qualitative methods documented construction techniques and spatial uses, while quantitative analysis measured material deterioration and structural parameters. The triangulated approach ensured comprehensive data alignment with research objectives.

3.4. Sampling Technique

Given impracticalities of studying the entire population, the research employed a hybrid sampling approach to optimize resources while ensuring representativeness. Stratified random sampling (probability-based) selected community informants to capture demographic diversity, following Kothari's (2004) methodology for generalizable data. For expert insights, purposive sampling (non-probability) targeted TTCB staff and key informants, enabling judgment-based selection of participants with specialized knowledge of Hidmo architecture. This dual approach balanced statistical rigor with the need for contextually rich qualitative data.

3.5. Sampling Size

The sample size of the study was implemented based on the calculation method of (Cochran & Israel, 1992), which is reliable up to 90% and deviation factor is less than 0.1 (social scientists usually establish a cut-off point at 10% chance of sampling error). To proportionally distribute the samples among the strata; the formula below was implemented.

$$n_h = \left(\frac{Nh}{Ns}\right) n \quad \text{or} \quad n = \frac{N}{1+N(e)^2}\, n$$

Where: n_h = Sample size from each stratum

Nh = Total population from each stratum / Size of the total household representatives

Ns = Total population of the sum of strata for the study

n = Total sample size from the study population

e = acceptable error in social science

Given a total sample, size of 100 by using a stratified sampling method the sample size was proportionated into the 7 target population as follows:

1. Culture and Tourism Bureau of Tigray: $\frac{76}{1000} * \mathbf{100} = \mathbf{7.6}$
2. Mekelle Municipal Office: $\frac{150}{1000} * \mathbf{100} = \mathbf{15}$
3. Elders and Masons: $\frac{150}{1000} * \mathbf{100} = \mathbf{15}$
4. Homeowners: $\frac{400}{1000} * \mathbf{100} = \mathbf{40}$
5. MU (Scholars): $\frac{100}{1000} * \mathbf{100} = \mathbf{10}$
6. Mekelle agency of house association: $\frac{50}{1000} * \mathbf{100} = \mathbf{5}$
7. Tourism of Mekelle city zonal administrative office**:** $\frac{74}{1000} * \mathbf{100} = \mathbf{7.4}$

The following table 8 shows the entire target population and their proportionate sample considered for this study.

Population Category	**Total Population**	**Sample Size**
Culture and Tourism Bureau of Tigray	76 **(Nh)**	7.6 **(nh)**
Mekelle Municipal Office	150	15
Elders and Masons	150	15
Homeowners	400	40
MU (Scholars)	100	10
Mekelle agency of house association	50	5
Tourism of Mekelle city zonal administrative office	74	7.4
Total	**1000 (Ns)**	**100 (n)**

Table 8: Stratified Sampling of the Target Population and Sample Size. SPSS Result, 2020.

3.6. Ethical Consideration

The study adhered to rigorous ethical standards, commencing with formal approvals from Mekelle University's Institute of Paleoenvironment and Heritage Conservation, supplemented by an official recommendation letter from the Department of Heritage Conservation and Management. Prior to data collection, written informed consent was obtained from all participants, with explicit disclosure of research objectives and their voluntary participation rights. The researcher maintained utmost respect, courtesy, and transparency throughout engagements to foster trust and candid responses. All data were treated with academic integrity, ensuring honesty, diligence, and originality in documentation and analysis, while safeguarding participant anonymity and source credibility.

CHAPTER FOUR: RESULTS AND DISCUSSION

This study employed a multi-modal analytical approach to interpret data collected through recordings, interviews, focus group discussions, photographic documentation, and archival review. Quantitative data were processed using SPSS (v.21) for statistical computations and Excel for spatial metrics, presented through tables, bar charts, and pie charts to visualize patterns in architectural features and material conditions. Qualitative findings from interviews and FGDs were thematically coded and triangulated with photographic evidence and sketches to contextualize Hidmo's socio-cultural significance. Documentary video analysis supplemented these methods by capturing temporal changes in construction techniques. This integrated presentation strategy enabled systematic addressing of each research question while maintaining methodological transparency through visual and statistical verification.

4.1. Respondents Result

Data were collected from a total sample size of 100 respondents via questioners. According to the Tigray Tourism and Culture Bureau, Culture and Tourism of Mekelle city zonal administrative office, Mekelle Municipal Office, Elders and Masons, Homeowners, Mekelle agency of house association were distributed and the response rate was 100 %. See table 9.

No	Respondent	Distributed	Collected	Incorrectly filled	%
1	Culture and Tourism Bureau of Tigray	8	8	0	100
2	Mekelle Municipal Office	15	15	0	100
3	Elders and Masons	15	15	0	100
4	Homeowners	40	40	0	100
5	MU (Scholars)	10	10	0	100
6	Mekelle agency of house association	5	5	0	100
7	Tourism of Mekelle city zonal administrative office	7	7	0	100
Total		**100**	**100**	**0**	**100**

Table 9: Distributed and Collected Total Questioners. SPSS Result, 2020.

4.2. Socio-Demographic Characteristics of the Respondent

The respondents who contributed data on the survey for the investigation and documentation of vernacular Hidmo houses included: Tigray Tourism and Culture Bureau, Culture and Tourism of Mekelle city zonal administrative office, Mekelle Municipal Office, Homeowners, Mekelle agency of house association, Elders and Masons. This section described the personal information of the respondent's gender, marital status, age, occupation and level of education and general information such as monthly income in Eth birr and length of residency**:**

The findings revealed that 69% of respondents were male while 31% were female respondents, indicated in Chart-1.

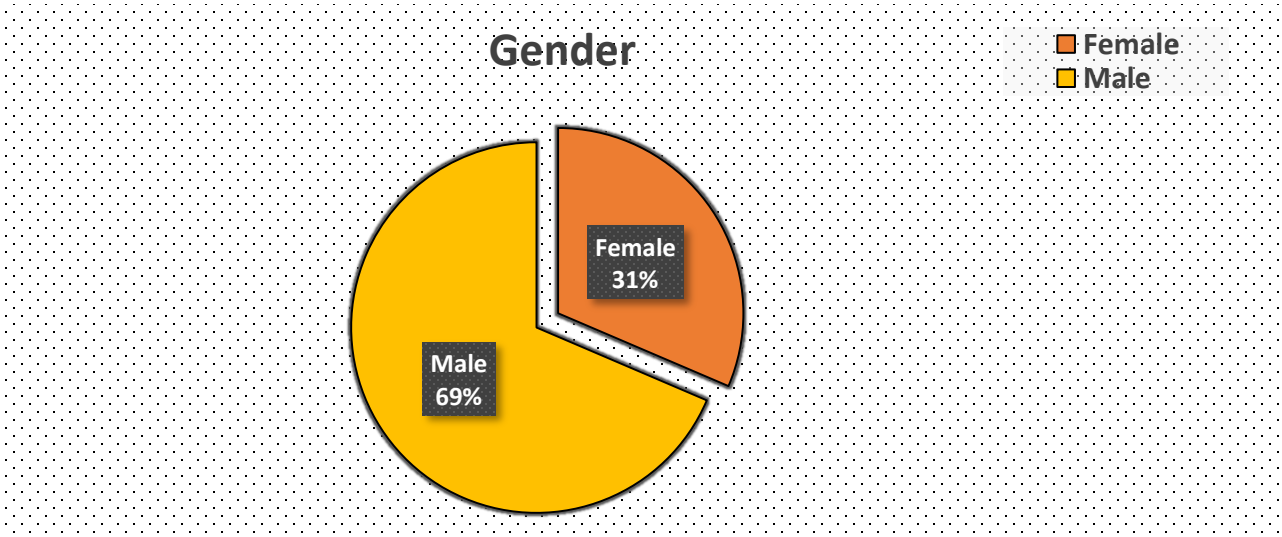


Chart 1: Distribuition of Gender Respondents. SPSS Result, 2020.

Based on the Chart-2, the information obtained from the respondent responsible for about 83% of the participant were married and the remaining 17% were single.

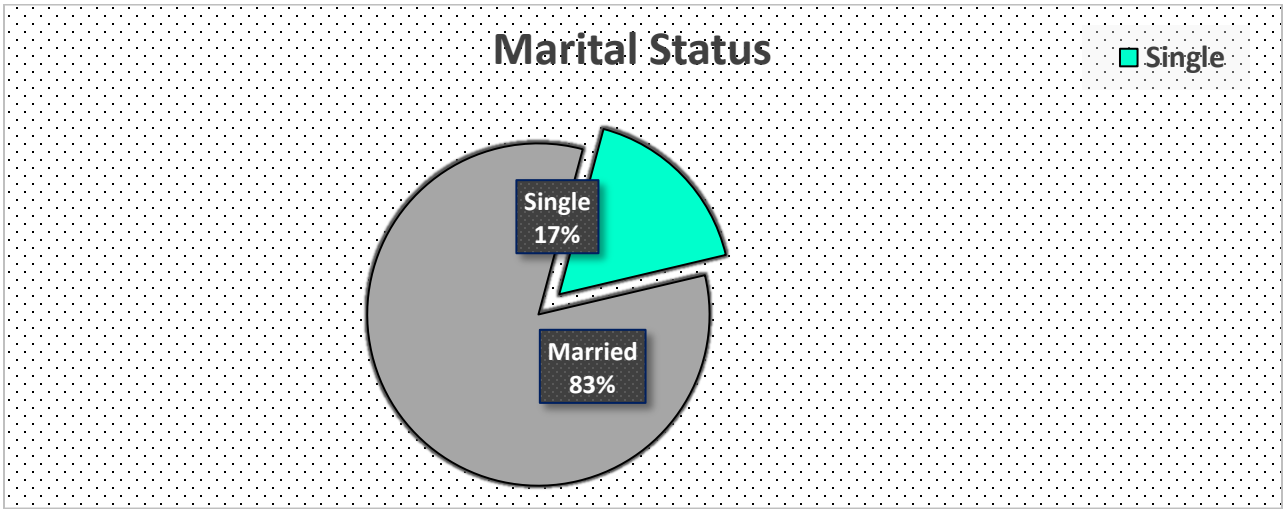


Chart 2: Marital Status of Respondents. SPSS Result, 2020.

Based on Chart-3, the age structure of the respondents was varied. The majority of the respondents were elders available above the age of 61 years which scored, 37.1%). The second-largest group was found under the age range of 46-60 years which counted 25.7%) and the third consisted under the age range of 21-35 which scored 20% and the smallest responsent was under the age ranges 36-45 and scored 17.1%.

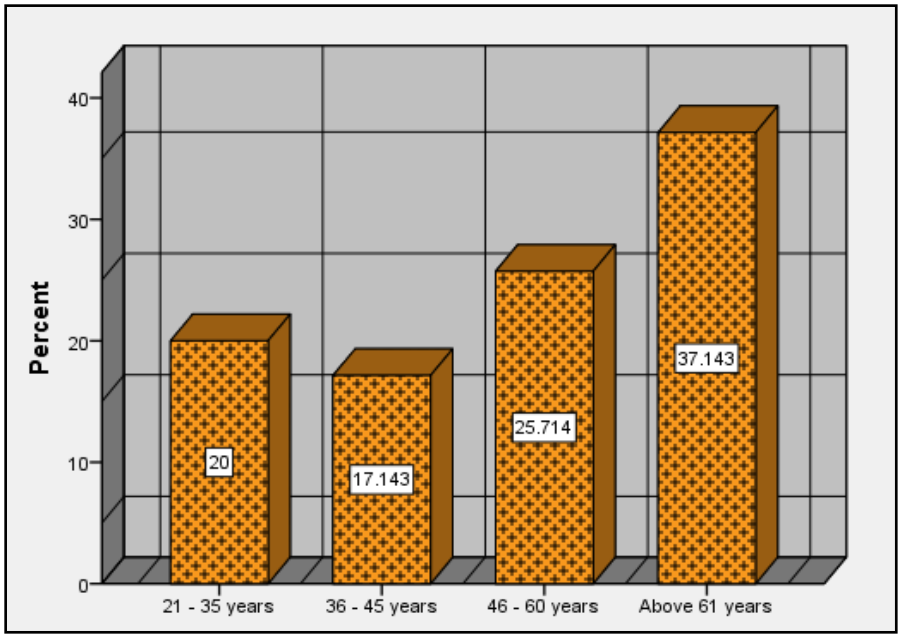


Chart 3: Age Category of Respondents. SPSS Result, 2020.

Based on Chart-4, the incidents of the respondent regarding their occupation that indicated the majority of respondents were employed in different sectors either in governmental or non-governmental organizations which counted for about 60% and followed by 20 % of respondents which were depended on other economic aspects like housewife and farming activities and for about 17.1% of the respondents were also self-employed and the last 2.85 % become students.

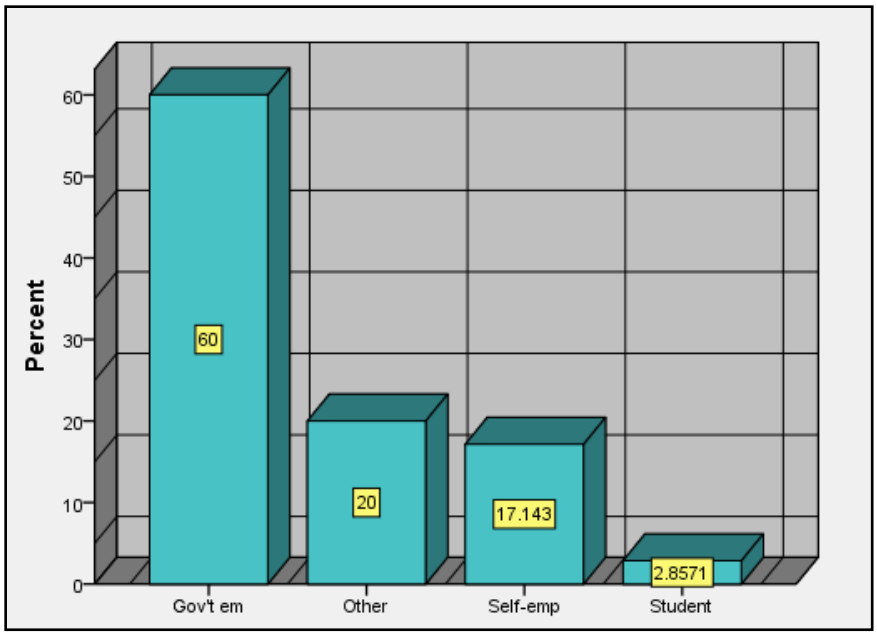


Chart 4: Occupation of Respondents. SPSS Result, 2020.

The other factor that the researcher intended to identify was the educational level. As indicated in Chart-5, most of the respondents 42.85 %), were below diploma and followed by degree holders 28.57%, and 20% become master holders, and lastly, 8.57% were Ph.D. holders.

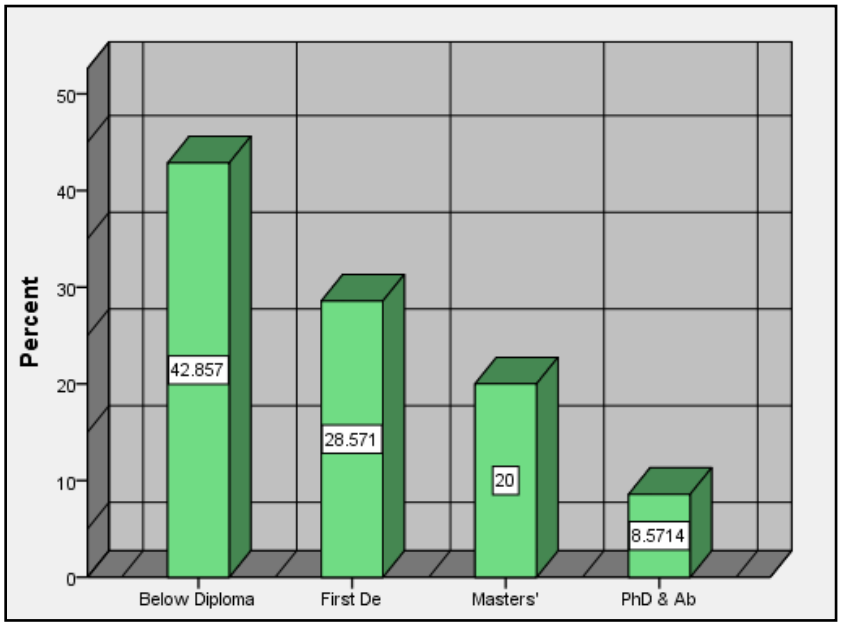


Chart 5: Education Level of Respondents. SPSS Result, 2020.

As shown in Chart-6, most of the respondents gets above 5001 with a monthly income in ETB who were more qualified gained their income become 40% of the respondents reporting that respectively 2001-5000 birr monthly income is 31.4%, below 1000 birr monthly income become 22.8% and the least 1001-2000 birr monthly income is 5.7 %.

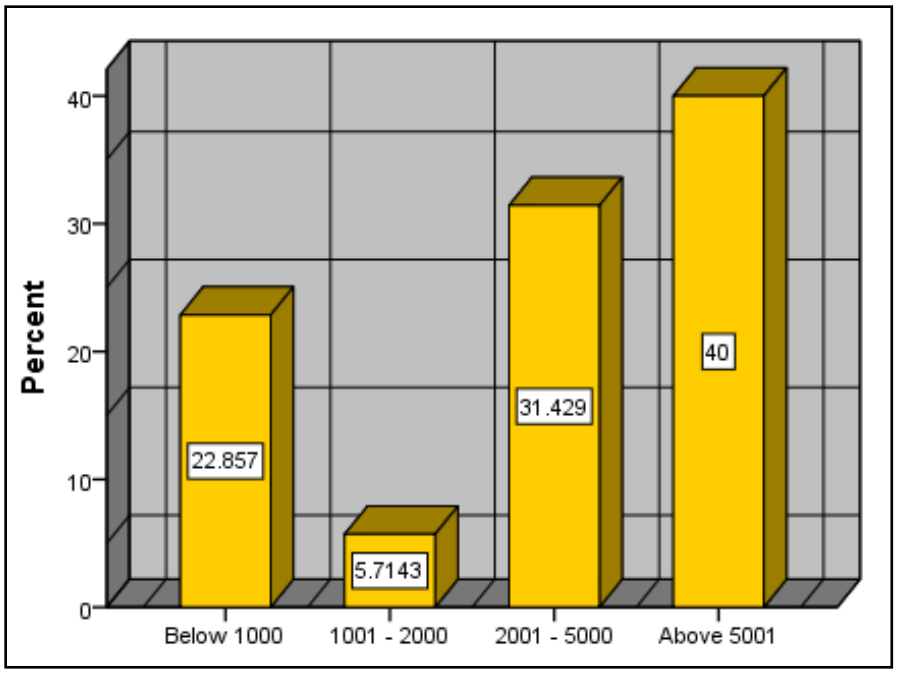


Chart 6: Monthly Income of Respondents (In Ethiopian Birr). SPSS Result, 2020.

The above Chart-7, describes the length of residency of the respondent. Based on the collected data the majority of respondents (82.85%) were residents 10 years and above and from 0-5 year's residents (14.28 %) from the sample space. And the remained (2.8%) were residents for about 6-10 years.

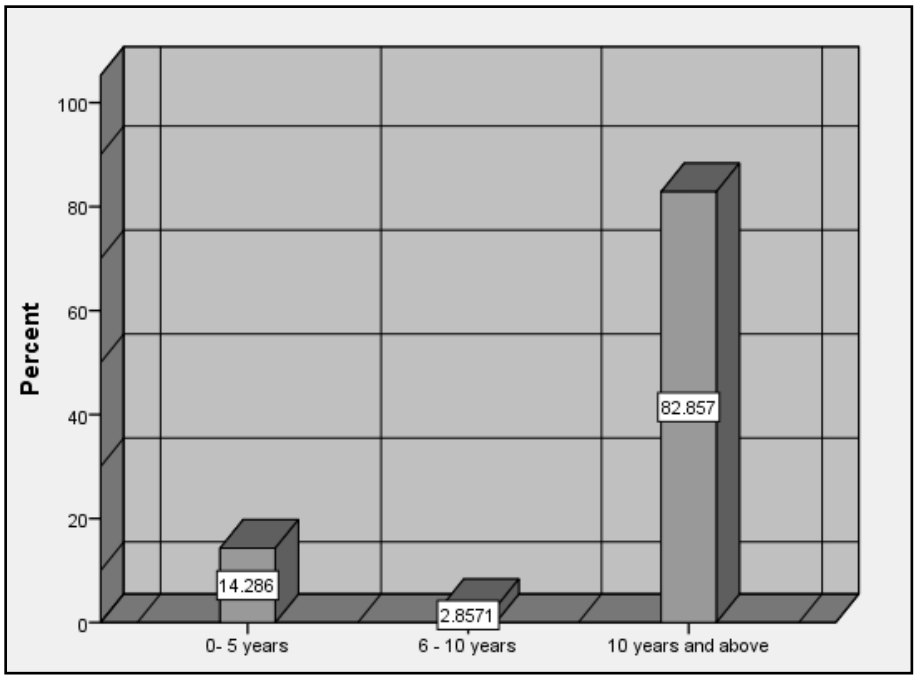


Chart 7: Residency Length Stay of Respondents. SPSS Result, 2020.

As indicated on Chart-8, the level of participation in heritage preservation of vernacular Hidmo house majority of the respondent (60%) of the respondent under high participation, whereas the remained participation of the respondent (20%) become medium and low respectively.

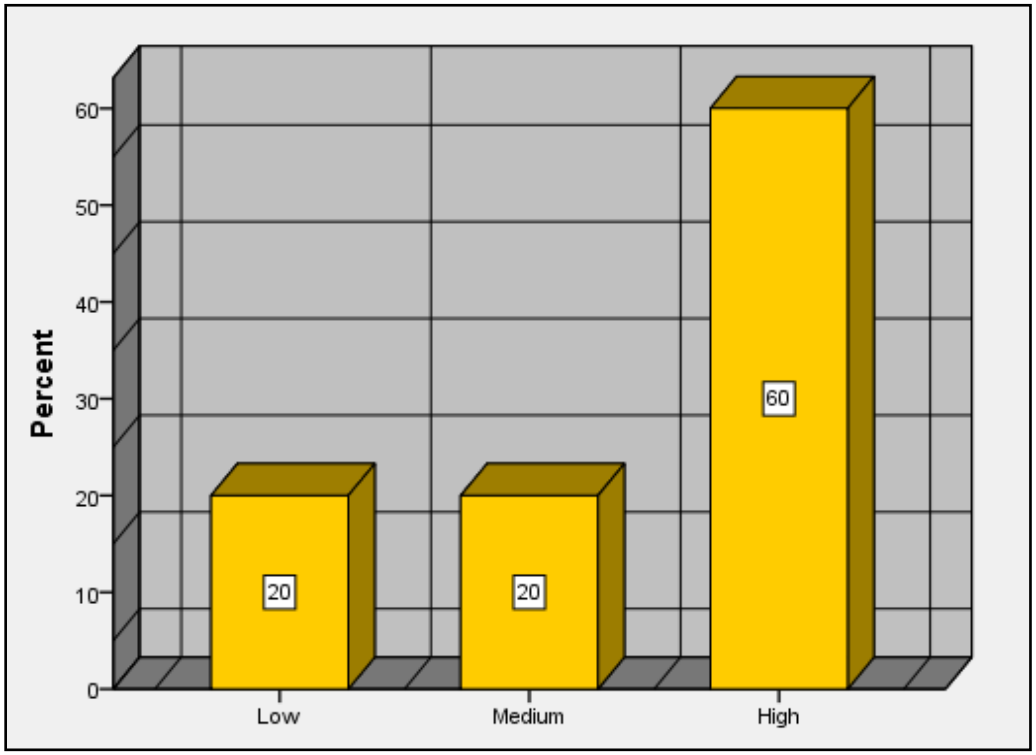


Chart 8: Level of Participation in Architectural Heritage Preservation. SPSS Result, 2020.

4.3. Descriptive Statistics

As discussed in the previous chapters, this study attempts to explore the vernacular Hidmo house factors and the issue of sustainability in some selected areas, Aynalem and Kebele 14 in Mekelle city. In this part, descriptive statistics in the form of mean and standard deviation as well as chart were presented to illustrate the level of agreement of the respondents with their implications to the current architectural heritage preservation practices, human and natural factors damaging vernacular Hidmo houses, and supposed retention mechanism that could help to ensure the sustainability of the age-old heritage Hidmo houses through minimizing the degree of future deteriorations. The findings of this study are discussed as follows:-

4.3.1. Preservation Practices of Vernacular Hidmo Houses in the Study Area.

This part trying to describe the preservation practices that are damaging the heritage Hidmo houses in the study areas. And quantified below in the form of a table by mean and standard deviation and chart by percentage.

Variables	Mean	Std. Deviation
The level of structural problem (deterioration) of the vernacular Hidmo houses is increasing from time to time	4.80	.447
The preservation practices in the vernacular Hidmo houses are not adequate	4.40	.548
The preservation practices in the vernacular Hidmo houses need closer supervision and regulation	4.40	.894
The existing heritage preservation practices are affecting the sustainability of heritage resources of the Hidmo	4.00	1.000
The original doors of the Hidmos are changed by new doors	4.40	.548
The original windows of the Hidmos are replaced by new	3.80	.447
Lack of maintenance by qualified expertise	4.20	.837
Improper maintenance	4.00	.707

Table 10: The Situation of Preservation Practices in the Study Area, Mean, and Standard Deviation. SPSS Result, 2020.

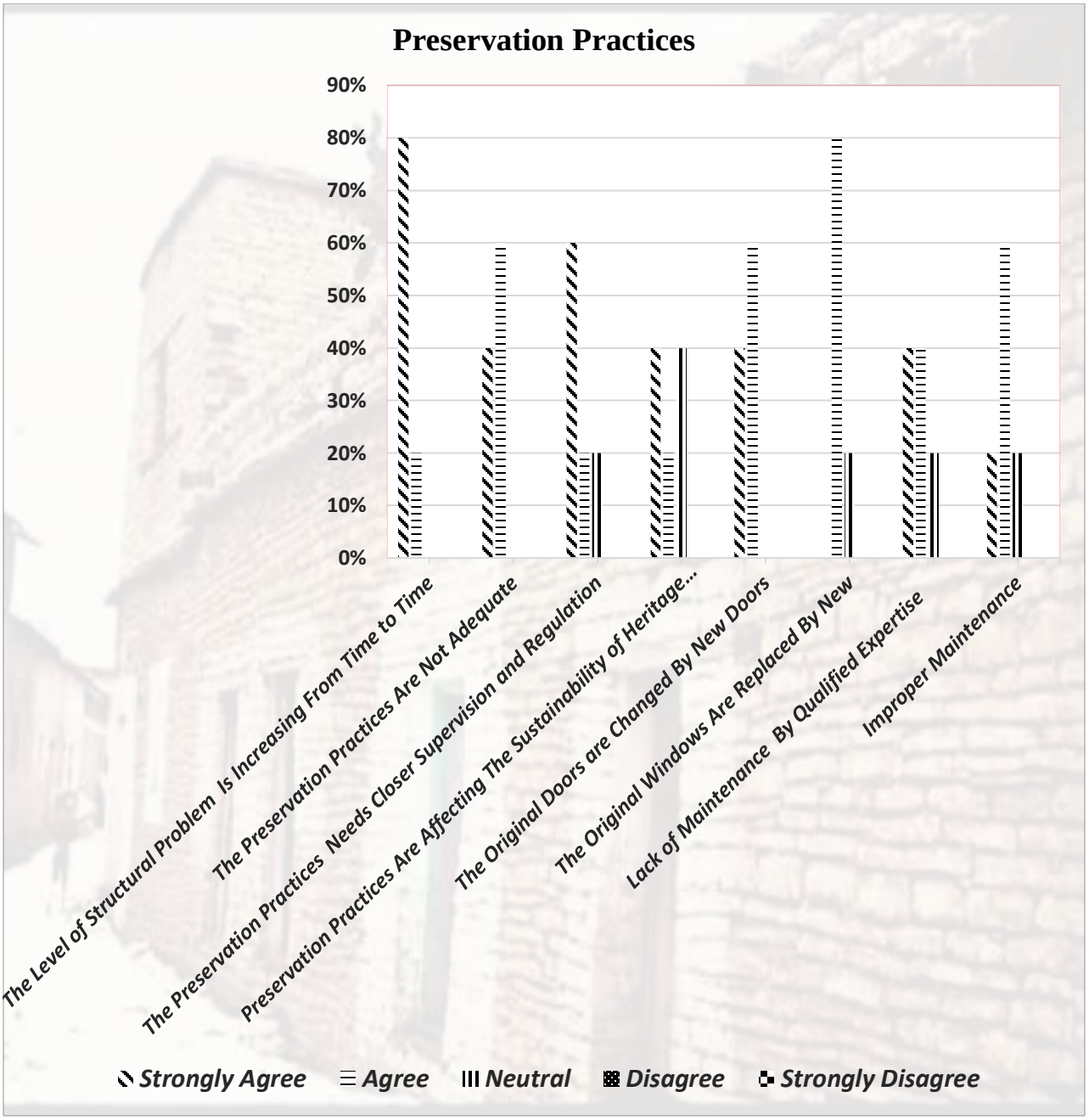
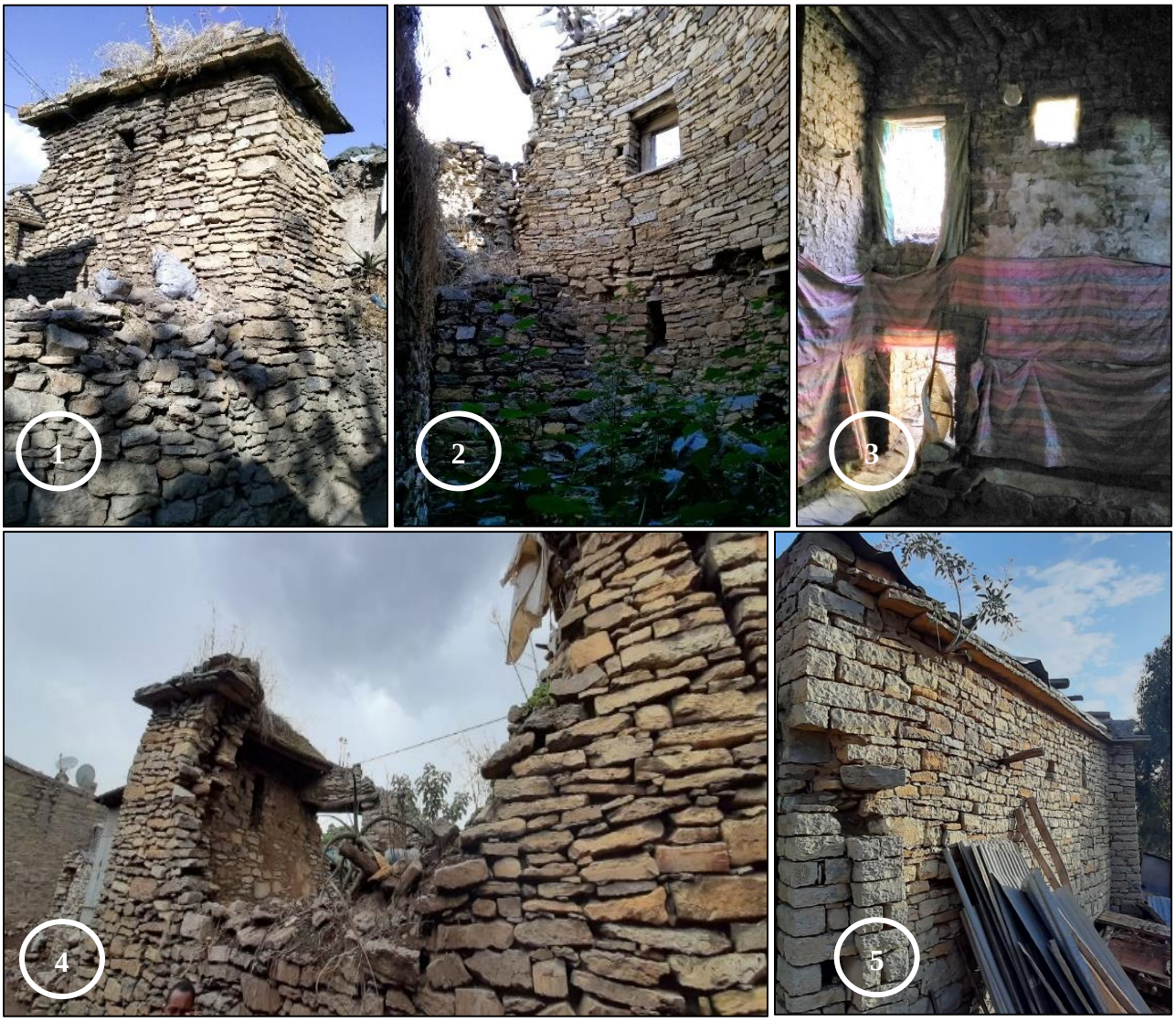


Chart 9: The Situation of Preservation Practices in the Study Area, Presented By Percentage. Excel Result, 2020.

The architectural heritage preservation practices in the selected areas in Aynalem and Kebele 14 in Mekelle city were examined utilizing (8) variables (See Table 10). The whole mean score of these variables or The level of structural problem (deterioration) of the vernacular Hidmo houses is increasing from time to time ranges from (M = 4.80 SD = 0.447) and the respondent strongly agree

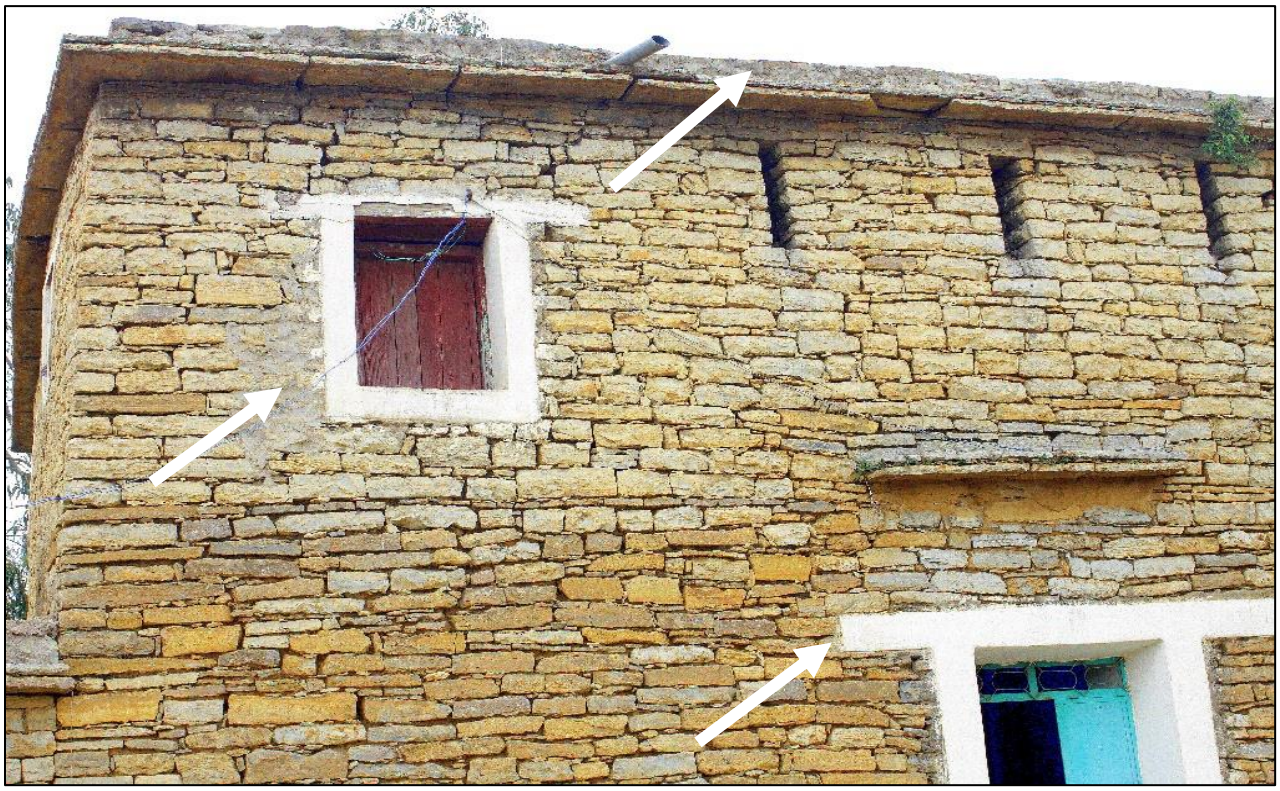
80% and also supported agree by 20%. This indicates the highest score in the finding. For more, see Picture 7.



Picture 7: Structural Damages of Hidmo Houses in Kebele 14 (Pic 1, 4), Kebele 010 (Pic 2), and Aynalem (Pic 3, 5). Field Survey, 2020.

Depending on the respondent regarding the preservation practices in the vernacular Hidmo houses are not adequate (M=4.40, SD=0.548) or in other words, 60% strongly agree and 40% become agree. Based on the circumstance of the preservation practices in the vernacular Hidmo houses that need closer supervision and regulation the respondent responded (M=4. 40, SD=0.894) or for about 60% Strongly Agree, Agree 20% and Neutral 20% respectively. So that this is implies demanding the vernacular Hidmo houses need closer supervision and regulation for sustainability vernacular Hidmo houses as sources income for tourism development and to maintain their cultural authentic values.

The existing heritage preservation practices are affecting the sustainability of vernacular Hidmo houses, (M=4, SD= 1) the respondents asserted based on the existing heritage preservation practices are affecting the sustainability of heritage vernacular Hidmo houses Strongly Agree 40%, Agree 20% and Neutral 40% respectively.



Picture 8: The Existing Heritage Preservation Practices are Affecting the Sustainability of Heritage Resources of the Hidmos and They are Not Adequate, E.g,Assefa Tedla Mansion. Field Survey, 2020.

The original doors of the vernacular Hidmo houses are altered by new doors. When we observe the attributes outputs, the respondents indicated that the level of deterioration in the vernacular Hidmo houses is fostering from time to time (M = 4.40, SD= 0.548) in other words the respondent, almost 60% Agree, and Strongly Agree become 40%. Although, the participants stated concerning the original windows of the Hidmo were substituted by new materials. (M=3.80, SD=0.447), and strongly Agree 80% and neutral 20% and this indicated the existence of low preservation of vernacular Hidmo houses in the study area. See Picture-9.

Picture 9: Altered Doors and Windows, the Mansion of Assefa Tedla, and Blata Tsegay. Field Survey, 2020.

Respondents responded that both the lack of maintenance by qualified expertise scored (M = 4.20, SD = 0.837) and strongly agree 40%, agree 40% neutral 20%. Also improper maintenances achieved (M = 4.00, SD = 0.707) and strongly agree 20% agree 60% neutral 20%. This implies the persistence of improper maintenance of the vernacular Hidmo house in the study area is very high and the same pattern based according to "***KI6*** *stated that currently the vernacular Hidmo house which found inside the city and around the city are damaged lazily besides he recommended that concerned body must*

be run critical maintenance by professional experienced, without any compromising its authentic asset of the vernacular architectures of the Hidmos."

Picture 10: Resulted by Lack of Proper Maintenance and Qualified Expertise, the Mansion of Assefa Tedla (Compound one, Belay Assefa). Field Survey, 2020.

Generally, the researcher identified and recognized some factors that accelerate for insufficient preservation of vernacular Hidmo house such as, structural problem (deterioration), inadequate preservation practices, lack of sustainability, lack of supervision and regulation, replaced by new materials, lack of maintenance, and improper maintenance were more exposed in the study area.

4.3.2. Natural Factors Affecting the Heritage Resources of the Vernacular Hidmo Houses in the Study Area.

This part demanding to distinguish the major factors that are detrimental to the heritage Hidmo houses in the study areas. These factors causing architectural heritage resources were divided into two: natural and human factors quantified below in the form of tables and charts.

Variables	Mean	Std. Deviation
Birds dropping	3.40	1.140
Earthquakes	3.20	1.304
Rain	4.60	.548
Moisture and Dampness	3.60	.894
Temperature Fluctuations	3.80	1.095
Algae and Insects	3.40	1.140
Trees and Vegetation	3.60	.548
Leakage (Patch Work And Seepage)	3.80	1.304
Flood-Related Damages	3.40	1.517

Table 11: Natural Factors Affecting Heritage Resources of Vernacular HH. SPSS, Result 2020.

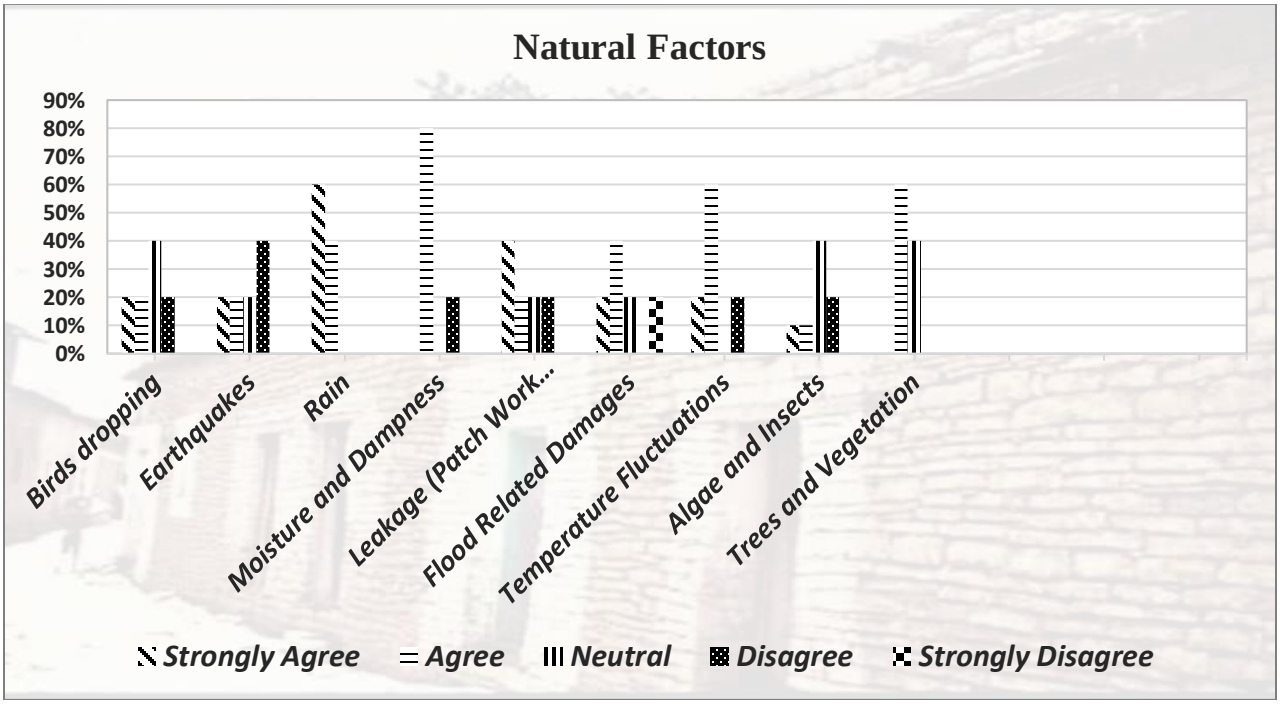
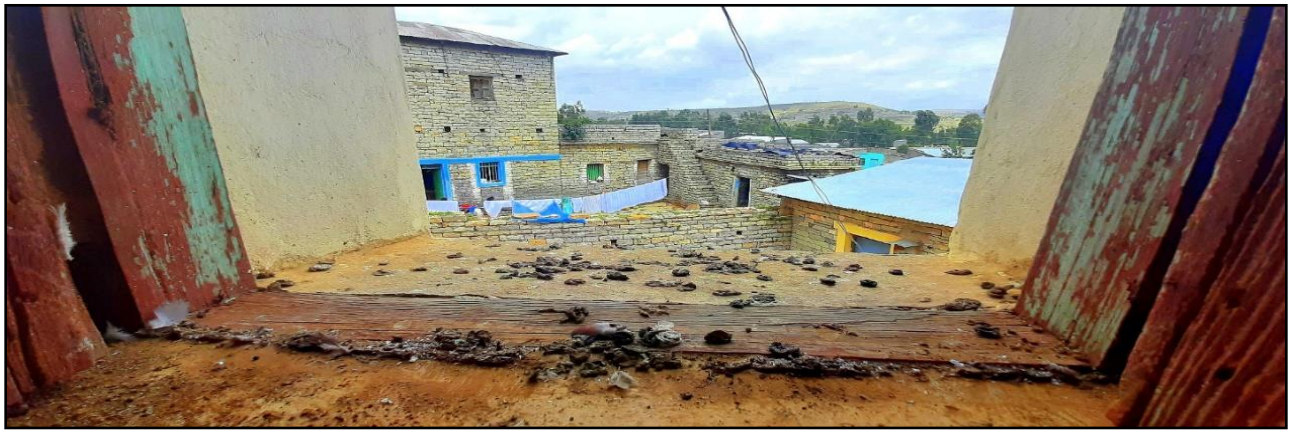


Chart 10: Natural Factors Affecting Heritage Resources of Vernacular HH. Excel Result, 2020.

The natural factors causing damage in the selected vernacular Hidmo houses were investigated using (9) variables (See Table 11). The overall situation means a score of these variables ranges from (M = 3.40, SD =1.140) of the Birds dropping in other words strongly agree (20 %,), agree (20 %), neutral (40%) and disagree become (20%) eventually, birds dropping has a medium impact for damaging of vernacular Hidmo house in the study area. See the picture below.



Picture 11: Factor of Birds Dropping. Field Survey, 2020.

Based on the respondents reacting regarding rainfall have another major factor booming the destruction of the vernacular Hidmo house, and seeking heavy Rainfall and based on the respondent's outlook scored (M=4.60, SD=0.548) or strongly agree 60%, and agree 40% this results from rainfall has a factor that hastening for the destruction of vernacular Hidmo house. See the picture below.

Picture 12: Rain Damages of Hidmo Houses in Kebele 14 (Pic. 1, 2, 3, 4, 5) and (Pic. 6, Aynalem). Field Survey, 2020.

Earthquakes become emerging and regarding the respondent response scored (M= 3.20 SD=1.304) strongly agree, agree, and neutral (20%) each, while the remained 40% disagree and this refers to earthquakes has facilitating for cracking and devastation of vernacular Hidmo houses, and rarely affected for damaging of vernacular Hidmo houses.

Picture 13: Earthquake Damages, a Hidmo Houses in Kebele14. Field Survey, 2020.

Besides Flood-Related Damages also followed this scored (M=3.40, SD=1.517) agree (40%), strongly agree (20%), neutral (20%), strongly disagree (20%). Another consequence of rainfall would create Leakage (patchwork and seepage), when we see the variables-wise outputs, the respondents indicated that the natural factors causing damage results (M=3.80, SD =1.304) or strongly agree (40%) and agree, neutral, and disagree scored (20%) each.

Picture 14: Leakage (Seepage) Damages of Blata Tsegay Mansion House. Field Survey, 2020.

Based on the respondent's response perceived that the Leakage (Patch Work and Seepage) has an impact on damaging vernacular Hidmo houses. And the same pattern those create additional major factors like Moisture and Dampness (M= 3.60 SD=0.894) or agree 80% and disagree 20% this implies moisture, and dampness has great major problems, among natural factors that affect the demolition

Picture 15: Moisture and Dampness Damage, Case Study (Compound Three Kitchen Celling), and Kebele 14 Random Hidmo Celling. Field Survey, 2020.

of demolition of vernacular Hidmo house in the study area. Eventually, those creating fertile ground for reproduction of Algae and Insects factors and based on the respondent response scored (M=3.40, SD=1.140) or strongly agree, agree, and disagree scored (20%) each and neutral scored (40%). This indicates among the natural factors causing damage that respondents acknowledged the problems Algae and insects have a neutral negative impact on demolition vernacular Hidmo house.

Picture 16: Algae and Insects Damage in Kebele 14 (Pic. 1, 2 and 3, Algae), and (Pic. 4, in Aynalem Shows Insects or Termite Damage). Field Survey, 2020.

As Trees and Vegetation growing near to the vernacular Hidmo house through gradual span the leaves and roots of vegetation making cracking and spoiling of the vernacular Hidmo house, according to the respondent feedback scored (M=3.40, SD=0.548) or agree 60% neutral 40%. (Fig). This has simultaneous effect with Temperature Fluctuations and buildings in dray climates invariable have high thermal mass or significance amount of insulations, again based on the respondents scored (M= 3.80 SD=1.095) in another word strongly agree 20%, Agree 60% and disagree 20% and this indicated that Temperature Fluctuations by crates worms inside the wood and easily hastening more fragile for the demolition of the vernacular Hidmo houses. As the Temperature increases at an unknown season

Picture 17: Damage Due to Trees and Vegetation Growing in the Case of Kebele 14, (Pic. 1, 2, 3), and (Pic. 4, in Aynalem Area). Due to Temperature Fluctuations also, Shows (Pic.5 and 6, in Aynalem Area). Field Survey, 2020.

4.3.3. Human Factors Affecting the Heritage Resources of Vernacular Hidmo Houses in the Study Area.

This part trying to tell between the major factors that are unfavorable to the heritage Hidmo houses in the study areas. Consequently, the human factors affecting architectural heritage resources were quantified below in the form of a table and chart.

Variables	Mean	Std. Deviation
Neglect and ignorance	4.00	.707
Inadequate maintenance	4.00	.707
CO_2 emission and waste	4.20	.447
More population are concentrating in cities	4.00	.707
Impact of major infrastructure programs	4.20	.447
The local people need to build new buildings	4.20	.447
Passing heavy vehicles along the way that caused vibration	3.60	.548
Lack of Management Plan Policy	3.80	.447
Lack of preventative measures	4.00	.000
Lack of experienced professionals	4.00	.000
Lack of preservation knowledge	4.00	.000
Lack of community participation	3.80	.447
Use of inappropriate methods	3.80	.447
Use of inappropriate materials	3.80	.447
Deforestation	4.00	.000
Limited funding	4.80	.447
Land prices	3.80	1.095

Table 12: Human Factors Affecting Heritage Resources of Hidmo Vernacular Houses. SPSS Result 2020.

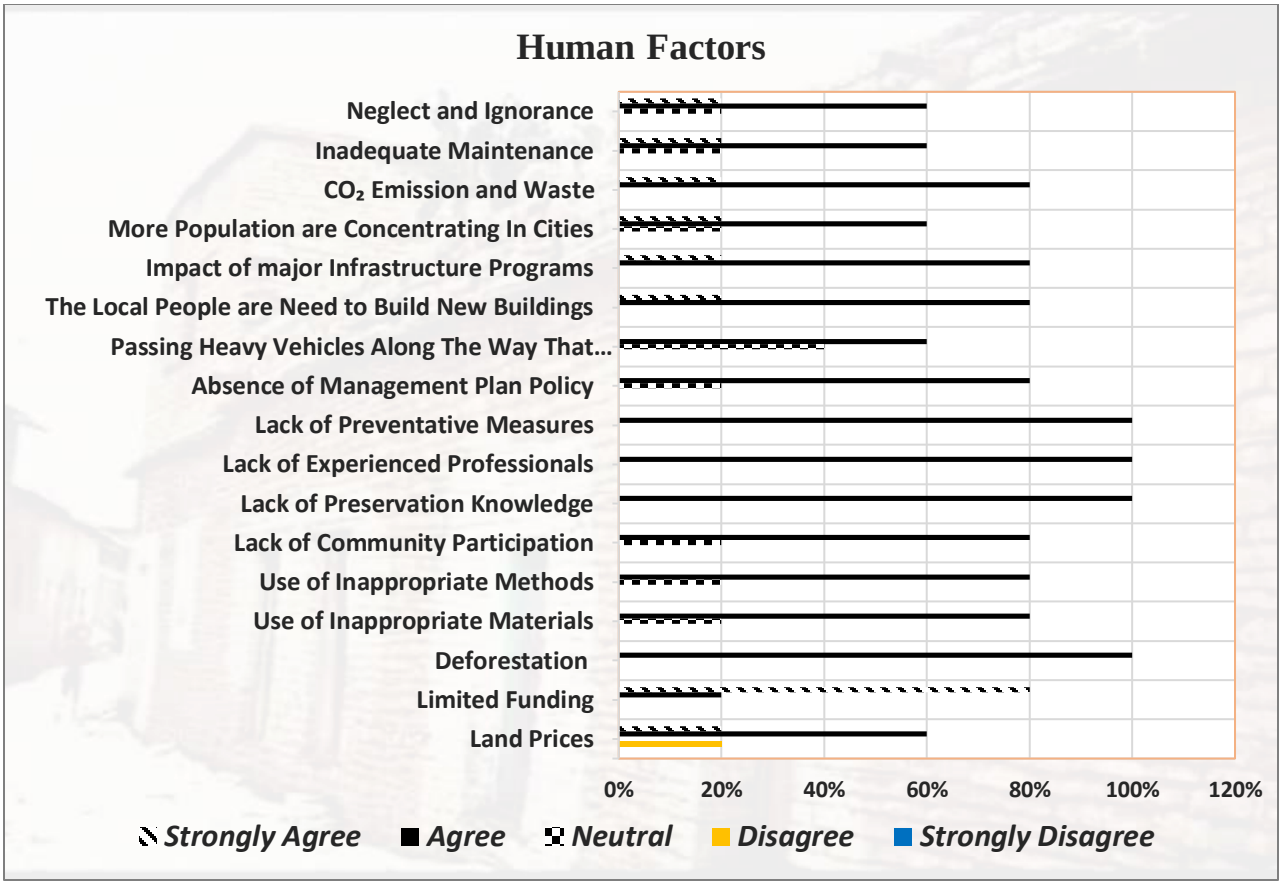


Chart 11: Human Factors Affecting the Heritage Resources of Hidmo Vernacular Houses. Excel Result 2020.

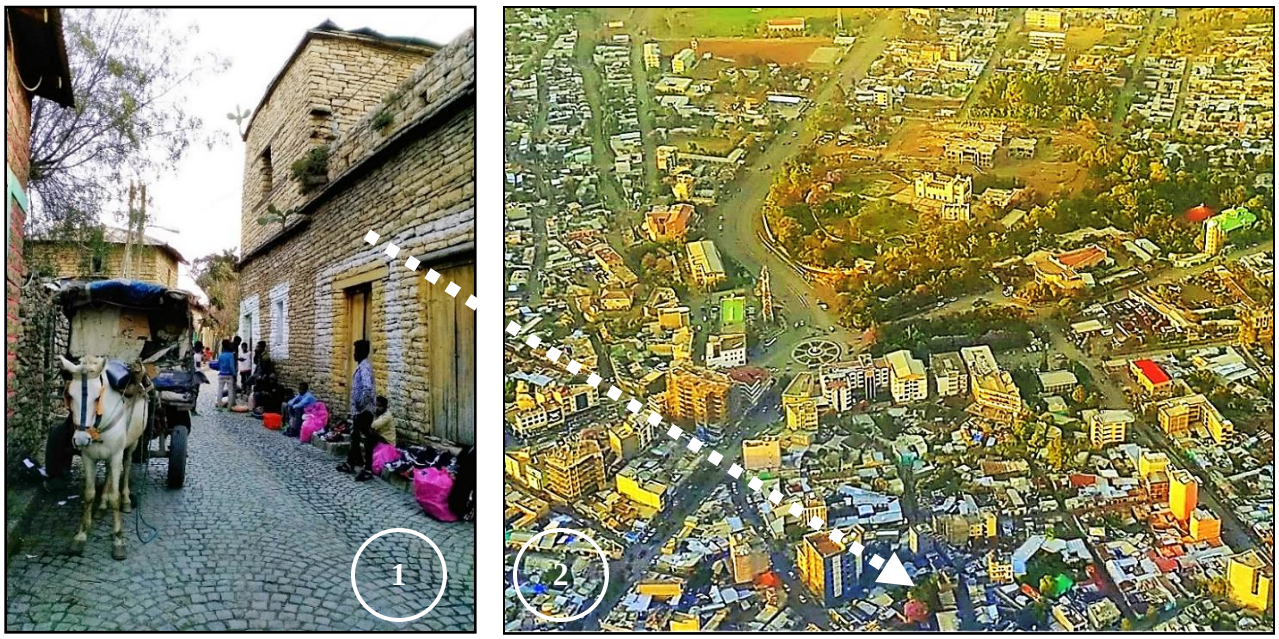
The human factors affecting the heritage of vernacular Hidmo houses in the nominated study areas were investigated using (17) variables (See Table 12). The overall mean score of these variables ranges from (M= 3.60, Passing heavy vehicles along the way that caused vibration) to (M= 4.80, Limited funding) accordingly. When we see the variables results, the respondents indicated that the local community needs to build new buildings.

Lack of community participation is one of the most important things in the same time it is one of the human factors that influences for diminishing of vernacular Hidmo house and respondent statically scored (M=3.80, SD=0.447), in other word agree (80%), and neutral (20%) and most of the respondents were agreed the local community and private investors were not involved and participated on vernacular Hidmo house and apart from this, Neglect and ignorance another factor that affects the vernacular Hidmo houses and participant scored (M=4, SD=0.707), in another word strongly agree (20%), agree (60%), and neutral become (20%), and this results from the concerned

bodies have less attention, care, lack of knowledge or awareness and failure to preserving and manipulating of vernacular Hidmo houses.

Picture 18: Neglect and Ignorance Devastations, in Kebele 14 (Pic. 1, 2, 3) and (Pic. 4, in Feleg Dea'ro). Field Survey, 2020.

Population concentration in cities lead the rapid urban expansion and based on respondent response scored (M=4., SD=0.707), in another word strongly agree 20%, agree 60%, and neutral becomes 20%, this implies the existence of high population migration to cities and reversely the vernacular Hidmo house become demolishing from time to time



Picture 19: Due to Population Concentrating in Cities. (Pic.2, Satellite Image.), and Field Survey, 2020.

and these people demanding to build new buildings scored (M=4.20, SD=0.447), in another word strongly agree 20%, agree 80%, this indicates the majority of the respondent convinced that nowadays people aspiration become to live in a villa or modern buildings house and as a result, the vernacular Hidmo house became disappeared and changed into new buildings.

Picture 20: Impact of New Buildings in Kebele 010 (Left) and in Kebele 11 (Right). Field Survey, 2020.

As the number of buildings increases infrastructure programs also ascending, it has another major impact that hastening for demolishing of the vernacular Hidmo house based on the respondent data scored (M=4.20, SD=0.447), in another word strongly agree 20%, agree 80%, and this reflects high

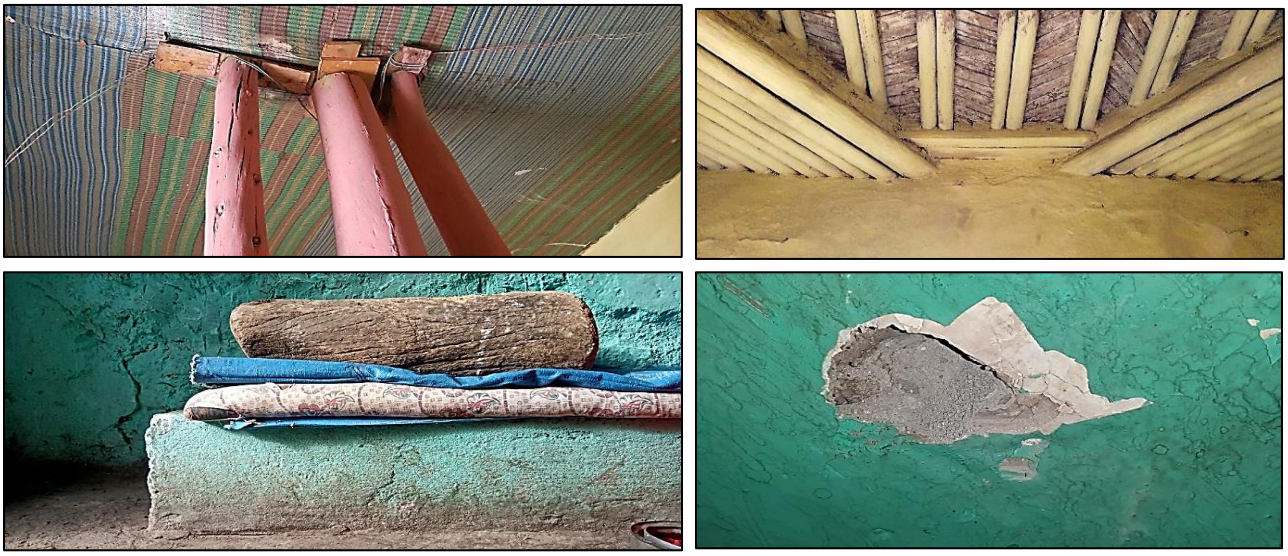
infrastructure programs is expanding in the study areas and immediately the vernacular Hidmo houses become more demolished and destructed.

Picture 21: Impact of Infrastructure Programs, a Assefa Tedla Mansion. Field Survey, 2020.

The other case is the impact of heavy vehicles vibration on vernacular Hidmo houses scored (M=3.60, SD=0.548), in other word agree, 60%, and neutral 40%, and this manifests the existence of higher impacts vibration on vernacular Hidmo house emanates from heavy vehicles in the study area. There are policies in thus developed countries that prohibited heavy vehicles to pass through a vernacular building. Even in Tigray, this policy has been implemented particularly in the Axum monuments. All those rules and regulations are drafted to prevent vernacular buildings and cultural heritages from the vibration of the ground which resulted in cracking and crashing. Therefore, I recommended that constructing optional road access to this vernacular Hidmo houses is very essential. See Pic. 22.

Picture 22: Passing Heavy Vehicles Along the Way that Caused Vibration on Blata Tsegay Mansion. Field Survey, 2020.

Absence of Management Plan Policy another a key challenge for the preservation of vernacular Hidmo house starting from the federal till the regional governments and based on the respondent response scored (M=3.80, SD=0.447), in other word agree 80%, and neutral 20%, and this reveal there is no effective rules and regulation policy on preserving and managing of the vernacular Hidmo houses. The consequence of this event leads of Lack of Preservation Knowledge scored (M=4, SD=0.0), in other word agree (100%), and this implies the respondents completely convinced that the shortage of preservation knowledge from TTCB and higher institution lab experiment is not conducted and performed on vernacular Hidmo houses. At the same, a lack of Experienced Professionals also manifested in the study area. Based on the respondent scored (M=4, SD=0.0), in other words, agree (100%) and these results display still they are not recruited professional experienced for articulating and preserving of Hidmo house. In addition to the aspect of maintenance on vernacular Hidmo house is Inadequate maintenance, based on the respondent response scored (M=4, SD=0.707), in another word strongly agree (20%), agree (60%), and neutral become (20%), this indicated that majority of the respondent agreed in the study area there is insufficient maintenance,



Picture 23: Inadequate Maintenance of Mansion Blata Tsegay. Field Survey, 2020.

even the lack of preventative measures that had been taken scored (M=4, SD=0.0), in other wordss agree 100% and this reflects preventive Measures was not taken from the responsible body completely for the preservation of the vernacular Hidmo houses. Similarly used of inappropriate Methods by experts and based on the respondent response scored (M=3.80, SD=0.447), or agree 80%, and neutral 20% this indicated that how to preserve and wisdom to articulate the vernacular Hidmo house steal it reflects the problem of how to use the methods.

Picture 24: Use of Inappropriate Methods, on Blata Tsegay Mansion. (Left Pic., Felimon Yibrah, 2006 G.C), and Field Survey, 2020.

Besides utilized inappropriate Materials for maintenance preservation and depending the respondent response scored (M=3.80, SD=0.447), or agree 80%, and neutral 20% and a majority of the respondent stated agree and this implies to build and repair the vernacular Hidmo houses that utilized the input materials are not appropriate and don't keep the aesthetic value as well as the sustainability of the vernacular Hidmo house in the study area.

Picture 25: Use of Inappropriate Materials, on Assefa Tedla Mansion (Pic 1, 2, 4) and Blata Tsegay Mansion (Pic 3). (Pic. 1, Sources, Ashu Pictures, 2012 G.C), and Field Survey, 2020.

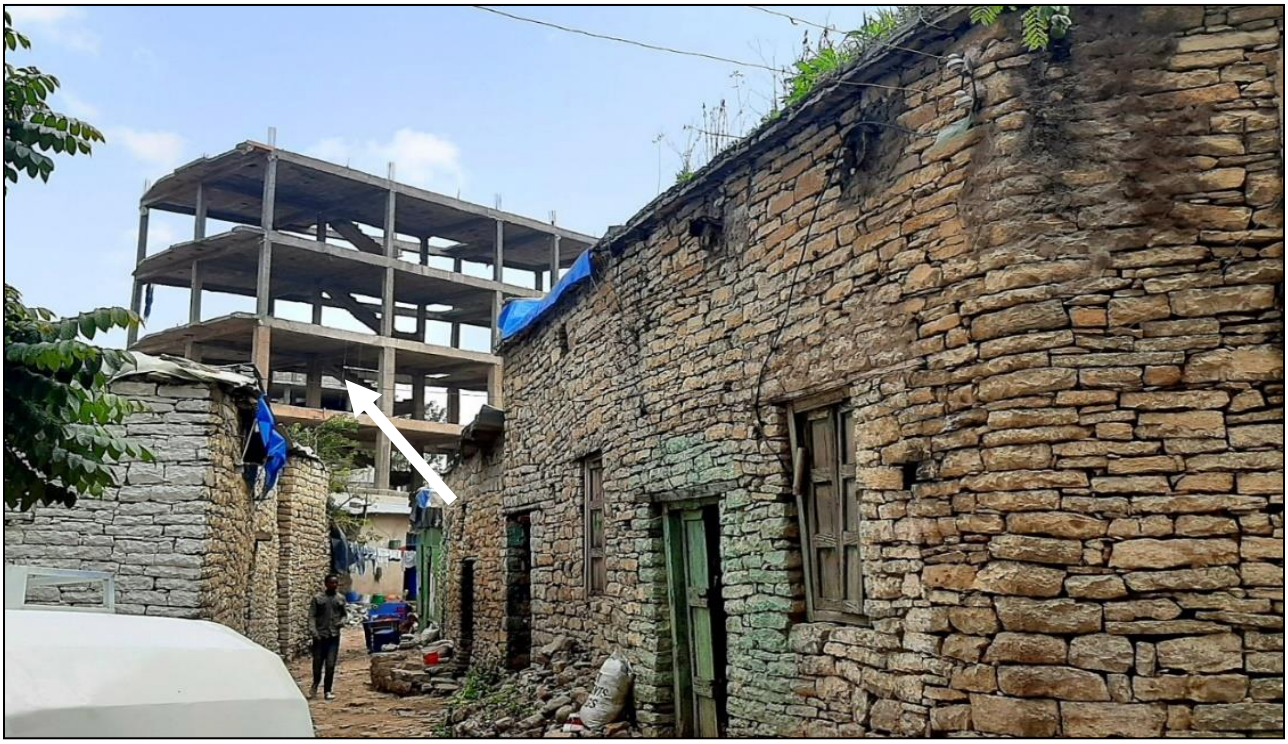
This study finds that the Deforestation of plants in the area and nearest of the area causing as one of the factors for the devastation of Hidmo houses, it resulted (M=4 SD=0.0), in other word agree 100%. Therefore, if there is no lithe wood for the old used materials of the Hidmo houses, as a result, there will be hastening the demolition of Hidmo vernacular architecture.

Picture 26: Impact of Deforestation in Kebele 14 (Need replacement). Right Pic. Des'ea. (Source, DW TV), and Field Survey, 2020.

Based on the respondent's response regarding CO_2 emission and waste, it is one of the human factors that accelerating fading the original value of Hidmo houses and quantified (M=4.20 SD=0.447), or strongly agree 20 %, agree 80%.

Picture 27: Impact of Co_2 Emission and Waste in Kebele 14. Field Survey, 2020.

Limited Funding is one of the human factors that create destruction of vernacular Hidmo houses in the study area and based on participant response scored (M=4.80, SD=0.447), in another word strongly agree 80%, and agrees 20%, and it is known that Gov.t is offering low fund for vernacular Hidmo houses and the reverse is true and giving adequate fund for modern or Villa house. Eventually, the event of limited funding is the most important human factor to demolish the original vernacular Hidmo houses in the study area and similarly Land Prices also another major human factor that accelerating the demolishing of Hidmo house and based on the respondent feedback scored (M=3.80, SD=1.095), in another word strongly agree 20%, agree 60%, and disagree become 20% ultimately this enforced the local communities more interested to change the vernacular Hidmo house to modern furnished house to get excess land price.



Picture 28: Image Showing Urban Pressure on Hidmo Houses in Kebele 14, due to Rising Land Prices. Field Survey, 2020.

The same pattern according to ***KI8*** *mentions that at present the core problem for our vernacular Hidmo house changing into the villa and modern buildings in Mekelle city Kebele 14 to seek better land price and as well as for selling high estimation cost. Besides for renewal or maintenance of the house also, they used new or unrelated materials.* Again *according to* ***KI5*** *explained that, recently, Mekelle city and its surrounding areas highly expanding its urbanization as a result of this situation the most of the vernacular Hidmo houses existing in the study area completely converted into villa*

houses and modern buildings to get a high price. Therefore, the government should be motivated for the owners of Hidmo's house by providing adequate funds for preservation and renewing them without changing the cultural value of its heritage. Besides according to ***FGD*** *also provided some relevant major problems that emanated from human and natural factors that aggravate for demolition of vernacular Hidmo houses includes in the study area such as, rapid urban expansion, Globalization impact, absence of Inventory problem, the planners of the city do not keep the rules and ethics as well they didn't cooperate with the other stakeholders, lack of low-income society for preservation, the existence of Core zone / buffer zone problem , lack of excessive woods (timber) deforestation, the problem of management for scattered vernacular Hidmo houses, the society demanding new technology advancement and, shortage of expertise in architectural heritages of Hidmo house, the existence of minimum fund of Gov't interest in vernacular architectures, the vernacular architectures never seen as tangible cultural heritages, the cheap price of zinc and the reverse is true the society thinks as they reach if they live in a corrugated house, the awareness problem of society on respecting their own culture than think of the new western culture as a modern, they may think about the durability of the Hidmo house could be shorter than the corrugated house, lack of providence of regulation, procedures, and laws and less media coverage on vernacular architectures of Hidmo houses.*

4.3.4. Retention Mechanism Needed to Minimize the Loss of the Vernacular Hidmo Houses in the Study Area.

This part is trying to discuss tension mechanisms for the detrimental of heritage Hidmo houses in the study areas. Thus, the retention mechanisms that give remedial measures for the demolition of heritage resources were quantified below as follows.

Variables	Mean	Std. Deviation
Training and education	4.20	.837
Awareness programs	4.40	.548
Appropriate methodology	4.40	.548
Management Plan and Strict quality control	4.20	.837
Proper installations	4.20	.837
Proper routine maintenance	4.40	.548
Community participation	4.20	.837
Sufficient funding	4.00	1.000
Tourist exposure	3.00	1.000

Management involvement	3.80	1.095
NGOs involvement	4.00	1.000
Government involvement	3.80	.837
Local materials should be used for the construction	4.20	.447
Legal framework and dealings with owners	4.00	.000
A comprehensive study in architectural preservation practices	4.20	.837
The government should give enough compensations and lithe area for the owners of historic sites.	3.80	.447

Table 13: Retention Mechanism Needed to Minimize the Loss of Vernacular Hidmo Houses. SPSS Result 2020.

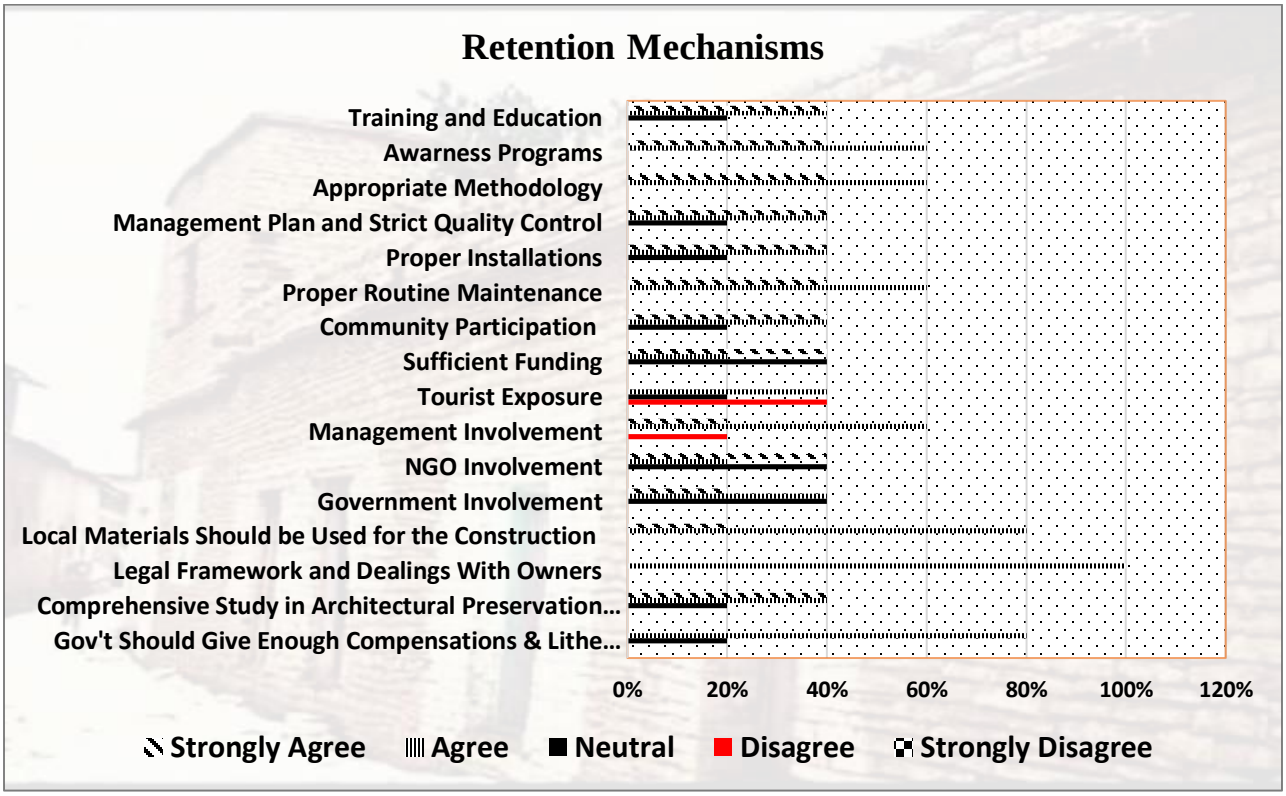


Chart 12: Retention Mechanism Needed to Minimize the Loss of Vernacular Hidmo Houses. Excel Result 2020.

The retention mechanism needed to minimize the loss of vernacular Hidmo houses in the selected study areas was investigated using (16) variables (See Table 13). The overall mean score of these variables ranges from the highest (M= 4.40, Awareness programs, Appropriate methodology, and Proper routine maintenance) to the lowest range (M= 3.00, Tourist exposure) respectively. See the variable results as follows:

Creating the idea of awareness Programs is another relevant measure for the preservation of vernacular Hidmo houses and based on the respondents scored (M=4.40, SD=0.548), in another word strongly agree (40%), agree (60%), and the level of awareness Programs in the society was propagated effectively and the same pattern the respondents more agreed and the government should enforce for higher institution and media to create important awareness how to preserve and sustaining of about vernacular Hidmo house in the society and nevertheless Training and Education also play as a critical attribute to prolong for the preservation of vernacular Hidmo house and depending on the respondent scored (M=4.20, SD= 0.837), in other words strongly agree (40%), agree (40%), and neutral become (20%), and this results in the training and education on vernacular Hidmo house was not given effectively and efficiently. So that government should be conducting consecutive, Training and Education either by the higher institution or by TTCB and also the manpower recruited that fit with purpose the vernacular Hidmo house

Proper Routine Maintenance one of the most important retention mechanism for preservation of vernacular Hidmo house and according to the respondents response scored (M=4.40, SD=0.548), in another word strongly agree (40%), agree (60%), and it is known that the proper routine maintenance was not applied on vernacular Hidmo house and apart from this the respondents agreed that for the future should be applying proper usual maintenance on Hidmo house in the study area. Depending on the respondent's data the using of local materials for the construction scored (M=4.20, SD=0.447), in another word strongly agree (20%), agree (80%), and the majority of the respondent asserted agree so that the owners of vernacular Hidmo houses should utilize the local material in building Hidmo house to attract its original value. As well as Proper installations of the materials score (M=4.20, SD=0.837), in another word strongly agree (40%), agree (40%), neutral (20%), and Appropriate methodology of preservation of Hidmo houses indicates (M = 4.40, SD = 0.548), in another word strongly agree (40%), agree (60%), In addition to Strict Quality Control and Management Plan also play a great role for the preservation of vernacular Hidmo houses and again based on the respondent scored (M=4.20, SD=0.837), in another word strongly agree (40%), agree (40%), and neutral become (20%), even though the respondents agreed and acknowledged to conduct strict quality control on vernacular Hidmo house practically is not applied on the ground. Therefore, the concerned body should be address to conduct strict quality control on vernacular Hidmo house.

Community Participation is an essential tool that plays a vital role for preservation and sustaining of vernacular Hidmo house the respondents gave feedback scored (M=4.20, SD=0.837), in another word

strongly agree, agree (40 %), and neutral become (20%), despite the fact this implies averagely the involvement of the society and private sectors is not satisfactory. and the pattern the Involvement NGOs also play a lion share on vernacular Hidmo house scored (M=4, SD=1), in other words strongly agree (40%), agree (20%), and neutral become (40%), and this result is not effective. So the government should invite and encourage the local communities, private investors, and NGOs to invest their capital effectively in the preservation of vernacular Hidmo houses.

respondent feedback on Government Involvement scored (M=3.80, SD=0.837), in other words strongly agree (20%), agree (40%), and neutral become (40%), and this indicates the degree of Government Involvement on vernacular Hidmo houses still it is no more sufficient. Therefore, this incident demanding more government and stakeholder's involvement and contribution for preservation and documentation of vernacular Hidmo houses in the study area and similarly the Management Involvement on vernacular Hidmo house scored (M=3.80, SD=1.095), in other words strongly agree (20%), agree (60%), and disagree become (20%), and even though Management Involvement is existing practically on the ground from the concerned body was not effective and efficient.

Finally, according to the respondents on Tourist Exposure scored (M=3, SD=1), in other words, agree (40%), neutral (20%), and disagree become (40%), and this indicated that the vernacular Hidmo houses till the present did not get the benefits tourism Exposure. So that Government in collaboration with stockholders, NGOs, and private investors should provide top attention and create a good platform for preservation vernacular Hidmo houses to become sources income tourism and besides to Sufficient Funding again another critical facility that expected various parts human organizations for preserving and sustaining of vernacular Hidmo houses. Depending on the respondent response regarding Sufficient Funding scored (M=4, SD=1), in other words strongly agree (40%), agree (20%), and neutral become (40%), and this manifests unsatisfactory fund for the preservation of the Hidmo houses. Government, NGOs, and private investors provide Sufficient Fund for the preservation of vernacular Hidmo houses is the last alternatives, but also Government should give enough compensations to the lithe area for the owners of historic vernacular Hidmo houses and depending on the respondent feedback scored (M=3.80, SD=0.447), in other word agree (80%), and neutral become (20%), and the same pattern the respondent agreed and recommended that Government should give enough compensations and lithe area for the owners of historic vernacular Hidmo house and finally, this motivated for the owners to maintain and fostering their historic vernacular Hidmo

house authentic values. Also, the Legal framework and dealings with owners are a very important solution for the preservation of Hidmo houses and by applying the rules it helps to protect the house its authentic value, according to the respondents this scored (M=3.80, SD=0.447), in other word agree (100%).

Based on the participant's data on Comprehensive study in architectural preservation practices scored (M=4.20, SD=0.837), in another word strongly agree (40%), agree (40%), and neutral become (20%), and the respondents acknowledged that Comprehensive study in architectural preservation practices from concerned bodies, higher institutions, and other stakeholders did not conduct an effective investigation on vernacular Hidmo houses. The same pattern according to ***KI3*** *addressed that vernacular Hidmo house one of the most important valuable asset of architecture's identity of local society; it assists as sources of tourism attraction and balancing weather situation. As a result of this incident, the Regional government in collaboration with other stakeholders should be inducting some retention mechanism for preservation and sustain of vernacular Hidmo house like conducting strict supervision, effective maintenance, active community involvement, adequate government fund, combating the natural factors, finally try to make profound effort to register the architectural heritage Hidmo houses in UNESCO world heritage.*

4.3.4.1. Reflection of FGD on Retention Mechanisms of Hidmo Houses in the Study Area.

FGD, By the Federal Gov't proclamation, cost-sharing of the house has to be implemented and has to give to owners in an exchange for the houses, Gov't must list as a proclamation; the architectural heritage places should be as a craft center and promote the area for artifact commercial places and as vernacular architectural heritage sites than as an engagement of prostitute place, the Gov't and the people should create market centers, like handicrafts and shops on the vernacular heritages, inventory and resignation of the treasures of the vernacular architectural heritage has to be made by TTCB, in the vernacular architecture; people have to live inside it. For this reason, the heritage houses will be cleaned and preserved as its original value, souvenir shops shall be promoted on architectural sites, by creating small scale enterprises, the Gov't or TTCB could commercialize the Hidmo hoses for selling artifacts as Axum city souvenir centers, the vernacular Hidmo houses shall be made to be an Ethnography Museum. For instance, in Axum city, W/ro Etenesh and Fetawrare Belay house have become an Ethnography Museum, the people's bad perception of the name of "kebele 14", for that matter, the place name has to change in a new expression. And, the people as well as the new generation will take to mean the heritage site as a valuable heritage epicenter than an unworthy center

for a prostitute, awareness has to be built in the society and the people, the wealthy individuals shall invest in the vernacular architectures, planting trees on the deforested areas, which is important and full filing for constructing the vernacular Hidmo houses as the collective tradition of the society, Improving the old vernacular Hidmo house without changing its authentic value, TTCB and Gov't have to prepare rules and regulations for vernacular Hidmo architectures, making the Hidmo houses as mini museums and adaptive reuse them, for instance, the big Hidmo's like Atse Yohannes Palace, Dejat Abraha Castel, Ras Mengesha Seyoum palace, Assefa tedla Hidmo house, and Blata Tsegay Seyfu Hidmo houses, Cooperation between universities and society is needed, higher institutions must work on practical and down to the bottom level of society, the Curriculum system must be included in heritage and one's cultural values, the Center of Excellence for the experimental institution must be established, Prepare and arrange for training, the Federal Gov't proclamations shall be localized and act as they differ in every applicable site accordingly, TTCB and Gov't there is no much exposure for preserving and conserving vernacular architectures. For this reason, the heritage sector of vernacular architecture must understand its social, economic, cultural, and educational advantage of vernacular Hidmo houses, Cooperation with foreign sectors and other countries would be given many advantages, human resources of the expertise on the heritage management, tourism, preservation, and conservation areas are very less, instead, it is better to enhance the human resources expertise and motivate them to work on it and by TTCB and Gov't effort a specific categorization of architectural heritage lists must be prepared.

4.3.5. Correlation Analysis of the Vernacular Hidmo Houses in the Study Area.

The spearman's correlation coefficient was used to compute for determining the relationship between the variables. Pearson's correlation coefficient is a suitable method to determine the correlation between the predicting and outcome variable (Andy, 2006). Correlations are the measure of the linear relationship between two variables. A correlation coefficient has a worth ranging from (-1 to 1). Values that are closer to the absolute value of 1 be a sign that there is a strong relationship between the variables being correlated whereas values closer to 0 implies that there is little or no linear relationship (parson, 2006).

The gauge typed questionnaire entered to the IBM SPSS Statistics 21 software to process correlation analysis. Based on the questionnaires, which were filled by the informants, the following Pearson correlation outputs were originated.

The outcome shows that the correlation coefficient among itself is obvious that always becomes absolute value (1), which means there is a strong relationship amongst. Consequently, the variables result is a negative and statistically significant relationship between natural factors and preservation practices (PC = -.072, S <.908). The human factors and preservation practices have a positive though statistically significant relationship (PC = .692, S <.196). There is also a positive and statistically significant relation between preservation practices and retention mechanisms (PC = .942*, S < .017). Human factors and natural factors has negative and statistically significant relationship (PC = .127, S < .839). There is a negative and statistically significant relation between retention mechanism and natural factors (PC = -.001, S < .999). There is a negative and statistically significant relation between retention mechanism and human factors (PC = .441, S < .457). (See table 14).

Correlations					
		Preservation Practices	**Natural Factors**	**Human Factors**	**Retention Mechanism**
Preservation Practices	**Pearson Correlation**	**1**			
	Sig. (2-tailed)				
Natural Factors	**Pearson Correlation**	**-.072**	**1**		
	Sig. (2-tailed)	.908			
Human Factors	**Pearson Correlation**	**.692**	**.127**	**1**	
	Sig. (2-tailed)	.196	.839		
Retention Mechanism	**Pearson Correlation**	**.942***	**-.001**	**.441**	**1**
	Sig. (2-tailed)	.017	.999	.457	
*. Correlation is significant at the 0.05 level (2-tailed).					

Table 14: Pearson Correlations Output of the Factors, Preservation Practices, and Retention Mechanism of the Vernacular Hidmo House, SPSS Result 2020.

4.4. Characteristics of Vernacular Hidmo Houses in the Study Area.

Characteristics of Vernacular Hidmo houses is a feature or quality that makes the vernacular architectural heritage or Hidmo houses recognizable. (Microsoft® Encarta® 2009. © 1993-2008 Microsoft Corporation.) There are 7 Physiognomies or appearances grounded on it's Method of

Construction, Materials, Features, values or impacts, it's Form or Shape, Formation, and based on Societal Status or rank. See Diagram 3.

Formation of Hidmo Houses: According to KI, the formation and layout settlement of Hidmo houses there are major types:

Urban Layout; this Hidmo houses are usually set as associated or grouped huses.Whereas

Rural Layout; is Hidmo houses are usually set as scattered and remote formation settlement.

Societal status: According to **KI3** , High class and Middle class society are the ones which are related mainly with the Hidmo houses.

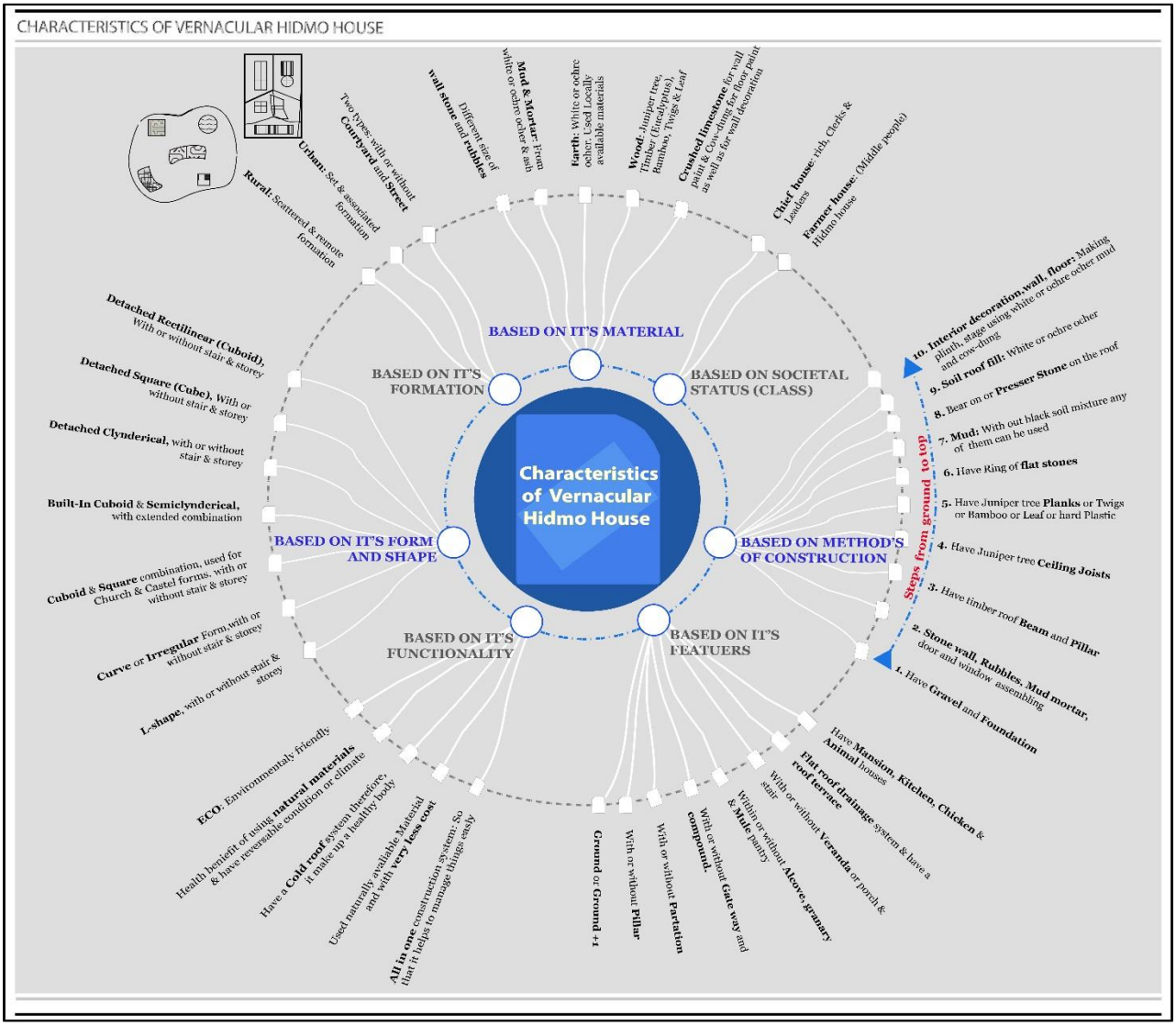


Diagram 3: Characteristics of Hidmo Vernacular Architecture. Own Model, 2020.

4.4.1. The Construction Materials of Tigrayan Hidmo Vernacular Architecture.

Based on the preliminary survey of the researcher that observed in the study area situation of materials, features, construction methods, impacts and forms of vernacular Hidmo houses in the study area is described as follows.

Hidmo houses, shaped by local traditions, climate, and available resources, showcase sustainable and culturally significant construction methods. These structures rely on indigenous materials which are carefully selected for their durability, thermal properties, and environmental adaptability. By utilizing regionally sourced and often renewable materials, vernacular architecture not only reflects the ingenuity of local craftsmanship but also offers valuable lessons in eco-friendly building practices. This section explores the diverse LBM's used in HVA and their role in creating resilient, energy-efficient, and culturally meaningful dwellings.

No	Hidmo House Materials	Description	Best Use
1	**Stone**  	**Hard nonmetallic material:** the hard solid nonmetallic substance that rocks are made of. It is abundant everywhere in the areas where the Hidmo is erected as a traditional house. There are white, grey, reddish, and black stones of different sizes. Also, there are three types of stone used for the construction of Hidmo; shaped stone, Granular stone, and slat stone (ketsela).	▪ Were commonly used for wall and foundation construction building material of Hidmo house. ▪ Can custom-size. ▪ No finish plaster is needed on the exterior. ▪ Regulates the climate and have a cooling benefit. ▪ Regulates humidity ▪ Low-tech ▪ Intuitive
2	**Slate Stones**  	**Slate stones** playing a crucial role in their structural integrity and thermal performance. Locally sourced from the surrounding highlands, these flat, layered stones are carefully stacked and mortared with minimal mud or clay to form thick, load-bearing walls. And a light thin narrow strip of stone (Flat stones), constructed as double stones. There are also white, grey, reddish, and black stones.	▪ Use as framing for the house head, also known as a ring of flat stones, and use as a drainage system. In some places of Tigray also they used it for roof cover, as a substitute for plank woods. ▪ Protect the wall from rainfall, water leakage, and sun.

			▪ Aesthetic and Structural Versatility, decorative effect, showcasing traditional Tigrayan masonry techniques ▪ Low-tech ▪ Intuitive
3	**Rubble Stones**  	Rubble stones irregular, uncut rocks gathered from local fields, riverbeds, or quarries are a fundamental building material in vernacular architecture worldwide. Their cost-effectiveness, abundance, and structural versatility make them ideal for sustainable, load-bearing constructions. It is a small piece of rock of any shape. And help to strengthen a wall cavity. There are white, grey, reddish, and black stones of different small sizes. Beside are the most effective applications:	▪ Used as fill tamped into a wall cavity so that is stacked with the mud or mortars. ▪ **Thermal Regulation:** Thick rubble walls buffer temperature extremes. ▪ **Disaster Resilience:** Earthquake-resistant when properly mortared or dry-stacked. ▪ Native ▪ Low-tech

4	**Mud, Cow-Dung**    	**Mud** is a mixture of Silt clay soil fine and short straw of the Ethiopian common cereals teff and barley with water. It has thoroughly been mixed by treading with human feet. As long as awaited as mud mixture for 3 days up to 1 month it enhances its strength. The main weakness of mud as building materials are: -Its cracking tendency as it dries out or loses moisture is higher. -Almost the complete lose of strength when it gets wet. A short life of service (durability) **Cow-Dung:**is important flooring materials of most Hidmos combined with water and small amount of soil. It prevents dust not to rise up. It is more durable flooring material than soil. And **Carbon-Negative** Sequesters CO2 when used in earthen builds.	▪ Native ▪ Low-tech ▪ Use as mortar for the wall, it uses as cement material in every traditional construction and uses as filling materials on wooden frames. ▪ Interior plastering. ▪ Roof fill can be applied. ▪ **Natural Disinfectant:** Cow dung's high pH and microbes inhibit harmful bacteria, making it ideal for kitchen walls and grain storage areas. ▪ **Odor Control:** Used in traditional toilets ▪ **Termite Resistance:** Its odor and composition deter insects, protecting organic structures.
5	**Soil**   	**Silt soil, red-loamy and Geu'ila (Termite soil):** **Silt Soil:** Fine-grained, smooth texture, holds moisture but drains poorly. **Red-Loamy Soil:** Rich in iron oxides, well-draining, and fertile. Ideal for compressed earth blocks (CEBs) and cob walls due to its cohesion. **Geu'ila (Termite Soil):** Processed by termites, ultra-fine, and highly sticky when wet. Prized in Africa (e.g., Tigray Hidmo houses) for crack-resistant plasters and stronger mud mortars.	▪ **White Soil:** Use for wall plastering and roof fill. ▪ Used in plasters when mixed with clay/straw for stability. ▪ **Ochre Ocher:** Bottom part of the house wall and sometimes mixed with cow-dung for the floor plastering. ▪ **Geuila** (**Termite soil**): Sometimes used as a plaster for the floor and its property is a substitute as cement.

6	**Wood/ Timber**  	**Wood** has been used as a building material for a long time in northern Ethiopia. Wood in its various forms has been man's most useful traditional building material until the comparatively recent innovation of metallic and other materials. It has been used for making windows, doors, pillars, lentils, ceiling, and used as partitions. **Juniper tree,** Olive tree, Mimosa tree (De'aro), Fig tree (A'wehe), Eucalyptus tree, (Hohhot tree), Woyba, Fasha, Ake'ma, and Tsiqanta'.	▪ The woods are mostly nominated by their resistance to termites attack and by their durability. Of course, for best strength, they have a season for cutting time. And used for roofing, windows, doors, pillars, and beams construction. ▪ Woyba, Fasha, Ake'ma, and Tsikenta' these are the local names of woods mostly used around the Shire area, Tigray. They used for making the Fishbone ceiling roof structure, pillars, and beams of Hidmo's.
7	**Hard plastic and cement concrete**  	**Hard plastic** a synthetic material made from a wide range of organic polymers such as polyethylene, PVC, nylon, etc., that can be moulded into shape while then set into a rigid or slightly elastic form. **The Cement Concrete is** a building material made from a mixture of gravel, sand, cement, and water, forming a stone-like mass on hardening. This are the recent materials substitute for the earthen roof as a covers. And I recommend that the hard plastic could be used as substitute for the planks, leafs and twig Hidmo roof covers to protect leakage.	▪ **Hard plastic:** is used to cover the Hidmo roof and protect the compacted earthen Hidmo roof from rain that causes leackage. ▪ **The Cement Concrete:** also used to cover the Hidmo roof and protect the compacted earthen Hidmo roof from rain that causes leackage.

8	**Thin Bamboo, Planks, and Twig**   	**Thin Bamboo:** Lightweight, grows rapidly. Naturally flexible, **Planks (Timber Planks):** Sawn wood (often local softwood or hardwood). It requires treatment (e.g., tar, lime) to resist pests and moisture. It is very durable and versatile. **Twigs (Wattle, Brushwood):** A twig is a stick with multi branches, (thin branches or flexible saplings) (e.g, willow, hazel, acacia) woven into wattle-and-daub walls or thatched roofs.	▪ **Bamboo:** Used for walls, roofing, and fence. ideal for earthquake resistant structures and holds the soil. ▪ **Planks** :Used for walls, floors, doors, and roofing. ▪ **Twigs:** Used to cover the roof as planks or bamboo/ timber and for walls,. It is lightweight, insulating, and quick to assemble. ▪ Low-cost, natural insulation.
9	**Leaf**   	**Eucalyptus Leafs are Underlayer for Slate/Stone Roofs:** In some Hidmo houses, leaves are packed beneath heavy slate or stone slabs to: - Cushion the roof structure and prevent cracking. - Add extra insulation and moisture resistance. **Temporary Shelters & Grain Stores** Smaller Hidmo outbuildings (e.g., granaries) may use pure leaf thatch for quick, biodegradable roofing. **Locally Sourced:** Harvested from nearby forests/fields. **Rainproof:** Properly layered, they direct water away effectively. **Thermal Regulation:** Air pockets in thatch buffer temperature extremes.	▪ Used for covering the roof above planks, bamboo, or twig. are ingeniously used in roofing for their lightweight, insulating, and waterproofing qualities. ▪ Used as paint for the decorative purpose for interior and exterior bottom part of the house wall. ▪ **Natural insulation:** (keeps interiors cool in heat, warm at night). ▪ Low-tech ▪ Intuitive

10	**Straw**  	In **Tigray's Hidmo houses**, Long dry straw is common in some parts of tigray to use as a roof material. Typically, a hay straw is a vital, sustainable material, especially for roofing, insulation, and reinforcement. Its hollow structure provides natural thermal regulation and lightweight durability. **Application:** Tightly bundled dry straw is layered over a wooden lattice (made of Juniper or Olive branches) and secured with twisted sisal rope or leather strips.	▪ Sometimes used as roof cover substitute for the leaf. ▪ **Primary Thatch Roofing** ▪ **Water Resistance:** When densely packed, straw thatch sheds rain efficiently. ▪ **Insulation:** Traps air, keeping interiors cool in daytime and warm at night. ▪ **Low-Cost & Renewable:** Replaced every 5-10 years using farm waste.
11	**The chaff of wheat**  	Typically, from teff, barley, or wheat harvests. In **Tigray's Hidmo houses**, wheat chaff the thin, papery husks separated during threshing is a versatile byproduct used for **lightweight insulation, binding, and reinforcement**. Though less common than straw, its unique properties make it valuable in traditional construction. **Roof Infill:** Mixed with clay or mud, chaff is packed between wooden rafters or beneath slate/stone roofing to: **Earthen Floors**: Chaff is kneaded into **clay-cow dung flooring mixes** to: Prevent cracking underfoot. Add slight springiness and warmth.	▪ Regulate temperature (traps air for thermal buffering). ▪ Dampen sound from rain or wind. ▪ Used to strengthen the mud by mixing and applied as a mortar for flooring. ▪ Lightweight Insulation for Roofs & Walls ▪ Wall Cavities: Blown into gaps in wattle-and-daub walls to reduce drafts.

12	**Corn Husk**  	In **Tigray's Hidmo houses**, corn husks the dry, fibrous outer layers of maize cobs are creatively repurposed as a **lightweight, insulating, and binding material**, though less common than straw or chaff. Their flexibility and abundance make them ideal for specific applications. **Thatch Roofing & Insulation** **Roof Underlayer**: Woven or layered corn husks are used beneath **primary thatch (straw/slate)** to:	▪ **Block wind** and fine dust. ▪ **Add insulation** by trapping air pockets. ▪ **Temporary Roofing**: In resource-scarce areas, tightly packed husks serve as **short-term waterproofing**. ▪ **Limitation**: Less durable than straw best for **short-term or secondary uses**.
13	**Cow-Horn**   	In Tigray's Hidmo houses, cow horns while not a primary construction material hold cultural, spiritual, and practical significance. Their use reflects the agro-pastoral traditions of the region. **Modern Decline**: Today, plastic/metal tools replace many functional uses, but horns persist in ritual and decorative roles. **Protective Symbolism & Spiritual Markers** Doorway & Roof Adornments: Horns are mounted above entrances or on roof peaks to: - Symbolize prosperity and cattle wealth. - Sacred Spaces: Embedded in walls of grain storage rooms to invoke blessings for abundance.	▪ Fixed to walls and used to hang (hook) Corn, Sorghum, tools of farm, Coat Rack or clothes, and other crafts. ▪ **Craft & Ornamentation** - **Jewelry Hooks**: Fixed to walls to hang **amulets or tools**. - **Musical Instruments**: Blown as ceremonial horns - **Decorative stamps** to imprint patterns on wet clay walls. - **Drink cups**
14	**Crushed Limestone or White Soil** 	In Tigray's Hidmo houses, crushed white limestone locally sourced from quarries or riverbeds is a prized material for its durability, brightness, and binding properties. Its applications blend with cultural aesthetics. **Mortar for Stone Walls** - **Stabilized Masonry**: Acts as a natural binder for rubble/slate	▪ Use as plastering for the interior wall in a liquid substance. ▪ **Wall Plaster & Finishing** - **Exterior/Interior Coat**: Mixed with **water or cow dung**, crushed limestone creates:

		walls, reducing cracks vs. mud-only mortar. - **Vault/Arch Construction**: Critical for Tigray's rock-hewn church-inspired masonry. **Antimicrobial Wash** - **Food Storage Areas**: A limewash (limestone + water) coats granary walls to deter pests/mold. - **Animal Pens**: Sanitizes surfaces and neutralizes odors. **Flooring & Pavement** - **Compact Limecrete**: Combined with clay and gravel to form: - **Hard, dust-free floors** (ideal for main living spaces).	○ **Smooth, water-resistant plaster** (protects mud walls from erosion). ○ **Bright, reflective surfaces** that cool interiors by deflecting sunlight. ▪ **Decorative Patterns**: Pressed into wet plaster for **geometric or symbolic designs**.
15	**Ash** 	In Hidmo houses and other traditional builds, animal droppings ash (e.g., cow) and timber ash (from burnt wood) are valuable byproducts, prized for their chemical, binding, and protective properties. Here's how they're used: **Lightweight Insulation** - Fills gaps in wattle-and-daub walls. Use as a mixture with the mud and helps to strengthen the mortar for wall building.	▪ **Timber Ash (Wood Ash) Best Uses:** - Accelerate drying and reduce erosion. - **Lime-Ash Floors**: Mixed with **lime and water** to create durable, smooth floors, harden surfaces and absorb moisture. - **Metal Protection**: Rubbed on **wooden pegs/nails** to prevent rust in timber joints. - **Cultural Legacy**: Used for centuries in Tigray's granaries and ritual spaces.

Table 15: Local Building Materials of HVA. Own Survey, 2020.

4.4.2. Features and Compenents of Hidmo Vernacular House.

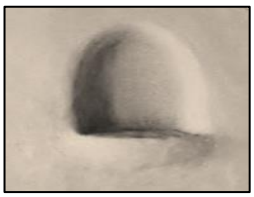
Key features include its rectangular or round layout, thick stone walls for insulation, an intricately constructed wooden roof, and an interior organized around functional and social needs. By examining

its distinct architectural elements such as main living space, storage area, and entrance courtyard etc., we gain insight into how the Hidmo house harmonizes practicality, tradition, and environmental resilience.

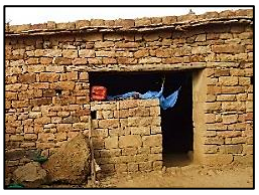
No	Hidmo House Features	Description	Best Use
The Main Mansion House			
1	Ground Hall or Mansion (አዳራሽ, Adarash)   	**Ground Hall or Mansion (አዳራሽ, Adarash):** This is the largest Hidmo house and it shows the wealth of the owner. **Layout & Structure:** - Rectangular or Square Plan: Built with thick stone walls (up to 50cm wide) for thermal mass and stability. - Low Ceiling & Compact Design: Retains heat in cold highland nights while staying cool by day. - Central Support Pillar **Key Zones:** - Leaving/Sleeping Area - Raised Earthen Platforms (Mede'b): - Niche Shelves (Ka'hebe or Chigot): - Stage seat (Medye'ab): - Ground +1 (Debre'): - Stair (Dereja): Way to upper room. - Mule pantry Room: - Alcove Room: Adaptability: In modern Hidmo houses, the Adarash may include metal lamps or cement floors, glass windows or zinc roofing, but the Adarash's layout and core design remains unchanged. Proverb: "A house built on stone feeds seven generations."	▪ **Cultural & Social Significance.** - Use as a guest reception room - Use as a dance fest "Diges" (Cultural ceremony) room. - Use as a bedroom and as a salon room. - Community Hub: Hosts weddings, religious rituals, and elder councils (chig). ▪ **Why the Adarash Matters:** - Climate-Proof: Stays warm in cold nights and cool in daytime. - Multi-Generational: Designed for extended families (privacy is minimal, fostering communal living). - Disaster-Resilient: Stone walls and flexible timber roofs withstand earthquakes.
The Mansion Built-In Rooms			
2	Alcove or Granary Room (ውሻጤ, Wusha'te):  	- **Alcove Room, (ውሻጤ, Wusha'te):** A semi-enclosed or fully enclosed storage space integrated into the walls of a Hidmo dwelling, designed to preserve grains (silos), legumes, pottery, tools and dried foods. Constructed from stone, compacted earth, and clay plaster, these alcoves feature thick walls for insulation and often have elevated floors to deter pests. Small ventilation slits regulate airflow, while wooden or woven grass doors secure the contents. In larger Hidmos, the granary may occupy a dedicated corner or sub-room, sometimes decorated with symbolic carvings or protective motifs.	**Best Use:** Food Preservation: The thick earthen walls maintain stable humidity and temperature, preventing mold and spoilage (ideal for storing teff, barley, or chickpeas). Pest Control: Elevated floors, cow-dung and clay linings deter insects and rodents, while aromatic herbs (e.g., neem leaves) are often placed inside as natural repellents.

		-Cultural Significance: -Symbol of Prosperity: A full granary signifies a family's diligence and divine favor. Architectural Harmony: Blends storage with aesthetics; some alcoves are painted with geometric patterns or crosses. Key Features: -Materials: Stone base, clay or cow-dung-lined interior, timber-reinforced shelves. -Innovation: Contemporary designs incorporate metal mesh for improved ventilation. -Proverb: "A wise farmer builds his granary before his kitchen."	Seasonal Planning: Acts as a household's "food bank" during lean seasons, reflecting agrarian resilience. Sacred Storage: In some communities, the innermost alcove reserves seed stock for the next planting, blessed during Meskel (Festival of the Cross). Occasionally, used as bed room if there are no crops inside:
	Mule or Horse Leaning Room: 	-**Hidmo Mule or Horse Leaning Room:** A built-in stable or sheltered corner within the Adarash (ground-floor hall) of a Hidmo dwelling, designed to temporarily house mules, horses, or donkeys during harsh weather or overnight stays. Constructed from the same stone and earth materials as the main structure, it features: - Low partition walls (1–1.5m high) to separate animals from living areas while allowing airflow. - Earthen floor slightly sloped for drainage, often covered with straw or dried grass for comfort. - Tethering rings embedded in the walls to secure animals. - Adjacent storage for feed (barley, hay) and tack (bridles, saddles) in smaller niches. - Proverb: "A home with a horse leans toward prosperity."	▪ This room serves as a living part for the owner's special mule or horse. **Best Use:** Protection & Security: Shields livestock from theft or predators while keeping them warm in cold highland nights. Labor Efficiency: Allows farmers quick access to animals for pre-dawn ploughing or market trips without venturing outdoors. Manure Management: Proximity to the household enables easy collection of dung for fuel or fertilizer. Cultural Rituals: In some communities, prized warhorses or bridal mules are kept here before ceremonial processions.
	Ground +1 (ደብሪ, Debre') 	-**Ground +1 (ደብሪ, Debre'):** The storied floor of Hidmo and a traditional Tigrean residential structure typically serves as a raised ground floor with thick stone wall. Upper floor (Debre') Designed to: reserved for younger family members/storage.	**Best Use:** Used for Guest Quarters, Servants' or kid's bed Room: In some cases, it may serve as extra sleeping space for the husband and wife.
The Mansion Built-In Features			
3	Plinth (ሙደብ, Mede'b)	**Plinth or Raised Earthen Platforms (ሙደብ, Mede'b):** It is a traditional elevated earthen bed along walls, covered in woven mats or hides.	▪ **Plinth (ሙደብ, Mede'b):** A traditional raised platform used for sleeping and seating inside the ground-floor hall.

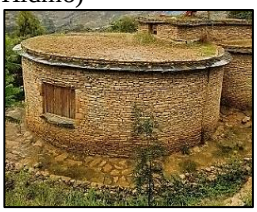
			
	Stage or seat (Medye'ab) 	**Stage Seat (Medye'ab):** A traditional elevated earthen bench built along the interior walls of a Hidmo dwelling, constructed from compacted earth, stone, or mud bricks and finished with smooth clay plaster. The Medye'ab typically stands at knee height, with a flat or slightly curved surface, and is often covered with handwoven rugs, jute mats, or animal hides for comfort and insulation. These benches are integral to the home's architecture, blending seamlessly with the walls and sometimes incorporating hidden storage beneath the seating platform. Key Details: -Construction: Often includes a recessed base (hidden storage for injera baskets or tools). -Textiles: Goat hides in rural areas; intricate cotton weavings in urban Hidmos. -Placement: Wraps around hearths or sacred spaces (e.g., near family altars). -Modern Adaptation: Inspires today's sunken seating (e.g., "Ethio-modern" lounges) and sustainable furniture design. -Unique Feature: Unlike movable stools, the Medye'ab is part of the home's structure: a permanent stage for daily life and community.	**Best Use:** Primarily used as a seating area, but occasionally serves as a sleeping space for guests when needed. Social & Ceremonial Gatherings: Serves as communal seating during coffee ceremonies (bunna), meals, or storytelling, reinforcing social bonds. Thermal Comfort: The earthen mass retains heat in cool seasons and stays cool in hot weather, while natural fiber coverings add warmth. Space Efficiency: Doubles as a daytime workspace (for weaving, grinding) and nighttime sleeping area for guests. Cultural Aesthetic: The layered textiles (such as rugs or shema rugs) display household craftsmanship and status. -Proverb: "A house without a Medye'ab is like a sky without stars."
	Chicken house 	**Chicken house:** Mostly, built under the plinth (Mede'b) in the kitchen room, sometimes it may be in the main mansion room.	**Chicken house:** The earthen structure under the plinth provides natural insulation, trapping heat at night and keeping for the chickens' warm and comfortable.
	Niche Shelves (Ka'hebe, Chigot) 	**Niche Shelves (Ka'hebe or Chigot):** Traditional recessed shelving units carved or built into the thick stone or earthen walls of Hidmo (Tigrayan vernacular dwellings). These geometric niches are crafted during construction, using the same natural materials as the structure typically stone, clay mortar, and sometimes reinforced with timber. Their sizes vary from small cubbies (for cups/oil	**Best Use:** Space Optimization: Exploits wall depth to create storage without encroaching on limited interior space, critical in compact Hidmo houses. Climate Regulation: The thermal mass of stone/clay helps stabilize temperatures, keeping

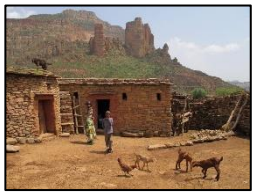
		lamps) to larger alcoves (for storing mesob baskets, pottery, shoe, bible or sacred artifacts). Surfaces are often smoothed with clay plaster or left in raw stone for aesthetic contrast. Modern Adaptation: Now emulated in eco-architecture for minimalist, zero-waste storage solutions. Unique Feature: Unlike freestanding shelves, these niches are part of the architecture itself, reflecting a philosophy where utility and structure are inseparable.	stored goods cool and dry in arid climates. Cultural Display: Used to exhibit heirlooms, religious items (e.g., crosses), or utilitarian pottery, blending daily function with cultural identity. Structural Integrity: The recessed design distributes weight evenly, reinforcing walls while minimizing protruding hazards in low-light environments.
	Candle or Lampe place (Kuraz, Qe'ra'rot)   	**Candle or Lampe place (Kuraz or Qe'ra'rot):** A traditional wall niche or small platform carved into the stone or earthen walls of a Hidmo dwelling, specifically designed to hold oil lamps (kuraz) or beeswax candles (qe'ra'rot). These niches are typically shallow, with a slightly raised lip or depression to prevent dripping wax or oil from staining surfaces. Often positioned at eye level near seating areas, entryways, or religious icons, they are carefully placed to cast warm, ambient light while minimizing fire risk. Modern Adaptation: Reinterpreted in contemporary design as minimalist LED alcoves or candle nooks in eco-lodges. Cultural Note: Unlike freestanding lamps, Kuraz/Qe'ra'rot niches reflect Tigrayan resourcefulness light is woven into the architecture itself.	**Best Use:** Controlled Illumination: Provides directed lighting for evening tasks (weaving, cooking, dinner) or ceremonial use, with the niche shielding flames from drafts. Safety & Cleanliness: The raised edge contains spills, while the stone/clay material is naturally fire-resistant. Sacred Symbolism: In Christian Orthodox households, the lamp's light symbolizes divine presence, often placed near tabots (altar tablets) or family shrines. Aesthetic Harmony: The soft glow enhances the textured beauty of stone walls, creating a meditative atmosphere.
		The Mansion Structural Features	
4	Pillar (Ame'de') 	- **Central Support Pillar (Ame'de'):** A singular or paired column, intricately carved from juniper or olive wood, serving as both a structural and decorative focal point.	▪ **Pillar (Ame'de'):** Used often holds the roof, symbolizing strength and unity. - Symbolism: The central pillar (*Ame'de'*) represents the family's lineage; some are carved with crosses or ancestral motifs.
	Seray'eat, Muhuts and Beam (Teshegagare)	- **Seray'eat (Planks), Muhuts and Beam (Teshegagare):** These structural ceiling elements exposed juniper beams and branch lattice are intentionally left visible for aesthetic appeal.	▪ **Seray'eat (Planks), Muhuts and Beam (Teshegagare):** Used for roofing, and ideal for earthquake resistant structures and holds the soil as well as water leakage.

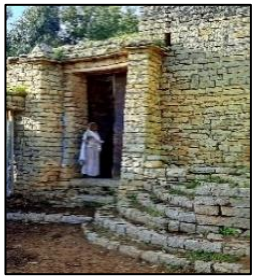
			
	Staircases  	- **Staircases (Medeyea'be):** The property incorporates dual staircase systems, interior steps (wood or stone) connecting to upper living spaces (Debri), and exterior stairs providing access to the characteristic earthen roof terrace (known locally as Na'hese). Both variants demonstrate vernacular construction techniques adapted to local materials and daily needs.	▪ **Functional Design:** Indoor staircases: serve as primary vertical circulation between floors. Outdoor staircases: facilitate rooftop access for maintenance and seasonal use.
	Veranda (De'geaf, Af'Gebe' la) 	**Veranda (De'geaf, Af'Gebe'la):** A cantilevered outdoor balcony on the ground level, featuring built-in seating made from wood, mud and stone. The De'geaf (or Af'Gebe'la) is a raised, semi-open veranda that wraps around the exterior of a traditional Tigrayan Hidmo, serving as a transitional space between the home's interior and the courtyard. Built from the same local stone and earth as the main structure, it features: Stone Columns or Pilasters: Supporting a lightweight roof of timber and thatch (or corrugated metal in modern adaptations). -Low Perimeter Walls (10-15cm high): Acting as seating ledges while maintaining open sightlines. -Earthen Floor: Often polished with a mix of clay and cow dung for durability. -Decorative Elements: Some have geometric carvings or white limewash patterns (e.g., crosses, zigzags). Proverb: "A house without a veranda is like a face without a smile." -Climate Mediator: The overhanging roof blocks midday sun, while the open sides allow cross-ventilation. In rainy seasons, it becomes a dry workspace for pottery-mending or hide-tanning.	▪ **Veranda (Afde'ge, Af'Gebe'la):** Use as protection to the main door of the Hidmo house from rain, sun, and provides rest or chatting place for the owners. **Best Use:** Social Hub: Primary space for coffee ceremonies (Bunna), meals, and storytelling, shaded from the sun but open to breezes. Elders hold court here, resolving disputes or sharing oral histories (Tigrigna: "De'geaf ""The veranda is where wisdom sits"). -Work and Craft Space: Women spin cotton (Feta'let) or weave baskets (mesob) in the cool morning air. Farmers sort grains or repair tools before storage in the Debri. -Ceremonial Gateway: Bridal processions pause here before entering the home (Tigrayan: "de'geaf" "The veranda welcomes blessings"). Mourners gather to recite prayers (tsom) during funerals.

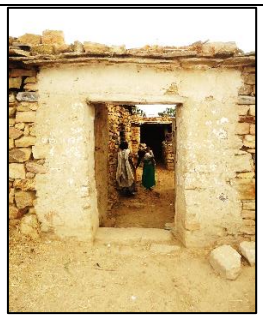
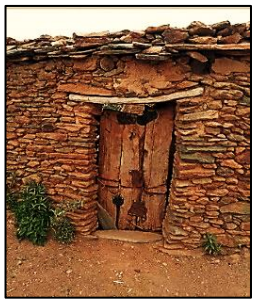
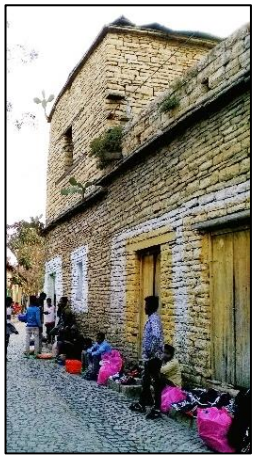
Detached Rooms			
5	Cattle Pen Houses (Af'gebella)  	- **Livestock Shelter (Af'gebella):** Af'gebella is a traditional Tigrayan livestock shelter, typically attached to the Adarash (main hall) or built as a detached structure. Characterized by its partially open design, it features: - Three Solid Walls: Constructed from dry-stacked stone or compacted earth, providing wind protection and structural stability. - Open Frontal Side: Allows easy access for animals and ventilation, often with a low stone ledge to contain bedding. - Lumped Roof: A single-slope or rounded thatch/timber roof (modern: corrugated metal) that sheds rain while maintaining low height for heat retention. Earthen Floor: Slightly inclined toward the open side for drainage, covered with straw or dry grass for insulation. Cultural Significance: - In agrarian communities, the Af'gebella's proximity to the home reflects the Tigrayan ethos of interdependence between humans and livestock. - Modern Adaptations: upgraded versions use recycled plastic roofing for durability.	▪ **Livestock Shelter:** Basically, used as a cattle pen or shelter, and sometimes used as an entertaining place for the owner. **Best Use:** Overnight Shelter: Houses goats, sheep, or calves during cold nights or rainy seasons, protecting them from hyenas or thieves. The open front allows shepherds to monitor animals without entering. Manure Collection: Dung accumulates on the earthen floor, later harvested for fuel or fertilizer. Multi-Season Adaptability: Dry Season: Functions as a storage area for fodder (hay, barley stalks). And a milking station.
	Bees place (እንዳ ንህቢ,En'da Ne'hbe): 	- **Bees place (እንዳ ንህቢ,En'da Ne'hbe):** A semi-open, elevated structure attached to the Hidmo's exterior, designed to house traditional woven beehives (Qe'fo or Go'doo). Characterized by: Open Frontal Wall: Allows bees easy access to flowering fields while providing shade. Earthen, thatched or Wooden Roof: Extends beyond the walls to protect hives from rain and sun. Earthen or Stone Base: Elevated on stilts or a low platform to deter ants and small predators. Wicker Hive Racks: Suspended from the roof beams or mounted on shelves, often smeared with cow dung to repel pests. Langstroth Hives: Urban beekeepers blend modern frames with traditional placement. Cultural Symbolism: Bees are considered as hard-working creatures and "God's messengers" hives are never disturbed during sunny and fasting periods.	▪ **Best Use:** Used as a keeping place for bees and help to breed them warmly there. Honey Production: Houses 5–15 cylindrical hives (woven from gesho branches or bamboo and coating with cow dung), yielding Tigrayan red honey, prized for its medicinal purity. Positioned near wild Acacia or (Chiena Adam) nectar sources. Pollination Hub: Boosts yields of nearby crops (e.g., teff, gesho). Farmers note "fields near bee place bear fatter seeds." Ceremonial & Economic Role: Honey is used in Me'ss (mead), church rituals (Qurban), and wound care. A thriving hive signifies prosperity brides' families gift

		The Bees hive leverages Tigray's dry climate and symbiosis between architecture and agroecology. Climate-Smart Design: The veranda's airflow prevents hive overheating, while the roof's overhang shields from heavy rains.	hives as dowry and for guest too. Modern Adaptations: Eco-Tourism: Some Hidmos offer "bee veranda" experiences to visitors.
	Hidmo Kitchen (እንዳ እቶን, En'da E'ton or እንዳ ሞጎጎ, Mogogo):   	- **E'ton or Mogogo):** Traditionally features a sunken firepit, this kitchen design incorporates a cylindrical structure lined with mud and stone. At the top of this rounded assembly, a fixed clay plate serves as the primary baking surface, blending functionality with traditional craftsmanship and besides there is an E'ton, open cooking feature (without clay plate). - **Hidmo Kitchen (እንዳ እቶን, En'da E'ton or እንዳ ሞጎጎ, Mogogo): The Hearth of the Home.** A semi-enclosed or dedicated corner within the Hidmo, centered around a sunken firepit (e'ton) the heart of Tigrayan culinary traditions. Key features include: Firepit Construction: Cylindrical stone/earth lining to retain heat. Clay griddle (mogogo) placed atop for baking injera. Ventilation: Smoke escapes through a small high window, mud made chimney or roof gap (no chimney), preserving the home's warmth. Ancillary Spaces: Stone shelves (ka'hebe) for spice jars (e.g., berbere, shiro). Hanging ropes for drying kolo (roasted barley) or utensils. Modern Adaptations: Rocket Stoves: NGOs promote efficient, smoke-reducing models. Solar Ovens: Paired with traditional methods in hybrid kitchens. Rural Tigray: Outdoor mogogo under a thatched shade for summer use.	▪ **Best Use:** Daily Cooking: Injera Preparation: Fermented teff batter is poured onto the mogogo for slow, even cooking. Stews (Wot): Clay pots (des'te) simmer over coals, infusing flavors into tse'bhe der'hoo or Ber'shen. Social Rituals: Women gather here to grind spices and share chatter. Coffee beans (bunna) are roasted over the fire before ceremonial brewing. Preservation Techniques: Smoke from the firepit cures meats (quanta) and deters insects from stored grains. Embers are buried in ash overnight for next-day reignition ("fire never dies in a Tigrayan kitchen"). Climate Resilience: The sunken design conserves fuel by concentrating heat. Winter nights: Families sleep near the hearth for warmth. Proverb: "A cold hearth chases away even the bravest guest."
	Shelve (Qoreqor, mender'der, Armadio)	- **Shelve (Qoreqor, mender'der, Armadio):** Traditionally constructed as sturdy bunks, these structures are built from layered stone, interwoven sticks, and compacted mud, combining durability with locally sourced materials. Their simple yet robust design reflects a functional approach to sleeping	▪ **Shelve (Qoreqor, mender'der, Armadio):** -Climate Adaptation: (insulation, moisture resistance). -Space Efficiency. -Cultural Context.

		quarters, often integrated into the walls or corners of dwellings.	
	Traditional Stone Grinding Grains (Met'hane) 	- **Traditional Stone Grinding Grains (Met'hane):** A durable, flat or slightly concave stone slab paired with a smaller handheld stone (mano or muller), used to manually grind grains, legumes, or spices into flour or paste. Typically made from locally sourced basalt, granite, or sandstone, its coarse texture aids in efficient crushing while its weight ensures stability during use. The grinding motion back and forth allows for adjustable coarseness, from fine flour to cracked grains.	▪ **Best use:** -Preservation of Nutrients: Unlike metal mills, stone grinding generates less heat, retaining the grain's natural oils and flavors (ideal for, sorghum, or coffee). -Processes diverse: ingredients (grains, seeds, herbs) and allows control over texture for traditional dishes like injera or spice blends. Off-Grid Utility: Requires no electricity, making it essential in rural or sustainable kitchens.
	Granary pan and room (Mak'en/ Go'doo' Bokra) 	- **Granary pan, (Mak'en, Go'doo', Bokra):** A rounded structure made of mud and cow dung. In other words, it is a mud made structure used to collect unbroken grains that built-in inside the Hidmo or placed in the kitchen room**:**	▪ **Granary pan, (Mak'en/ Go'doo'):** Used to hold the graded grains. Often sealed with cow-dung plaster to prevent pests.
Other Features and Parts:			
6	Flat Roof (Nah'se or Hidmo)  	It is an open roof terrace and a lumped earthen flat roof house of Tigrean. The flat roofs of traditional Hidmo houses in Tigray, Ethiopia, are a marvel of vernacular engineering, optimized for the region's arid climate, seismic activity, and scarce timber resources. Unlike sloped thatch roofs found elsewhere, Hidmo flat roofs prioritize multi-use space, thermal mass, and durability. **Disaster-Resilient**: Performs well in earthquakes and heavy winds.	▪ **Best Use:** It covers the roof of the stone house and protects the sun's radiation and others. - To put rick straws and grass on it. - Dogs can go up and use as a protected area. - The owner uses this as a watch place. - Use for Malt expand.
	Straw/Bran Place (ዳሓሰር, Da'haser)	- **Straw/Bran Place (ዳሓሰር/ Da'haser):** Mostly located at the side or backyard of the Hidmo house. A simple yet essential vernacular structure (Da'haser) found in the	▪ **Best Use:** Fodder Storage:

		side or backyard of a Hidmo dwelling, designed to store straw, animal fodder, and crop byproducts like wheat husks, barley husks or teff chaff. Typically constructed with: -Low Stone or Earthen Walls (1m high): To contain materials while allowing airflow. -Open, thatched or Corrugated Roof: Elevated on wooden posts to shield contents from rain and sun. -Open or Partially Woven Walls: Often made of acacia branches or bamboo to balance ventilation and wind blow it helps to keep in place. -Compacted Earthen Floor: Slightly raised to prevent moisture absorption and pests. -Cultural Significance: Considered the "kitchen of livestock" a household's wealth is partly measured by its straw reserves. -Proverbs: "A empty Da'haser sings the song of hunger."	Stores dried straw, hay, and crop residues to feed livestock (oxen, goats) during dry seasons. -Recycling: Bran and husks are reused as animal feed, compost, or even fuel bricks when mixed with dung. -Multi-Purpose Utility: Children's Play Area: The soft straw lining provides a safe spot for calf's and toddlers during farm work. -Seasonal Adaptations: Rainy Season: Becomes a temporary shelter for chickens or lambs. -Harvest Time: Expands with additional piled sheaves (dembe).
	Hidmo's Centeral Courtyard (Dembe'/Mereba, or Qetse're)   	- **Hidmo's courtyard (DM/ MR/QT):** This has a free space or compound inside the fence. An open, multifunctional compound enclosed within the Hidmo's stone or thorn-fence perimeter (Qetse're), serving as the nucleus of daily activities. - Key features include: - Compact Earthen Floor: Hardened by daily use and polished with a dung-clay mix for durability. In some houses use flat stones as flooring. - Perimeter Walls: Built from dry-stacked stone or woven branches, offering privacy and wind protection. - Central Features: The heart of domestic life, often includes a tree, or animal feeding woods or elevated masonry. - Shade Elements: An open space or tree area awning for respite from the sun. - Climate Adaptation: Dry Season: Dampened with water to cool the air via evaporation. Rainy Season: Sloped edges channel runoff to gardens or cisterns. - Night time Security: Dogs and watchful children sleep here to guard stored harvests.	▪ **Best Use:** Agrarian Activities: Threshing Floor: Grain is spread and beaten with sticks, then winnowed in the breeze. Handicraft Hub: Spinning cotton, weaving baskets, or tanning hides under the open sky. Social & Ceremonial Space: Coffee Rituals (Bunna): The courtyard hosts guests for hours of conversation and incense. Weddings & Feasts: Me'ss (mead) is served here, with elders seated on hides or medye'ab benches. Livestock Integration: Animals to relaxing there, chickens and goats forage scraps, while donkeys are tethered near the gate aftermarket trips. Spiritual Significance: Mourning Space: gatherings.
	Fence (Dogol)	- **Hidmo Fence (ዶጎል/ Dogol): The Guardian Boundary.** A versatile perimeter barrier surrounding the Hidmo compound, crafted from locally	▪ **Best Use:** Security & Privacy:

	   	available materials to suit the terrain and purpose. And seen as a beauty of the compound. Key types include: -Stone Wall (Dogol): Dry-stacked basalt or limestone, with random rubble masonry type, often 1–2m high. Mortarless construction for flexibility during earthquakes. -Thorn Fence (Plants): Woven branches of wait-a-bit thorn (Acacia mellifera) or prickly pear cactus (Opuntia). Reinforced with timber posts in circular or zigzag patterns. -Wooden Palisade (Dogol): Twig, vertical acacia or juniper logs, sharpened at the top. Used in forested highlands where timber is abundant. -Key Features: Eastern Tigray: Low cactus fences (Beles Dogol) around Hidmo gardens. Souther Tigray: High cactus fences (Beles Dogol) around Hidmo gardens. Central Highlands: Ornate dry-stone walls with random rubble masonry.	Deters predators (hyenas, leopards) and thieves especially critical for protecting livestock at night. Shields family activities from outsiders, per Tigrayan proverbs: "A fence speaks before the owner does." Microclimate Control: Stone walls block erosive winds, creating a calm courtyard for drying crops or weaving. Thorn fences double as living barriers, their roots stabilizing soil against erosion. Livestock Management: Cactus fences serve dual roles: Boundary marker for grazing zones. Emergency fodder during droughts (peeled pads fed to cattle). -Maintenance: Annual repairs post-rainy season ("A leaning fence invites trouble").
	Main Gate/ Porch (Dege 'Selam)   	- **Hidmo Main Gate/Porch (ደገ ሰላም, Dege 'Selam - "Gate of Peace"): The Welcoming Threshold.** The Dege 'Selam is a roofed, stone-framed entrance gate integrated into the Hidmo's perimeter fence (Dogol). Used as the grace of the gate, security, strength & insulation. This semi-ceremonial portal features: -Stone Architecture: Two or one massive (1–150m length) dry-stone laying in footing as supporting lintel to strengthen the wall and frame. A small thatched, corrugated or earth with timber roof shelters the entrance from rain/sun. -Door Construction: Wooden doors of acacia, cactus or juniper, reinforced with iron or rubber straps in wealthier homes. Low stone threshold (Footing Stone (Menge'rger): to block dust and snakes. -Symbolic Elements: White limewash (nora) on the pillars or side wall for spiritual protection.	**Best Use:** Ceremonial Welcome: Guests pause here to receive blessing before entering. Bridal processions stop at the gate for songs and coffee. -Sun Moderation: Roof shades daytime visitors during negotiations (shimglina). -Security & Surveillance: The roofed design allows guards or dogs to monitor arrivals without exposure. Stone frame deters forced entry narrow width permits only single-file passage. At night, the gate's overhang traps warmth from the courtyard's hearth. -Spiritual Significance: "Selam" (peace) rituals: Newlyweds anoint the gateposts with butter. Funerals: The deceased are carried out feet-first through

		A hollowed stone niche (Meshe'gor) near the gate for locking purpose from inside. -Why It Matters: More than an entrance, the Dege 'Selam embodies Tigrayan values hospitality guarded by vigilance, tradition framed in stone.	Dege 'Selam to confuse evil spirits. Defensive Utility: In historic times, boiling water could be poured from Dege 'Selam onto intruders.
	Hidmo Doors   	- **Hidmo Doors:** The doors of Hidmo house and fences in Tigray are typically made from locally sourced, durable materials, reflecting both functional resilience and cultural aesthetics. The most common woods used include: 1. Euphorbia (Cactus Wood) Design: - Often carved into planks and bound with leather or metal straps. - May feature geometric patterns symbolic of Tigrayan heritage. 2. Timber (Local Hardwoods) - Common Species: Olive and Oak tree. Design: -Thick, single-plank doors or multi-plank constructions joined by wooden pegs. - Often adorned with iron nails or carved crosses for decoration. 3. Stone-Framed Doors (For Security & Insulation) - Hidmo doors are set within thick stone walls, with a raised threshold to block dust and pests. - Some feature a small "judas window" (Mechi'loqi) for viewing visitors. 4. Traditional Locking Mechanisms - Wooden Latches (Meshe'gor): A sliding bar system, sometimes secured with rope. - Iron Locks (Qulfi): Introduced later, often handmade by local blacksmiths	▪ **Best Use:** Cultural & Functional Significance • Symbolism: Doors often face east (toward sunrise) for spiritual significance. • Defense: Thick doors provided protection from wild animals and conflicts. Climate Adaption: Tight-fitting doors prevent dust and cold winds from entering. Why Used? - Euphorbia (Cactus Wood): Is resistant to pests and decay due to its toxic sap. - Lightweight yet sturdy when dried properly. - Olive wood is dense, termite-resistant, and ages beautifully. - Oak provides superior strength for larger doors. - From inside there is a hollowed stone niche (chi'got) near the gate for oil lamps or incense.
	Wooden Lock (Mere'gets or Meshe'gor)	- **Traditional Wooden Lock (Mere'gets/Meshe'gor):** A vernacular security mechanism consisting of a wooden bar that slides horizontally behind the door, engaging with wall-mounted receptacles on both sides of the door frame. Key Features: 1. Construction & Operation: - Carved from dense hardwood (typically acacia or olive wood).	▪ **Best Applications:** -Interior doors requiring privacy. -Secondary security for external doors. -Storage areas needing simple access control. ▪ Cultural Significance: - Represents indigenous engineering wisdom

		- Functions as a sliding deadbolt that engages with wall sockets. - Installed at mid-height (approximately 1.2m from floor) 2. Installation Details: - Wall-mounted receiving holes (5-15cm diameter) on both door jambs - Locking bar slightly longer than door width for secure engagement - Often features carved handgrip for easy manipulation 3. Security Mechanism: - Bar spans the entire door width when engaged - Resists forced entry through friction and structural integrity - Secondary smaller wooden peg sometimes used to secure the bar.	- Demonstrates adaptation to local materials - Often features decorative carving (especially on visible ends) ▪ Modern Adaptation: While largely replaced by metal locks, contemporary versions: - Incorporate metal reinforcement cores Appear in eco-lodges and cultural centers serve as emergency backup locks.
	Footing Stone (Menge'rger, Te'regatse')  	▪ **Footing Stone (Menge'rger, Te'regatse'):** The large, flat stone at the base of a traditional main gate serves both practical and symbolic purposes in architecture. It is carved from durable stone (e.g., granite) and align with the gate's proportions. In essence, ensuring the gate stands firm while embodying cultural values. - It is a resultant force for the door. Its best use lays in honoring both function and tradition. Symbolic & Cultural Significance: - Status Marker: In traditional societies, the size and craftsmanship of the footing stone reflected the owner's wealth/social rank. - Threshold Guardian: Symbolizes a transition between outside and inside spaces (e.g., sacred/secular, public/private).	▪ **Best Use:** Aesthetic & Functional Design ▪ Visual Anchoring: Provides a balanced, grounded appearance to the gate. ▪ Step Function: Often used as a stepping stone for everything. Structural Stability & Protection - Foundation Support: Acts as a sturdy base for gate pillars, distributing weight evenly to prevent sinking or tilting. ▪ Moisture Resistance: Elevates wooden or vulnerable gate components above ground, reducing rot and water damage.
	Large, Medium and Small -sized Windows (Mel'kok) 	-**Large, Medium and Small -sized Windows (Mel'kok):** It play a crucial role in natural ventilation and climate control, harmonizing with the region's hot, arid environment. Here's how they function: 1. Strategic Placement for Cross-Ventilation - Located on opposite walls to facilitate airflow, leveraging wind direction. - Positioned at mid-height (neither too high nor too low) to allow warm air to escape while drawing in cooler breezes. 2. Size & Shape for Optimal Airflow	▪ **Best Use** ▪ **Ventilation:** Smoke escapes through small roof vents or doorways (no chimney). ▪ Basically, use as air ventilation and light illumination. ▪ During bad time it help to watch enemies from inside. ▪ Use as building beauty.

	 	- Medium-sized (smaller than modern windows but larger than arrow slits) to balance ventilation and thermal mass. - Often rectangular or arched, with wooden or stone lintels to maintain structural integrity. 3. Thermal Regulation - Stone/Mud Brick Walls + Windows: The thick walls (thermal mass) absorb heat during the day, while windows allow hot air to rise and exit, keeping interiors cool. - Night Venting: Cool night air enters, flushing out residual warmth stored in walls.	4. Protection & Privacy -Sometimes fitted with wooden shutters or covered with woven mats to adjust airflow and provide shade. Placed at heights that allow light and air while maintaining privacy.
	Drainage System (Mel'kok)  	**Drainage System (Mel'kok):** In traditional Hidmo houses of Tigray, Ethiopia, the drainage system (Mel'kok) is a crucial yet simple feature designed to manage rainwater or fall easily from the lumped roof and prevent erosion around the structure. Given that Hidmo houses are typically built from stone and earth with thick walls and flat roofs, proper drainage is essential to maintain structural integrity. **Traditional:** Locals often use dry-stone masonry (stacked stones without mortar) for gutters, allowing water to seep through gradually. **Modern Improvements:** Some households now incorporate cement-lined channels or PVC pipes for more efficient drainage.	▪ **Prevents Wall Deterioration:** Mud and stone structures are vulnerable to water damage. ▪ **Preserves Fertile Soil:** In rural areas, diverted water can be directed toward farmlands. ▪ **Cultural Ingenuity:** The system reflects sustainable vernacular architecture, using local materials intelligently. ▪ **Roof Drainage (Flat Roof Design):** A slight slope or **raised edges** help direct water toward designated drainage points.
	Roof Eaves/ Ring of Flat Stones (Kinfi/ Qetsela or Tem'berek)  Door eaves (Kinfi/ Chih'me) 	▪ **Roof Eaves/ Ring of Flat Stones (ክንፊ,Kinfi/, ቀጸላ/Qetsela or ተምበረኽ/ Tem'berek):** A flat or slant stone constructed with a bonded structure and placed in the top of the building as a ring. Large, flat stones (basalt/sandstone) used as: -Roof Ring Stones: Placed atop angular or cylindrical walls to create a compressive bond, distributing the timber or thatch roof's weight. -Construction: Stones are precisely shaped to interlock without mortar (dry-bonded). Often carved with simple geometric grooves for better adhesion. ▪ **Door Eaves (ጭሕሚ,Chih'me):**	▪ **Roof Eaves/ Ring of Flat Stones Best Use:** - Use as protection for the wall and woods, from sunray, rain, and water seepage. -Seismic Resilience: The interlocked design flexes during earthquakes, preventing collapse. -Load Distribution: Roof-ring stones (Qetsi'la) prevent wall splaying under heavy rains. -Aesthetic Symbolism: Beauty for the building as framing. ▪ **Door Eaves (Chih'me) Best Use:**

		Door Cantilevers: Projected above entrances as lintels, supporting the wall above the doorframe. In another word, a small, protruding stone or timber shelf fixed above doors in Hidmos lacking verandas (Afde'ge). -Design: Flat Stone (Qetsi'la) Version: A cantilevered slab (10–30cm deep) constructed through the masonry. Timber Version: Acacia wood brackets holding a clay-covered shade or thatch.	-Weather Protection: Shields doorways from rain/sun, keeping thresholds dry. -Ceremonial Marker: Blessings: Elders place me'ss (mead) or incense here during holidays. -Mourning: A black cloth (kobero) hung here signals a household in grief.

Table 16: Hidmo Vernacular Architectural Features and Compenents. Own Survey, 2020.

4.4.3. Construction Method of Tigrayan Hidmo Houses.

This part examines the socio-technical dynamics of HH construction, emphasizing labor stratification, gendered division of work, and evolving material practices. By investigating the roles of skilled artisans (masons, roofers) versus unskilled laborers, alongside the communal role of women in plastering, the research explores how traditional knowledge is transmitted and adapted in modern contexts. It further investigates the implications of material substitutions (e.g., cement for mud plaster) on cultural sustainability and architectural authenticity.

The construction of HH involves a hierarchically organized labor system characterized by distinct divisions of skilled and unskilled roles, as documented by DI16 (the principal mason) and DI8. The process commences with quarrymen extracting undressed stone, followed by master wall builders establishing structural layouts, while unskilled laborers perform excavation tasks, historically compensated through in-kind payments (food, nominal wages). Foundation work employs cyclopean masonry, with larger stones placed without precise dressing, relying on the wall builder's expertise for stability. The wall construction phase exhibits a pronounced skill hierarchy: exterior masons demonstrate advanced proficiency in coursed rubble techniques, ensuring precise vertical and horizontal alignment with meticulous facade finishing, whereas interior masons prioritize structural bonding and verticality, as their surfaces are concealed beneath plaster.

Material logistics depend on unskilled laborers supplying rubble infill, mortar, and stone to masons during cavity wall construction. The roofing phase demands comprehensive expertise, with roofers overseeing the fabrication and installation of load-bearing wooden members, *Gadim* (primary beam), *Serait* (secondary beam), and *Muhuts* (planking), requiring precise dimensional tolerances. The final plastering stage employs a gendered labor model, where women collectively apply a two-

phase earthen render: an initial *Memerag* (scratch coat) of coarse mud-straw composite to fill interstices, followed by a fine finish coat after curing. Contemporary adaptations substitute traditional clay plasters with cementitious mortars, altering both material behavior and sociocultural dynamics. This system underscores the interdependence of specialized craftsmanship, communal labor organization, and evolving construction technologies in vernacular architecture. See the diagram of chronological construction method.

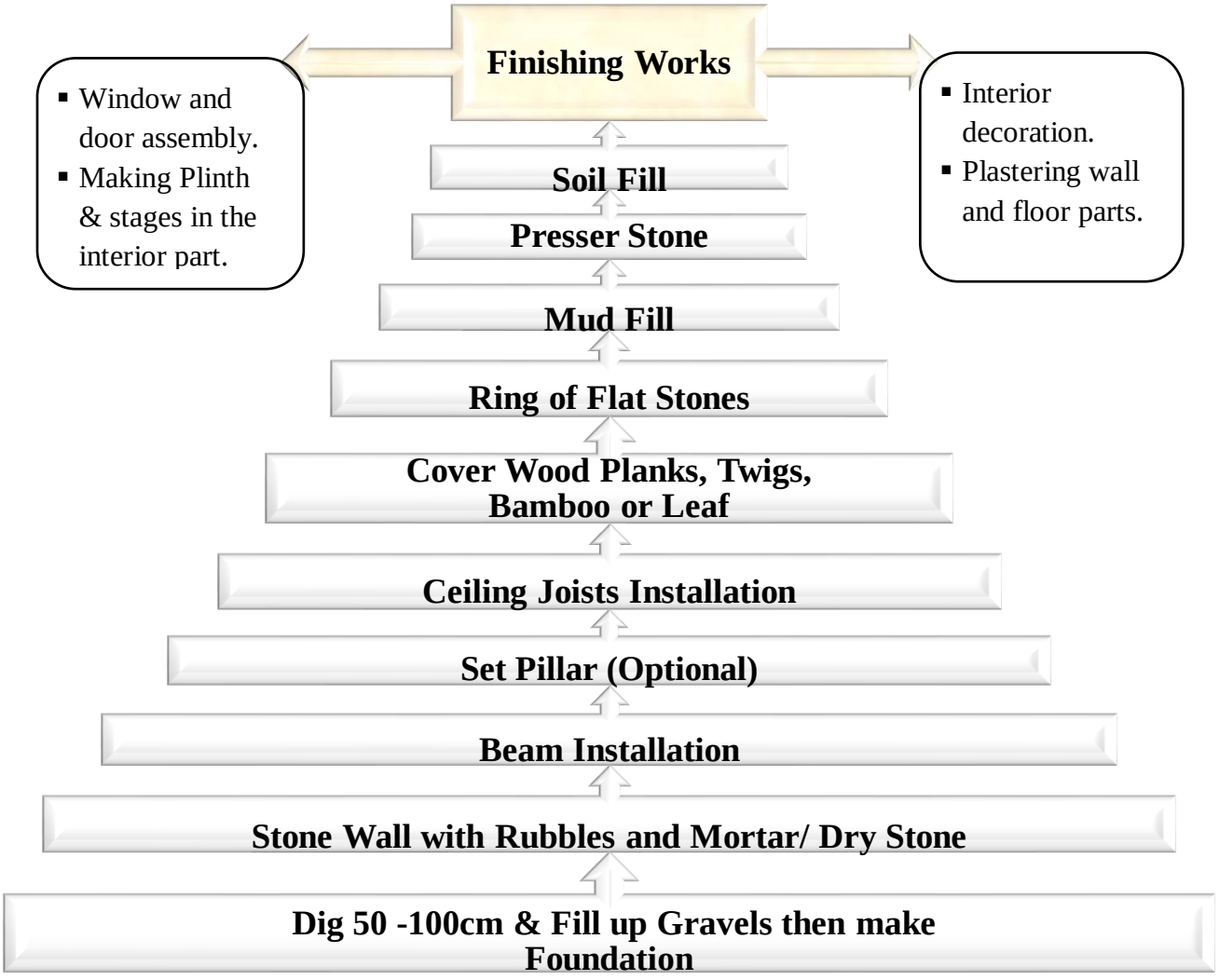


Diagram 4: Chronological Construction Method of Hidmo Houses. Own Survey, 2020.

4.4.3.1. Foundation and Wall Construction Techniques of Hidmo Vernacular Architecture

According, DI16 (the principal mason) and DI8. Builders employ a rope and wooden wedge (Shekal) to lay out precise rectangular or circular measurements, adjusting diagonals for accuracy, a method

still valued in construction. Trenches are excavated with Badeila (pickaxe) and Megihofya (shovel) until a stable subsoil is reached, typically to 50cm-1m depth. Foundations use large, unshaped basalt stones for their load distribution and water resistance, ensuring long-term stability. Unlike modern concrete-beam foundations prone to cracking, century-old Hidmo structures remain intact with minimal repairs, demonstrating superior durability through traditional techniques.

Wall construction in Tigray represents a core architectural tradition that has evolved due to factors such as workability, aesthetic preferences, and material availability. Various techniques are employed depending on the building's function, scale, resource accessibility, and the owner's socioeconomic status. Most of the vernacular Hidmo's are built by *random rubble masonry techniques* classified into *the mortared wall* method, commonly used in residential structures, which involves dressed stones of uniform size to ensure alignment and layered precision. In contrast, *the dry-stone wall*, resembling a *monkey-head wall* (Aksumite wall style) without wooden reinforcement, is typically utilized for fencing or, in stone-scarce regions or low-class societies, rudimentary housing with mud mortar. While functional, dry-stone construction often sacrifices aesthetic quality. Hidmo houses exemplify refined craftsmanship, featuring well-dressed exterior stones and minimally dressed interior stones, balancing structural integrity with visual appeal.

The construction process demands meticulous attention to vertical and horizontal alignment, with builders employing tools such as fixed ropes and a Toumbi (plumb bob) to ensure precision. Vertical alignment is critical for load-bearing capacity and seismic resilience, and the big-sized stones are placed in the lower part, while gradually the small stones are placed at the waist height of the wall. Horizontal alignment primarily serves aesthetic purposes. Cornerstones, carefully selected for their 90-degree angles and smooth dressing, act as directional guides for wall construction. At intervals, large binding stones are integrated to enhance stability, with preference given to exterior placement for both structural and visual benefits. Scaffolding holes (Meshikot) are strategically carved at waist height to support timber frameworks, later filled with stones. This systematic approach underscores the interplay of skilled labor, material selection, and traditional knowledge in Tigray's enduring architectural practices.

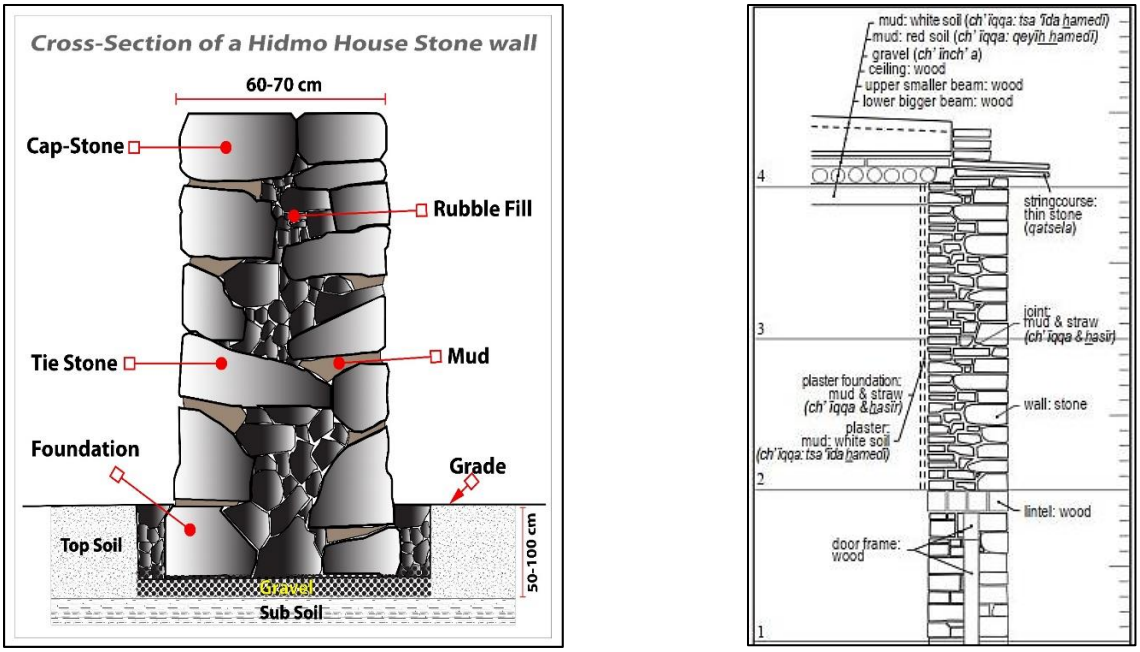


Figure 1: Wall Construction Method of Hidmo House. Made Using Adobe Illustrator, 2020. And, to the left Sources, Shimizu et al (2019).

Below is a visual typology chart (text-based) of traditional stone wall types, customized to highlight both global examples and region-specific styles, including Ethiopian highland and *Hidmo* architecture.

📊 Traditional Stone Wall Typology Chart (with Regional Context)

Typology	Construction Method	Material	Structure	Regional Examples
1. Dry Stone Wall	No mortar; interlocked stone placement	Fieldstone, basalt	Double or single-faced with rubble core	British Isles, Andes, Ethiopia (*Hidmo*)
2. Coursed Rubble Masonry	Mortared or tightly fitted rubble in horizontal layers	Local stone (rough-cut)	Semi-regular courses, medium finish	Tigray (*Hidmo*), Levant, Anatolia
3. Ashlar Masonry	Finely dressed blocks laid in regular courses	Limestone, granite	High precision, thin joints	Aksumite monuments, Roman temples
4. Polygonal Masonry	Irregular polygonal stones fitted tightly	Andesite, granite	Complex joins, no mortar	Inka Empire (Cusco), Mediterranean sites
5. Cyclopean Masonry	Large unshaped boulders stacked	Massive stone blocks	No mortar, massive scale	Mycenae (Greece), Gonder, early Ethiopia

6. Ledge Stone Wall	Horizontally laid flat stones (uncoursed or coursed)	Flat schist, slate	Layered appearance, stable on slopes	Himalayas, Appalachians, northern Ethiopia
7. Random Rubble Masonry	Uncoursed irregular stone with or without mortar	Fieldstone	Informal, rustic look	Vernacular homes in India, Africa, Andes
8. Boulder Walling	Large, rounded stones (dry or mortared)	River stone, basalt	Heavy base walls, agricultural use	Sahel region, East Africa, Highland terraces
9. Hidmo Wall Typology	Dry-laid stone, wide wall thickness, timber ties	Basalt, local stone	Double-faced, often with mud fill	Tigray (Ethiopia), especially Mekelle & Gheralta

Table 17: Traditional Stone Wall Typology Chart (With Regional Context). Citing Sources Such As: Pankhurst (1990), Fisseha Gebrehiwot (On *Hidmo* Housing), and UNESCO Documentation on VHA.

4.4.3.2. Roof Construction Techniques of Tigrayan Vernacualr Architecture

The roof represents the most technically demanding component of Hidmo architecture, particularly due to challenges of water infiltration during rainy seasons. As of DW documentary video and DI16 (the principal mason). Construction methods vary based on structural scale and builder expertise, with larger structures requiring robust central columns (Amdi) crafted from durable, termite-resistant hardwoods such as Olea europaea or Juniperus procera to bear substantial loads. The roof-support system integrates both functional and aesthetic elements, beginning with primary load-bearing walls and Amdi, followed by a hierarchical beam structure. The Mere'bea/Gadim (primary beam), matching the column's strength, distributes weight to the Amdi, while the Seraye't (secondary beam), positioned at 23 –30 cm intervals, provides additional support. The Mohots (planks), meticulously fashioned from hardwood using a Misar (cutter axe), serve dual purposes: load transfer from overlying soil and ceiling embellishment. Precise placement of these planks is critical, as gaps compromise structural integrity and occupant safety.

The final phase involves a multi-layered waterproofing system. A base layer of carefully selected coarse aggregate or twigs, composed of hard, non-absorbent, angular stones, shields the wood from termites and moisture. This is overlaid with mud or nora (calcium carbonate-rich soil), mixed with water and straw to enhance cohesion, which is then compacted to form an impermeable, thermally regulative membrane. The Nora's thickness is strategically graded, with a central bulge to direct water runoff (drainage), while eaves, extending 15 cm beyond the walls and lined with 5 cm stone slabs (ring of flat stones), prevent mortar erosion at wall junctions. Then place bear on presser stones finally

cover with compacted white soil. This sophisticated integration of material science and craftsmanship ensures Hidmo roofs achieve hydrostatic resistance, thermal comfort, and long-term durability, underscoring their adaptability to hot climates. See diagram 5, step by step roof construction method.

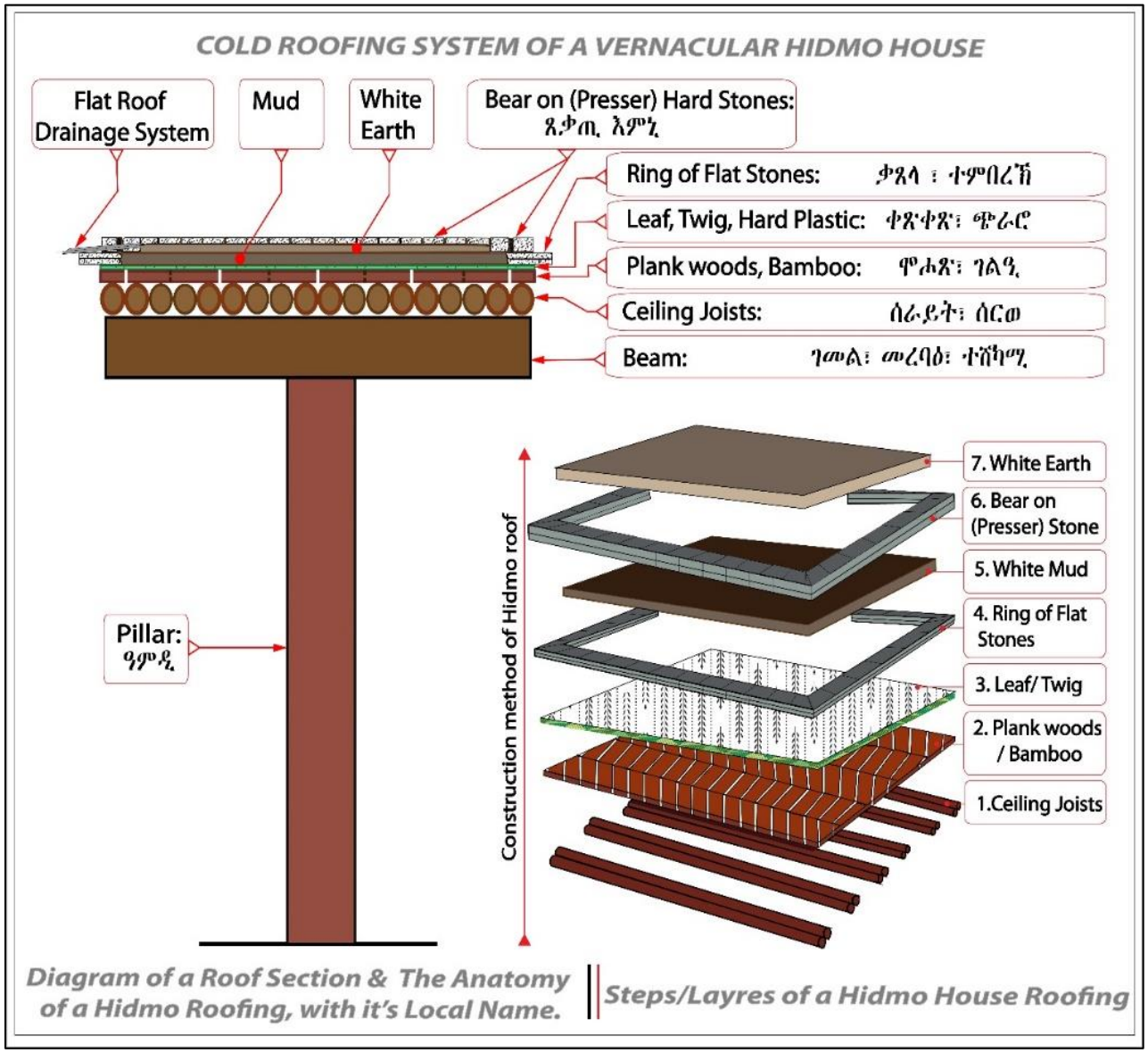


Diagram 5: Chornological Construction Methods of Hidmo Roof. Made Using Adobe Illustrator, 2020.

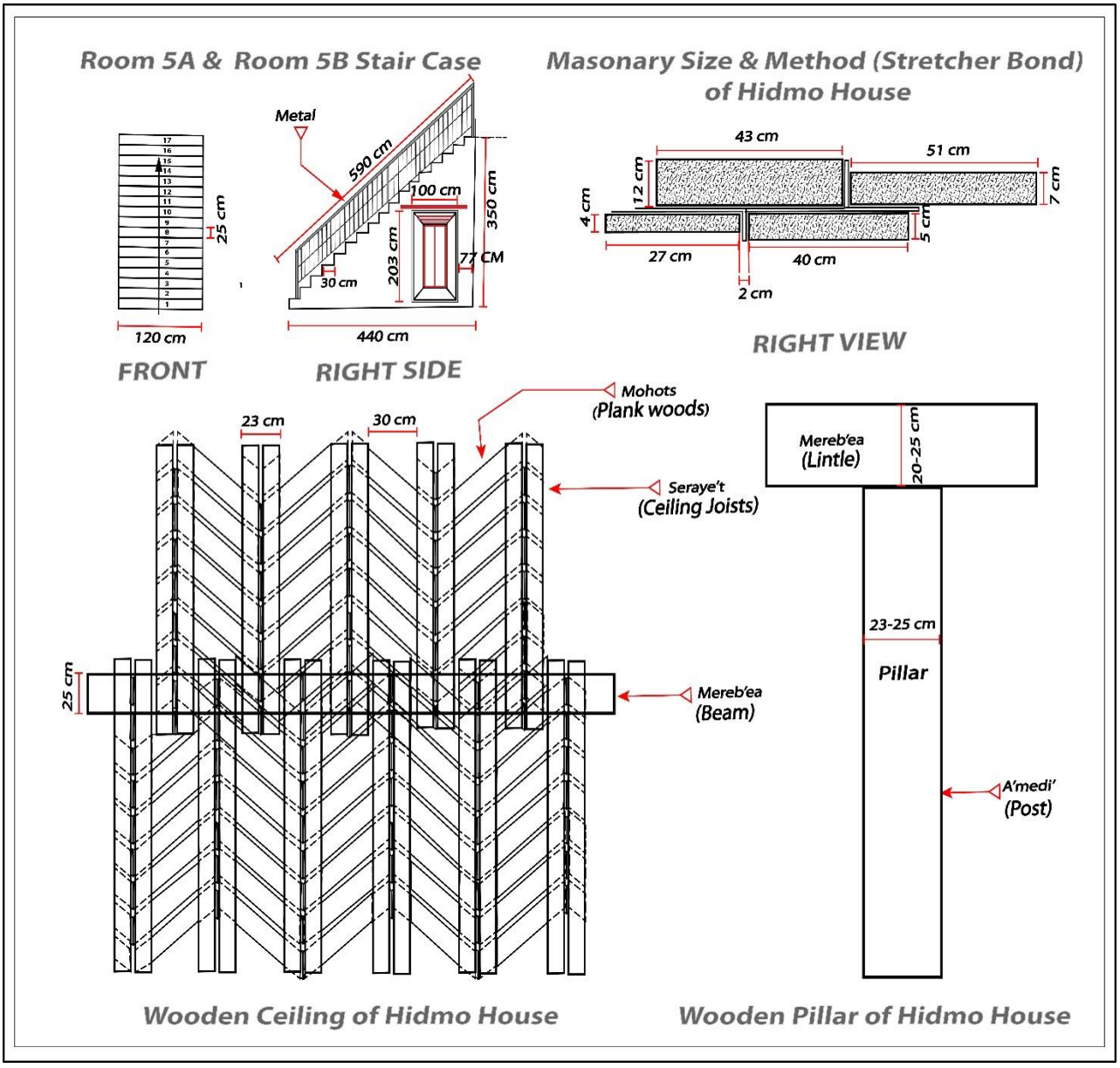


Figure 2: Hidmo Fragment Parts of the Study Area. Made Using Adobe Illustrator, 2020.

4.4.3.3. Door and Window Construction Techniques of Hidmo Vernacular Architecture: Functional and Security Features

Door Construction: Hidmo houses employ robust door systems characterized by durable lintels constructed from either dressed stone or decay-resistant hardwoods, predominantly *Juniperus procera* (Tsihdi) and *Olea europaea* (Awlie). A distinctive small eave, analogous to the roof's double-layered *Qetsela*, is installed above the door to divert rainwater and prevent infiltration. The doors feature an ingenious security mechanism: the door edges are fully enclosed by the exterior wall layer, rendering external access impossible when locked from inside. Traditional locking employs

a *Meshegor*, a stout wooden bar concealed within a precisely chiseled wall cavity when not in use. Modern adaptations occasionally incorporate steel chains affixed to the wall for external securing. See diagram.

Window Construction: Hidmo design incorporates two window typologies: rectangular and trapezoidal. Rectangular windows, primarily found in storage or alchove areas (indoor), serve limited light diffusion due to their interior accessibility and often utilize wooden lintels for longer spans where stone is impractical. Trapezoidal windows, conversely, function chiefly as ventilation apertures rather than light sources. Their shorter spans allow for stone lintels or even fully stone-clad closures, reflecting adaptability to material constraints and climatic needs. Both forms demonstrate the builders' pragmatic approach to balancing structural integrity, environmental control, and security in vernacular architecture.

Fence (ዶጎል, Dogol) Construction: The Hidmo compound is a multifunctional boundary enclosed system, traditionally called *Dogol*, a versatile perimeter fence constructed from locally sourced materials that harmonizes functionality with aesthetic appeal, serving as both a protective barrier and an ornamental feature of the homestead. Four primary types are documented: (1) *Stone Wall (Dogol)*, employing dry-stacked basalt or limestone in random rubble masonry (1-2m height), designed for seismic resilience through mortarless flexibility (Ferede et al., 2020);
(2) *Thorn Fence*, woven from *Acacia mellifera* or *Opuntia* cactus branches in zigzag or circular patterns, reinforced with timber posts; (3) *Wooden Palisade*, featuring vertically placed sharpened *Acacia* or *Juniperus* logs in timber-rich highlands. Regional variations include low *Beles Dogol* (cactus fences) in eastern Tigray's gardens versus taller implementations in the south, while central highlands showcase ornate dry-stone walls with intricate rubble patterns (Negash, 2021). These constructions reflect adaptive responses to microclimatic conditions, material availability, and socio-cultural preferences in vernacular architecture.

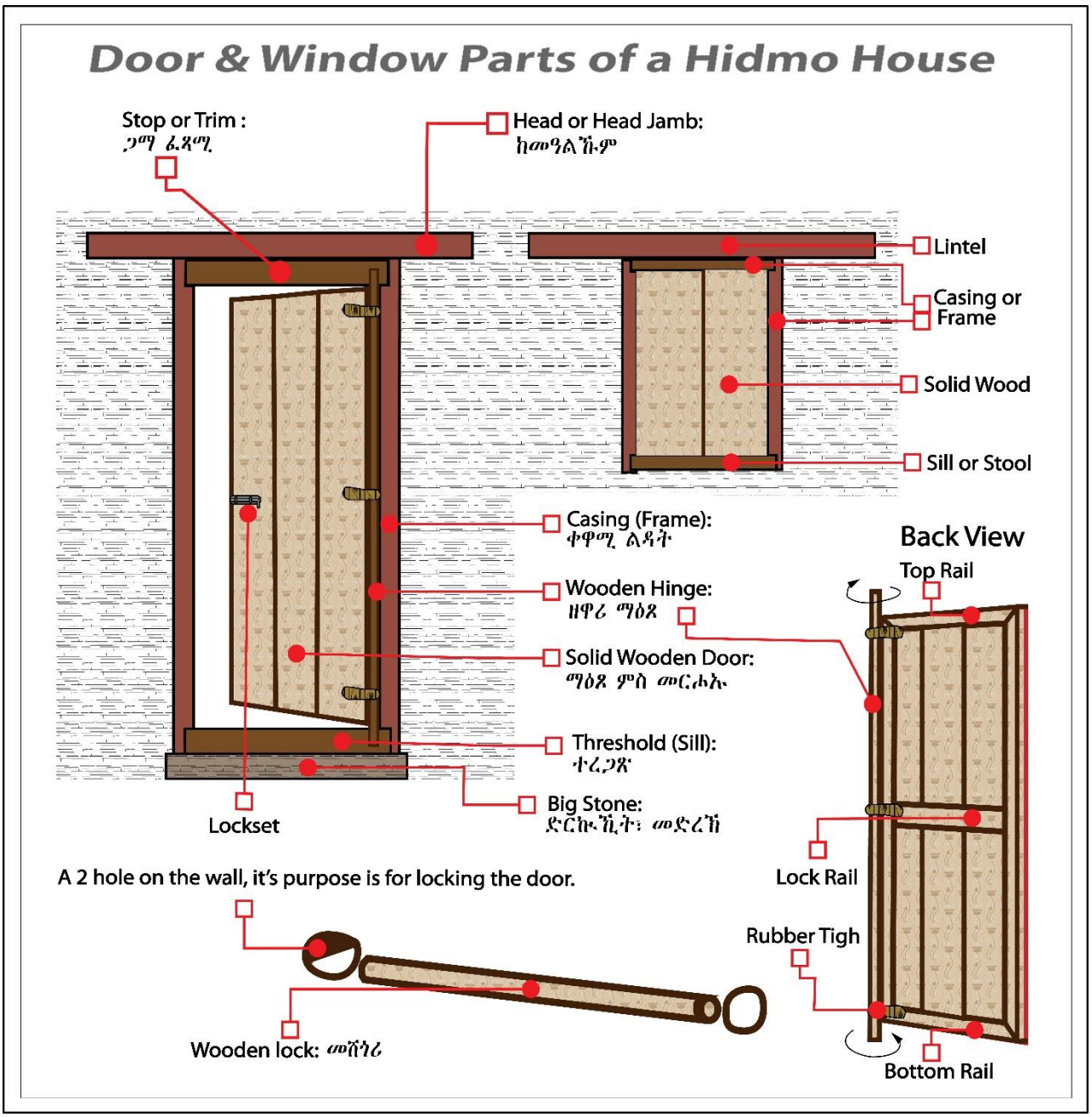


Figure 3: Door and Window Parts of Hidmo Houses and its Local Names. Made Using Adobe Illustrator, 2020.

4.4.3.4. Plastering and Finishing Techniques of Hidmo Construction

The finishing of Hidmo walls, floors and plenth employs a plastering system that utilizes locally available binding and fills materials, with composition varying based on availability, cost, and desired durability. Primary traditional materials include Nora (calcium-rich white soil), Baekhel (red soil), Cow dung, Termite soil (Guila), Ash, straw, fine sand, and in prestigious constructions, eggs, the

latter being a costly additive reserved for wealthy households or religious structures (Woldegebriel et al., 2021). Nora and Baekhel exhibit regionally variable adhesive properties, with straw often incorporated into Baekhel mixtures to compensate for its weaker cohesion (Araya, 2020). Straw, typically repurposed from decomposed cattle feed or termite-affected stores, serves as a fibrous reinforcement. Modern adaptations increasingly integrate locally sourced sands of varying granulometry into cementitious plasters, reflecting evolving construction practices.

The plastering process follows a two-stage methodology analogous to contemporary cement work: initial Gerfa (rough coat) application with thin, gap-filling mud to prevent slumping, followed after drying by a final smooth-finish layer emphasizing evenness (DI16). This phased approach ensures proper adhesion and surface refinement while accommodating the material constraints of earth-based plasters.

4.4.4. Forms and Typology Analysis of Hidmo Vernacular Architecture in the Study Area

This study employs a systematic architectural survey methodology to document and analyze vernacular Hidmo dwellings in Mekelle (specifically Kedamay Woyane and Hadnet sub-cities) and selected sites within Tigray's Inderta Woreda. Combining empirical field observations with qualitative building assessments, and analysis. The research establishes a comprehensive understanding of these traditional structures.

The methodological framework includes in-situ documentation through measured drawings, photographic surveys, and material analysis to capture the morphological and typological characteristics of Hidmo architecture. A typological classification system is developed based on spatial organization, construction techniques, and material applications, while regional variations are examined to identify architectural continuities and divergences.

Preliminary findings reveal distinct patterns in structural systems, adaptive design features, and craft traditions, which are further analyzed through comparative case study assessments. This approach facilitates the identification of both archetypal forms and localized adaptations within the Hidmo building tradition. Additionally, the survey methodology serves as a critical tool for assessing preservation states, documenting material degradation, and identifying threats to structural integrity. By grounding the research in first-hand architectural documentation, this study provides an empirical foundation for analyzing Hidmo dwellings as both cultural heritage artifacts and sustainable architectural precedents. The findings contribute to broader scholarly discourse on vernacular

architecture conservation, indigenous knowledge systems, Hidmo typologies and the challenges of preserving traditional built environments in rapidly urbanizing contexts.

4.4.4.1. Tigrayan Vernacular (Hidmo) Architectural Typology

Findings reveal that while Tigray exhibits diverse traditional housing forms, these structures generally conform to four primary classifications: (1) *Guji/Tukul:* characterized by circular wooden walls with mud plastering and thatched roofs. (2) *Hidmo*: featuring durable stone walls and earthen roofs, renowned for their structural resilience and longevity compared to *Tukul*. (3) *Degde'ga:* comprising wooden frames with mud-plastered walls and zinc roofing, and (4) *Villa*: distinguished by stone masonry walls and zinc roofs. Among these, *Hidmo* represents a particularly robust architectural tradition, with its stone construction offering superior durability relative to the more ephemeral *Tukul* structures. This typological framework underscores the interplay between local material availability, environmental adaptation, and cultural building practices in Tigray's vernacular architecture. Based on the preliminary research of the researcher, *Hidmo* house typologies are classified in to seven forms:-

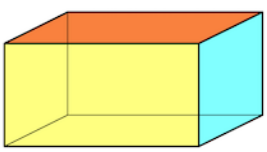
1. Detached Cuboid/ Tri-Parted Hidmo House Typology: Form and Shape Characteristics

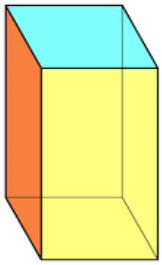
The Detached Cuboid Typology, commonly referred to as the Tri-Parted House, is a quintessential example of Tigrayan vernacular Hidmo architecture. Its defining features include:

Freestanding, Cuboidal Structure: A cuboid (or rectangular box) is a three-dimensional shape that is shaped like a box. That is, a cuboid has six rectangular faces that meet at right angles. The house is typically constructed as an independent mansion, rectangular (cuboid) volume, with thick stone or earth walls supporting a flat or slightly pitched roof.

Modular Expansion: While the basic form is compact, auxiliary extensions (e.g., appended rooms, verandas) may be added over time to accommodate growing family needs.

Vertical Articulation: Some variants incorporate a double-storey tri-parted house or lofted storage space, accessed through a ladder, enhancing functional efficiency without expanding the building's footprint.





Cuboidal Forms

Spatial Organization: The Tripartite Division

The interior follows a strict tripartite layout, reflecting a deeply rooted socio-spatial logic:

Central Zone (Main Living Area): Functions as the primary communal space for daily activities, including cooking, socializing, and religious rituals. Often features a central hearth, reinforcing its role as the household's social and thermal core.

Lateral Zone 1 (Sleeping Quarters): A private space reserved for family members, sometimes partitioned for individual privacy. In some cases, elevated sleeping platforms (mede'b) are used to improve ventilation and protect against dampness.

Lateral Zone 2 (Storage/Service Area): Typically includes grain storage (Wu'shate), tools, and household valuables. In double-storey variants, this zone extends vertically, with a loft accessed by a wooden or stone ladder.

Construction Techniques and Materiality

Walls: Built using dry-stone masonry or rammed earth (hidmo), often plastered with a mud-lime mixture for durability.

Roof: Traditionally constructed with timber or juniper beams (e.g., Eucalyptus or Olive tree) overlaid with thatched reeds or compacted earth. Modern adaptations may use corrugated metal.

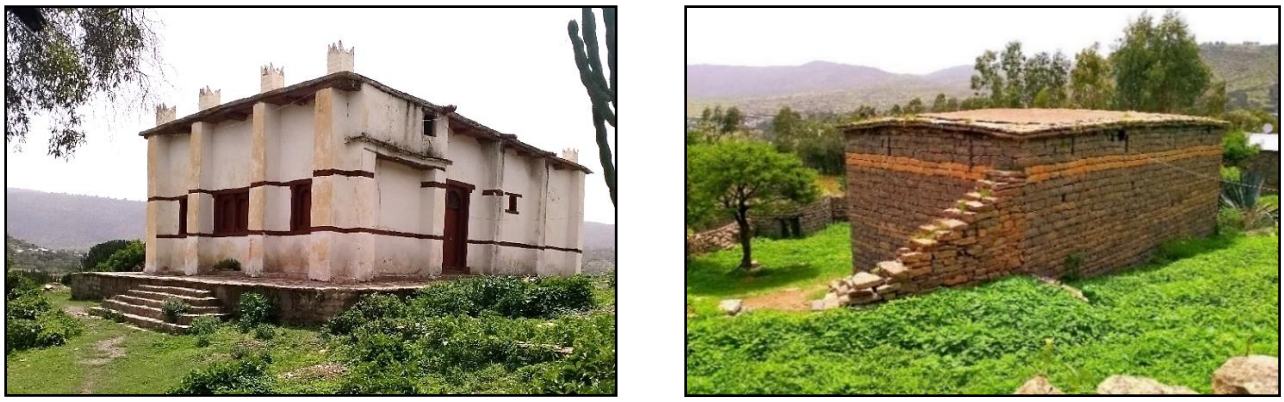
Openings: Small, strategically placed windows and low doors enhance thermal insulation and security.

Case Study Examples: -

Based on the preliminary research of the researcher, representative examples include the Medihane-Alem Church (constructed circa 1535 CE) and a farmer's hidmo house in Feleg Dea'ro, Mekelle both of which exemplify this cuboidal structural approach.

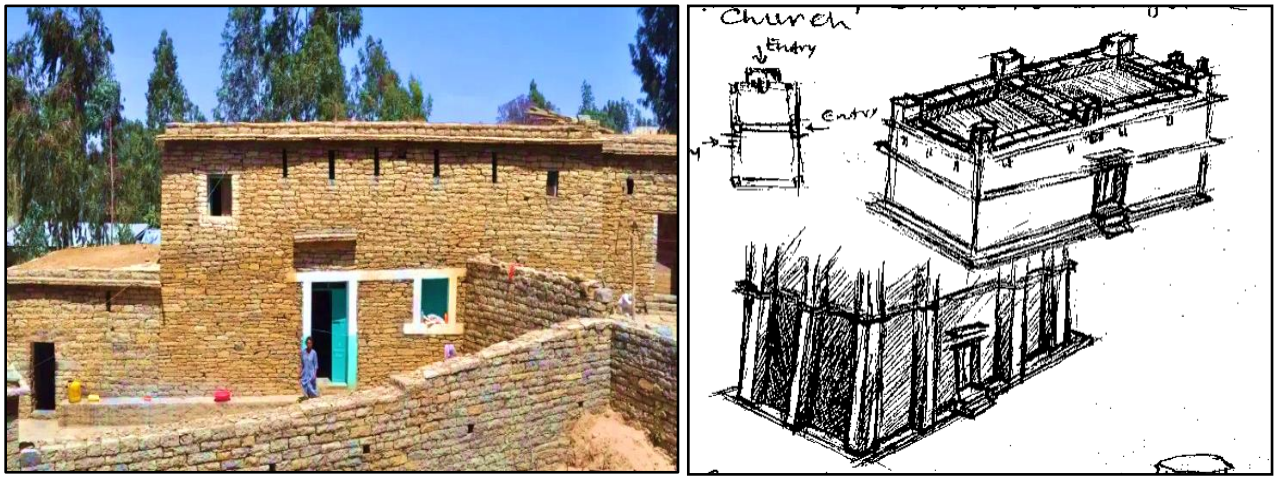
Medihane-alem Church (c. 1535 CE), (Feleg Dea'ro, Mekelle): Demonstrates the sacred application of the tripartite form, with a central nave flanked by side chambers for liturgical functions. And, Suggests the typology's antiquity and cultural continuity.

Farmer's Hidmo House 1 (Feleg Dea'ro and Aynalem, Mekelle): A residential example with an original tripartite core with additional alcoves. As well, Illustrates outdoor stair and of traditional forms cuboidal structural.



Picture 29: Old Church of Medhane-Alem and Farmer Hidmo House (Feleg Dea'ro, Mekelle). Field Survey, 2020.

Farmer's House 2 (Aynalem, Mekelle): Hidmo House of Ayte Assefa Tedla in (Aynalem, Mekelle), constructed circa 1931 G.C., exemplifies a traditional residential Hidmo with a tripartite core structure**,** featuring ancillary alcoves (Wu'shate) and mule lateral extensions**,** demonstrating the typology's adaptability to domestic needs. The inclusion of an indoor elevated stair leading to a one-storey structural room (Debri) highlights sophisticated spatial organization within vernacular Tigrayan architecture. This dwelling preserves original construction techniques**,** serving as a critical example of Hidmo's functional versatility balancing living quarters, storage, and livestock spaces. However, like many vernacular structures, it faces preservation challenges due to modernization**.** Documenting its layout, materials, and socio-cultural role is essential for safeguarding Tigray's architectural heritage and informing sustainable rural housing solutions.



Picture 30: Ayte Assefa Tedla Mansion Hidmo House (Aynalem, Mekelle). Own Drawing and Field Survey, 2020.

Functional and Symbolic Significance

Cultural Continuity: The tripartite division mirrors Axumite spatial traditions, preserving ancestral living patterns.

Climate Resilience: The compact form and thick walls provide thermal mass, moderating indoor temperatures in Tigray's semi-arid climate.

Social Hierarchy: The centrality of the living space reinforces communal values, while peripheral zones denote privacy and utility.

Challenges and Transformations

Declining Prevalence: Examples were identified in the study area, highlighting erosion due to modernization.

Material Shifts: Replacement of traditional roofing with cement, metal roofs alter antiquity, aesthetic and thermal performance.

Spatial Modifications: Additions (e.g., appended kitchens) disrupt the original layout, reflecting changing lifestyles.

Summery

This architectural typology is defined by its freestanding, geometrically cuboidal form, with variations that include both single- and multi-level configurations, often incorporating optional stair access. Representative examples include the Medihane-Alem Church (constructed circa 1535 CE) and a farmer's hidmo house in Ayn-alem and Feleg Dea'ro, Mekelle both of which exemplify this cuboidal structural approach.

The tri-parted house constitutes a foundational form of vernacular architecture originating in rural Tigray. Its design is based on a tripartite spatial organization: Central Zone: Serves as the primary living area. And, Lateral Zones: Function respectively as sleeping quarters and storage spaces.

The storage compartment typically features a double-storey or lofted design, accessible via a ladder. Field surveys conducted within the study area identified two extant examples of this typology, both of which have undergone spatial expansion through the addition of auxiliary structures.

2. Detached Cubic Hidmo House Typology

Form and Shape Characteristics

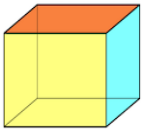
The Detached Cubic Hidmo is a prominent vernacular architectural typology in Tigray, distinguished by its geometric purity and compact, cubic form. Cube form architecture, also known as cubic or

cubist architecture, utilizes cubic shapes as the fundamental design element in buildings. Key features include:

Freestanding Cube Structure: Typically, a single, self-contained cubic unit with near-equal length/ Square, width, and height dimensions, creating a balanced and modular appearance.

Flat or Slightly Pitched Roof: Traditionally constructed with timber beams and compacted earth, though modern versions may use corrugated metal.

Optional Multi-Level Configuration: Some variants incorporate a second storey or loft, accessed via an internal or external staircase (often a simple wooden or stone ladder).



Cubic Form

Spatial Organization and Functional Features

Unlike the Tri-Parted House, which follows a strict tripartite division, the Cube Hidmo tends to have a more flexible internal layout, though it still adheres to traditional Tigrayan living patterns:

Ground Floor (Primary Living Space): Serves as a multi-functional area for cooking, dining, and socializing. Often includes a central hearth for heating and food preparation. And, storage niches may be built into the walls for household items.

Upper Storey (Debre') /Loft (If Present): Used for sleeping quarters or grain storage. Accessed via a fixed staircase (in more permanent structures) or a removable ladder (in traditional variants).

Exterior Features: Decorative Wall Finishes: Some Cube Hidmos feature incised geometric patterns or white lime wash for aesthetic and protective purposes. Minimal Openings: Small windows and low doorways help regulate temperature and enhance security.

Construction Techniques and Materiality

Walls: Built using dry-stone masonry or rammed earth (hidmo technique), often reinforced with wooden beams for stability.

Roof: Traditionally made of layered Juniper, timber, thatch, and compacted earth, providing insulation against heat and cold.

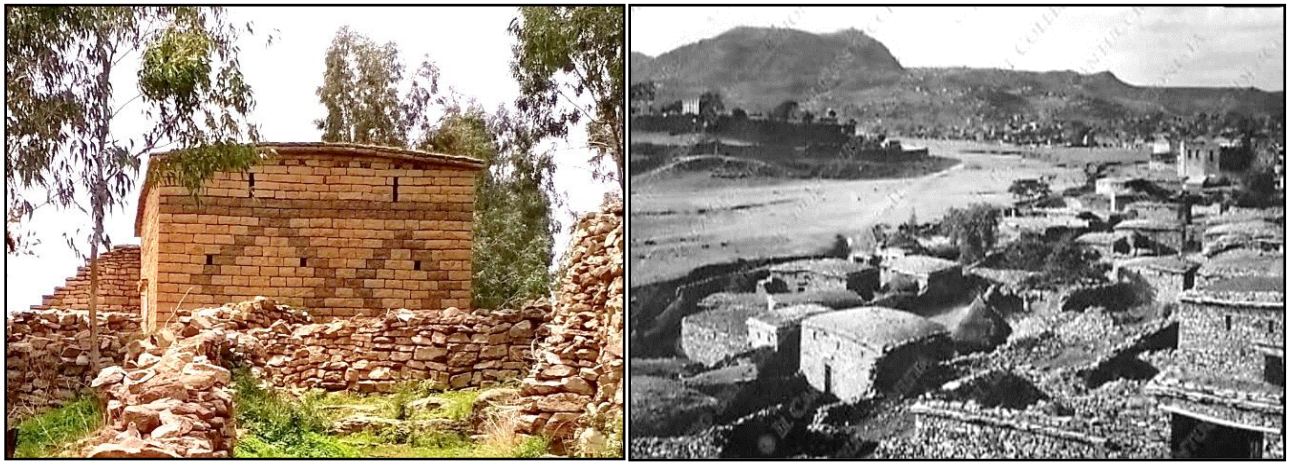
Foundations: Elevated stone bases prevent moisture infiltration and improve durability.

Case Study Examples: -

Based on the preliminary research of the researcher, a representative example is the decorative wall, the farmer Hidmo's house (Feleg Dea'ro, Mekelle), and the fabric of old Mekelle city with associate detached cube Hidmo houses.

Farmer's Hidmo House (Feleg Dea'ro, Mekelle): A well-preserved example of a single-storey Cube Hidmo, showcasing traditional construction methods. And, features ornamented wall with geometric shape of black stones.

Old Mekelle City Fabric (Pre-20th Century): Historical records (e.g., Pic. Girmay Berehe, 1935 G.C) reveal clusters of Detached Cube Hidmos, illustrating their prevalence in urban settings before modernization. Some structures had whitewashed exteriors, indicating a blend of practicality and aesthetic refinement.



Picture 31: Decorative Wall, Farmer Hidmo House of (Feleg Dea'ro, Mekelle). And, the Fabric of Old Mekelle City With Associate Detached Cube Hidmo Houses. Pic. Girmay Berehe, et al.(1935 G.C.). Field Survey, 2020.

Cultural and Functional Significance

Symbol of Tigrayan Identity: The Cube Hidmo represents a distinct regional variation of the broader Hidmo tradition, differing from the elongated Tri-Parted or Lumped-Roof types.

Adaptability: Its modular form allows for easy expansion (e.g., adding adjacent cubes for extended family needs).

Climate Resilience: The thick earth walls and compact design provide excellent thermal regulation, keeping interiors cool in summer and warm in winter.

Challenges and Transformations

Declining Use: Increasing urbanization has led to the replacement of Cube Hidmos with modern concrete houses, villas, and row houses eroding this architectural heritage.

Material Substitution: Traditional thatch and earth roofs are often replaced with corrugated metal, altering the structure's thermal and aesthetic qualities.

Lack of Documentation: Few intact examples remain, necessitating urgent preservation efforts.

Summery

The Detached Cubic Hidmo House Typology is a distinctive vernacular architectural form in Tigray, characterized by its compact, geometrically cubic shape and freestanding construction, traditionally built with dry-stone masonry, rammed earth, and timber roofing. Unlike the Tri-Parted House, the Cube Hidmo features a more flexible interior layout, with multifunctional ground floors and optional upper storeys or lofts used for sleeping or storage. Notable architectural elements include flat or slightly pitched roofs, minimal window openings, and occasionally decorative wall finishes such as incised geometric patterns or lime wash. Case studies from Feleg Dea'ro and old Mekelle city illustrate the typology's historical presence and craftsmanship. Functionally and culturally significant, the Cube Hidmo symbolizes Tigrayan identity, offers adaptability for extended families, and demonstrates resilience to local climatic conditions. However, modernization, material substitution, and lack of documentation pose challenges to its preservation.

3. Grand (Cuboid with Cube) Hidmo House Typology

Form and Shape Characteristics

Based on the preliminary research of the researcher, this monumental typology represents the most architecturally sophisticated Hidmo variant, characterized by:

Geometric Composition: Primary cubic/square volumes combined with cuboid/rectangular extensions, strict symmetrical organization, and clear hierarchical spatial arrangement.

Massing and Proportions: Monumental scale or castle (typically 8-15m per side), Balanced proportions following sacred geometry, and often 2-3 stories in height

Facade Treatment: Ornamental stone coursing, decorative window/door framing, projecting cornices and parapets, and strategic use of light/shadow patterns.

Construction Techniques and Materials

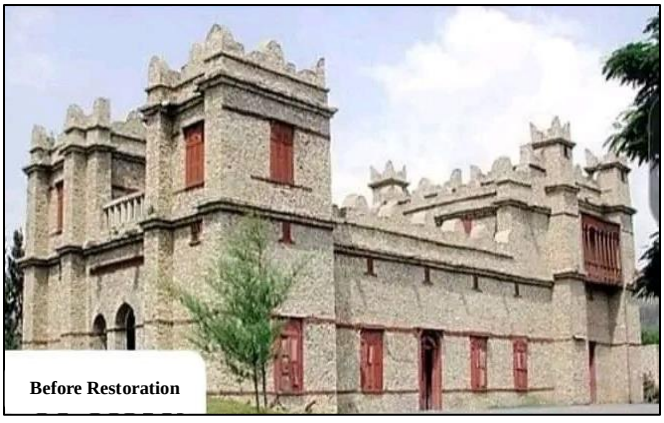
Advanced Masonry: Precision-cut stone construction, interlocking corner joints, and hidden structural reinforcements.

Roof Systems: Multi-level flat roofs, internal drainage channels, and ceramic tile or stone slab finishes

Material Sophistication: Selected volcanic stone varieties, imported wood species for beams, and lime-based mortars and plasters.

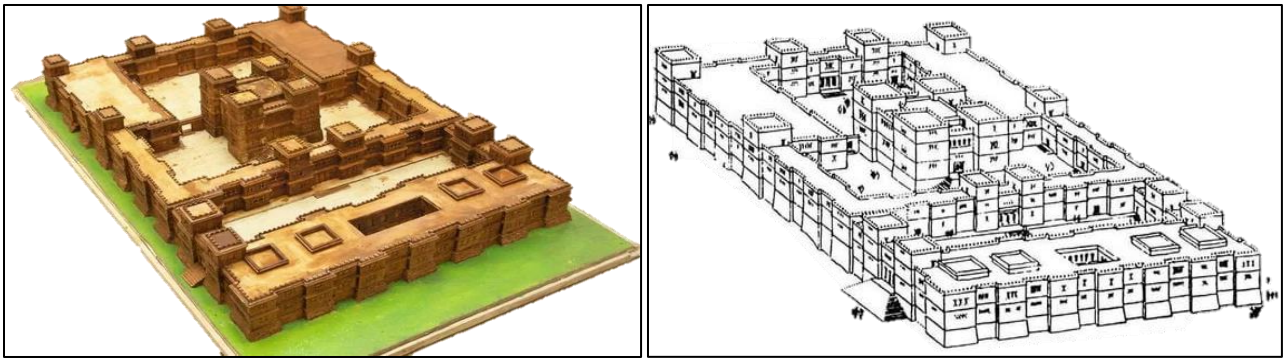
Case Study Examples: -

The Palace of Atse Yohannes IV, located in Mekelle, Tigray, Ethiopia: is a historic and architectural landmark that served as the royal residence of Emperor Yohannes IV (r. 1872–1889). The palace is a significant symbol of Ethiopia's 19th-century monarchy and Tigrayan heritage. Features, 12m × 15m main block with 2 subsidiary cubes, 1 cuboid, the centeral Adarash giving four services (Gebri seat, military leader seat, Nobels seat and Religious leaders seat) and having ten pillars, original 3-story configuration, and sophisticated defensive features as well as kitchen class. Built in the Tigrayan style, the palace combines traditional Ethiopian stone masonry with some European influences. The structure features stone walls, wooden balconies, and circular large courtyards, reflecting the grandeur of the emperor's reign. A central tower stands out, which was used for military observation and ceremonial purposes. The palace was not only his residence but also a political and military headquarters during his reign. It was the site of important diplomatic meetings and strategic planning. The construction of the palace began in 1872 and was completed in 1874, taking approximately three years to finish (Pankhurst 1990). Today, the palace functions as the Yohannes IV Museum, showcasing artifacts from his reign, including: Royal clothing, crowns, crafts, weaponry, historical manuscripts, religious items, paintings, photographs of the emperor and his era. The museum also highlights Tigrayan culture and the broader history of Ethiopia. The palace remains a testament to Yohannes IV's leadership and Ethiopia's resistance against colonialism. Despite damage during conflicts (including the 2020–2022 Tigray War), efforts are not made to preserve this historic site and need an urgent preservation.


Before Restoration

Picture 32: Emperor Yohannes IV Palace (Museum), Mekelle, Before Restoration. Sources, Https://Www.Minube.Net/Place/Musee-Yohannes-IV.

Bete Ta'akha Maryam "Palace of the Queen of Sheba": (Also spelled Bet Ta'akha Maryam or Dungur Palace) is an ancient archaeological site, located west of Axum's stelae field, accessible by foot or short drive., Tigray, Ethiopia, often associated with the legendary Queen of Sheba (Makeda). Although its exact origins remain debated, the ruins are popularly believed to be the remains of her palace. The palace was one of the largest in Axum, pre-6th AD century royal complex, multiple interconnected cuboid units, Ceremonial axial approach, Astronomical alignments, Ecclesiastical compound, 9m × 9m central sanctuary, Cloistered square courtyard, and integrated defensive walls. covering an area of 120 meters by 80 meters, which was much larger than many European palaces at the time. Excavations revealed a large, multi-room complex with foundations resembling other Aksumite elite structures. Features include: Stone walls with square and rectangular rooms, Courtyards and staircases, A possible throne room and ritual space, Artifacts like pottery, inscriptions, and coins suggest it was a high-status residence. Architecture & Layout: Built in classic Aksumite style, using granite stones (some with decorative carvings). The structure had two stories, with wooden beams and possibly a central pavilion. Nearby, the Dungur ruins (another elite complex) share similarities, fueling debate over which was the "true" Sheba palace. It is part of the Axum UNESCO World Heritage Site (1980), though less preserved than the famous stelae. (UNESCO World Heritage List. Axum (1980).



Picture 33: Ta'akha Mariam Ruined Palace, Axum (6th.C. Ad), and the Reconstructed Model, By Daniel Krencker. (Deutsche Aks.Exp.,11,'Hg.251). Sources, Reddit.Com/

Functional and Symbolic Significance

Power Representation: Embodied political/religious authority, designed for ceremonial functions, and spatial hierarchy reflecting social order. Technical Mastery: Advanced structural engineering, sophisticated climate control, and acoustic considerations. Cosmological Symbolism: Quadripartite organization, axis mundi representation, and Celestial orientations.

Comparative Analysis

Feature	Grand Hidmos	Common Hidmos
Scale	Monumental	Domestic
Symmetry	Perfect	Approximate
Ornamentation	Extensive	Minimal
Construction Time	1- 3 years	15 day-6 months
Craftsmanship	Master level	Vernacular

Table 18: Comparative Analysis of Grand Hidmos With Common Hidmos. Own Analysis, 2020.

Preservation Status and Challenges

Current Condition: Loot, damage, partial restorations, and adaptive reuse attempts. Major Threats: War, Seismic vulnerability, Material degradation, and Inappropriate interventions. Conservation Needs: Structural stabilization, proper intervention, traditional crafts revival, and controlled tourism access.

Summery

The Grand (Cuboid with Cube) Hidmo House Typology represents the pinnacle of Tigrayan vernacular architecture, characterized by its monumental scale (8-15m per side), strict symmetry, the

beautiful facades create a sense of prominence and majestic appearance for the building. And, sophisticated geometric composition combining cubic and cuboid volumes. These structures, exemplified by the 19th-century Palace of Atse Yohannes IV (Mekelle) and the pre-6th century Bete Ta'akha Maryam royal complex, showcase advanced construction techniques including precision-cut stone masonry, multi-level compacted earth roofs, and imported materials, reflecting their status as symbols of political and religious power. Their design incorporates sacred geometry, celestial alignments, and hierarchical spatial organization, serving both for Church and castle forms edifices ceremonial and defensive functions. Despite their structural ingenuity and cosmological significance, many grand Hidmos face threats from war damage, seismic vulnerability, and inappropriate interventions, necessitating urgent conservation efforts that prioritize structural stabilization, traditional craft revival, and controlled tourism access. This typology's exceptional craftsmanship (1-3-year construction) and ornamental sophistication starkly contrast with common Hidmos, underscoring its unique position in Ethiopia's architectural heritage as both a technical and cultural masterpiece.

4. Detached Cylindrical Hidmo House Typology

Form and Shape Characteristics

Based on the preliminary research of the researcher, the Detached Cylindrical Hidmo represents a unique vernacular typology in Tigray's architectural heritage, characterized by its autonomous, circular form and remarkable structural longevity. Cylindrical form architecture refers to buildings or structures with a cylindrical shape, meaning they are round and tube-like. Key features include:

Cylindrical Geometry: Single-room circular structure with inner diameters ranging from 2.50m to 5m. The uniform radial load distribution of the cylindrical walls enhances structural stability, enabling the building to endure for centuries.

Roofing System: Flat earthen roof supported by the cylindrical walls, constructed using compacted earth and timber. The circular design minimizes roof span stress, reducing the need for internal supports.

Openings and Access: Typically features 1 door, 3-6 small windows, and 1-2 additional openings for ventilation. Some variants include a loft or second storey, accessed via a simple ladder or built-in stairs.

Construction Techniques and Materiality

Wall Construction: Built using dry-stone masonry or rammed earth (hidmo), layered without mortar for flexibility and seismic resilience. The cylindrical shape inherently resists lateral forces, making it earthquake-resistant. Labor and Time Efficiency: According to DI16, construction is completed in 15-30 days by a skilled mason with minimal unskilled labor. Demonstrates efficient use of locally sourced materials (stone, earth, timber). Functional Adaptability: Originally served as kitchens, fireplaces, or granaries due to their thermal efficiency and durability. Some were repurposed for elite recreational use (e.g., Ras Gugsa Arayaselassie's 1920s lodge).

Case Study Examples: -

The farmer Hidmo's house, seen on the left side, is situated at Feleg Dea'ro northeast of Mekelle city. Currently, it is out of service. See Figure. According to DI21, DI15, and DI12, the abandoned vernacular Hidmo house seen on the left side was built in the 1922s G.C. by Ras Gugusa Arayaselassie, Governor of East and South Tigray from 1922-1933G.C, grandson of Emperor Yohannes IV. By the time the building was supposed to be for recreational purposes, prearranged by Atse Yohannes IV. Currently, it is readapted for use as a lodge (Da' Rasi Lodge, Mekelle), sold to Ato Mulugeta, owner of the Milano hotel. However, the old vernacular Hidmo houses that are situated in the compound are still neglected, replaced by new buildings as well, and practice improper maintenance, as they are covered and rendered with cement. See Figure. The construction method and materials of these old ruined Hidmo houses are the same as other vernacular Hidmo houses in the study area.

Farmer's Hidmo House (Feleg Dea'ro, Mekelle): A disused cylindrical Hidmo, now abandoned, showcasing traditional construction. Besides, it illustrates the typology's decline in vicinities and rural areas due to modernization.

Da' Rasi Lodge (010 Kebele, Mekelle): Originally built in 1922 G.C. as a recreational structure for Ras Gugsa Arayaselassie, grandson of Emperor Yohannes IV. The adaptive reuse as a lodge, though the original Hidmos in the compound are neglected and improperly maintained (e.g., cement rendering).

Picture 34: Ruined Hidmo House in Feleg Dea'ro. in the Center is the Remains of the Hidmo House of Ras Gugsa Araya Selassie (Da' Rasi Lodge). To the Left is Wuk'ro Lodge. Field Survey, 2020.

Wuk'ro Lodge: is a recreational building located about 40km to the east of Mekelle situated near other significant historical sites (e.g, Wuk'ro Cherkos rock hewan church) in Wuk'ro town. It was originally constructed early 21th century, adapted to the Tigray plateau's arid climate and reflecting the traditional Tigrayan Hidmo and thatched architectural style, characterized by small size stone walls, flat and thatched roofs, and wooden-framed big windows. The lodge served as amusing, boarding house for training and pension center, most likely associated with international and regional sociocultural heritage services. Wuk'ro Lodge remains a valuable cultural landmark, offering insight into elite residential patterns, vernacular architecture, and modern approach to this period.

Cultural and Structural Significance

Symbol of Indigenous Engineering: The cylindrical form exemplifies Tigrayan mastery of passive structural resilience, requiring no reinforcement yet enduring centuries. It reflects socio-spatial traditions, where circular spaces were used for communal or utilitarian functions.

Climate Responsiveness: The thick earthen walls and small openings regulate indoor temperatures effectively. The compact design minimizes exterior surface area, reducing heat exchange.

Challenges and Threats to Preservation

Abandonment and Neglect: Many cylindrical Hidmos are falling into ruin, replaced by modern buildings (e.g., Da' Rasi Lodge's compound). Cement rendering (as seen in Da' Rasi's Hidmos) accelerates decay by trapping moisture in traditional earth walls.

Lack of Documentation: Few intact examples remain, and their construction techniques risk being lost. No systematic studies on their seismic performance despite their proven durability.

Summery

Based on the preliminary research of the researcher, The Detached Cylindrical Hidmo is a vernacular architectural typology from Tigray, Ethiopia, characterized by its autonomous circular form (2.5–5m diameter), dry-stone or rammed earth (hidmo) construction, and flat earthen roof, which ensure structural stability, seismic resilience, and thermal efficiency. Traditionally used as kitchens, granaries, or elite recreational spaces, these structures exemplify indigenous engineering, requiring no reinforcement yet enduring centuries. However, modernization, neglect, and improper interventions (e.g., cement rendering) threaten their preservation, with many abandoned or repurposed (e.g., Da' Rasi Lodge). To safeguard this architectural legacy, urgent conservation, community engagement, and research into seismic performance and material science are needed to integrate Hidmo principles into contemporary sustainable design while preserving cultural heritage.

5. **Built-In Hybrid Hidmo House Typology:** (Cube, Cuboid with Cylinder, and Semi-Cylindrical Forms)

Form and Shape Characteristics

Based on the preliminary research, this hybrid hidmo typology represents an innovative fusion of four primary Hidmo forms: The cube or cuboid section, typically serves as the main living quarters. And, cylindrical or Semi-cylindrical extension, often functions as kitchen or granary, rarely functions as living quarters.

Key architectural features:

Geometric Composition: Rectilinear or square main body (cuboid or cube) with curved appendage (cylinder or semi-cylinder), seamless integration of forms creates structural continuity and typically features a shared wall between sections.

Spatial Organization: Cuboid portion contains primary living spaces, semi-cylindrical section houses service functions (cooking, storage) and often includes transitional spaces between volumes.

Structural Elements: Unified roof covering both forms, thick transitional walls (50-70cm) at junction points and small, strategically placed openings in cylindrical section.

Construction Techniques and Materials

Wall Construction: Traditional dry-stone masonry or rammed earth (hidmo), curved sections built using radial stone coursing and lumped technique at wall-roof junctions

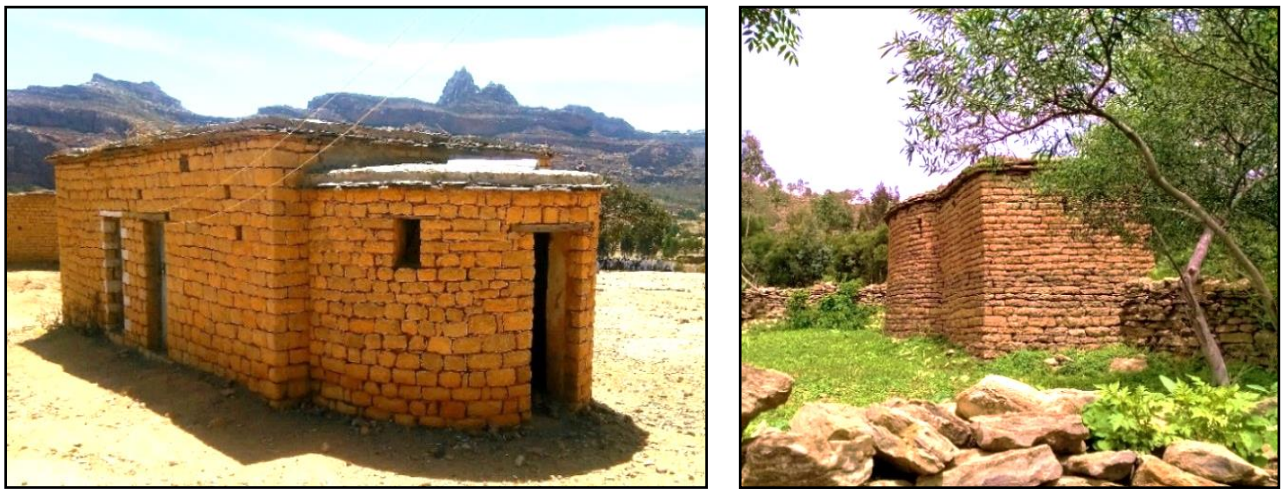
Roof System: Flat earthen roof with timber support beams later corrugated roof, gradual transition from flat (cuboid) to slightly domed (cylindrical).

Material Palette: Local stone and earth primary materials, wooden lintels over openings and traditional mud plaster finishes.

Case Study Examples: -

Based on the preliminary research of the researcher, Dugum Lodge (Dugum, Megab,Tigray): Architectural showcase by Leul Ras Mengesha Seyoum, larger scale (cuboid 6m × 2m, cylinder 2m diameter). According to DI22, the depicted structure is Dugum Lodge (built in 1968 G.C.), commissioned by Leul Ras Mengesha Seyoum, then governor of Tigray. Strategically positioned along the main highway 13km from Abraha-we-Atsbeha church to Megab, this gateway site to the Gheralta mountains offered panoramic views of southern cliffs. Designed as an architectural showcase of authentic Hidmo typology, it was conceived as tourist accommodation for visitors to Gheralta's rock-hewn churches. Now in ruins, the site stands as a testament to unrealized cultural heritage ambitions, its deterioration reflecting both the vulnerability and potential of vernacular architectural preservation.

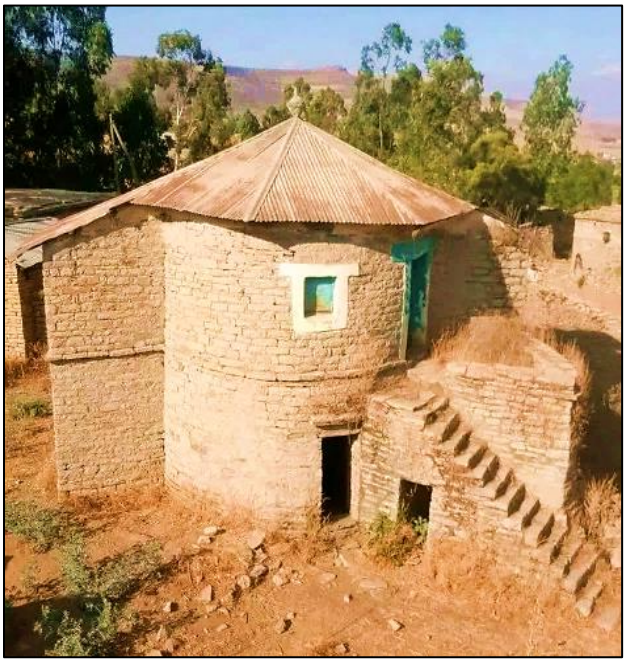
Farmer's Hidmo House 1 (Feleg Dea'ro, Mekelle to the northeast.): Represents vernacular adaptation, cube section: 4.2m × 3.8m, semi-cylindrical extension: 2.8m diameter and demonstrates functional zoning in rural context.



Picture 35: Old Lodge of Ras Mengesha Seyoum (Dugum, Megab), and a Farmer Hidmo House 1 in (Feleg Dea’ro, Mekelle). Field Survey, 2020.

Farmer's Hidmo House 2 (Feleg Dea'ro, Mekelle): This corrugated hybrid structure, blending cuboid and semi-cylindrical forms, is a distinctive Hidmo residence located in Feleg Dea’ro, Mekelle (Inderta). Constructed in the mid-20th century by Ato Gebrekidan Woldu (d. 1992), it exemplifies a harmonious fusion of vernacular and modern architectural elements. The design integrates a cuboid

main structure with cylindrical and cubic extensions, featuring a corrugated upper floor and an exterior staircase leading to a basement alcove showcasing adaptive modernization within traditional Hidmo architecture. While preserving the Hidmo's seismic resilience and thermal efficiency, the hybrid typology incorporates contemporary materials such as corrugated sheeting, reflecting a transitional phase in vernacular construction. As a vital cultural heritage site, its preservation is essential for understanding Tigray's architectural evolution amid modernization pressures. Further research into its construction techniques and socio-historical context is recommended to develop sustainable conservation strategies.



Picture 36: Ayte Gebrekidan Woldu, Corrugated Hidmo Residence 2, In Feleg Dea'ro, Mekelle Mid-20th-C. Field Survey, 2020.

The Ruins of Dejazmach Gebresillassie Woldesillassie's Hybrid Hidmo Residence (Agula'e, Tigray): These remnants represent a complex and fascinating example of early 19th-century vernacular architecture, showcasing the seamless integration of cuboid and cylindrical forms. The structure's hybrid design highlights the adaptability of traditional Hidmo construction, blending geometric precision with functional resilience. Notably, its close proximity just 500 meters from Emperor Yohannes IV's palace suggests a deliberate architectural or symbolic dialogue, possibly reflecting political, social, or cultural connections of the era. Today, however, the site faces severe threats from decay, environmental exposure, and neglect, which jeopardize its surviving features. Without urgent intervention, this important heritage landmark risks irreversible deterioration. Further research into

its historical significance, construction techniques, and socio-political context is essential to guide preservation efforts and ensure its legacy endures for future generations.

Picture 37: The Dejazmach G/Sillassie W/Sillassie Residence in Agula'e Town, Ethiopia, Early 19th-Century Vernacular Building Old and in Ruins. Source, Dr. Alula Tesfay Asfha. 2025 G.C.

Functional and Cultural Significance

Climate Adaptation: Cylindrical form improves wind resistance, thermal mass regulates interior temperatures, and compact footprint minimizes heat exchange Socio-Cultural Aspects: Represents evolution of traditional forms, demonstrates functional specialization, and reflects hierarchical space organization. Structural Performance: Combined geometry enhances stability, curved elements improve seismic resilience, and integrated form reduces maintenance needs.

Preservation Status and Challenges

Current Condition: Few intact examples remain, Dugum lodge in advanced decay, and rural versions being replaced. Threats: Lack of maintenance, modern material substitutions, and loss of traditional skills. Conservation Issues: Structural vulnerability at junctions, moisture damage at transitions, and inappropriate repairs (e.g., cement use).

Comparative Analysis with Other Hidmo Types

Feature	Built-in Hybrid	Pure Cuboid	Pure Cylinder
Form Complexity	High	Medium	Low
Construction Skill	Advanced	Basic	Advanced
Spatial Zoning	Explicit	Implicit	Minimal
Prevalence	Rare	Common	Rare

Table 19: Comparative Analysis Built-In Hybrid With Other Hidmo Types. Own Analysis, 2020.

Summery

The Built-in Hybrid (Cuboid with Semi-Cylindrical) Hidmo House Typology represents an innovative fusion of traditional Tigrayan vernacular architecture, combining a rectilinear cuboid (primary living quarters) with a semi-cylindrical extension (service spaces like kitchens or granaries). Key features include seamless geometric integration (shared walls, unified roof), thick transitional walls (50-70cm), and adaptive spatial zoning, blending functional specialization with structural resilience. Constructed using dry-stone masonry or rammed earth (hidmo), these hybrids exhibit enhanced seismic performance and climate adaptability through curved wind-resistant forms and thermal mass regulation. Case studies like Dugum Lodge (1968 G.C.), Agula'e, The Ruins of Dejazmach Gebresillassie, Farmer's House 1 and 2 (Feleg Dea'ro) illustrate their socio-cultural evolution, from elite lodgings to rural adaptations, though many now face decay, inappropriate modern interventions (e.g., cement rendering), and loss of traditional craftsmanship. This typology's rare complexity and explicit spatial zoning distinguish it from pure cuboid or cylindrical Hidmos, underscoring its significance in Tigray's architectural heritage. Urgent documentation, conservation, and research into transitional construction techniques are needed to preserve these structures as models for sustainable, culturally grounded design.

6. L-Shaped Hidmo House Typology

Form and Shape Characteristics

The L-shaped Hidmo house typology, alternatively referred to as the lumped roof variant, represents a refined architectural evolution within Tigray's vernacular tradition, synthesizing geometric precision with functional hierarchy. Its defining L-alphabet footprint formed by two perpendicular wings creating a sheltered alcove exhibits a symmetrically balanced massing typically rising 2-3 stories, comparable in scale to the grand Hidmo typology yet distinct in its angular articulation.

The spatial organization follows a rigorous vertical stratification: the ground floor dedicates itself to service and utility functions, the first floor accommodates primary living quarters, and the second-floor houses private chambers, linked by corbelled staircases and punctuated by an open balcony that mediates between interior and exterior realms. Structurally, the system relies on load-bearing juniper wood pillars and innovative cattle horn wall fixtures dual-purpose hooks serving both utilitarian and symbolic roles while cantilevered balconies demonstrate advanced timber engineering. This configuration not only optimizes thermal performance through compact geometry but also embeds cultural practices within its very framework, as the alcove's orientation mitigates solar gain while the

balcony facilitates social surveillance, a testament to how traditional design negotiates environmental and societal imperatives through architectural form.

Construction Techniques and Materials of the L-Shaped Hidmo House Typology

The L-shaped Hidmo house demonstrates sophisticated vernacular engineering through its specialized construction system that harmonizes traditional craftsmanship with environmental adaptation. The load-bearing structure combines massive juniper wood pillars (typically 25-30cm in diameter) with dry-stone masonry walls constructed using precisely coursed basalt or sandstone blocks, laid without mortar but stabilized through careful interlocking. The roof assembly employs a unique composite system: primary juniper beams support secondary acacia rafters, overlaid with a 15-20cm layer of compacted earth mixed with straw for thermal mass, topped by waterproofing stone slabs in a corbelled configuration.

Wall System: Composite stone masonry with earth mortar, juniper timber framing at critical junctions, and decorative stone coursing patterns.

Floor/Ceiling Construction: Juniper beam support system, compacted earth roof, and wooden planking on upper levels.

Roof Details: Flat earthen roofs with parapets, 15 original crown-shaped finials (Axumite influence), and concealed drainage channels.

Case Study Examples: -

Dejazmach Abraha Araya's Architectural Legacy in Tigray: Dejazmach Abraha Araya (1872–1917), son of Ras Araya Dimtsu of Enderta and a cousin of Emperor Yohannes IV, was a prominent political and military figure who governed vast territories in southern Tigray (1902–1909) before serving as Ethiopia's Minister of the Interior (1911–1917). His architectural patronage reflects both his political stature and cultural vision, blending traditional Tigrayan elements with imperial symbolism. According to Melake Tsehay, the earliest of his commissions, the En'da Selassie Church (1901) in Mekelle's Kebele 17, exemplifies classic ecclesiastical Hidmo architecture through its rectangular sanctuary, vaulted ceiling, and stepped exterior profile. Though the main building is replaced, it only the gate remains today, this structure marked the beginning of Abraha's architectural legacy, which would later include two significant castles that synthesized vernacular traditions with elite functions.

The Feleg Dae'ro Palace (1904): Abraha's first castle, constructed at Feleg Dae'ro with communal labor, epitomizes the L-shaped Hidmo typology through its sophisticated spatial hierarchy and

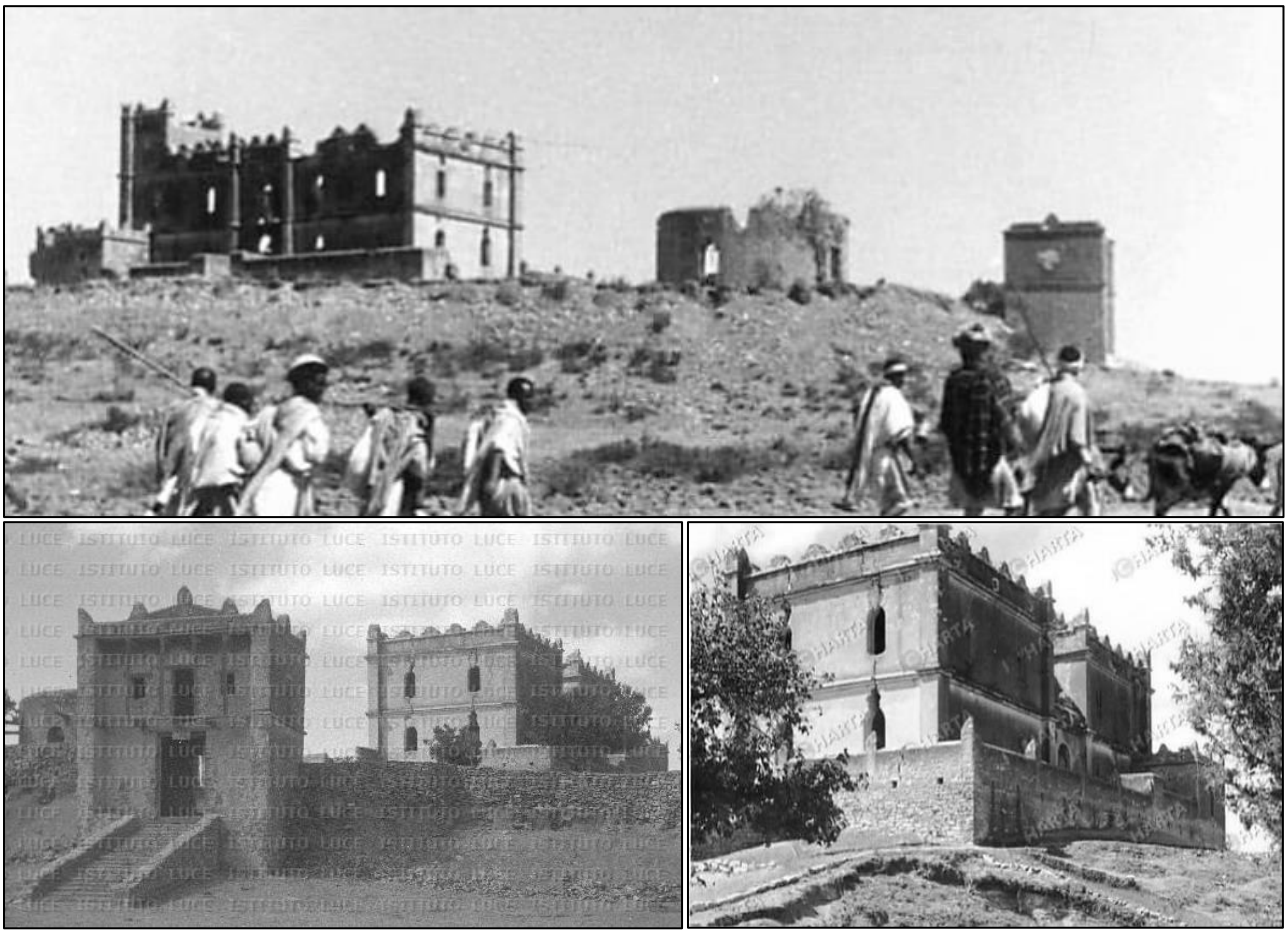
traditional craftsmanship. Built using juniper wood, dry-stone masonry, and earthen mortars, the three-story structure features a functional division of space: five utilitarian rooms on the ground floor supported by six massive pillars; four living quarters on the first floor; and a private chamber with storage spaces and a ceremonial balcony on the top level. Notable elements include embedded cattle horns (serving as multi-purpose hooks) and Axumite-inspired crown motifs adorning the roofline, though most of these decorative features have been lost. Historical accounts by M/Brihan Negede T/Haimanot link its design to the nearby 16th-century Medihanealem Church, which dates back to the 1535s, during the reign of Emperor Gelawdewos. See figure of an old and present status of the palace.

Picture 38: Palace of Dejazmach Abraha, Feleg Dea'ro, Mekelle. Field Survey, 2020.

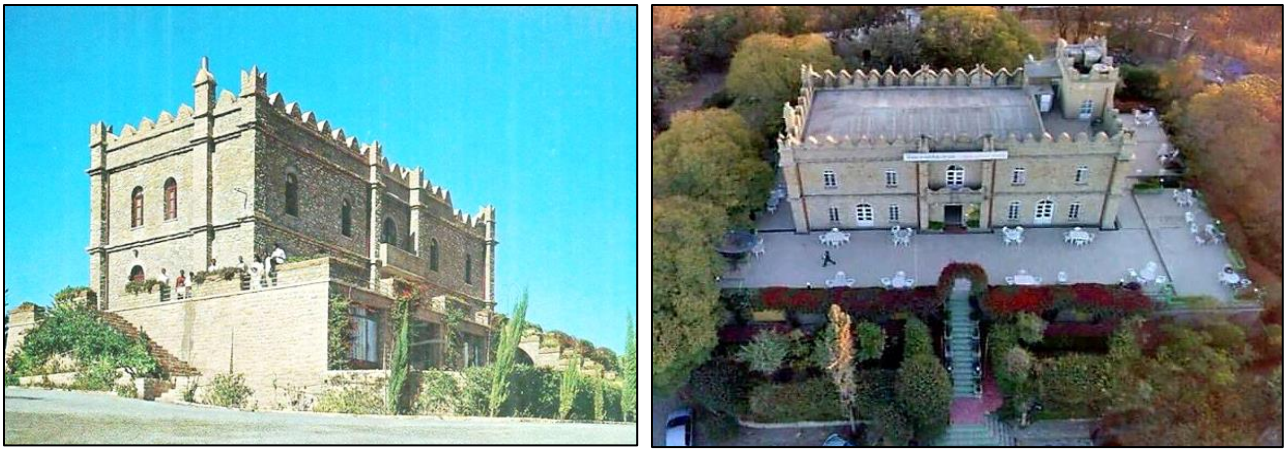
Adaptation and Legacy of a Hidmo Masterpiece: The Mekelle Abraha Castle (1910s)

The second castle, built near Mekelle's Kebele 18 in the 1910s, initially mirrored the Feleg Dae'ro design but underwent significant transformation after being damaged during Emperor Haile Selassie's reign. Later renovated into a hotel by Ras Mengesha Seyoum, the structure retains its original L-shaped plan and corbelled staircases while incorporating modern amenities like glass windows and cement plaster. Its adaptive reuse exemplifies the tensions between preservation and modernization,

with the original basement multi bed rooms and upper-floor chambers repurposed for hospitality functions. Abraha's untimely death during the 1917 Spanish flu pandemic adds historical poignancy to these structures, which now serve as tangible links to Tigray's early 20th-century political and architectural history. Their preservation underscores the urgent need to safeguard such heritage sites, not only as architectural artifacts but also as living testimonies to Tigray's resilience and cultural continuity.



Picture 39: Abraha Castel During Damage and Negligence, Mekelle, Before 1960s G.C.



Picture 40: Abraha Castel After Adaptive Reuse as Hotel, Mekelle. After, 1961s G.C.

Picture 41: Present View of Abraha Castel and Proposed 3-D Model by Sur-Construction Company, Mekelle. 2019 G.C. And Field Survey, 2020.

The Blata Tsegay Seyfu Hidmo house (1924s): The Blata Tsegay Hidmo house in Mekele Kebele 14 exemplifies the L-shaped Hidmo typology, a refined evolution of Tigrayan vernacular architecture. Its lumped roof, a thick, dry stone and mud roof, combining geometric precision with functional hierarchy. The L-shaped layout separates private and communal spaces. Constructed from locally skilled masons and materials like dry stone, timber, mud and egg mixture mortar.

Rooted during the administration of Ras Gugusa Araya, the Hidmo embodies cultural and social values, serving as multi functions and residential purpose. The L-shaped variant often signifies modest prosperity, accommodating livestock or grain storage in one wing. However, modernization poses challenges, as some Hidmos incorporate concrete or corrugated roofing, walls, and floors risking the loss of vernacular authenticity. The Blata Tsegay house stands as a living heritage of Tigray's architectural resilience, yet its preservation requires balancing contemporary needs with traditional construction techniques, especially in the face of urbanization and seismic vulnerabilities exposed during recent conflicts.

Picture 42: Case Study of Blata Tsegay Hidmo House, Kebele 14, Mekelle. Field Survey, 2020.

The Blata Tsegay Hidmo is a testament to Tigray's architectural ingenuity, blending environmental pragmatism, historical memory, and social function. Its L-shaped lumped-roof form is not merely a dwelling but a cultural artifact, embodying resilience against many factors, like climatic and political adversities. Future conservation must balance material modernization with tectonic authenticity to sustain this legacy.

Comparative Analysis with Other Hidmo Types

Feature	L-Shaped Hidmo	Cuboid Hidmo	Cylindrical Hidmo
Plan Complexity	High	Medium	Low
Vertical Levels	2-3 stories	1-2 stories	Typically, 1
Structural System	Hybrid	Load-bearing walls	Monolithic
Spatial Hierarchy	Explicit	Implicit	Minimal

Table 20: Comparative Analysis of L-Shaped Hidmos With Other Hidmo Types. Own Analysis, 2020.

Functional and Cultural Significance

Climate Adaptation: Alcove provides wind protection, thermal mass regulates temperatures, and balcony facilitates passive cooling. Defensive Considerations: Elevated entry points, restricted access sequence, and defensive sightlines from balcony Socio-Political Statement: Demonstrates elevated status, incorporates royal architectural motifs, and serves as community landmark.

Preservation Status and Challenges

Current Condition: Severe deterioration of wood elements, partial collapse of upper floors, and loss of decorative finials. Major Threats: Termite damage to juniper elements, erosion of earth mortars, and vandalism/theft of architectural elements. Conservation Potential: Intact structural framework, surviving decorative details, and strong community memory.

Summery

The L-shaped Hidmo house typology exemplifies a sophisticated iteration of Tigrayan vernacular architecture, distinguished by its geometric precision and functional hierarchy. Characterized by perpendicular wings forming a protective alcove, this 2-3 story structure employs a hybrid load-bearing system combining juniper wood pillars (25-30cm diameter) with coursed dry-stone masonry, demonstrating advanced tectonic intelligence through cantilevered balconies and corbelled staircases. Its vertically stratified spatial program systematically allocates functions: utilitarian service areas on the ground floor, primary living quarters on the first floor, and private chambers with storage on the upper level, culminating in a ceremonial balcony that facilitates environmental mediation and social surveillance. Construction techniques reveal refined material knowledge, featuring composite earth-stone roofs (15-20cm compacted layers with waterproofing slabs) and innovative cattle horn wall fixtures serving dual structural-symbolic purposes. The typology's climatic adaptation is evidenced by its solar-responsive orientation, thermal mass regulation, and passive ventilation systems, while its cultural significance is articulated through Axumite-derived crown motifs and hierarchical spatial arrangements that reflect social stratification. Case studies like Dejazmach Abraha's Feleg Dae'ro Palace (1904) and the Blata Tsegay residence (1934) demonstrate the typology's evolution from vernacular tradition to elite architectural statement, though contemporary preservation efforts face challenges from material degradation and inappropriate modern interventions that threaten the integrity of this distinctive architectural heritage.

7. Curvilinear/Arched Hidmo House Typology

Form and Shape Characteristics

The curvilinear/arched Hidmo house typology represents a contemporary reinterpretation of Tigray's vernacular architecture, blending traditional design principles with modern innovation. Characterized by dynamic, organic curves and a seamless integration with the natural landscape, this architectural style embodies movement and harmony. Its structural form features interconnected, flowing spaces constructed with dry-stone walls, mud roofs reinforced with cement, and wooden ceilings materials that reflect both functional adaptability and cultural identity. This synthesis of indigenous craftsmanship and updated techniques highlights the typology's evolution, preserving Tigray's architectural heritage while addressing contemporary needs.

Organic Geometry: Flowing, curvilinear forms inspired by natural landscapes, asymmetrical yet balanced composition, and softened edges contrasting with traditional angular Hidmos. Spatial Configuration: Cluster of small interconnected volumes, decentralized "widespread hotel" concept, and central courtyard as organizing element. Design Features: Undulating dry-stone walls, green-painted wooden ceilings, strategic window placement framing mountain views, and integrated indoor-outdoor transitions.

Construction Techniques and Materials

Wall System: Traditional dry-stone masonry with modern precision, curvilinear coursing techniques, and reinforced structural points. Roof Structure: Mud roofs with improved waterproofing, wooden support system with green finish, and thermal insulation layers. Material Innovation: Local stone with enhanced mortar mixes, sustainably sourced timber, and natural pigments for finishes.

Case Study Examples: -

The traditional Hidmo residence of farmers in Inderta, Mekelle, represents a quintessential example of Tigrayan vernacular architecture, characterized by its distinctive curvilinear/arched typology that harmoniously blends indigenous craftsmanship with functional design. These structures typically feature interconnected cylindrical forms and flowing spaces, constructed using locally sourced materials such as dry-stone walls, mud roofs, and wooden ceilings, which collectively create a thermally efficient and culturally resonant living environment.

The organic, curved geometry of the Hidmo not only reflects a deep connection to the natural landscape but also demonstrates sophisticated passive climate control strategies, with the thick stone walls and earthen roofs providing natural insulation against Tigray's extreme temperature variations. This architectural form embodies centuries-old building traditions while maintaining remarkable

adaptability to contemporary needs, serving as both a practical dwelling and a cultural symbol of Tigrayan identity. The design's spatial organization, with its interconnected volumes and centralized courtyard concept, facilitates social interaction while maintaining privacy, showcasing how vernacular architecture can achieve complex programmatic requirements through simple, locally-available materials and time-tested construction techniques.

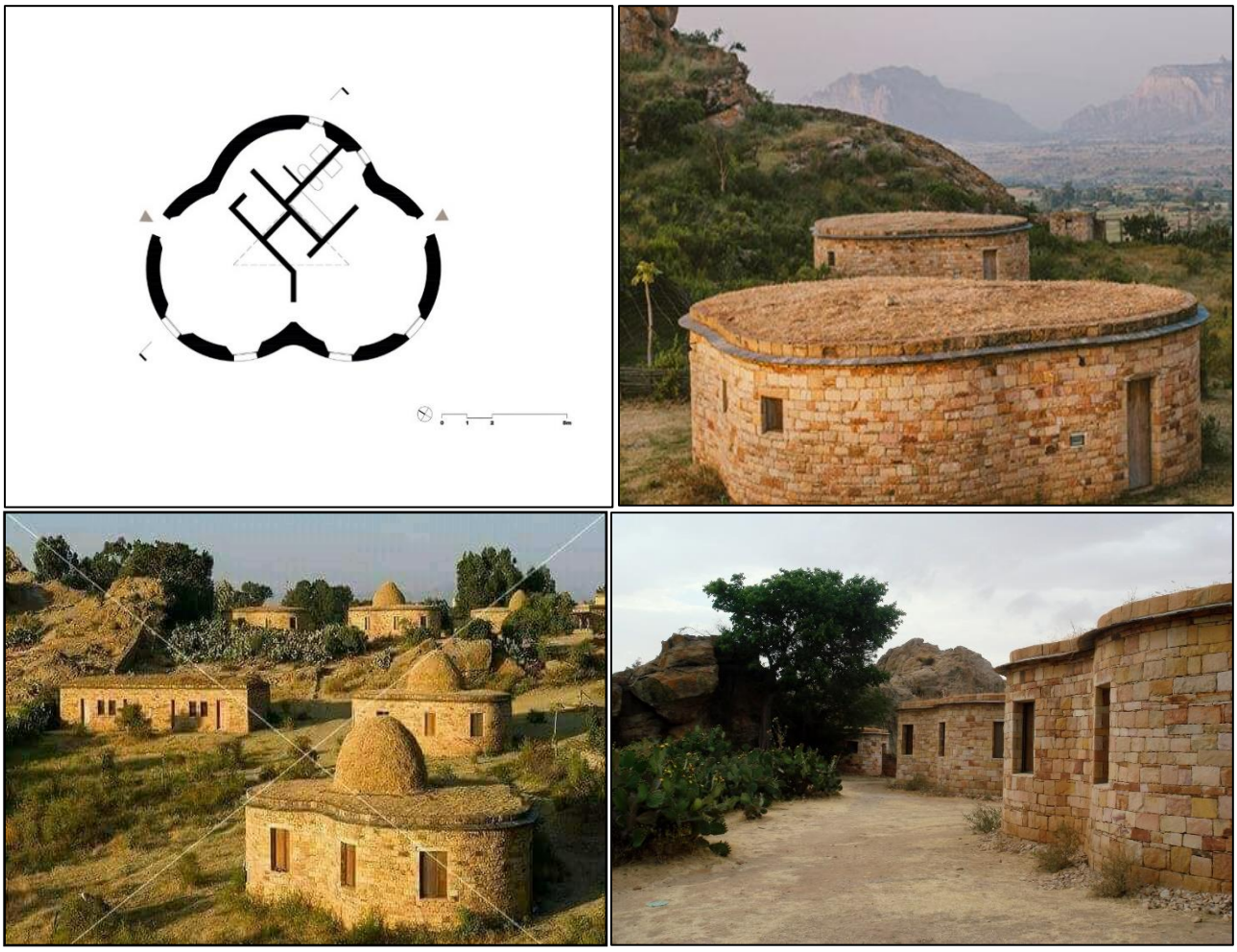
Picture 43: Traditional Hidmo Residence of a Farmer in Inderta, Mekelle. Pic. Gebreselassie Tesfay, 2025 G.C.

Gheralta Lodge: Vernacular Modernity in Tigray's Landscape

Nestled within the rugged, sun-scorched terrain of northern Ethiopia's Tigray region, the Italian-designed Gheralta Lodge (2014) harmonizes vernacular Hidmo architecture with contemporary hospitality. Conceived by Giuseppe Tommasi and Nicole Cieri Architects, the 2,000 m² lodge employs traditional Tigrayan materials, dry-stone walls, wooden ceilings with green paints to achieve climatic resilience and cultural continuity. Its decentralized "albergo diffuso" (widespread hotel) model, featuring scattered cabins linked by pathways, immerses guests in the dramatic Gheralta massif, 15 individual guest units, framed by rock-hewn churches. The design centers on a protective

courtyard, a nod to local domestic architecture that shelters inhabitants from the harsh sun and wind while maintaining visual connectivity to the landscape.

The lodge exemplifies a synthesis of modernity and tradition, leveraging indigenous construction techniques to ensure thermal comfort in the semi-arid climate. Inspired by the curvilinear Hidmo typology, characterized by organic, wavy forms and natural materials, the project reflects a deliberate departure from urban freneticism, prioritizing ecological and cultural integration. Client Nature and Culture plc and local collaborators, including RAAS Architects, emphasized sustainability through regionally sourced materials and passive design. Reviews highlight the lodge's immersive charm, with cozy rooms set against golden meadows, friendly animals roam the grounds including a beautiful horse, donkey and roaming wildlife, solidifying its status as a benchmark for context-sensitive tourism architecture in Ethiopia (ArchDaily; Tripadvisor).



Picture 44: Gheralta Lodge, Hawzen, Tigray Shows a Curvilinear/Arched Hidmo Style. Pic. Nicole Cieri, 2014 G.C.

The Devastation and Fragile Recovery of Tigray's Tourism Sector: Tigray's tourism industry, once a thriving economic pillar, has faced near-total collapse due to the compounded effects of the COVID-19 pandemic and the regional war. Among the casualties is Gheralta Lodge, a 11-year-old Italian-owned eco-lodge in Hawzen, which represented a 150-million-birr investment and employed 60 permanent staff while attracting 20,000 annual visitors, 95% of them international. Like other lodges in the region, including Korkor Lodge, Mahbere-Seb lodge and Kuriftu Sabian Lodge, it was completely destroyed by Eritrean troops, ENDF and later repurposed as a military camp. These establishments previously generated over 10 million birrs annually for the local economy, offering employment and global exposure for Tigray's cultural heritage. However, as manager Welday Asgedom notes, reconstruction without compensation or security guarantees remains an insurmountable challenge, deterring investors from re-entering the sector. Recently, pictures obtained from local residents' example of Gheralta showed the destruction of Gheralta Lodge, and the newly-built Kurifutu Sabian Lodge.

Picture 45: Gheralta Lodge Damage, Hawzen, Tigray. Pic. Tigray TV, 2022 G.C. and Showed the Destruction of the Newly-Built Gheralta Kurifutu Sabian Lodge. Tghat.Com Respectively.

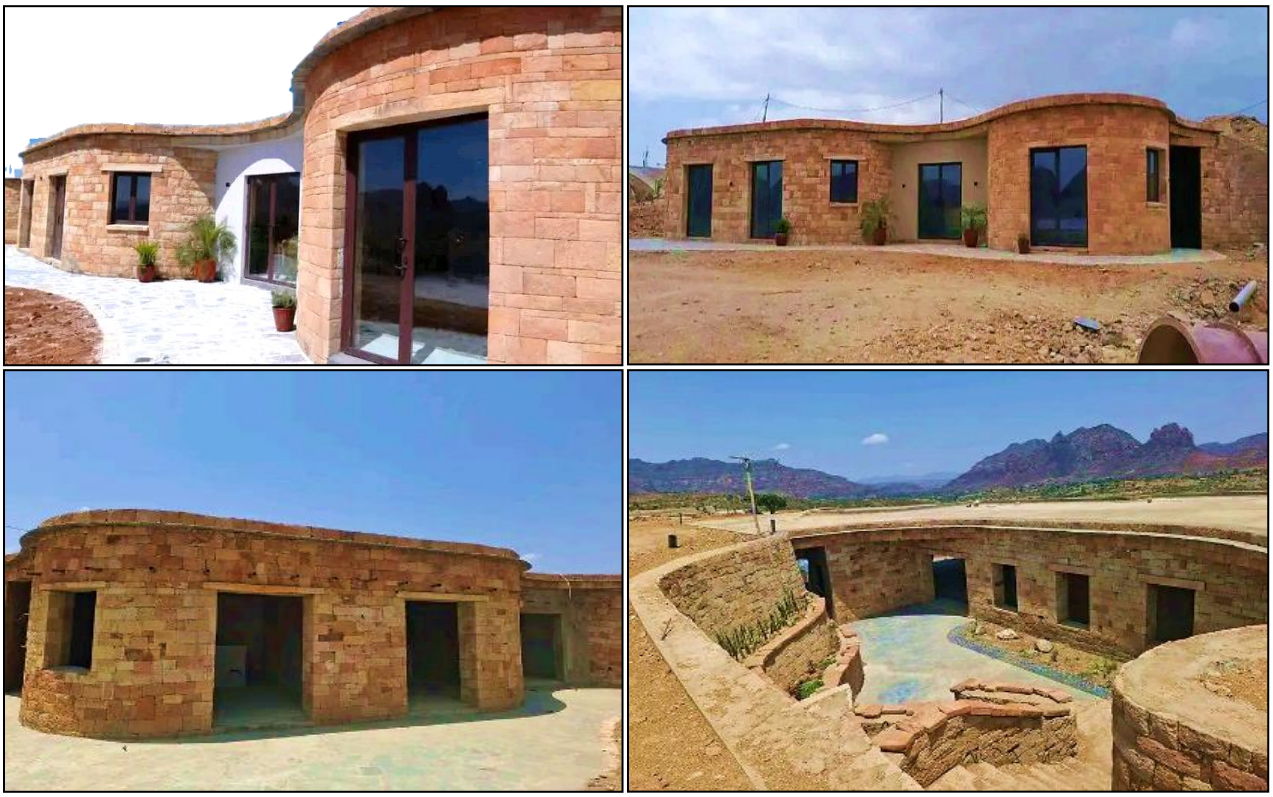
Despite these setbacks, tentative steps toward recovery are emerging. Mr. Atsbeha G. Dr., head of Tigray's tourism bureau, acknowledges that full restoration may take decades but proposes interim measures, such as partial reopening's through partnerships with local service providers. Gheralta Lodge's vision to position Tigray as a premier East African tourist destination by blending vernacular architecture with international standards now seems distant. Yet, ongoing discussions with authorities signal cautious optimism. The lodge's legacy endures as a symbol of resilience, having once transformed local livelihoods while showcasing Tigray's unique historical and architectural identity. The path forward hinges on sustained collaboration, security assurances, and strategic investment to revive a sector critical to the region's socio-economic recovery.

Gheralta Guh Eco Lodge Project: A resort project located in the Gheralta Hawzen district of Tigray, the contract for which has been awarded to EEIG Construction, in 2024 G.C. The project timeline is 18 months. Structurally, a curvilinear Hidmo house typology, a distinctive form of Tigray vernacular architecture, characterized by its dynamic sense of movement, organic curves, and harmonious integration with inspiration of the natural landscape. Preliminary research reveals that this architectural style features interconnected, flowing structures with dry-stone walls, mud roofs coated with cement, and wooden ceilings, a design that reflects both functionality and cultural identity.

In contemporary adaptations, the Gheralta Guh Eco Lodge has embraced this traditional form with the mountains form, as exemplified by the ongoing Gheralta Guh Eco Lodge project. Situated in Hawzen Woreda (Eastern Zone), the lodge is part of the governmental broader Gabta Lehager development initiative. According to Project Engineer Gebeyehu Tesfay, construction has reached 70% completion, employing 900 workers and 33 heavy machinery units.

Beyond its structural homage to the Hidmo aesthetic, the lodge integrates modern tourism amenities, offering over 40 guest rooms while preserving the region's architectural heritage style. As of June 25, (Tigray Communication Affairs Bureau [TREB], 2025). This synthesis of traditional design and contemporary hospitality underscores Tigray's commitment to sustainable cultural tourism.

Picture 46: Gheralta, Tigray Region Guh Eco Lodge, U/C. 3-D Model, Skyscraper City. 2024.



Picture 47: Actual View of Gheralta Guh Eco Lodge, in Hawzen, Tigray, U/C. Pic. Dr. Atsbha Gebreegziabher, 2025 G.C.

Climate Adaptation: Curved walls deflect hot winds, thermal mass regulation, and passive solar orientation. Cultural Synthesis: Reinterpretation of traditional patio, modernized Hidmo spatial principles, and contemporary use of vernacular aesthetics.

Modern Buildings in glimpse: Contemporary architecture in Tigray has witnessed a growing prevalence of modern buildings characterized by rigid rectilinear forms, a stark departure from the organic curvilinear language of traditional Hidmo structures. These buildings employ industrial construction methods, utilizing steel frames, concrete slabs, and prefabricated materials, that prioritize speed and cost-efficiency over regional craftsmanship. While such methods enable rapid urbanization, they often result in structures that are thermally inefficient, relying heavily on-air conditioning to mitigate Tigray's harsh semi-arid climate, unlike traditional Hidmo homes, which leverage passive cooling through thick stone walls and natural ventilation. Moreover, many modern designs exhibit a disconnect from cultural roots, lacking meaningful references to Tigray's architectural heritage in form, materiality, or spatial organization. This absence of vernacular influence raises concerns about cultural erosion, as these buildings prioritize generic, globally standardized aesthetics over locally resonant design principles. The shift toward climate-dependent mechanical systems and culturally neutral architecture underscores a broader tension between modernization and sustainable, identity-conscious development in Tigray's urban landscape.

Comparative Analysis

Feature	Curvilinear Hidmo	Traditional Hidmo	Modern Buildings
Form Language	Organic	Geometric	Rectilinear
Construction	Hybrid	Vernacular	Industrial
Climate Response	Enhanced	Effective	Dependent on AC
Cultural Roots	Reinterpreted	Preserved	Often Absent

Table 21: Comparative Analysis of Curvilinear Hidmo With Traditional and Modern Buildings. Own Analysis, 2020.

Comparative Analysis of L-shaped and Curvilinear Hidmo house typologies: This table highlights how the L-shaped Hidmo prioritizes structured functionality and vertical expansion, while the Curvilinear Hidmo emphasizes organic integration with the landscape and communal living. Both adapt vernacular principles to distinct socio-environmental needs.

Feature	L-Shaped Hidmo	Curvilinear Hidmo
Formal Rigor	Angular L-plan with geometric symmetry	Organic, flowing curves inspired by nature
Structural System	Post-and-beam timber framework with dry-stone infill	Continuous load-bearing stone walls
Spatial Hierarchy	Vertical zoning (split across 2-3 stories)	Horizontal clustering (single-level flow)
Ornamentation	Functional cattle horn fixtures (structural hooks)	Sculptural wall textures and undulating surfaces
Climate Response	Shade optimization via angular alcove	Passive cooling through curved wind-deflecting walls
Material Emphasis	Heavy timber (juniper) and stone composites	Stone-dominant with minimal timber
Cultural Symbolism	Represents social hierarchy (vertical division)	Embodies communal unity (circular forms)

Table 22: Comparative Analysis of Curvilinear Hidmo and L-Shaped House Typologies. Own Analysis, 2020.

Functional and Environmental Performance

Thermal Comfort: Temperature differential, natural ventilation optimization, and humidity regulation. Sustainability: 90% local materials, near-zero construction waste, and low embodied energy. User Experience: Seamless nature integration, enhanced visual privacy, and acoustic benefits of curved walls.

Preservation and Adaptation Challenges

Maintenance Requirements: Specialized stonework upkeep, roof membrane renewal, and paint system maintenance. Technical Limitations: Skilled labor scarcity, material sourcing challenges, and code compliance issues. Cultural Acceptance: Balancing innovation with tradition, community design participation, and tourist expectations management.

Summery

The curvilinear/arched Hidmo represents an innovative evolution of Tigray's vernacular architecture, blending traditional design principles with modern functionality. Characterized by organic geometries, decentralized spatial configurations, and integrated environmental strategies, this typology features undulating dry-stone walls, mud roofs reinforced cement, and green-painted wooden ceilings that maintain cultural identity while improving climatic performance. Case studies like Gheralta Lodge (2014) demonstrate successful implementation of this approach through its

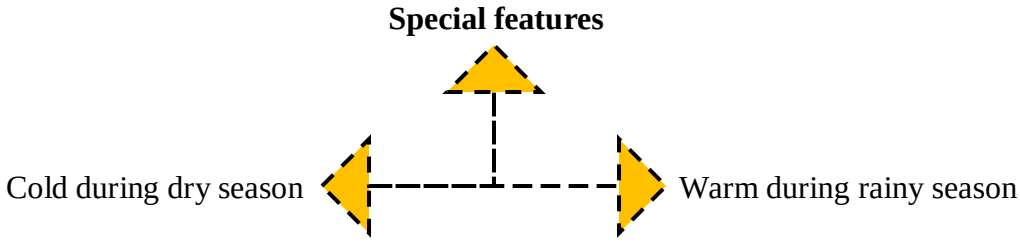
"albergo diffuso" model, using local materials and passive design to achieve thermal comfort in Tigray's semi-arid climate. However, the region's tourism infrastructure, including significant examples of this architecture, suffered devastating destruction during recent conflicts, with reconstruction efforts now facing substantial challenges. Current projects like Gheralta Guh Eco Lodge (2024) aim to revive this architectural tradition, employing 900 workers to create over 40 guest rooms while preserving Hidmo aesthetics. According, Skyscraper City, the typology shows particular strengths in thermal regulation (5-7°C differential), sustainable material use (90% local), and cultural continuity, though faces ongoing challenges in skilled labor availability, maintenance requirements, and balancing modernization with vernacular authenticity. This architectural approach represents both an important cultural preservation effort and a potential model for context-sensitive, sustainable design in post-conflict recovery contexts.

4.4.5. Values or Impacts of Vernacular Hidmo Houses in the Study Area.

The Hidmo houses has its own impact and functions, these part may related with the benefit of environmental friendly materials (natural materials), social impact, economic impacts, political impact and aesthetic impacts.

Values of Using Environmental Friendly Materials

It has health beniefits of using natural materials compare to the modern materials and have reversible condition. These means when environment become cold weather and inside the Hidmo house it creates warm condition, the reverse is true in warm condition. The materials is quite durable and highly appropriate for hot and dry conditions.



In addition of using environmental friendly materials of Hidmo house. When fire or war is occure especially, the Hidmo wall and the earthen roof play an important role to protect easly the house from burningdown and attacking.

1. Social Impact

According to the local informants, the position of the traditional house of Hidmo's is grouped in nearby or round in the specific area. The main reason why the community settles in a specific location is to facilitate different activities in their day-to-day activities and easily accesses service. In addition to this, they are also safe for the protection of society from different harm full things. The traditional architectural style of this house is reflected in the identity and authenticity of the local socio-cultural value of the community. For instance, in one compound houses observes different cultural values. Within this compound, a ground of houses is encompassing having various functions and all of their main entrance is toward the center of the compound. Why their entrance towards the center of the compound is to easy access for the families living within it. The orientation of the house was through the traditional local builders or cultures or cultural of the society let say, Adarash is one part of the compound house most of the time its location is at the main get of the compound which is far part from the kitchen house. The reason is that easily accessible for guests and new comes during the traditional ceremony and festivals and to protect smoke to save the economy. Most of the socio-cultural interactions such as funeral ceremonies, weddings, traditional festivals, traditional folks, coffee ceremonies, and the like are undertaken within the Adarash house. All the traditional houses were erected as a result of social interaction rather than by individuals. In some cases, the traditional houses had their cultural barriers. This implies men are not allowed to enter the kitchen house. Because according to the culture of the local community kitchen is allowed only for women.

According to **FGD** also stated some benefits of the vernacular Hidmo houses like an identity for the society, by preserving the vernacular Hidmo houses it creates and achieve a nationalist society and mostly created a society of proudly by their history, It creates a society with reasonable and self-esteem, by nature, Hidmo houses have a reversible climate, in the hot time the Hidmo house becomes cold and in the cold time, the Hidmo house becomes hot. As a result, it is advantageous for societal health, have a benefit of health by using environmentally friendly materials, by preserving the vernacular Hidmo houses the next generation will take a lesson from it and improve their architectural historic culture to the maximum level, It helps for academic purposes and shows the evolution or timeline of architectural culture, the mental action or process of acquiring knowledge through thought, experience, and the senses. A perception, sensation, or intuition resulting from this.

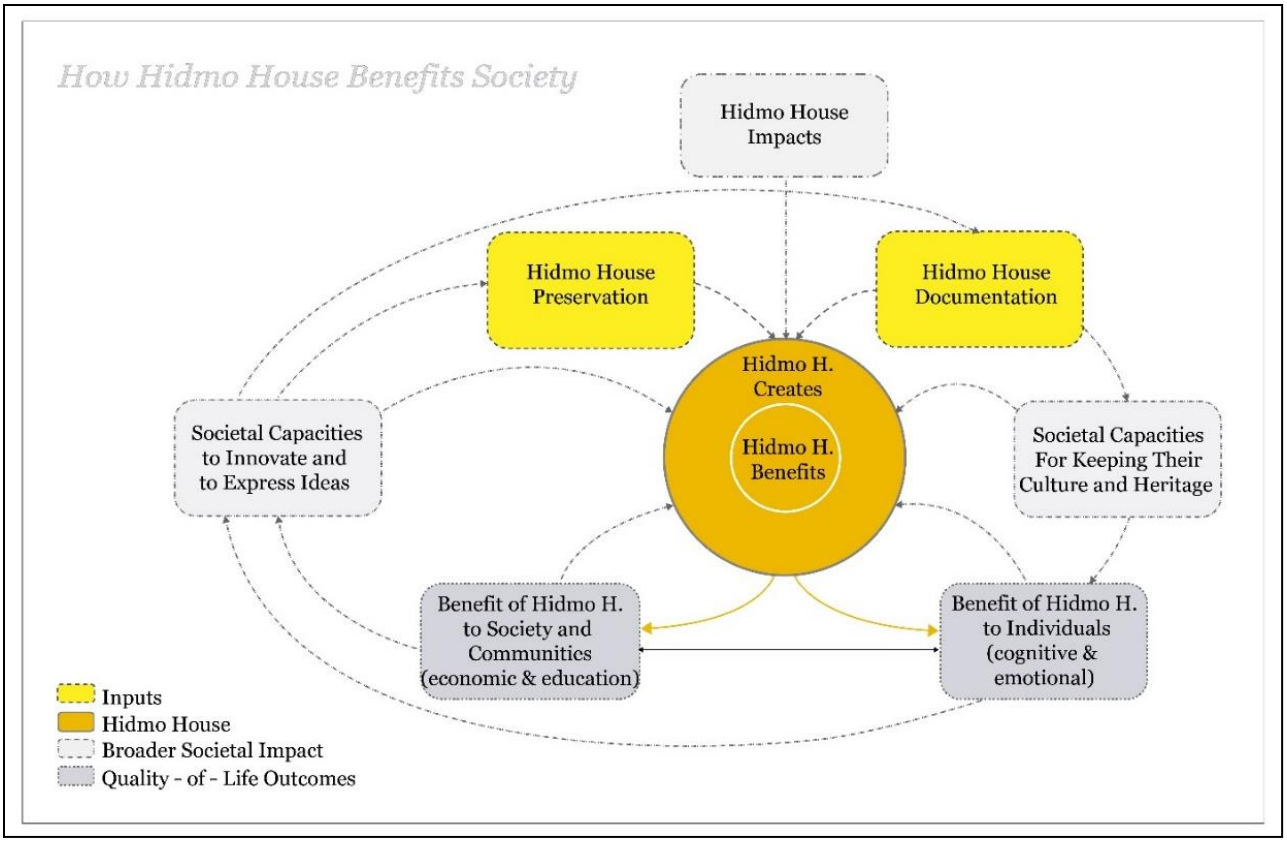


Diagram 6: Benefits of Hidmo Vernacular Architecture on Society. Own Model, 2020.

At the core of the map are variables related to Hidmo house Benefits and Hidmo house creation, which have cascading effects, represented by Benefit of vernacular Hidmo house to Individuals (cognitive and emotional) and Benefit of vernacular Hidmo house to Society and Communities (economic and education). According to the how vernacular Hidmo house benefits society, these benefits lead to second-order effects, represented by Societal Capacity to innovate and Express Ideas, which, in a virtuous cycle, feeds back into the two key inputs of the system: Preservation of vernacular Hidmo house and Documentation of vernacular Hidmo house:

2. Economic Impact

According to **FGD** that listed concerning the economic aspect of vernacular Hidmo houses like in such a way, it develops the tourism sector and helps for Tourist attraction, the society will be benefited from its means of income. On the other hand on the construction of a traditional house, the local society is used locally available materials to save their economy and less cost of the materials. When the researcher compared the construction of the modern house and the traditional house, the modern one is costly in all aspects, such as technique, the material available, labor, and so on, however, since the traditional architecture uses the accessibility of local materials that obtained at their environment

it is too economical. The materials which are used for the construction of traditional architecture are brought up by the co-operation of the local societies without giving payment or expenditure for the providers from their surroundings. However, in some cases, they prepare some traditional feast "Degis" with having local beverage and food. But it is no more extravagance.

3. Political Impact

The vernacular Hidmo houses, if the common people and the noblemen's have some difference in terms of construction, decoration, use of materials, skilled of manpower, location and arrangement of its setting and the common people the noblemen's used a common vernacular architecture to build places of political authority. The vernacular architecture style generates the hierarchical power mostly by manipulating the noblemen's building strategies usually attributed to monumental construction. These noblemen were local administrative authorities with full local power and in some cases hold the military title. These noblemen commanding local society to cut and carry the local materials for construction of roof and ceiling emanated from distant places, to build a house. They are also extracted local peasant labor to build their houses by right or correction.

The traditional houses or nobles are larger and more elaborate forms of vernacular architecture and more reflected the identity and cultural aspects of the noble's men as well as the peasants. In terms of decoration and position more decorative and put at a suitable strategically place. As the researcher observed the internal surface of the noblemen's house more adorned especially in the ceiling part of the house. In construction time also required more time to build than the peasant house, as well as in terms of functional accounts more economical.

The residences of the nobles or elites are multistoried and often cursive from the plan. They consist of a lot of houses beyond the compound house of Hidmo like a guest house or Adarash, kitchen, storied buildings, etc. however, the feasting hall is taller and more decorated than the other Hideo. In addition to this elite house and feasting hall enclosed by an inner wall which means that compound by compound. As compared to the noble's houses and the peasant's house, the noble' has wood house supported walls for structural demand for multistoried buildings? However, this is not common in smaller Hidmo. This wood supported wall is inherited from the post Axumites Christian architecture.

The peasant's house was constructed anywhere, not selected specific place like that of the noble's house. The reason why not to select is, the peasants are poor and their positions are under the

noblemen, and in all aspect,s the peasants are less in positions than of the noblemen. Then they are randomly arranged and constructed constructed their house with less economy and decoration.

4. Aesthetic Impact

Aesthetic values are mainly derived from human appreciation of the beauty of the architectural styles of Hidmo. This is associated with the process in which people gain sensory and intellectual in spar ration from the structurere looking at all its features. The aesthetic value of these traditional houses results from its beautiful façade quality, architecture style, and unique features, land scope, and its geological materials and similarly according to FGD stated regarding the value of vernacular Hidmo houses and its aesthetic worth like**,** For the city fabric, Collective memory and the history of the city, It gives a fleeting look and able to see, how has been the art of construction techniques besides the historical value of tangible and intangible wisdom are applied in the vernacular Hidmo houses.

4.5. Documentation and Case Studies of Blata Tsegay Seyfu and Haleqa Assefa Tedla, Architectural Hidmo Houses.

The research focuses on Mekelle's Kebele 14 (Zeselassie) and Aynalem (Tabia Selam) due to: (1) high density (68%) of intact Hidmo houses representing all architectural subtypes (Tigray Cultural Bureau, 2022); This strategic delimitation optimizes time efficiency while capturing Hidmo architecture's full typological spectrum, from traditional to modernized variants, within a compact yet representative zone.

4.5.1. Urban Development and Governance of Mekelle (1872–1960 G.C.)

Mekelle was founded as a royal capital by Emperor Yohannes IV between 1872 and 1889 G.C., initially serving as a strategic political and commercial hub. Under his son Ras Mengesha Yohannes, the city retained its prominence as a center of trade and administration. According to DI15, significant urban expansion occurred during the tenure of Ras Gugsa Arayaselassie (1922–1933 G.C.), who governed eastern and southern Tigray as commander-in-chief, while Ras Seyoum Mengesha (grandson of Yohannes IV) administered western and northern Tigray. This dual governance structure persisted until Ras Seyoum consolidated authority over all Tigray from 1935–1960 G.C., further shaping Mekelle’s development. The city’s growth during these periods reflects its enduring role as a nexus of political power and economic activity, anchored by the legacy of Yohannes IV’s dynasty (see *Rulers of Ethiopia, Tigray, and Mekelle* and the *Yohannes IV Family Tree* for lineage details).

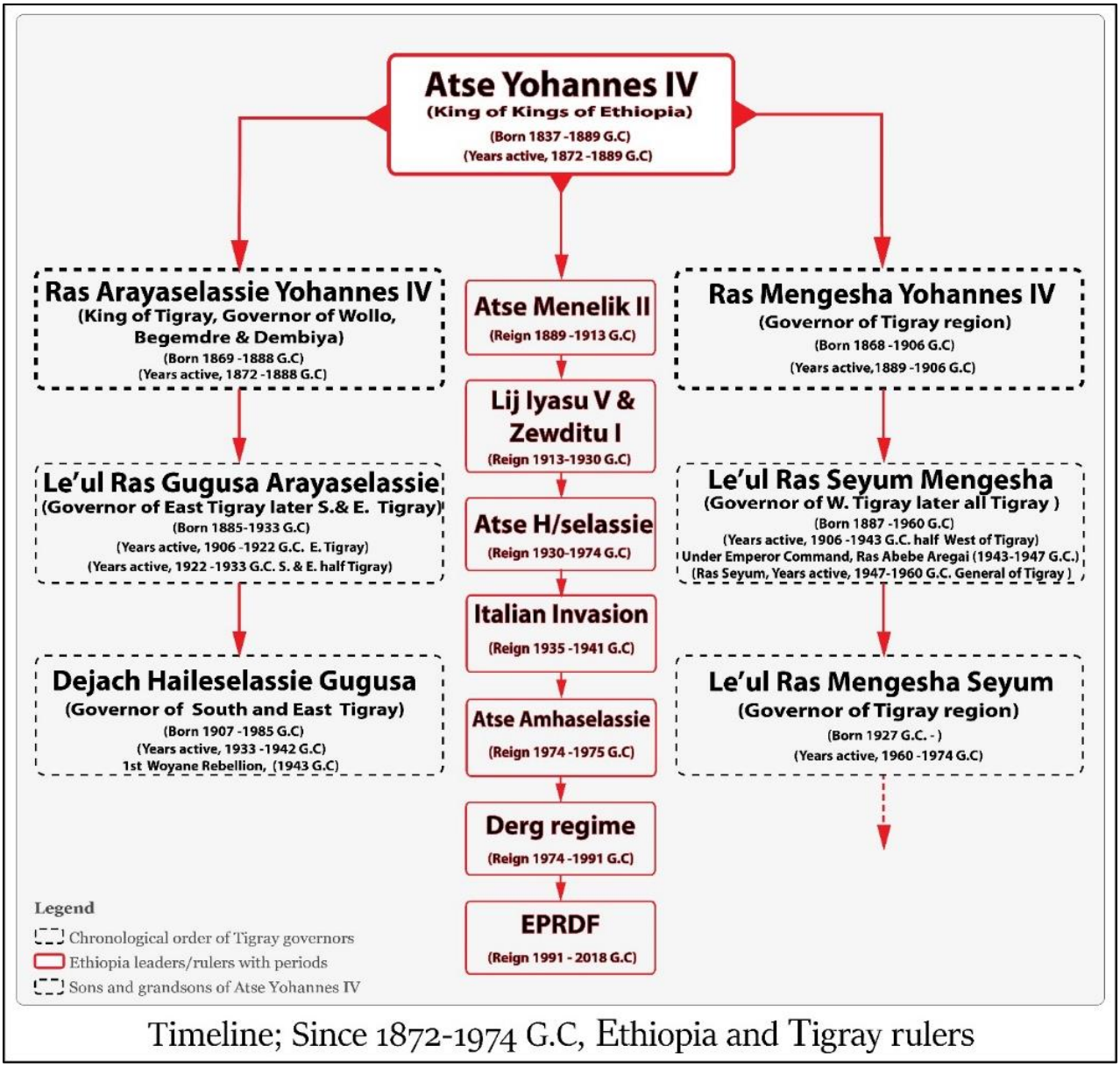


Diagram 7: Ethiopia, Tigray and Mekelle Rulers, and the Family Tree of Emperor Yohannes IV. Own Survey, 2020.

According to DI13, Mekelle once contained numerous Hidmo houses, particularly in kebeles 04, 05, 01, 02, 07, 08, 09, 10, 12, 14 and 15, as well as in the historically significant area of Tabia Aynalem (formerly "Mete're"), located 6km south of the city. This zone, known for its refreshing climate, preserves several traditional Hidmos constructed during the era of Ras Gugsa Arayaselassie and Ras Seyoum Mengesha. However, in Qedamay Woyane's Kebele 14 (Tabia Zeselassie, Ketena Maebel), most Hidmo houses have been demolished without conservation efforts, reflecting a troubling trend of heritage loss. Among the surviving examples, the Blata Tsegay Seyfu Hidmo house stands as a

remarkable testament to this vernacular architectural tradition, underscoring both the cultural significance of these structures and the urgent need for their preservation amidst ongoing urban development pressures.

4.5.2. Blata Tsegay Seyfu Hidmo House

The Hidmo house is located in Mekelle City's Qedamay Woyane district (Kebele 14,Tabia Zeselassie, Ketena Mae'bel), a central urban zone characterized by its historical significance. Georeferenced at UTM Zone 37 (13°29'59"N, 39°28'29"E, 2,068m elevation), the 496.29 km² plot is bordered by residential properties, Jera Wond Assefa (west), Qegnat Mekonen Tsegay (north), and Gera Meruts (south), and an eastern street. Its proximity to the Atse Yohannes Hotel (500m) further underscores its accessibility and integration into Mekelle's urban fabric.

The subject building is a single-story (G+0) structure comprising seven rooms and one alcove at sinle-story level. According to oral testimonies from informants DI12 and DI13, this Hidmo house was constructed circa 1923 G.C. under the commission of Blata Tsegay Seyfu, who served as a prominent judicial authority administering justice in both Mekelle and Enderta Woreda during the governance of Ras Gugsa Arayaselassie. The construction period coincides with a significant historical era in Tigrayan administration, reflecting the socio-political influence of its patron.

4.5.2.1. Land Allocation and Construction Process

According to DI13, the land in question was originally allocated by Ras Gugsa Arayaselassie to several noble chiefs, including Blata Tsegay Seyfu, for residential purposes. The Hidmo house itself was constructed through a collaborative effort, utilizing both skilled local masons from Chilekot and laborers drawn from Blata Tsegay's own household staff. This construction approach reflects traditional Tigrayan building practices, where high-status individuals mobilized both specialized artisans and domestic labor for such projects.

4.5.2.2. Construction Materials and Techniques of Blata Tsegay Hidmo House

The Hidmo structure employs three primary materials: stone, wood, and soil, each utilized through regionally specific methods.

1. **Stone Masonry**: Irregularly shaped fieldstones, collected from nearby sites through shallow excavation, form the building's core masonry. Unlike dressed stone, these were used in their natural state, reflecting vernacular construction practices that prioritize locally available

resources. The stone masonry used mud as a mortar with the mixture of egg yolk and water to create a pasty charachter. (DI8 and DI9).

2. **Timber Elements**: According to DI8, juniper trees (*Juniperus procera*) sourced from the *Des'ea* forest (eastern Tigray, ~60 km from Mekelle near the Afar border) provided material for ceilings, doors, and windows. The wood was felled seasonally, rough-hewn by skilled craftsmen within the forest, and transported collaboratively, a labor-intensive process involving the chief's retinue, local villagers, and pack animals (camels and donkeys). This highlights the social mobilization required for elite construction projects.

3. **Earthen Materials**: DI16 and DI9's account details three soil types with distinct functions: Silt and *Geu'ila* (termite mound soil): Used as white plaster for walls and roof filler, valued for its cohesion. *Red loam:* Stabilized the lower walls and, when mixed with cow dung, formed durable floor plaster. *Geu'ila*: Served as a cementitious substitute for floor surfacing, demonstrating indigenous knowledge of geopolymer-like materials.

These material selections exemplify adaptive vernacular architecture, optimizing local geology, ecology, and traditional craftsmanship.

4.5.2.3. Historical Land Grant of the Compound

According to oral testimony from DI2, Ato Blata Tsegay is believed to have been born around the 1888s and assumed a position of leadership by the 1909s, during which he served his community and local chief with distinction. During the Second Italian Invasion (1935–1941 G.C.), he actively participated in armed resistance. However, in 1942 G.C., he succumbed to an unidentified illness. Prior to his death, the historic Hidmo structure was sold at a nominal cost to Qegnat Gerlasse to cover medical expenses. Following this transfer, the building underwent partial modifications, including the addition of a metal staircase in Room 5A.

The historic property is formally recognized as the Blata Tsegay Seyfu Hidmo House, a name dating to its 1923 G.C. construction period during the reigns of Princess Zewditu I of Ethiopia and Ras Gugsa Arayaselassie of eastern Tigray (DI2, DI8). Despite its historical significance, key informants KI2 and DI1 confirm the structure has never received formal heritage designation at either national or regional levels. However, in 2019 G.C., the Mekelle Zonal Tourism Bureau acknowledged its cultural value by including it on their local inventory of traditional Hidmo heritage structures - a classification that, while not conferring legal protection, represents important institutional recognition

of its vernacular architectural importance. This discrepancy between local appreciation and official heritage status highlights common challenges in Tigray's cultural resource management, where many historically significant vernacular buildings exist in a bureaucratic limbo between community valuation and formal preservation frameworks. The building's naming tradition, explicitly linking it to both local nobility (Ras Gugsa) and national royalty (Princess Zewditu), underscores its dual significance as both a regional architectural landmark and a physical artifact of Ethiopia's imperial history.Owner of the historical Hidmo house, foremost so called is Blata Tsegay Seyfu as owner and builder, then in 1942s G.C they sold it for Qegnat Gerelasse (from Asmera) with low price for medical expense of Blata Tsegay. However, he didn't make it rather he died.

4.5.2.4. Modifications and Ownership Transition

Following Qegnat Gerelasse's acquisition of the Hidmo house, several structural modifications were implemented to adapt the building to contemporary needs. According to DI6, these alterations included the addition of metal safety railings to the staircase and the replacement of the traditional earthen flat roof over Room 5A (G+1) with zinc sheeting, a shift reflecting broader trends in material modernization during the late 20th century. However, Qegnat Gerelasse's ownership was cut short by illness, leading to his death in 1978 G.C. in Addis Ababa. Subsequently, the property was inherited by his children, who were raised and resided in the capital. This transition marked a significant shift in the building's stewardship, as its connection to the original socio-cultural context of Mekelle diminished. The modifications during this period illustrate the tension between preserving historical integrity and adapting to functional demands, a common challenge in vernacular heritage structures.

Blata Tsegay Seyfu Family Tree and Current Owners of the House

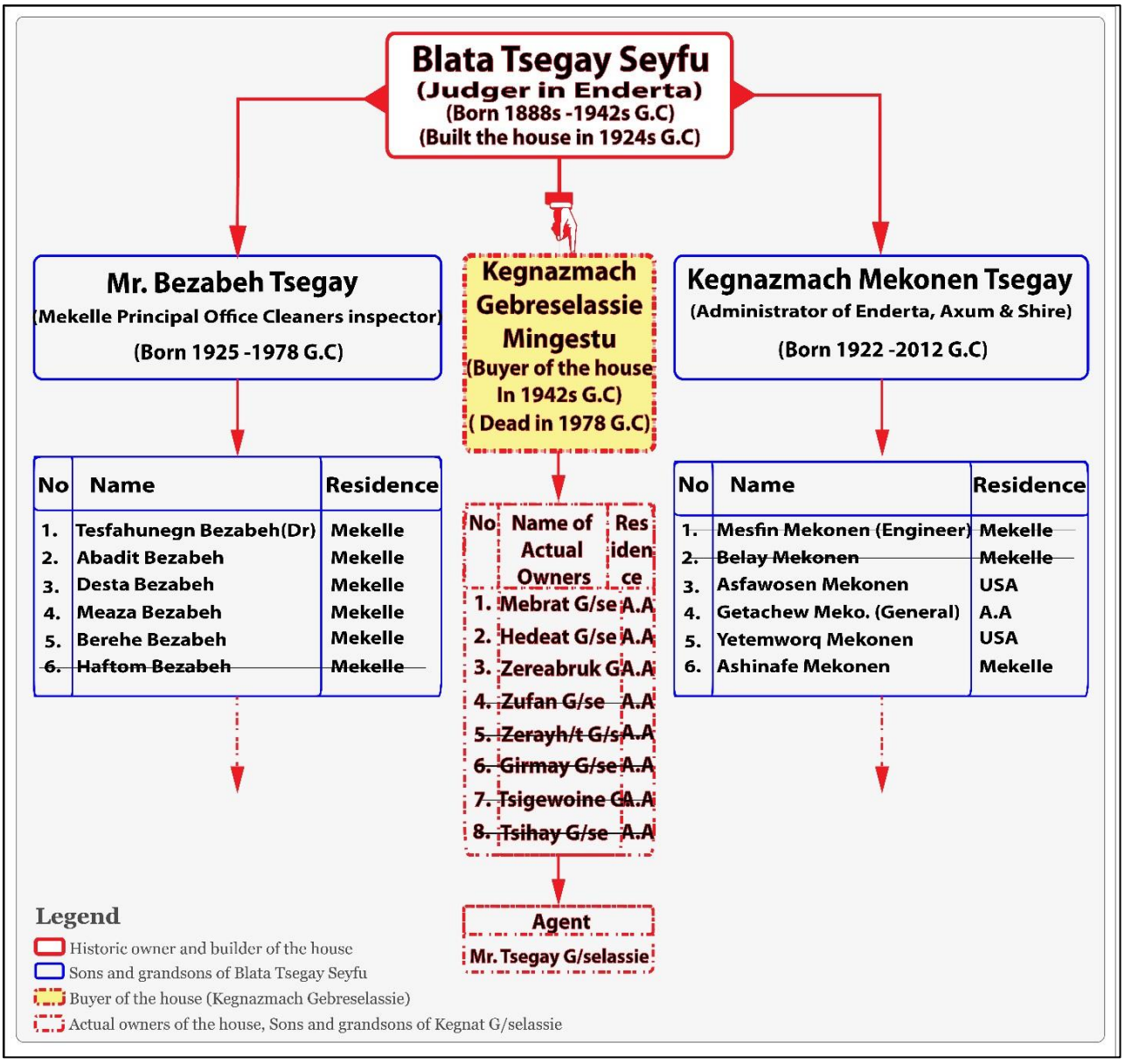


Diagram 8: Blata Tsegay Seyfu Family Tree and Current Owners of the Hidmo House. Own Survey, 2020.

4.5.2.5. Functional Transformation and Contemporary Use of the Blata Tsegay Hidmo House

This historic Hidmo compound served multiple socio-institutional functions that evolved through three distinct periods, reflecting Tigray's changing political and economic landscape. From 1923-1942 G.C. According to KI7, DI12, D13, DI2, and DI10, under Blata Tsegay Seyfu's stewardship, the building operated as a multifunctional complex combining judicial, penal, and residential uses - a physical manifestation of his dual role as both nobleman and judicial authority. The spatial

organization clearly segregated these functions: rooms 1A, 1B, 2, 3A, 3B, 6, 7A and 7B served as detention cells for tax evaders and criminals; room 4 functioned as the courtroom; while 5A-5B provided private quarters for Blata Tsegay himself, with room 8 housing his mules. A now-ruined western annex contained kitchen facilities. Following Blata Tsegay's death in 1942, the property transitioned to purely residential use under Qegnat Gerelasse until 1978, before adapting to commercial purposes in 1979 - a transformation mirroring Mekelle's urban development. This chronological functional evolution - from judicial-residential complex to private dwelling and finally commercial space encapsulates broader patterns of vernacular architecture reuse in Tigray, where significant buildings often cycled through institutional, domestic and economic roles in response to societal changes. The compound's history particularly illuminates how pre-modern Tigrayan elites combined domestic, administrative and judicial functions within single architectural entities, blending residential comfort with mechanisms of social control.

Since 1978 G.C., following its inheritance by Qegnat Gerelasse's descendants, the Hidmo house underwent a functional shift from a private residence to a commercial rental property catering to low-income activities. According to KI6 (the property's managing agent), the building initially accommodated businesses dealing in local beverages (Tila, Catekala, Areqi) and served as a space for sex work, a use pattern that persists today under the current management of Ato Tsegay G/Selassie. Presently, the structure operates as a hybrid commercial-residential space, hosting beer and Sewa (traditional beer) sales, food services, sex work, and limited residential occupancy. This transition reflects broader socioeconomic changes in Mekelle's urban landscape, where historic vernacular structures are increasingly repurposed for informal economies due to their affordability and central locations. The building's current use exemplifies both the adaptive reuse of cultural heritage and the challenges of preserving architectural integrity when economic pressures prioritize functionality over conservation.

4.5.2.6. Present Physical Condition and Preservation Challenges of the Blata Tsegay Hidmo House

The Hidmo house remains an architecturally significant structure that embodies the cultural heritage of the community, yet its current state reflects severe deterioration due to a combination of anthropogenic and environmental factors. The building, situated on a 496.24 km² plot, is bounded by a street to the east, Jerawond Assefa's house to the west, Qegnat Mekonen Tsegay's (son) residence

to the north, and Gira/Merutse's house to the south. The plan of the compound is leveled as 1st and 3rd, though its integrity is increasingly compromised by structural decay.

Picture 48: Blata Tsegay Hidmo House, Kebele 14, Mekelle. (Top Pic. Filimon, Before 2007), and Field Survey, 2020.

According to KI6 and KI7, the building has undergone several unregulated modifications that have altered its original fabric. The northern section (Room 1A), originally part of the traditional Hidmo structure, lost its historic roof due to heavy rainfall and leakage by 2017 G.C., leading to its replacement with zinc sheeting, a common but non-conservation-approved intervention. Similarly, Rooms 2 and 4 have seen their original doors replaced with metal sheets, further detracting from the

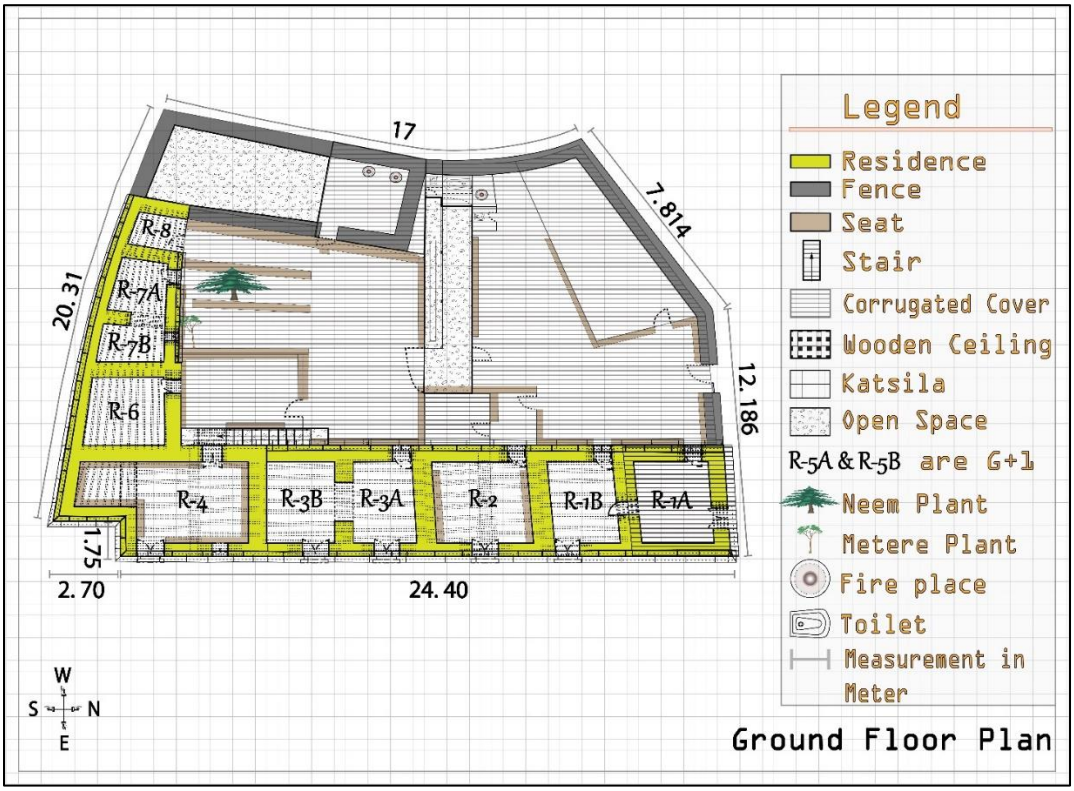
building's authenticity. The wooden ceilings in Rooms 1B, 3A, 3B, 7A, and 7B have suffered extensive damage from prolonged moisture exposure and smoke accumulation, resulting in darkening and structural weakening. Particularly severe are Rooms 7A and 7B, where dampness has caused significant deterioration of the ceiling beams.

Additionally, the walls and upper roof sections exhibit widespread cracking, exacerbated by invasive vegetation growth, a clear indicator of long-term neglect. These issues highlight the urgent need for structural stabilization and conservation efforts to prevent further loss of this culturally valuable asset. The current condition underscores the broader challenges faced by vernacular heritage structures in Tigray, where environmental stressors, inadequate maintenance, and ad-hoc modifications threaten their preservation. Without immediate intervention, the Hidmo house risks irreversible damage, eroding both its physical form and historical significance.

4.5.2.7. The Needs of Urgent Intervantion of Blata Tsegay Hidmo House

The Hidmo house exhibits severe structural deterioration, including cracks, moisture damage, and invasive vegetation, necessitating urgent stabilization. Previous modifications: such as zinc roofing and metal doors: compromise its traditional integrity, highlighting the need for reversible, conservation-approved alternatives. Environmental factors (leakage, rainfall) and human neglect (smoke damage, poor maintenance) have accelerated decay, underscoring the importance of improved drainage and regular upkeep. To safeguard this heritage asset, a comprehensive condition assessment and a culturally sensitive restoration plan must be prioritized to balance preservation with functional use.

4.5.2.8. Site Plot Map of Blata Tsegay Seyfu Hidmo House



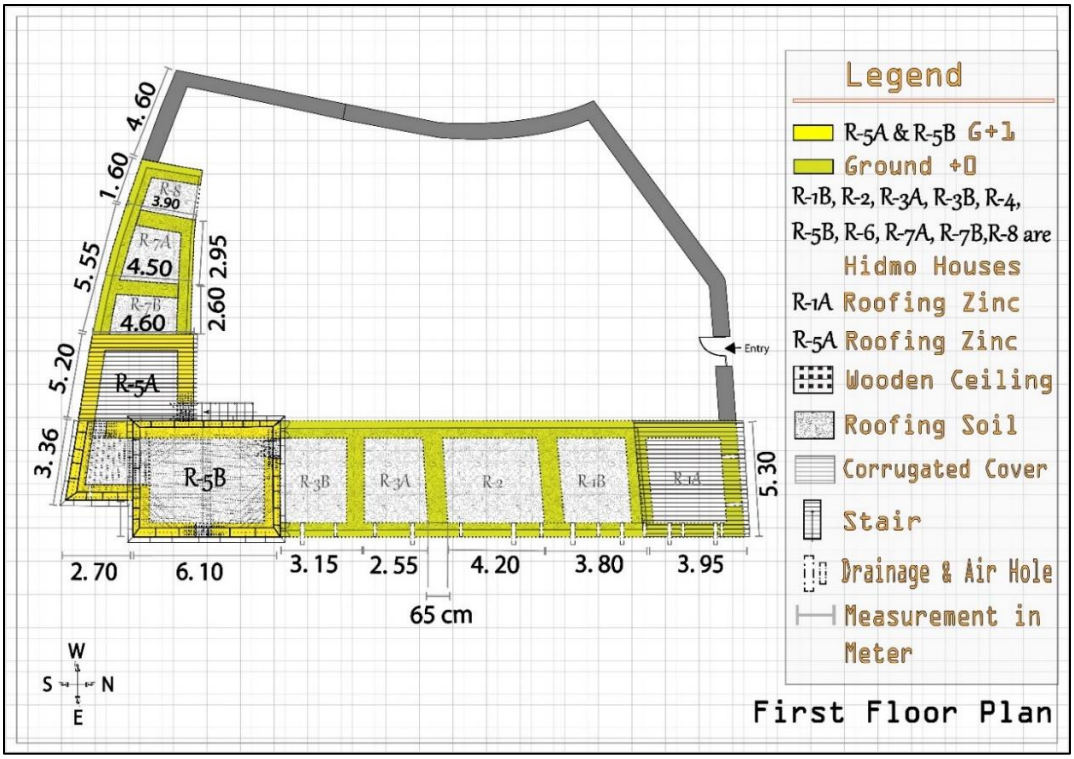


Figure 4: Plot Map and Ground Floor and First Floor Plan of Blata Tsegay Seyfu Hidmo House. Made Using Adobe Illustrator, 2020.

4.5.2.9. The Elevations of Blata Tsegay Seyfu Hidmo House

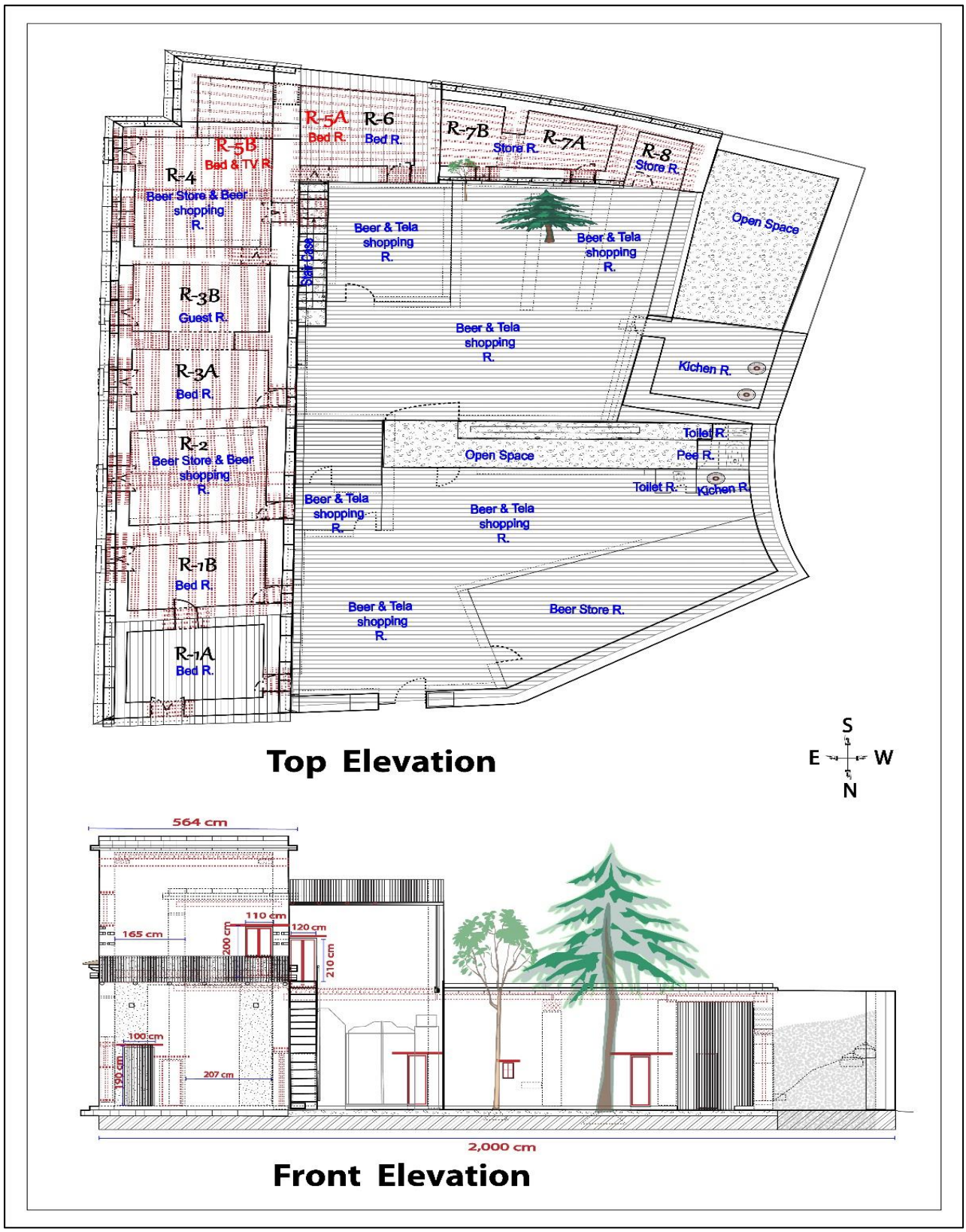


Figure 5: Top and Front View of Blata Tsegay Hidmo House. Made Using Adobe Illustrator, 2020.

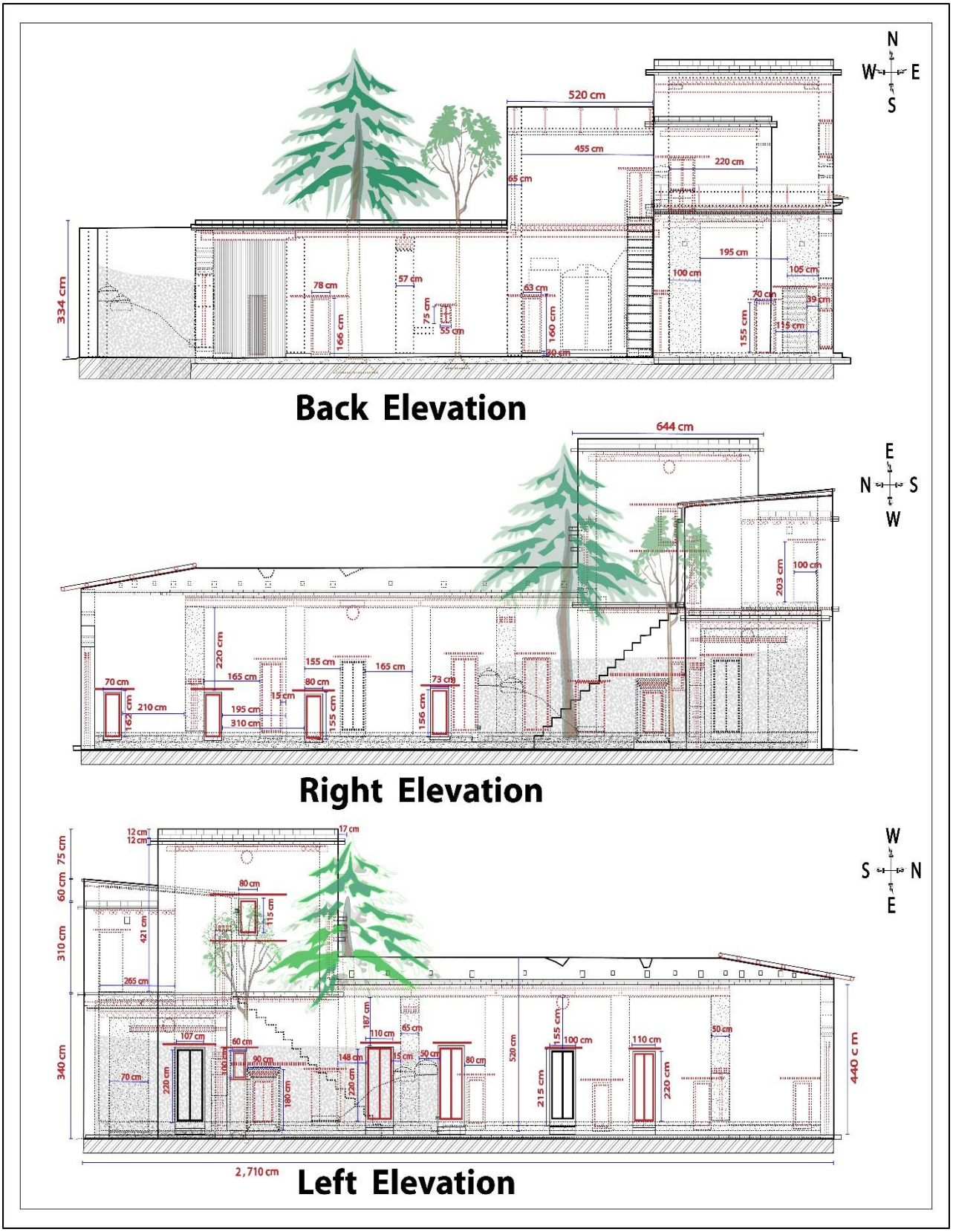


Figure 6: Rear, Right and Left View of Blata Tsegay Hidmo House. Made Using Adobe Illustrator, 2020.

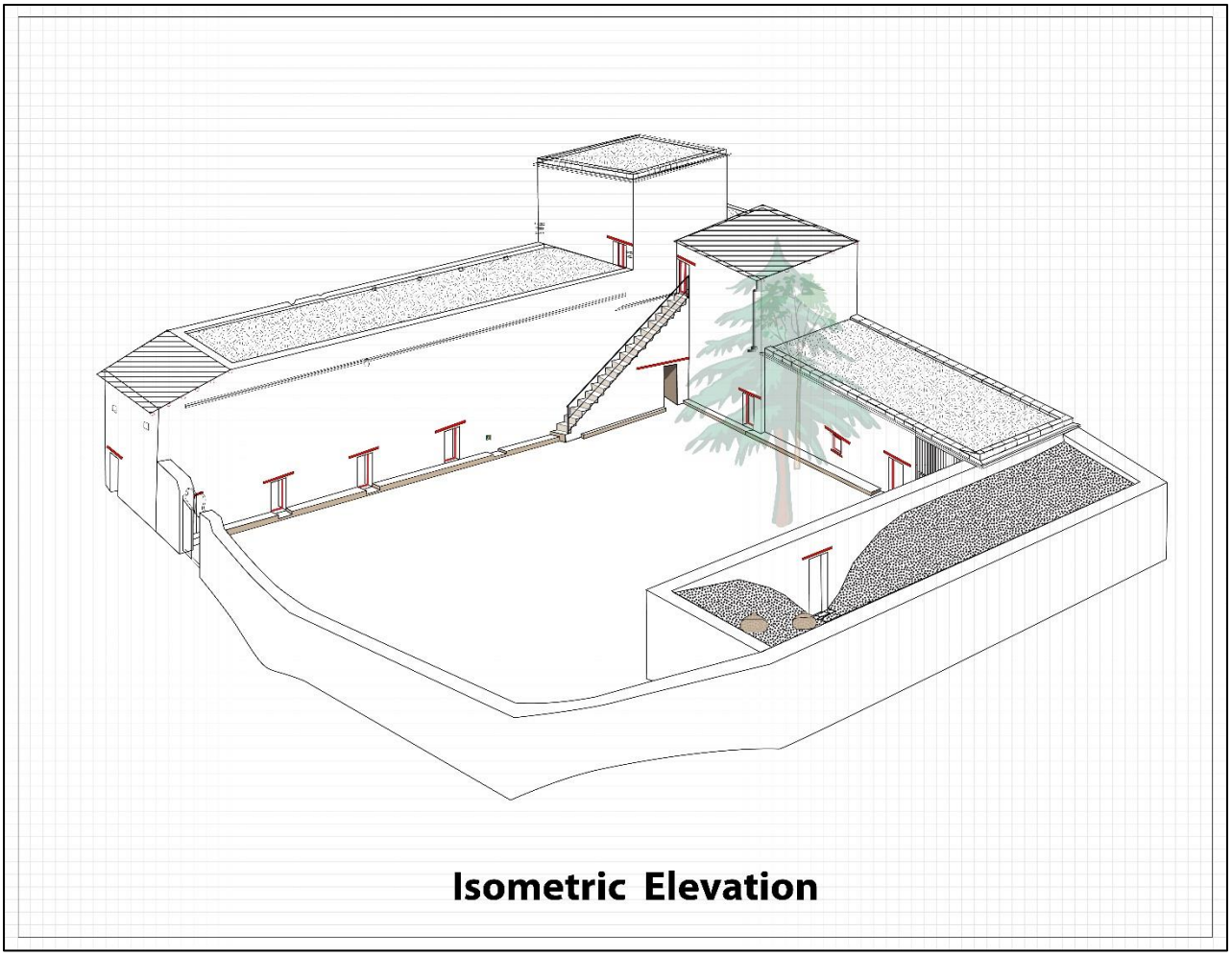


Figure 7: Isometric View of Blata Tsegay Hidmo House. Made Using Adobe Illustrator, 2020.

4.5.2.10. Architectural Significance and Preservation Imperatives of Blata Tsegay's Hidmo House

The structure exemplifies the traditional *L-shaped Hidmo* typology, distinguished by its *Seqala*-style hybrid roof construction. Built by skilled local artisans using vernacular techniques, it incorporates dry-stone masonry, timber beams, and mortar composed of mud and egg yolk mixtures, a testament to indigenous material innovation. *This construction methodology aligns with UNESCO's 1999 Charter on Built Vernacular Heritage, which emphasizes the conservation of techniques passed down through generations.*

Despite its architectural value, DI1 and KI6 reports that neither the owners nor the Tigray Tourism and Culture Bureau (TTCB) have not implemented systematic preservation, restoration, or regulatory measures, a lapse contradicting *ICOMOS Principles for the Preservation of Historic Timber*

Structures (1999) regarding maintenance of traditional building materials. However, KI1 reports that, the Mekelle Zonal Administration has initiated efforts to designate the house as a traditional heritage asset, issuing directives to prevent alterations to its authentic features, *a first step toward the Venice Charter's (1964) call for "protecting the full authenticity of monuments."*

Potential Benefits of Preservation: Proper conservation of Blata Tsegay's Hidmo house would enhance Mekelle's urban aesthetics by showcasing Tigrayan architectural artistry (aligning with UNESCO's mandate to safeguard intangible culture through tangible heritage), serve as a living archive for future generations and tourists, and provide scholarly value as a research hub for vernacular architecture, directly supporting SDG 11.4's target to protect cultural heritage. The site could function as an ideal locale for cultural media production (documentaries, dramas, or music videos) while generating tourism-derived income for local communities and owners, thereby operationalizing the Nara Document's (1994) principles on community-based stewardship. Collectively, these benefits would position the Hidmo as both a catalyst for sustainable development and a model of vernacular heritage preservation in the Horn of Africa.

To realize this potential, immediate action must include: (1) formal heritage designation by TTCB following World Heritage Convention guidelines; (2) development of enforceable conservation protocols based on the *Burra Charter's (1979) phased approach to cultural significance assessment;* (3) community capacity-building programs as outlined in the *Faro Convention (2005) framework for heritage communities*; and (4) authentic restoration employing traditional techniques per the *Kraków Charter's (2000) principles for training craftspeople in traditional techniques*. Such measures would not only safeguard this irreplaceable example of L-shaped Hidmo typology but also establish a replicable model for balancing vernacular preservation with contemporary utility in Ethiopia's rapidly urbanizing contexts.

As a rare surviving example of pre-20th century Tigrayan elite architecture, this Hidmo house meets multiple criteria for UNESCO Tentative Listing (Criteria ii, iv, v) through its demonstration of:

- Cultural interchange in vernacular architecture (ii)
- Representative building typology (iv)
- Traditional human settlement patterns (v).

4.5.3. The Origins and Development of Aynalem Area

Tabia Aynalem, historically known as "Mete're," is located 6 km south of Mekelle and serves as a culturally significant area. The village contains numerous traditional Hidmo houses constructed during the governance of Ras Gugsa Arayaselassie and Ras Seyoum Mengesha. Key informants (KI8, KI9) report that the original settlement of Aynalem's inhabitants was situated in the Kalamino area. Due to security threats from banditry, the community subsequently relocated to the elevated terrain of Inda'yesus before being forcibly resettled in their current location (then called Mete're, later Aynalem) by the Italian military unit *Forte di Galliano*. Following this displacement, multiple Hidmo houses were built, though many have since been demolished, replaced, or suffered structural deterioration. Concurrently, the area has experienced substantial population growth, reflecting its enduring socio-cultural importance.

Aynalem is also renowned for its traditional beverages, particularly *Sewa* and *Mes*, attracting visitors from various parts of the city and neighboring regions. Most of the establishments serving these indigenous drinks are housed within Hidmo structures, reinforcing their cultural authenticity.

Notable Hidmo Houses of Aynalem

Among the most significant Hidmo houses in Aynalem are the outstanding residence of Haleqa Assefa Tedla Gebray, constructed circa 1931, stands as a prominent example, however some of its parts are replaced, demolished and improper intervention. Therefore, to maintaining its structural integrity to this day it need urgent protection. The other notable hidmo house is the recreational Hidmo house of Le'ul Ras Seyoum Mengesha. Later, who served as the governor of Tigray from 1947 to 1960, frequently visited Aynalem for leisure, drawn by its scenic landscape. It was during this period that Emperor Haile Selassie, upon visiting alongside Ras Seyoum, reportedly referred to the area as *Mete're*, though it retained the name Aynalem. (Acoording to KI8 and KI9).

Ras Seyoum Mengesha commissioned the construction of a single-story Hidmo to serve as a retreat from Mekelle. This structure remains in relatively good condition but requires proper conservation due to previous inadequate preservation efforts. Presently, it is situated within the Mekelle Institute of Technology campus, the building stands as part of an institution that enrolls specialized students from across the region.

Picture 49: Ras Seyoum Mngesha Recreational Corrugated Hidmo House. Field Survey, 2020.

Ras Seyoum Mengesha maintained a close personal relationship with Haleqa Assefa, demonstrated through the customary exchange of ceremonial gifts such as livestock and monetary offerings during important events at the Ras Seyoum residence. Key informants (KI8, KI9) describe that in 1952 G.C., impressed by Haleqa Assefa's intellectual acumen and community standing, Ras Seyoum offered him an administrative position within the regional governance structure. However, Haleqa Assefa declined this political appointment, instead receiving honorary religious vestments as a mark of distinction. Notably, Haleqa Assefa consciously rejected aristocratic conventions, as evidenced by his deliberate choice to arrange his daughters' marriages with agricultural workers rather than noble families, despite repeated marriage proposals from elite households. This deliberate social positioning reflects a significant deviation from contemporary normative practices among the Tigrayan elite during this historical period (Ibid).

Haleqa Assefa Tedla: A Prominent Agriculturalist and Salt Trader in the 20th Century

Haleqa Assefa Tela Gebray (1891-1960 G.C.), was a prominent agrarian entrepreneur and salt trader (arhotai) working during the Italian colonial period in Tigray. Born in Highland of Mekelle (presently Enda Eyesus), his family was forcibly displaced in 1895 G.C. when Italian military forces occupied their ancestral lands, necessitating relocation to *Mete're* (present-day Aynalem). As a successful economic actor, Assefa Tela maintained substantial agricultural holdings of approximately 17.5 hectares (measured traditionally as 70 tsimdi), managed a salt trading caravan of many camels to the Afar Depression, and owned significant livestock assets including numerous cattles (Ibid).

St. George's Church in Aynalem, constructed in 1944 G.C., was financed by Haleqa Assefa and realized through the collective efforts of the local community. Building materials were transported from Des'a using Haleqa Assefa's own logistical resources like camel and Mule. The church was

designed in the traditional Hidmo architectural style and required two years to complete. Skilled Arab craftsmen, Mohamed and Sheriff, were responsible for the high-quality doors and windows. Notably, Rasi Seyoum was among the prominent figures who attended services at this church.

Structural modifications were made over time: in 1964 G.C., the original roof was replaced with corrugated iron sheets, and by approximately 1998 G.C., the church underwent a comprehensive reconstruction, adopting a new architectural design. Despite these changes, the church remains operational today (Ibid).

Haleqa Assefa Tela married Tsehaynesh Gebremaryam in 1919 G.C., when he was 28 years old and his wife was around 10 years old. Together have seven children, only two of them are still alive as of this documentation taken, named Halefom Assefa Tela (80 years old), and Eanda Assefa Tela (she had sick seriously). At the age of 69 Haleqa Assefa has passed away suddenly with no sickness, in 1960 G.C., his legacy still includes substantial urban land property holdings in Mekelle's Romanat Square, demonstrating the diversified economic strategies employed by successful Tigrayan agro-pastoralists in the 20th century. Key informants (Mr. Halefom Assefa Tedla and W/ro. Muluworq Assefa Teklu, wife of Belay Assefa). See the family tree figure.

4.5.4. Haleqa Assefa Tedla Hidmo House

Haleqa Assefa Tedla was a rich landowner who possessed extensive agricultural holdings, livestock, and pack animals used for farming, transporting construction materials and salt. Given the socioeconomic context of the time, only wealthy farmers or individuals holding governmental authority could afford to own a large (mansion) Hidmo house. As part of his first marital settlement, Haleqa Assefa constructed a substantial Hidmo in 1930 G.C., measuring 12.27 meters in width, 7.53 meters in hight, and 6.10 meters in depth, UTM coordinate lay in 13°27'19.6"N 39°29'11.0"E to oriented toward the south and designed with multifunctional utility in mind.

For centuries following the decline of Tigrayan civilization and until the second Italian invasion in 1935 G.C., traditional construction tools such as the Iskarbelo (pointed and flat chisel), Megihofya (shovel), Melakino (crowbar), Medosha (mash hammer), and Binta (steel wedges) remained unknown in the region. Consequently, pre-1935 structures were primarily built using small surface-level stones, reflecting the limited technological advancements in construction methods during that era. (KI8, KI9)

According to KI8, KI9, (the son of Haleqa Assefa and wife of Belay Assefa), the compound in Mete’re (Aynalem) was established on previously uncultivated farmland. The site was characterized

by abundant groundwater reserves, which supported irrigation, as well as expansive grazing pastures for livestock, a feature that persists to this day.

Haleqa Assefa Tedla Family Tree and Current Owners of the Hidmo House.

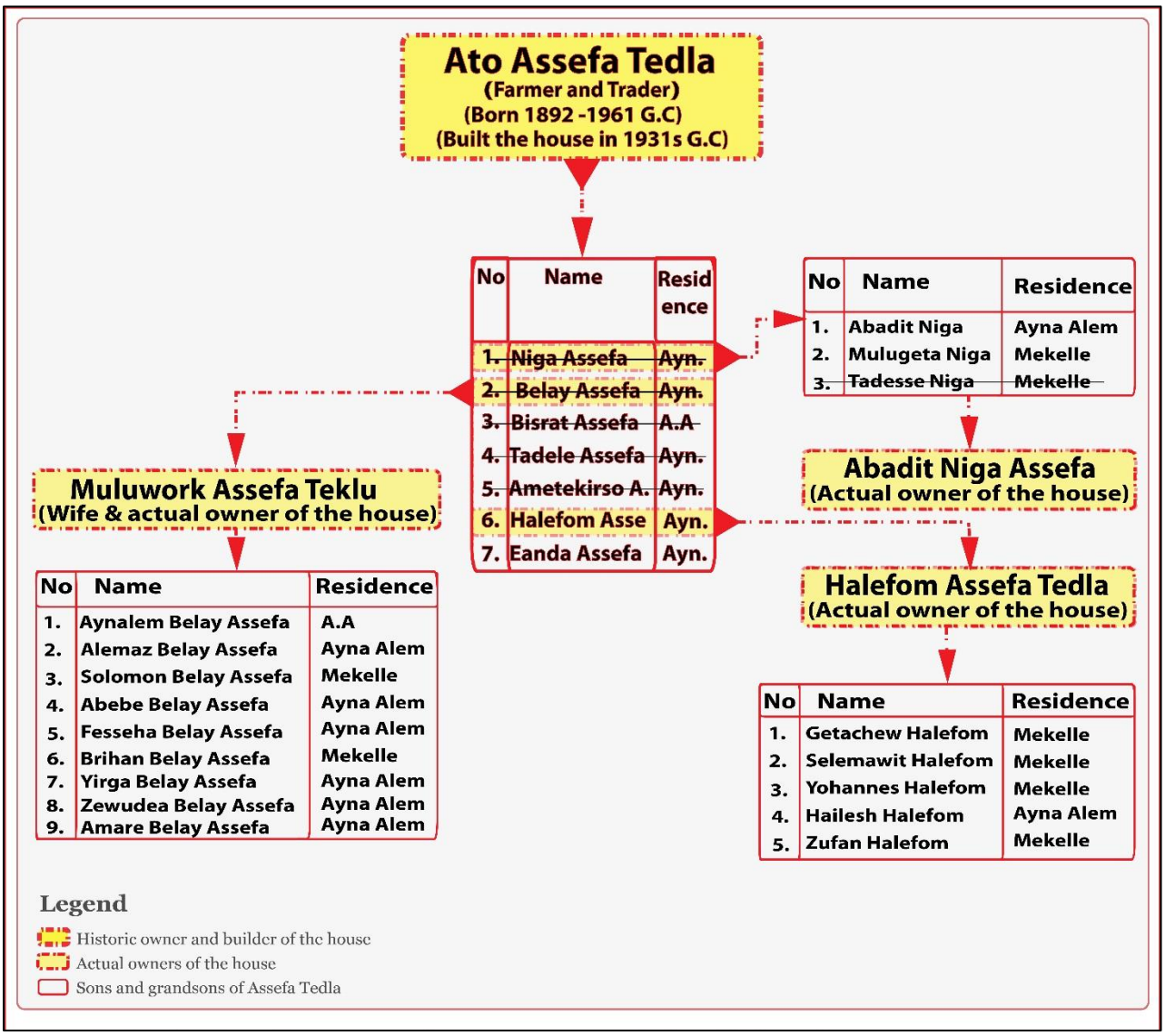


Diagram 9: Ato Assefa Tedla Family Tree and Current Owners of the Hidmo House. Own Survey, 2020.

4.5.4.1. The Architectural Style, Composition and Construction Evolution of Haleqa Assefa's Compound

It is characterized by its cuboid form, representing a distinct phase within the broader compound. The compound exhibits a blend of two distinct architectural styles, reflecting its phased construction. The predominant older design follows the traditional Hidmo roof structure, while one section features a

more modern G+1 building with a corrugated iron sheet roof. The division within the compound allows for a clear distinction between construction periods, with the relative age of each structure discernible through variations in stone size and masonry techniques. Notably, one of the G+1 buildings originally incorporated both a Hidmo roof and a corrugated iron sheet covering, suggesting a transitional phase in construction methods. This classification is derived from a comprehensive analysis of the construction timeline, as well as the nostalgic and authentic elements embedded in the compound's design. Key factors such as the specific construction techniques and the type of stone used, including stone size and dressing methods, contribute to the identification of each building's stylistic phase. Additionally, insights gathered from interviews with the compound's owners and residents further validate these architectural distinctions, offering a deeper understanding of the historical and aesthetic significance of the structure.

The compound is strategically situated on a peak area, with a 4-meter elevation difference that influences its spatial organization. This topographical feature results in semi-underground rooms on the lower levels and elevated upper-floor spaces. Interestingly, the primary façades of the buildings face south and west, an orientation that deviates from conventional Hidmo building practices, which typically avoid such exposures due to climatic and structural considerations. This divergence highlights an adaptation to site-specific conditions or evolving functional needs over time.

Compound Before 1942 G.C.

Compound Before 1950 G.C.

Compound Before 1960 G.C.

Figure 8: 3-D Models of the Site Through Time. Source, Mulugeta Fisseha.With Some Modification of the Years.

4.5.4.2. Transformation and Fragmentation of a Historic Compound of Haleqa Assefa Tedla

The transformation period of the compound reveals a dynamic interplay between family divisions, individual ownership aspirations, and architectural evolution. Originally spanning thousands of square meters, encompassing a backyard garden and stall, the compound has since been fragmented into three distinct sections due to diverging family interests. Despite this division, the compound retains its remarkable character. *The first compound,* historically the oldest mansion house, was initially owned by Belay Assefa and is now under the stewardship of his widow, Muluworq Assefa. This section remains relatively intact, with the Hidmo house, kitchen, and store room preserving their original structural integrity. *The second compound,* inherited by Ato Niga Assefa and currently owned by his daughter Abadit Niga, features a Hidmo corrugated house in good condition, though recently some traditional elements have been modernized, notably the roof, which now incorporates a cement-framed design. *The third compound,* belonging to Halefom Assefa, has undergone more extensive modifications, including the complete replacement of the Hidmo house roofs and the recent conversion of the kitchen's earthen roof to corrugated material. While these alterations reflect inaproprate adaptive reuse, they also underscore the urgent need for targeted preservation efforts to safeguard the compound's historical and architectural significance amidst ongoing transformations.

Figure 9: Compound Fragmentation of Ato Assefa Tedla Hidmo House. Sources, Mulugeta Fisseha, 2024 G.C. With Some Modification of the Compounds Arrangement.

4.5.4.3. Spatial Organization and Functional Adaptations of the Compound

The upper-level rooms feature corrugated iron sheet roofing and are extensively fenestrated on all sides to maximize natural light and ventilation. Access to these spaces is provided by an exterior stone staircase and an interior wooden ladder, with an adjoining open-air balcony serving as an intermediate transitional zone. In contrast, the traditional ground-floor Hidmo space functions as a multifunctional communal area accommodating daily living, dining, and sleeping activities. Adjacent to this central space is the semi-elevated Debri storage room, accessible only from within the main living area. While the Debri contains windows comparable in size to those on the upper floors, the main living quarters feature narrow apertures designed specifically for airflow rather than illumination or views.

The original layout includes a wushate area, typically partitioned into two sections for sleeping or storage in most Hidmo dwellings, though this particular compound divides it into three compartments to accommodate a mule. Traditional decorative elements, such as wall-mounted plates, contribute to the aesthetic character of the space. Notably, one structure initially built for salt storage - identifiable by its undecorated roof supports (Muhuts) - was later repurposed as a bedroom prior to its demolition. The first-floor (G+1) rooms exhibit distinct architectural features, particularly in their window configurations, and consist of two interconnected chambers: one serving as a honeymoon suite and the other as the family head's private quarters, reflecting the hierarchical organization of domestic spaces within Hidmo architecture.

4.5.4.4. Analysis of Construction Techniques, Material Applications, and Adaptive Features of The Compound

1. Material Selection and Wall Construction Techniques

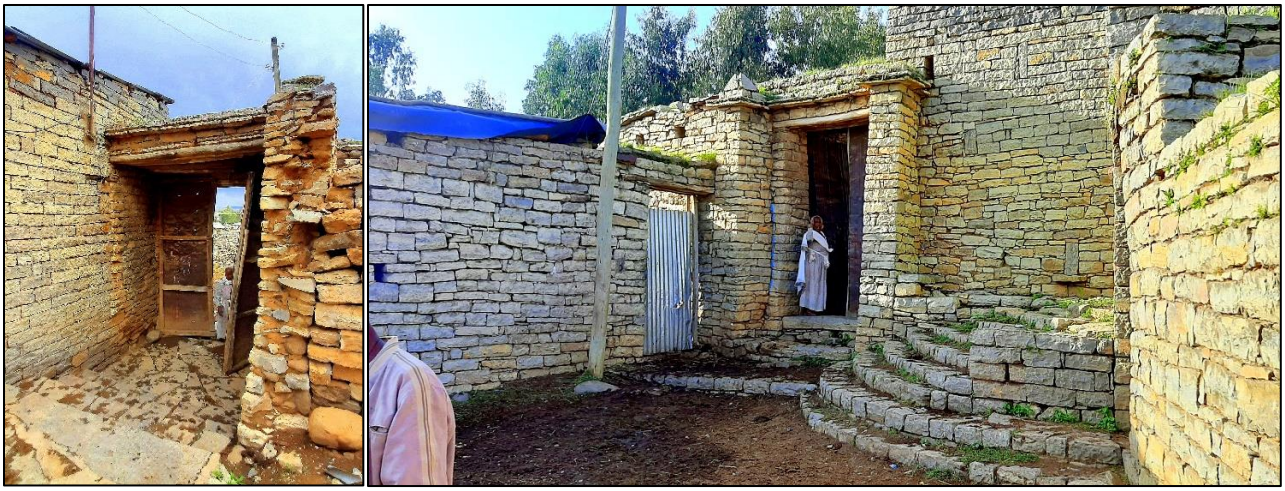
The compound demonstrates strategic use of LBM or locally sourced stones, primarily limestone, sedimentary, and water-resistant basalt for foundations, selected based on structural requirements and availability. Builders employ two distinct wall systems: (1) *Coursed Rubble Masonry*, typically less finely dressed than ashlar masonry, manly for fencing but in this compound they enhanced with alkaline soil mortar for stability, using irregular stones with unaligned courses. And, (2) *Coursed Square Masonry*, mortared or tightly fitted square or rectangular shapes in horizontal layers, 70% of structures, featuring partially dressed stones with systematic alkaline soil mortar application for durability, not DSW.

Picture 50: Typecally Coursed Rubble Masonry (CRM), and Coursed Square Masonry (CSM), With MW Technique of the Compounds. Field Survey, 2020.

2. The Porch (Dege-Selam/Dejeselam):

The *Dege-selam* serves as the principal entrance to the compound, embodying both ceremonial and utilitarian functions within Hidmo architecture. While maintaining the characteristic Hidmo roof design, this particular *Dejeselam* distinguishes itself through its unique wall layout and intermediate size compared to other compounds. Traditionally multifunctional, used for storing farming tools, providing shelter for animals, and even accommodating poultry through auxiliary wooden structures, the *Dejeselam* in this compound has been refined to emphasize its symbolic roles: establishing spatial hierarchy at the main entrance and serving as a welcoming space.

This selective preservation of functions highlights a deliberate prioritization of architectural symbolism over practical versatility, reflecting either the compound's elevated status or evolving spatial needs. The *Dejeselam's* reduced utilitarian role contrasts with its continued ceremonial importance, demonstrating how traditional spaces adapt to changing socioeconomic contexts while retaining core cultural meanings. The design maintains the roof's traditional form, a critical aesthetic link to Hidmo identity, even as its wall configuration asserts individuality within vernacular typologies. However, recently its nearby kitchen wall has demolished and it may affect its structural strength.



Picture 51: The Dege-Selam (Porch) Current Situation of the Compound One. Field Survey, 2020.

3. The Kitchen and Storage Complex:

This Hidmo compound exhibits an elaborate spatial organization that exceeds typical domestic arrangements, featuring specialized rooms that reflect both traditional design principles and adaptive innovations. The kitchen, storage areas, and horse stable demonstrate intentional variations in scale and fenestration, these utilitarian spaces maintain the general Hidmo construction approach but with smaller windows compared to living quarters. A notable departure from vernacular norms appears in the kitchen's ceiling construction: where traditional Hidmo compounds typically employ large slate rocks (*Qetsela*) or thin wood panels, this kitchen utilizes untreated bamboo and wood planks (*Mohots*), prioritizing cost-efficiency and ease of installation over conventional methods. While the bamboo provides visual interest, its structural implementation lacks the precise arrangement of *Serait* beams, diminishing the ceiling's aesthetic coherence.

Storage facilities in the compound reveal a sophisticated hierarchy of space utilization. Three distinct storage types coexist: (1) an autonomous, fully-realized Hidmo storage structure with characteristic small windows on all sides; (2) an integrated storage room within the G+1 residence, accessible only internally and featuring a single large window; and (3) the traditional *Debri* storage space, located in the main house with stone stair access. This tripartite system suggests functional specialization, potentially separating crop storage from salt preservation, while maintaining the cultural primacy of the *Debri* as the principal storage locus in Tigrayan domestic architecture.

The roofing of ancillary spaces serves dual purposes: storage and horse room ceilings double as first-floor balconies, demonstrating the compound's efficient use of vertical space. These technical and organizational variations highlight the compound's exceptional status while preserving the Hidmo's

fundamental architectural language, a testament to both the typology's adaptability and the residents' nuanced understanding of spatial functionality within vernacular parameters.

Picture 52: Rain Lekage and Smoke Damages of the Kitchen Cellings. Field Survey, 2020.

4. The Stall (Dembe): Spatial Organization and Adaptive Design in Hidmo Animal Husbandry

The DM represents a dedicated zone for livestock management within the Hidmo compound, strategically positioned adjacent to the *Mereba* (central courtyard) and preceding the main entrance in this particular configuration. This spatial arrangement underscores the integral role of animal husbandry in the household's daily operations while maintaining a clear separation between human and animal domains.

In this compound, the *Dembe* exhibits an unconventional design approach compared to traditional Hidmo standards. While most *Dembe* feature roofed structures for shade protection, this implementation opts for an open-air configuration, relying solely on partitioning walls to demarcate distinct sections for different livestock species (cows, oxen, and camels). This roof-less adaptation may reflect:

1. Climatic considerations (exploiting natural ventilation in specific microclimates)
2. Material economy (reducing construction demands)
3. Operational preferences (facilitating manure management or feeding routines)
4. Containing many cattles (advanced animal management with different livestock species)

The specialized zoning within the *Dembe* demonstrates sophisticated understanding of animal behavioral needs, with separate areas accommodating the different requirements of various livestock species. Its prominent placement near the entrance suggests either:

- Practical considerations for daily husbandry activities
- Symbolic representation of livestock's economic value
- Historical evolution of compound layout.

5. Staircase Systems: Functional Diversity and Material Innovation

The compound employs four strategically designed staircases, two interior and two exterior, to connect its multi-level spaces (ground floor, underground rooms, first floor, and balcony). Exterior stone staircases (70-90cm wide) feature dressed stone construction matching the mortared walls, with passageway doors for security. These demonstrate cost-effective vernacular engineering, though requiring more material than modern cement alternatives.

Interior circulation shows unique hybrid construction:

- Main Hidmo's semi-underground access combines stone (lower) and wood (upper) sections, accommodating a passageway.
- Debri access stairs transition from stone to wood, with an innovative inclined wooden lintel
- Former wooden ladder systems (now absent) were fully panel-based, as verified through oral history.

The exterior stairs' dual functionality, providing roof balcony access while servicing the repurposed first-floor storage space, highlights adaptive reuse of traditional circulation elements. This staircase network reveals sophisticated spatial planning balancing material properties, structural requirements, and changing functional needs in vernacular architecture.

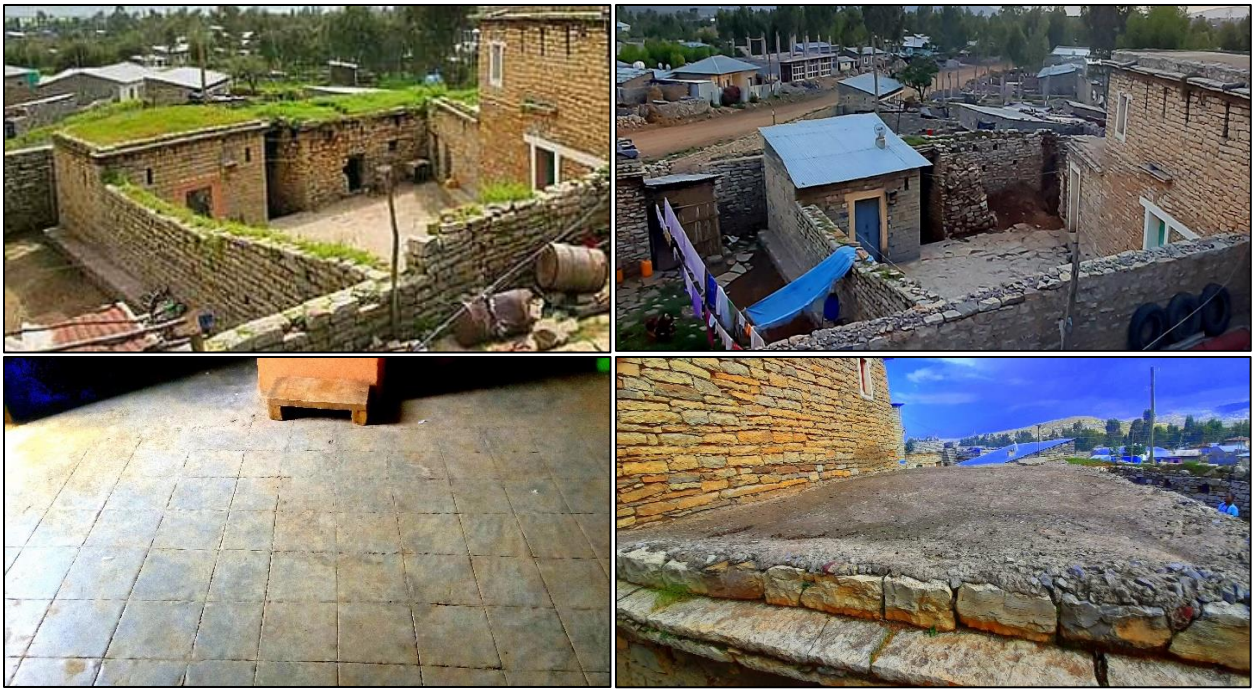
4.5.4.5. Adaptations, Modifications, and Current Status of the Compound

The three compounds demonstrate distinct approaches to preservation and adaptation, shaped by the owners' economic capacity, spatial preferences, and perceived architectural value. While two owners have limited modifications due to financial constraints, avoiding cement-based repairs to maintain traditional integrity, all compounds face persistent technical challenges, particularly roof leakage

during rainy seasons. These issues range from requiring major repairs to temporary patchwork solutions. Researcher observations suggest that one G+1 building's roof was likely altered significantly in the past, as evidenced by its current condition. To clarify the compounds' current state and document changes systematically, the analysis divides the site into three zones, aligned with existing family boundaries for accurate assessment of each area's unique adaptations and preservation challenges.

Compound One: Exemplifies the tension between functional adaptation and heritage preservation in Hidmo architecture, where only two authantic structures remain operational, while the other kitchen are demolished and the storage room roof part is replaced by corrugated, now the main Hidmo building and a smaller ancillary unit repurposed as a kitchen-storage space. Chronic roof leakage previously damaged structural timber and wall plaster, prompting radical interventions a decade ago that replaced the traditional compacted earthen roof with a reinforced concrete slab and overlaid the original *Nora* earth plaster with cement mortar. The sunken earthen floor was leveled with the entrance and converted to concrete, while the damaged ceiling, now painted red, exhibits a texture distinct from yet superior to other compounds. These modifications resolved water infiltration but introduced material dissonance, altering the building's bioclimatic performance (concrete roofs disrupt thermal mass regulation) and aesthetic authenticity (obscuring earth-based finishes). The case highlights how vernacular structures balance urgent repairs with cultural continuity, where modern materials ensure durability yet risk eroding architectural identity through cumulative technical compromises, from floor elevation changes to synthetic surface treatments, that prioritize utility over heritage values.

Critical Analysis: While these modifications resolved functional issues (notably water damage), they introduced material and formal dissonances within the Hidmo architectural language. The concrete roof slab, though effective for waterproofing, disrupts the original thermal mass behavior, while cement plaster obscures the expressive earth-based surfaces characteristic of Tigrayan vernacular architecture. The floor elevation change and ceiling painting further exemplify pragmatic compromises that prioritize utility over heritage continuity. This case underscores the tension between preservation and modernization in vernacular structures, where technical solutions often come at the cost of cultural authenticity.



Picture 53: Demolished and Replaced Parts of the Oldest Compound One. Field Survey, 2020.

Compound Two: This compound exemplifies sophisticated vernacular construction techniques, featuring shear walls that accommodate elevation differences while creating leveled ground floors and semi-underground spaces. Originally comprising two storage rooms, a horse stable, and a main building with first-floor quarters, the structure has undergone significant modifications to suit contemporary needs. Key alterations include blocked first-floor access points, three of four original entrances are now sealed, leaving only an external stone staircase functional. The first floor, initially designed for wedding gatherings and family use (evident from its multiple windows and doorways), has seen its accessibility reduced dramatically. Similarly, a former multi-granary store room, once accessible via both exterior and interior 150cm-high doors, has been converted into a bedroom, with its main entrance replaced by a window.

The compound's most pressing issue remains roof sustainability. While the first floor now has a corrugated iron roof, the tool store retains its traditional earthen roof, both previously patched with temporary plastic sheeting against leaks. Recent interventions have introduced concrete cement roofs, altering the architectural character, original soil roofs and parapet stone walls have been replaced with cement slabs and hollow concrete blocks. Floor finishes also reflect this hybridity: the main room features modern cement flooring, while other spaces retain traditional dung-plastered earthen floors.

Picture 54: Replaced Roof Facade of the Old and Current look of Compound Two. Field Survey, 2020, and 2025 G.C.

In the eastern section, chronic water infiltration has degraded wooden roof supports, leading to the collapse of the store room's ceiling. A temporary solution, thick black plastic sheeting, highlights the ongoing struggle between preservation and functional necessity, underscoring how ad hoc repairs risk further eroding the structure's heritage value while addressing immediate vulnerabilities.

Compound Three: exemplifies the profound transformation of Hidmo architecture through extensive material and functional modifications. The wholesale replacement of traditional roofs with corrugated iron sheets and complete facade alterations demonstrates a prioritization of modern convenience over vernacular principles, fundamentally altering the building's thermal performance and aesthetic integrity. The kitchen's conversion - featuring a concrete upper roof and cement-rendered walls - particularly illustrates this shift, where utilitarian needs eclipse traditional construction knowledge. Three obsolete east-facing doors (140cm × 65cm) stand as silent witnesses to the compound's original spatial logic, their diminutive proportions suggesting specialized historical functions now lost to contemporary use patterns. The kitchen's sophisticated tripartite organization (baking area, firewood storage, and crop room) reveals advanced vernacular planning for communal living, its current underutilization reflecting broader socioeconomic changes in household structures. These modifications present a heritage paradox: while improving weather resistance, they sacrifice the bioclimatic intelligence and social functionality intrinsic to Hidmo design. The compound's evolution underscores the challenges of maintaining architectural relevance amidst changing needs, where each intervention - from material substitutions to spatial reconfigurations - cumulatively distances the structure from its cultural roots while attempting to ensure its continued habitability. This case highlights the urgent need for documentation of original features and development of hybrid

solutions that might better balance preservation with modernization, particularly for functionally significant spaces like the kitchen that embody traditional ecological knowledge.

4.5.4.6. Effects of Damage on Cultural and Functionality of the Compound

The damamge and division of the compound through modernization have significantly compromised both its cultural and functional integrity, leading to a gradual erosion of its socio-architectural value. Originally designed as a cohesive unit fostering social cohesion, the compound historically served as a communal gathering space for family and community activities. However, its fragmentation has disrupted these vital social interactions, altering spatial relationships and undermining associated cultural practices, thereby diminishing its identity and cultural significance. The substitution of traditional materials, selected for their thermal efficiency, sustainability, and climatic adaptability, with modern alternatives has further degraded the architectural authenticity. Functional transformations, such as converting food storage areas into bedrooms and repurposing animal rooms as kitchens, have distorted traditional spatial hierarchies and utilitarian logic. Notably, the cultural symbolism of the *Dejeselam* (porch), once a ceremonial welcome space, has been diluted, as division necessitates multiple entrances, stripping the porch of its original hierarchical prominence.

Material and Modernity Paradox: The replacement of traditional earthen roofs with corrugated iron on upper floors exemplifies the tension between contemporary convenience and cultural continuity, while solving leakage issues, the metal roofing disrupts the structure's thermal inertia and acoustic properties, fundamentally altering the sensory experience of these historically climate-responsive spaces. In another word, these cumulative alterations reflect a broader tension between preservation and modernization, where pragmatic adaptations come at the cost of cultural continuity and architectural coherence, ultimately threatening the compound's legacy as a living heritage site.

4.5.4.7. Cultural Significance and Preservation Challenges of the Hidmo Compounds

The Hidmo house transcends its function as mere shelter, embodying the cultural identity, historical continuity, and environmental adaptation of the Tigrayan people. Its design, featuring thick stone walls for thermal regulation and compacted soil roofs for waterproofing, demonstrates an ingenious response to local climatic extremes, utilizing readily available materials to create sustainable living spaces. As Chibsa (2020) notes, the construction process itself is a socio-cultural ritual, fostering communal cohesion through collective labor while serving as a rite of passage for young men establishing families, as exemplified by Haleqa Assefa Tela’s personal narrative.

The compound's cultural value manifests in multiple dimensions: (1) as an architectural archetype reflecting indigenous knowledge of bioclimatic design (hot/dry season insulation, rainy season protection); (2) as a social arena facilitating ceremonial gatherings that reinforce communal bonds; and (3) as a tangible heritage artifact preserving construction techniques passed intergenerationally. However, this heritage faces existential threats from modernization (inappropriate material substitutions like corrugated roofing and cement roof as well as floor part), ecological degradation (deforestation of key timber species like *Olea europaea*), urban expansion, and conflict. Despite lacking formal heritage status, grassroots and institutional efforts to safeguard remaining compounds highlight their recognized cultural importance, though often inconsistently applied.

The spatial organization of Hidmo compounds, with specialized rooms, courtyards, and transitional spaces like the *Dejeselam* porch, encodes Tigrayan social values and daily practices. Their progressive erosion through subdivision and functional repurposing (e.g., converted storage rooms, multiple kitchens) not only diminishes architectural authenticity but also disrupts the socio-spatial rituals these structures were designed to accommodate. This tension underscores the urgent need for holistic preservation strategies that address both material conservation and the perpetuation of associated cultural practices.

4.5.4.8. Rationale for Focused Documentation on Site Plot Map of Compound One

The decision to limit the site plot map to Compound One, the oldest original Hidmo structure, was guided by both practical constraints and methodological considerations inherent to vernacular architectural documentation. Creating accurate plot maps and elevations of historic compounds presents several challenges: (1) Structural Complexity - Later additions and modifications to adjacent compounds often obscure original construction phases, requiring disproportionate time for phased documentation; (2) Material Ambiguity - Mortarless stone construction and organic material decay in secondary buildings complicate precise measurement of original dimensions; (3) Time-Intensive Processes - The irregular stone coursing and non-orthogonal geometries characteristic of Hidmo architecture demand 3-4 times longer to survey than rectilinear modern structures (per ICOMOS 2021 standards); and (4) Conservation Priority - As the oldest surviving section, Compound One exhibits the most intact examples of traditional construction techniques, from its shear wall configuration to original roof assemblies, making it the most critical subject for baseline documentation before assessing later adaptations. This focused approach follows UNESCO's (2017) recommendation to

prioritize "most significant fabric" when resources are limited, while still enabling comparative analysis of spatial organization principles that inform the broader compound layout.

4.5.4.9. Site Plot Map of Compound One

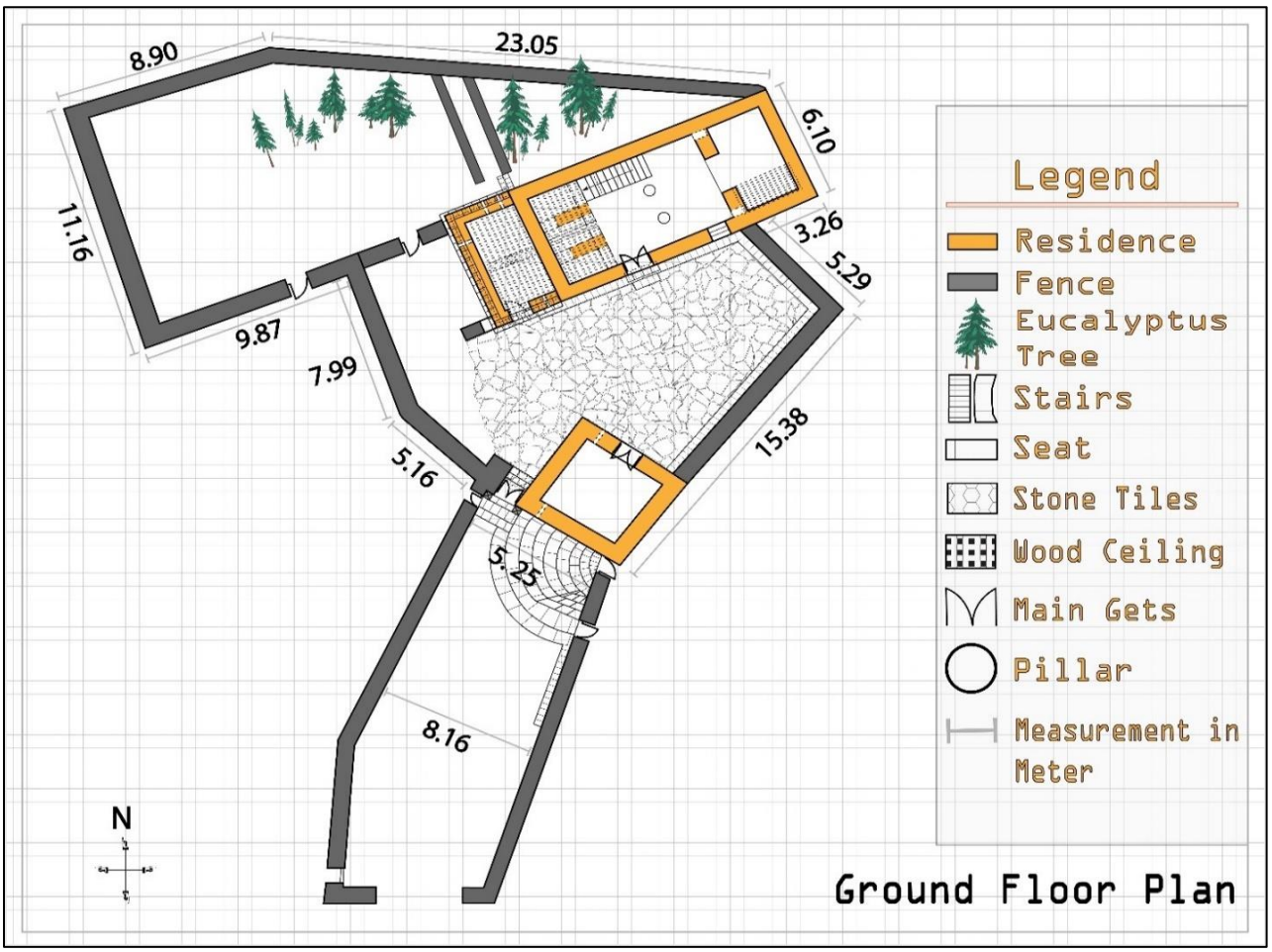


Figure 10: Site/ Plot Map and Ground Floor Plan of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

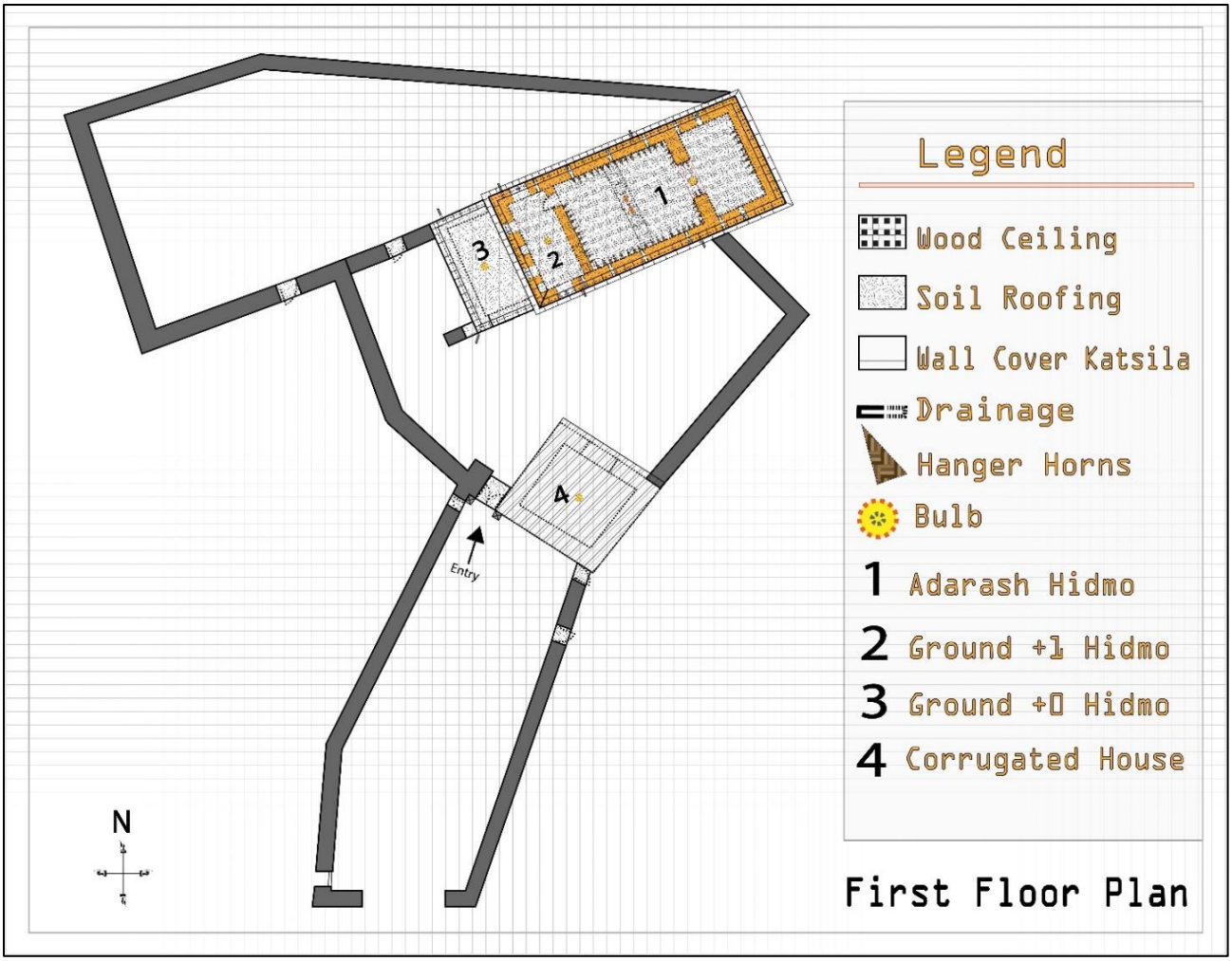


Figure 11: Site/ Plot Map and First Floor Plan of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

4.5.4.10. Elevations of Compound One

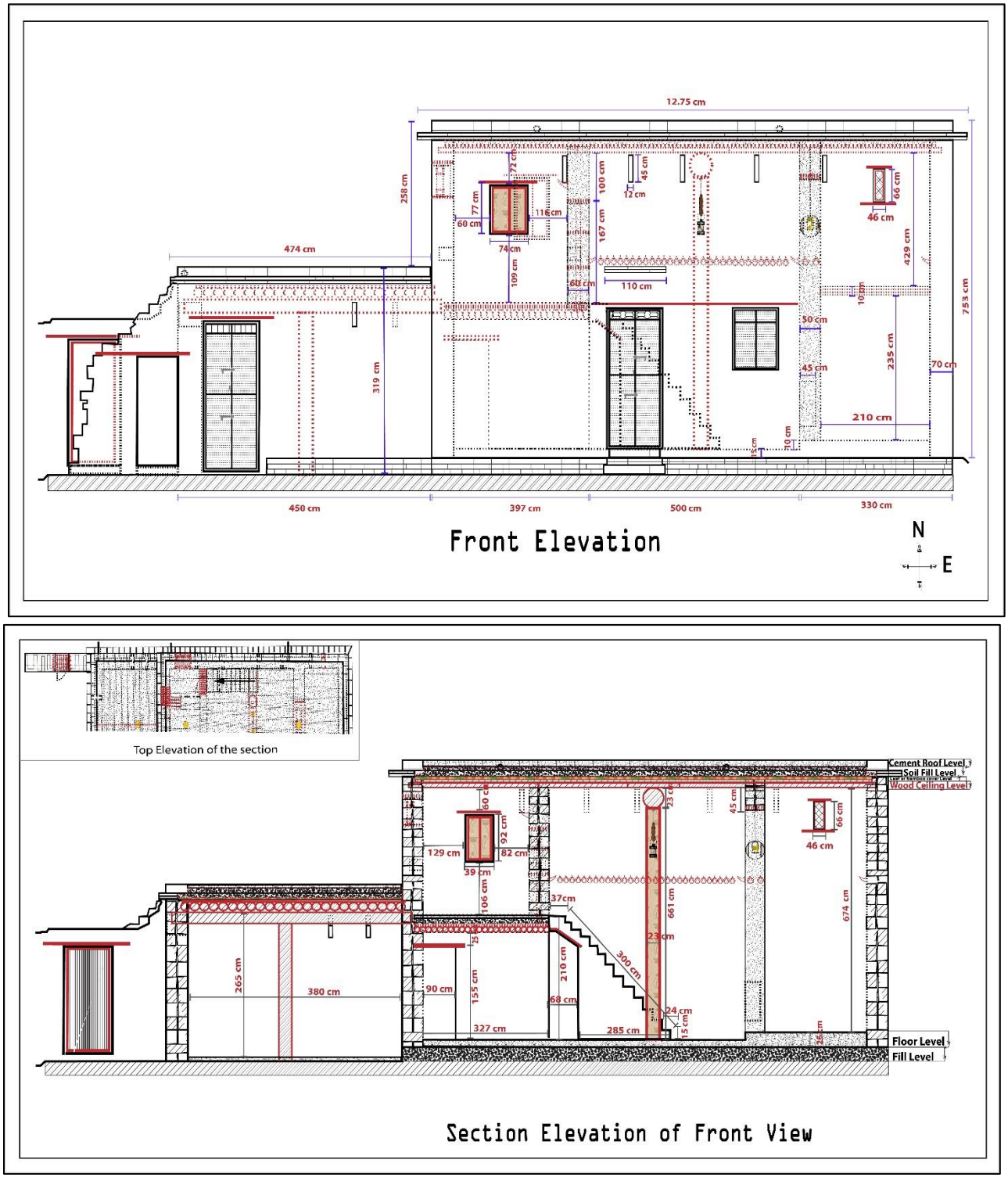


Figure 12: Front and Front Section View of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

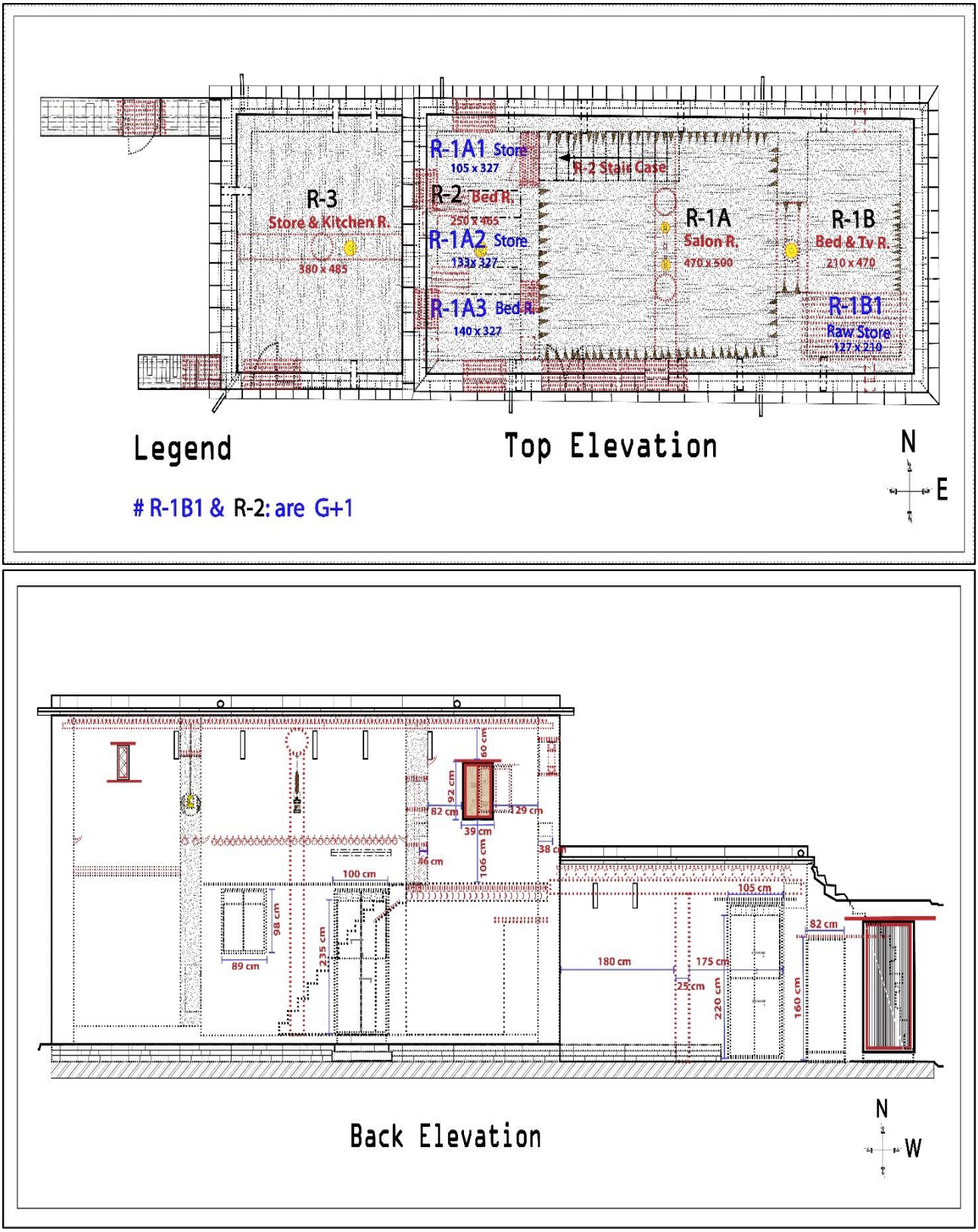


Figure 13: Top and Rear View of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

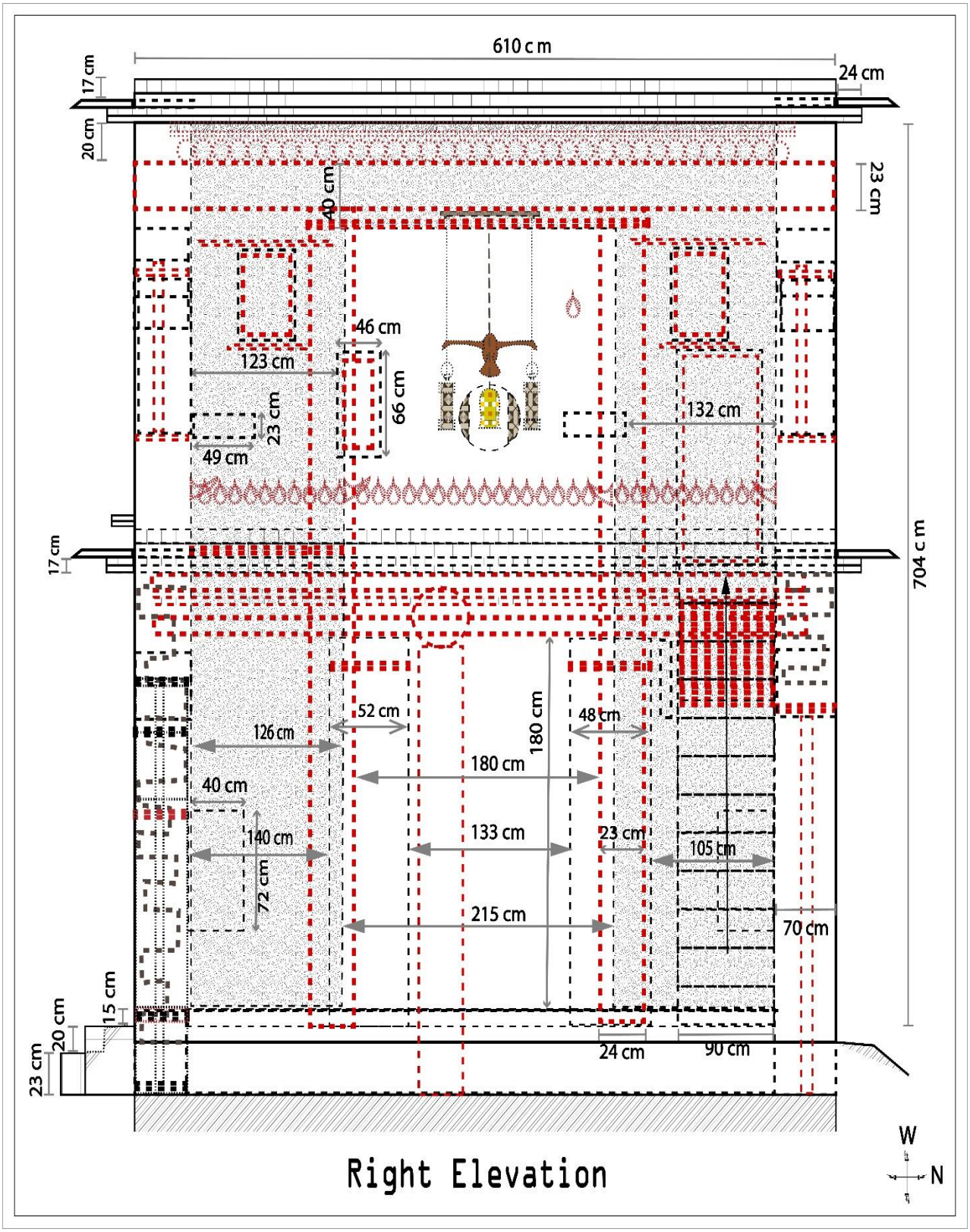


Figure 14: Right View of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

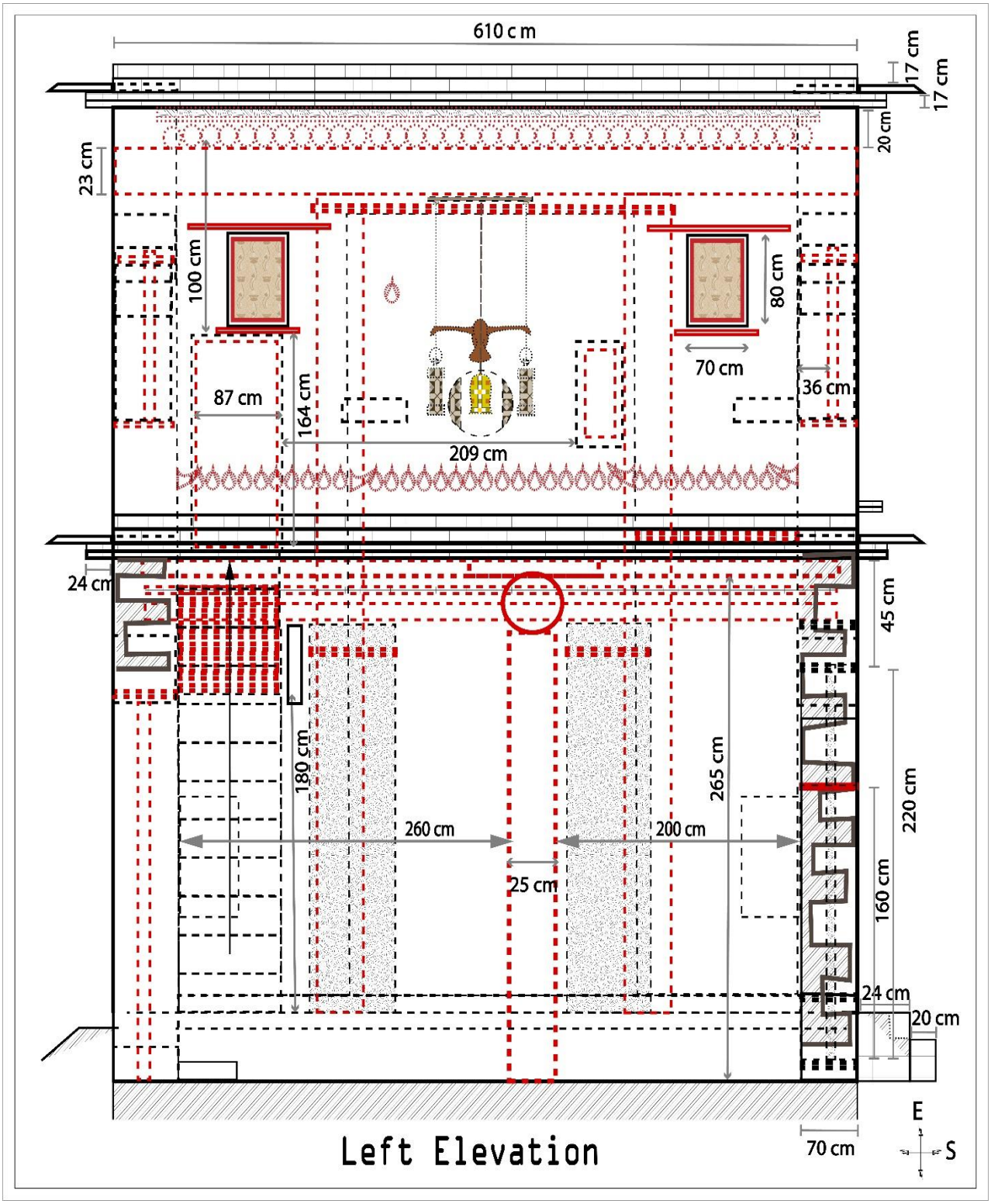


Figure 15: Left View of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

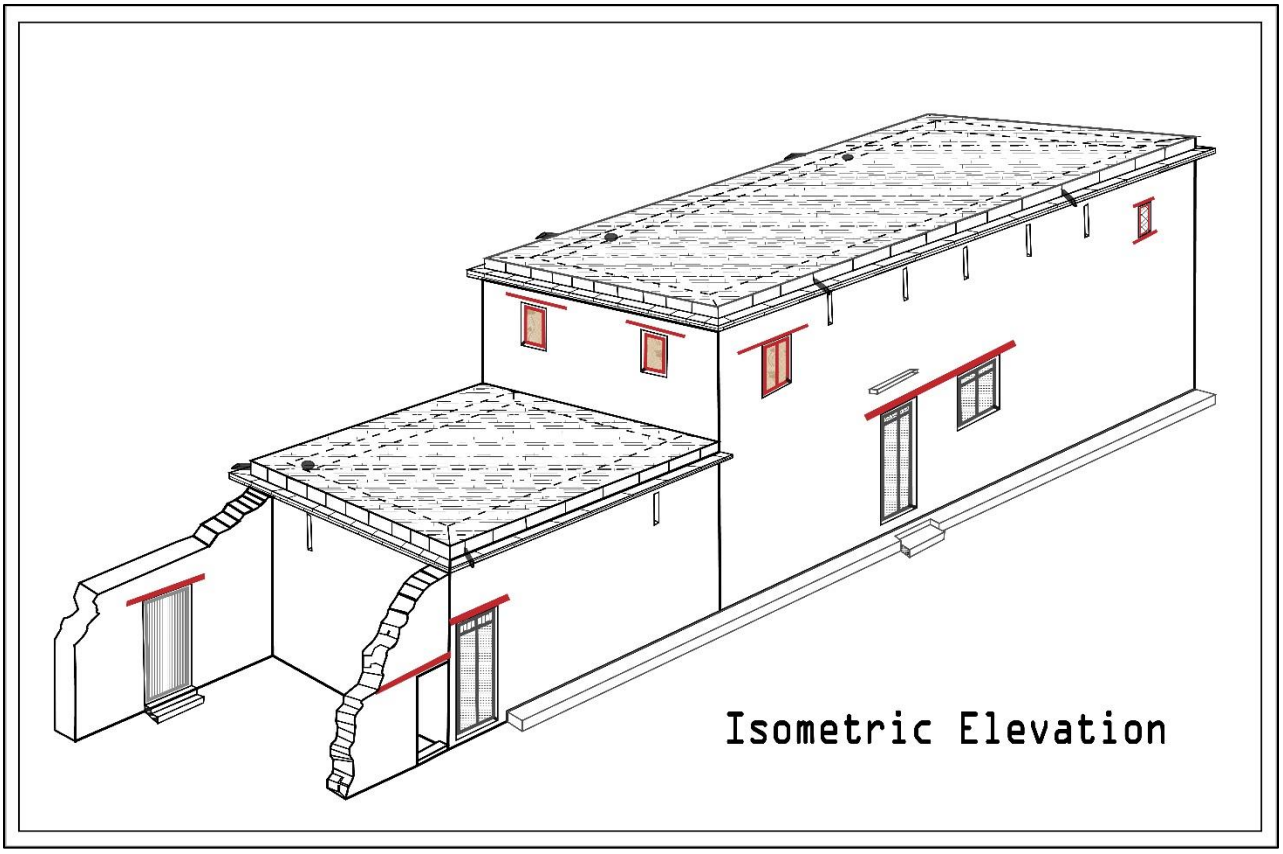


Figure 16: Isometric View of Ato Assefa Tedla Hidmo House. Made Using Adobe Illustrator, 2020.

4.5.5. Addressing Documentation Gaps in Vernacular Architectural Research: Critical Corrections to the Historical and Technical Record of Haleqa Assefa Tela's Hidmo Compound.

This study identifies and rectifies several substantive gaps in prior scholarly documentation (Mulugeat Fisseha, 2024) concerning Haleqa Assefa Tela's Hidmo house, which collectively undermine the accuracy of its architectural and historical record. First, the toponymic discrepancy, where the original settlement name *"Mete're"* (verified by multiple oral histories) was erroneously recorded as "Batere", requires correction to preserve the site's cultural geography. Second, the construction date of 1930 G.C., verified through cross-referenced oral testimonies and historical analysis, supersedes the previously cited 1920 EC/1927 G.C. dating, and create a mischornological order to the construction adaptations, which appears to stem from calendrical miscalculations or less cross check analysis. More critically, the misclassification of wall masonry typologies, wherein mortared stone construction was inaccurately conflated with dry stone techniques, demands technical rectification, and corelate with the types of wall masonary. As these systems entail distinct structural behaviors, material compositions (e.g., *Baekhel* mortar use), and seismic performance characteristics

(Asrat & Nebiyat, 2022). Additionally, the forgotten of demolished kitchen structures from the historical record and 3D modeling process as well as the erroneous dimensional data for the mansion house (likely due to asymmetrical wall measurements common in vernacular construction) have compromised the fidelity of prior reconstructions. By addressing these gaps, through archival verification, photogrammetric correction, and ethnohistory validation, this research not only corrects the record but also establishes a more rigorous methodological framework for documenting Hidmo architecture, one that integrates oral historiography with technical building archaeology to account for vernacular architecture's inherent material and temporal complexities.

Key Corrections:

- Toponymic accuracy: "Mete're" → "Batere"
- Chronological Precision: 1930 G.C. construction date.
- Masonry Reclassification: Mortared vs. dry stone distinctions.
- Spatial Completeness: Kitchen inclusion in historical record and 3D modeling.
- Metrological Rigor: Corrected mansion dimensions.

4.5.6. How do the Preservation Challenges and Threats Facing Hidmo Houses Compare to the Preservation Issues for Other Forms of Vernacular Architecture in the Region?

Based on the findings, the preservation challenges and threats facing Hidmo houses in Mekelle, Tigray, Ethiopia, are reflective of broader issues encountered by other forms of vernacular architecture in the region. Both Hidmo houses and other vernacular structures are primarily affected by modernization, urbanization, and the influence of new construction techniques and materials, which result in a loss of architectural and cultural values.

Specifically, Hidmo houses are facing threats due to neglect, improper treatment, and a lack of awareness about their heritage value. These factors contribute to their demolition as modern architectural styles become more prevalent. The spread of globalization has further compounded these threats by introducing competing cultural influences that overshadow local traditions and practices.

Similarly, other forms of vernacular architecture in Tigray face challenges such as rapid urbanization, which leads to the destruction of traditional structures without proper planning. This not only diminishes the cultural memory of the region but also threatens the sustainability of local construction practices that are environmentally friendly and climate-responsive.

Furthermore, there is a general lack of official and public awareness concerning the value of vernacular architecture, which hampers the development of local skills such as traditional craftsmanship. This lack of awareness is a common issue for vernacular structures throughout the region, not just for Hidmo houses.

In summary, while Hidmo houses in Mekelle face specific challenges such as neglect and modernization pressures, these issues are indicative of broader regional threats to vernacular architecture, including urbanization, loss of cultural heritage, and insufficient awareness and appreciation of traditional building methods. Addressing these challenges requires comprehensive documentation, preservation strategies, and increased public and official recognition of the intrinsic value of these architectural forms.

4.5.6.1. What Specific Strategies or Recommendations Does this Study Propose for Effectively Documenting and Preserving the Hidmo Vernacular Architecture?

The study on the vernacular architecture of Hidmo houses in Mekelle, Tigray, Ethiopia, proposes several strategies and recommendations for effectively documenting and preserving these traditional structures. The core objective is to safeguard the cultural and architectural heritage that Hidmo houses represent, particularly in the face of modernization and urbanization pressures. Here are the specific strategies and recommendations outlined in the study:

1. **Assessment and Documentation**: The study emphasizes the importance of thoroughly assessing the current preservation practices, construction methods, materials, and forms of Hidmo houses. This involves creating detailed documentation of existing structures to preserve their architectural integrity and historical significance.
2. **Identification of Demolition Causes**: Identifying the main causes of Hidmo house demolition is crucial. These include rapid urbanization, modern architectural influences, and a general lack of awareness about the value of these traditional structures. Addressing these factors is essential for developing effective preservation strategies.
3. **Retention Mechanisms**: The study suggests developing retention mechanisms to preserve Hidmo houses. This includes creating a management plan that incorporates the preservation of both tangible and intangible heritage values. The plan aims to maintain the historical memory of the city and enhance its cultural landscape.

4. **Tourism and Community Engagement**: Promoting Hidmo houses as tourist attractions can generate income and create job opportunities for local communities. This approach not only aids in preservation efforts but also raises awareness about the cultural significance of Hidmo architecture. The study highlights the potential for tourism to serve as a catalyst for preservation by transforming Hidmo houses into tourist destinations and integrating them into the local economy.

5. **Educational and Professional Involvement**: Engaging architects, professionals, and community members in the preservation process is vital. The study advocates for the use of indigenous materials and methods in modern architectural designs to inspire a resurgence in vernacular techniques. This involvement can foster a sense of pride and ownership among locals, encouraging them to participate actively in preservation efforts.

6. **Creating Awareness**: Increasing public and official awareness about the heritage values of Hidmo houses is essential. This involves educational campaigns and collaborations with governmental and non-governmental organizations to emphasize the importance of preserving these structures as part of Ethiopia's cultural identity.

In summary, the study proposes a multifaceted approach to documenting and preserving Hidmo houses, focusing on assessment, community engagement, tourism, education, and awareness to ensure these cultural treasures are safeguarded for future generations.

CHAPTER FIVE: CONCLUSION AND RECOMMANDATION

5.1. Conclusion

This study examined the vernacular architecture of Hidmo houses in Mekelle and its environs, focusing on their documentation and the threats to their preservation. Rapid urbanization, population growth, and industrial expansion have precipitated the widespread degradation and demolition of Hidmo structures, many of which have been replaced by modern villas and commercial buildings. The primary drivers of this decline stem from both anthropogenic and natural factors, including: Unplanned urban population growth and land-use competition, high land value pressures and large-scale infrastructure projects, environmental degradation (e.g., deforestation, climate-related erosion), Institutional gaps, such as insufficient public awareness, lack of expertise, neglegence, and natural hazards (rain, floods, humidity, earthquakes, and insect damage).

Addressing these challenges through targeted policy interventions, community engagement, and sustainable urban planning is critical to mitigating further loss. Preserving Hidmo architecture not only safeguards cultural heritage but also offers insights for revitalizing deteriorating urban landscapes in a manner that harmonizes tradition with development.

5.2. Recommendation

Based on the study's findings, the following recommendations are proposed to preserve and promote Mekelle's vernacular Hidmo houses:

5.2.1. Urban Planning and Waste Management

Mekelle's poor urban planning has led to waste accumulation in public spaces, damaging *Hidmo* structures. The regional government should engage qualified urban planners and designers to improve city aesthetics, cleanliness, and heritage conservation.

5.2.2. Community Training and Awareness

- The government, in collaboration with NGOs, should organize workshops to educate locals on *Hidmo* construction techniques and cultural value.
- Media campaigns (both government and private) should raise public awareness about preserving *Hidmo* houses as part of Tigray's architectural identity.
- Craftsmanship Revival: Training programs akin to CobBauge's earth-building workshops.

5.2.3. Tourism and Economic Incentives

- Federal and regional authorities should promote *Hidmo* houses as tourist attractions by supporting their adaptive reuse (e.g., heritage lodges).
- Public-private partnerships with investors and NGOs should be strengthened to fund restoration projects while maintaining cultural authenticity.

5.2.4. Maintenance and Conservation Policies

- Hybrid Policies: Blend Ethiopia's urban codes with vernacular conservation, as in Morocco.
- Implement routine maintenance programs to prevent the deterioration of *Hidmo* houses.
- Provide financial incentives (e.g., grants or tax breaks) to owners who preserve *Hidmo* structures instead of replacing them with modern buildings.

5.2.5. Environmental and Structural Protection

- Assess and mitigate climate-related risks (e.g., erosion, humidity) affecting *Hidmo* houses.
- Clear vegetation, dust, and microbial growth (fungi/grass) from roofs and walls to prevent decay.
- Restrict industrial construction near heritage sites to reduce environmental damage.

5.2.6. Heritage Revitalization in Kebele 14

- Digital Documentation: Laser-scanning Hidmo houses to create a heritage database.
- Prioritize the restoration of *Hidmo* houses in Kebele 14 to serve as a model for conservation.
- Foster inter-institutional collaboration (government, NGOs, academia) for research, funding, and policy development on vernacular architecture preservation.

5.2.7. Design and Typology Specific Recommendations.

The Detached cuboidal (Tri-Parted), and detached Cube, Typology is a vernacular icon in transition, and a cornerstone of Tigrayan vernacular architecture, embodying historical, environmental, and social wisdom. However, its survival depends on academic research to document its construction techniques and historical evolution, adaptive reuse strategies (e.g., eco-friendly housing projects), Heritage conservation policies to protect remaining structures and policy support to prevent its replacement by generic modern housing.

The Detached Cylindrical Hidmo is a disappearing architectural legacy, and a testament to Tigray's vernacular ingenuity, combining structural efficiency, cultural utility, and environmental adaptation. However, its preservation requires: Urgent conservation measures to prevent further degradation of surviving examples, community awareness programs to revive traditional building practices, and research into its seismic resilience to inform contemporary sustainable architecture.

The Built-in hybrid hidmo house typology represents: A sophisticated development in Tigray's vernacular architecture, successful integration of multiple geometric traditions, and functional response to evolving domestic needs. This typology exemplifies the innovative potential of vernacular architecture while facing imminent disappearance without intervention. Its study offers valuable insights for sustainable design and cultural heritage preservation. However, its preservation requires: Structural analysis of transitional elements, and integration into cultural tourism programs.

The grand (cuboid with cube) hidmo house typology represents: The apex of Tigrayan architectural achievement, synthesis of indigenous and imported techniques, and living repositories of traditional knowledge. This typology demands urgent attention as both cultural heritage and inspiration for contemporary African architecture. Its preservation offers invaluable insights into pre-modern engineering solutions and aesthetic principles. Even though, it required critical actions: Comprehensive digital documentation, establishment of conservation guidelines, training programs for traditional masons, and interdisciplinary research initiatives.

The L-shaped Hidmo hidmo house typology represents: A pinnacle of Tigrayan domestic architecture, successful fusion of vernacular and elite traditions, and important example of early 20th century adaptation. This typology's sophisticated design solutions offer valuable lessons for contemporary architecture while representing a critically endangered aspect of Tigray's built heritage. Its preservation would maintain an important link to early 20th century social history and construction knowledge. Urgent Interventions Needed: Structural stabilization of remaining fabric, documentation of construction techniques, and replication of crown finials based on archival evidence.

The curvilinear/arched Hidmo house typology represents: Successful vernacular architecture evolution, model for sustainable tourism development, and testament to Tigrayan design adaptability. This typology demonstrates how traditional knowledge can inspire contemporary solutions that address modern needs while respecting cultural heritage and environmental conditions. Its success suggests promising avenues for future vernacular architecture adaptations in Tigray and similar regions. Future directions: Develop curved-wall construction guidelines, train artisans in hybrid techniques, monitor long-term performance, and document as case study for climate-responsive design.

5.2.8. Further Research Directions

- GIS-based mapping of Hidmo architecture.
- Comparative studies between rural and urban Hidmo typologies.
- Comparative analysis with other Ethiopian cubic vernacular structures (e.g., Harari *Gey Gar*).
- Structural performance studies, given Tigray’s tectonic activity, and under seismic conditions.
- Comparative analysis with other African cylindrical vernacular structures (e.g., Nubian *dome houses*, and *Tukul* of Amhara).
- Comparative study with other African hybrid forms.
- Comparative studies with other African royal architecture.
- Comparative study with other Ethiopian L-plan structures.
- Community-led restoration initiatives to revive traditional building practices.
- Policy advocacy for integrating Hidmo principles into modern eco-architecture.
- Material science studies on the longevity of earth-walled cylindrical designs.
- Archaeometry material analysis.
- Structural modeling of historic techniques.

5.3. References

Aas, Christian, et al. *2005. "Heritage Tourism and Vernacular Architecture." Journal of Cultural Heritage 8(2): 112-125.* https://doi.org/10.1016/j.culher.2005.03.002

Adane, Mulubrhan. 1995. *The History of Atse Yohannes Comprehensive Secondary School at Maqalla.* Master's thesis, Addis Ababa University.

Adnan, F. 2005. *An Investigation of Past, Present and Future Curvilinear Architectural Forms.*

Armstrong, Michael. 2009. *Armstrong's Handbook of Human Resource Management Practice.* 11th ed. London: Kogan Page.

Asfha, AT. 2022. *Appraisal of Heritage in Mekelle City, Ethiopia. Journal of World Heritage Studies. .* https://doi.org/10.15068/0002003378

Asquith, Lindsay, and Marcel Vellinga, eds. 2006. *Vernacular Architecture in the 21st Century: Theory, Education, and Practice.* New York: Taylor & Francis.

Ayalew, Yonas. 2020. *Sustainable Vernacular Adaptations in Tigray.*

Ayalew, Yonas, Getaneh Assefa, and Alem Hailu. 2020. "Sustainability and Threats in Tigray's Vernacular Architecture." *Journal of African Heritage Studies* 12 (3): 45–62.

Ayalew, Yonas. 2022. "Conflict and Vernacular Heritage in Tigray." *African Heritage Studies.*

Bard, Kathryn, et al. *2014. "The Aksumite Empire: Archaeological Perspectives." Antiquity 88*(342): 712-731. https://doi.org/10.1017/S0003598X00101188

Burra Charter (Australia ICOMOS). *1979. The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.* https://australia.icomos.org/publications/burra-charter-practice-notes/

China State Council. *2018. "Guidelines on Strengthening Cultural Heritage Protection Policies.."* http://www.gov.cn/zhengce/content/2018-10/08/content_5328689.htm

Cochran, William G., and Glenn Israel. 1992. *Sampling Techniques.* 3rd ed. New York: Wiley.

Creswell, J. W., & Plano Clark, V. L. 2018. *Designing and Conducting Mixed Methods Research*. Sage Publications.

Damluji, Salma Samar. 2018. *The Architecture of Yemen.* London: Laurence King.

Desai, Miki. 2020. *Digital Heritage: The Bhunga Project.*

Ethiopian Heritage Fund. *Conservation Reports on Mekelle's Historic Sites.*

Faro Convention. 2005. Council of Europe Framework Convention on the Value of Cultural Heritage for Society. https://www.coe.int/en/web/culture-and-heritage/faro-convention

Fasil, G., & Yohannes, H. 2016. *Traditional Housing and Construction Practices in Tigray Region*. Journal of Ethiopian Architecture, 12(1), 45–62.

Fattovich, Rodolfo. 1990. "Remarks on the Pre-Aksumite Period in Northern Ethiopia." *Journal of Ethiopian Studies* 23: 1–33.

Fattovich, Rodolfo. 2010. "The Development of Ancient States in the Northern Horn of Africa." *Journal of African Archaeology* 8 (2): 207–238.

Fattovich, Rodolfo. 2010. "The Axumite Roots of Tigray's Stone Architecture." *African Archaeological Review.*

Federal Democratic Republic of Ethiopia. 2000. *Proclamation No. 209/2000.* *Federal Negarit Gazeta*, no. 39 (June 27): 1345–1346.

Ferede, Mulugeta. 2018. "The Decline of Hidmo Houses: Modernization and Cultural Erosion in Tigray." *Ethiopian Journal of Built Environment* 7 (2): 89–104.

Ferede, Mulugeta. 2018. *Policy Gaps in Ethiopian Vernacular Preservation.*

Finneran, Niall. 2007. *The Archaeology of Ethiopia.* London: Routledge.

Fisseha, Mulugeta. 2024. *A Study on the Vernacular Architecture in Tigray and Its Conservation: The Case of Assefa Tela's Hidmo House in Aynalem, Mekelle*. Master's thesis, Mekelle University.

Frescura, Franco. 1985. *Rural Shelter in Southern Africa.* Johannesburg: Ravan Press.

García, José. 2020. *Quincha Anti-Seismic Techniques.*

Garedew, Mengesha Weldekidan. 2015. *Transformation of Konso Vernacular Houses.* Master's thesis, Addis Ababa University.

Garedew, Mengesha. 2014. *Ethiopian Vernacular Architecture: The Case of Hidmo Houses.* Addis Ababa: Addis Ababa University Press.

Garlake, Peter. 2002. *Early Art and Architecture of Africa.* Oxford: Oxford University Press.

Gebrehiwot, Fisseha. 2015. *The Architecture of the Traditional Hidmo Houses in Tigray, Ethiopia*. Master's thesis, Addis Ababa University.

Gebremedhin, B. (2020). *Urbanization and Cultural Heritage in Northern Ethiopia*. Mekelle University Press.

Gordon, Linzee, Frances Linzee, and Jean-Bernard Carillet. 2003. *Ethiopia & Eritrea.* 2nd ed. Lonely Planet Travel Guide. Melbourne: Lonely Planet Publications.

Haile Mariam, Jara. 1990. "An Approach to the Conservation of the Historic Town of Harar." In *Proceedings of the First National Conference of Ethiopian Studies*, edited by Richard Pankhurst, Ahmed Zekarias, and Tadesse Beyene, 11–12 April. Addis Ababa: Institute of Ethiopian Studies, Addis Ababa University.

ICOMOS. 1999. *Charter on Built Vernacular Heritage.* https://www.icomos.org/images/DOCUMENTS/Charters/vernacular_e.pdf

ICOMOS. 1999. *Principles for the Preservation of Historic Timber Structures.*

ICOMOS. 2021. *Heritage at Risk: Tigray Assessment Report.* Paris: ICOMOS.

Italian Art Bonus. 2014. *Cultural Heritage Tax Incentives. Legislative Decree* No. 83/2014. https://artbonus.gov.it/en/legislation.html

IVAU. 2018. *International Vernacular Architecture Unit Guidelines.*

Japp, Sarah, et al. 2011. "Aksumite Construction Techniques." *Journal of Cultural Heritage* 12(1): 30-42.

Jetie, Samuel Bekele. 2019. "Appraisal of Vernacular Stone Housing Typology of Tigrai, Ethiopia." *International Journal of Architecture, Arts and Applications* 5 (1): 1–9. https://doi.org/10.11648/j.ijaaa.20190501.11

Keefe, Laurence. 2021. "*The CobBauge Project: Developing Sustainable Earth Buildings."* Construction and Building Materials 290: 123207.

Kebra Nagast *(The Glory of Kings).* 14th century. Translated by Miguel F. Brooks. 1996. Lawrenceville, NJ: Red Sea Press.

Kothari, C.R. 2004. *Research Methodology: Methods and Techniques.* 2nd ed. New Delhi: New Age International.

Kraków Charter. 2000. *Principles for Training Craftspeople in Traditional Techniques. And Principles for Conservation and Restoration of Historic Timber Structures.* https://www.icomos.org/en/179-articles-en-francais/ressources/charters-and-standards/165-the-krakow-charter-2000

Lawrence, Roderick J. 2006. *Learning from the Vernacular: Basic Principles for Sustaining Human Habitats.* New York: Routledge.

Likert, Rensis. 1975. *New Patterns of Management.* New York: McGraw-Hill.

Marcus, Harold. 1994. *A History of Ethiopia.* Berkeley: University of California Press.

Mekelle City Planning Office. 2021. *Hidmo Houses Demolition Records.*

Mekelle Municipality. 1965 EC. *Work Activities at the Tigray Municipality Offices.* Mekelle: Mekelle Municipality. (In Tigrigna)

Moughtin, J.C., et al. 2004. *Urban Design: Method and Techniques.* Oxford: Architectural Press.

MoHUA India. 2010. Heritage Conservation Guidelines. New Delhi: Ministry of Housing and Urban Affairs.

Moroccan Urbanism Code. 2015. *Heritage Protection Laws.*No. 12-90 on *Urban Planning. Rabat: Ministry of Urban Planning.*

Munro-Hay, Stuart. 1991. *Aksum: An African Civilization of Late Antiquity.* Edinburgh: Edinburgh University Press.

Nara Document on Authenticity. 1994. *Principles on Community-Based Stewardship.* https://www.icomos.org/en/charters-and-texts/179-articles-en-francais/ressources/charters-and-standards/386-the-nara-document-on-authenticity-1994

Okazaki, Rumi. 2009. *Study on the Urban Formation and Actuality of the Central District in Mekelle, Ethiopia: Appraisal of Historical Quarters and Inner City Problems.* Master's thesis, Keio University.

Oliver, Paul. 1971. *Shelter in Africa.* London: Barrie and Jenkins.

Oliver, Paul. 2006. *Built to Meet Needs: Cultural Issues in Vernacular Architecture.* Oxford: Elsevier.

Pankhurst, Richard. 1982. *History of Ethiopian Towns.* Wiesbaden: Franz Steiner.

Pankhurst, Richard. 1990. *A Social History of Ethiopia: The Northern and Central Highlands from Early Medieval Times to the Rise of Emperor Tewodros II.* Addis Ababa: Institute of Ethiopian Studies.

Phillipson, David W. 1997. *Ancient Ethiopia.* London: British Museum Press.

Phillipson, David W. 2012. *Foundations of an African Civilization: Aksum and the Northern Horn, 1000 BC–AD 1300.* Woodbridge: James Currey.

Prussin, Labelle. 1986. *Hatumere: Islamic Design in West Africa.* Berkeley: University of California Press.

Rapoport, Amos. 1969. *House Form and Culture.* Englewood Cliffs, NJ: Prentice-Hall.

Rubenson, Sven. 1976. *The Survival of Ethiopian Independence.* London: Heinemann.

Salt, Henry. 1816. *A Voyage to Abyssinia and Travels into the Interior of that Country.* Philadelphia: M. Carey.

Sekaran, Uma. 2003. *Research Methods for Business: A Skill-Building Approach.* 4th ed. New York: Wiley.

Shimizu, Hiroshi, Yuki Tanaka, and Amanuel Berhe. 2019. "*Architectural Heritage and Community-Based Conservation in Northern Ethiopia." Journal of Vernacular Architecture Studies* 12 (2): 101–118.

Sulas, Federica, and Marco Madella. 2012. "Vernacular Architecture in Tigray." *Azania: Archaeological Research in Africa* 47 (1): 39–52.

Tesfay, Hiwot. 2021. "Urban Expansion and Vernacular Erosion in Mekelle." *Journal of Ethiopian Urban Studies.*

UNESCO. 1999. *Charter on Built Vernacular Heritage.*

UNESCO. 2008. *Fujian Tulou Case Study*. World Heritage Centre. https://whc.unesco.org/en/list/1113

UNESCO. 2011. *Recommendation on the Historic Urban Landscape.* https://whc.unesco.org/en/hul/

UNESCO. 2013. *Managing Cultural World Heritage*. Paris: United Nations Educational, Scientific and Cultural Organization.

UNESCO. 2021. *Report on Vulnerable Vernacular Heritage.*

UNESCO World Heritage Centre and ICOMOS. 1979. *Reactive Monitoring Mission to the World Heritage Site of Edinburgh. Paris: UNESCO.* Accessed 2019. *https://whc.unesco.org/en/soc/[mission-report-number*.

UNESCO World Heritage Centre. 1980. *Axum.*

Venice Charter. 1964. *International Charter for the Conservation and Restoration of Monuments and Sites.* https://www.icomos.org/en/participer/179-articles-en-francais/ressources/charters-and-standards/157-the-venice-charter

Vellinga, Marcel. 2007. "The Inventiveness of Tradition." *Traditional Dwellings and Settlements Review* 18 (2): 7–20.

Yemane G., Nebyat T., and Yonas T. 2014. *Tigray: Cradle of Civilization.* Mekelle: Magazine.

Online Sources:-

Add Standard. 2024. *"Against All Odds: Tigray's Tourist Hotspots Gradually Roar Back to Life After a Three-Year Hiatus."* January 23. https://addisstandard.com/analysis-against-all-odds-tigrays-tourist-hotspots-gradually-roar-back-to-life-after-a-three-year-hiatus/

DW TV. 2019. *"ቤተ እንደርታ ሰሉዳዊ ምድላው" [Documentary on Hidmo Houses]*. YouTube video, 45:21. https://www.youtube.com/watch?v=example123

Natural Homes. 2018. *Natural Building and Vernacular Architecture*. https://www.naturalhomes.org/.

Reddit. n.d. *"The Taakha Maryam Palace Likely Built in the 6th Century."* Accessed 2024. https://www.reddit.com/r/Africa/comments/1fjealm/the_taakha_maryam_palace_likely_built_in_the_6th/.

SkyscraperCity. 2024. *Forum Discussion on Tigray Architecture.* https://www.skyscrapercity.com.

State Historic Preservation Office of Iowa. *Site Inventory.*

Tigray Wonders. 2019. *"Hidmo Houses."* August 10. https://tigraywonders.com.

TripAdvisor. n.d. *Review of Gheralta Lodge, Hawzen.*

https://www.tripadvisor.com/ShowUserReviews-g2214567-d676720-r1005360875-Gheralta_Lodge-Hawzen_Tigray_Region.html.

Notes on Formatting The Bibilography:

The researcher organized the entries in **Chicago style** (notes and bibliography system), alphabetically by author's last name (or title if no author is given) and followed Chicago Manual of Style guidelines for different source types (books, journal articles, theses, websites, etc.).

- **Authors:** Listed as last name, first name.
- **Titles:** Book and journal titles in italics; article/chapter titles in quotes.
- **Theses:** Include university and degree.
- **Online Sources:** Include access date if no publication date is given.
- **URLs:** Simplified (Chicago 17th allows shortening).

5.4. Annex

Annex 1: Key Considerations For Future Housing Strategies

To enhance housing development and urban livability, the following strategic actions should be prioritized:

1. **Policy Review and Strengthening**

- Conduct regular evaluations of existing housing policies to identify gaps and improve implementation.
- The Federal Government should promote cost-effective and sustainable construction technologies to increase affordable housing supply.

2. **Urban Land Management**

- City administrations must streamline land allocation and development control systems to facilitate residential construction.
- Mekelle should expand serviced land provisions, as this is essential for efficient housing development.

3. **Neighborhood Upgrading and Public Health**

- Implement urban renewal programs to improve living conditions, public health, and neighborhood aesthetics.

- Prioritize on-site resettlement in redevelopment projects to minimize community displacement.

4. Inclusive and Targeted Housing Support

- Design housing subsidies to assist low-income households rather than subsidizing individual units.
- Adopt inclusive housing policies that ensure equitable access for all socio-economic groups.

5. Housing Finance Reform

- The Federal Government should establish a viable housing finance framework to improve affordability and accessibility.

Annex 2: Codes of Key Informants, Documentation Informants and FGDs.

Code. No	Name, occupation, and sector	Nationality	Location	Sex
KI1	Zoba Mekelle city culture and tourism bureau head office (Mr. Meresa Hiluf)	Ethiopian	Mekelle	M
KI2	Tigray Tourism Culture and Bureau technical expert of attractions studies. (Mr. Haile G/tsadik)	Ethiopian	Mekelle	M
KI3	Ambo University Architecture expert (Prof. Fathi Bashir)	Sudan	Ambo	M
KI4	Mekelle University Geology expert. (Prof. Ayle Bekre)	Ethiopian	Mekelle	M
KI5	Mekelle University IPHC, Directorate (Inst.Tsige Berehe)	Ethiopian	Mekelle	M
KI6	ETV reporter and Agent of the Hidmo house (Tsegay G/Selassie)	Ethiopian	Mekelle	M
KI7	Residential (W/ro. Feteyen Teklay)	Ethiopian	Mekelle	F
KI8	Son of Assefa Tedla (Mr. Halefom Assefa Tedla)	Ethiopian	Aynalem	M
KI9	Wife of Belay Assefa Tedla (W/ro. Muluworq Assefa)	Ethiopian	Aynalem	F
FGD	Tigray Tourism Culture and Bureau technical experts	Ethiopian	Mekelle	M
	Documentation Informants			
DI1	Tigray Tourism Culture and Bureau senior research expert on Marketing and promotion. (Mr. T/haimanot Hailu)	Ethiopian	Mekelle	M
DI2	Mesfin Industrial Engineering, research and development head. Grandson of Blata Tsegay Seyfu (Tesfahunegn Bezabeh (Dr.).)	Ethiopian	Mekelle	M
DI3	Mekelle, Kidamay Woyane Sub-city information technical expert office (Medhin Girmay)	Ethiopian	Mekelle	F
DI4	Mekelle, Hadinet sub-city information technical expert office (Senayet Hailu)	Ethiopian	Mekelle	F

DI5	Mekelle municipal administrative office technical expert on city planning. (Berhe Teumelesan)	Ethiopian	Mekelle	M
DI6	Residential (W/ro. Leteyesus Fesuh)	Ethiopian	Mekelle	F
DI7	Residential (W/ro. Mereseat Tesfay /halafetey)	Ethiopian	Mekelle	F
DI8	Elder of the village (W/ro. Metsilal Mekonen)	Ethiopian	Mekelle	F
DI9	Neighbor (W/ro. Kindehafte Mebrehatu)	Ethiopian	Mekelle	F
DI10	Grandson of Blata Tsegay (Ashinafe Mekonen)	Ethiopian	Mekelle	M
DI11	Neighbor (Mr. Flemon Yibrah)	Ethiopian	Mekelle	M
DI12	An elder of the village (Mr. Assefa Meles Abadi)	Ethiopian	Mekelle	M
DI13	Member of Tigray House of Federation (Commander of 10 Abera Woldu)	Ethiopian	Mekelle	M
DI14	Wife of Mr. Bezabeh Tsegay (W/ro. Mentsigeba Kahsay)	Ethiopian	Mekelle	M
DI15	Mekelle head of Saint Merry Church. (Melake Sebhat Abreha G/Mariam)	Ethiopian	Mekelle	M
DI16	Mason and Farmer (G/tsadik G/Mariam)	Ethiopian	Mekelle	M
DI17	ETV reporter and agent of the Hidmo house (Tsegay G/Selassie)	Ethiopian	Mekelle	M
DI18	Director of 104.4 FM radio Mekelle, (Yekum Haile Meruts)	Ethiopian	Mekelle	M
DI19	Family of Blata Tsegay (Alemseged Zemariam)	Ethiopian	Mekelle	M
DI20	Granddaughter of Blata Tsegay (Abadit Bezabeh)	Ethiopian	Mekelle	F
DI21	Elder of the village (W/ro. Genet Melkamu)	Ethiopian	Mekelle	F
DI22	Scholar on Tourism (Andom Gebreyessus)	Ethiopian	Mekelle	M

Annex 3: Opinion Poll Questionnaire (English Version)

This questionnaire was used to gather public opinion regarding preservation of Hidmo houses in Kebele 14, Aynalem, and Feleg Dae'ro.

Investigating and documenting the vernacular architecture of Tigray: A case of vernacular Hidmo houses selected in Mekelle and its surroundings.

An Opinion Poll Questionnaire for M.Sc. (Architectural Heritage Conservation and Management) Thesis.

Request

The objective of this inquiry form is to study the actual living conditions of vernacular Hidmo houses of Mekelle and its surroundings, documentation, preservation, and the related issues which are possible only through your participation and cooperation, therefore, I request you to kindly respond to the following inquiries as available in part I and part II by ticking (√) your option on the specific applicable area.

Data and information collected through this opinion poll shall be confidential and will be used for this thesis work only.

The research findings will be useful for real-life preservation, investigation, documentation, and will be disseminated to you. Thanking you.

Yared Zekarias G/Mariam

M.Sc. Thesis Student

Heritage Conservation and Management Department

IPHC, Mekelle University

Mobile: +251912844473; Email: yaredzekarias@yahoo.com

Part I: Personal information

Gender: Male ( ) Female ( )
Marital Status: Single ( ) Married ( ) Divorced ( )
Age: Below 20 year ( ) 21-35 years ( ) 36-45 years () 46-60 years ( ) Above 60 ( )
Occupation: Student ( ) Self-employed ( ) Government employed ( ) Other ( )
Level of Education: Below diploma ( ) First Degree ( ) Master's Degree ( ) PhD & above ( )
Monthly Income in Eth Birr: Below 1000 ( ) 1001-2000 ( ) 2001-5000 ( ) Above 5001 ( )
Length of residency: 0-5 years ( ) 6-10 years ( ) 10 years and above ( )
Level of Participation in Architectural Heritage Preservation: Low ( ) Medium ( ) High ( )

Part II: Please identify your level of agreement by using "**5**" for strongly agree, "**4**" for agree, "**3**" for neutral, "**2**" for disagree, and "**1**" for strongly disagree.

1.	**Preservation Practices of Vernacular Hidmo Houses In The Study Area**					
No	**Variables**	**5**	**4**	**3**	**2**	**1**
1	The level of structural problem (deterioration) of the vernacular Hidmo houses is increasing from time to time					
2	The preservation practices in the vernacular Hidmo houses are not adequate					
3	The preservation practices in the vernacular Hidmo houses need closer supervision and regulation					
4	The existing heritage preservation practices are affecting the sustainability of heritage resources of the Hidmo					
5	The original doors of the Hidmos are changed by new doors					
6	The original windows of the Hidmos are replaced by new					
7	Lack of maintenance by qualified expertise					
8	Improper maintenance					
2.	**Natural Factors Affecting Heritage Resources of the Vernacular Hidmo Houses**					
No	**Variables**	**5**	**4**	**3**	**2**	**1**
1	Rain					
2	Moisture and dampness					
3	Temperature fluctuations					
4	Earthquakes					
5	Algae and insects					
6	Trees and vegetation					
7	Leakage (patchwork and seepage)					
8	Flood-related damages					
9	Bird droppings					
3.	**Human Factors Affecting Heritage Resources in the Vernacular Hidmo Houses**					
No	**Variables**	**5**	**4**	**3**	**2**	**1**
1	Neglect and ignorance					

2	Inadequate maintenance					
3	CO_2 emission and waste					
4	More population are concentrating in cities					
5	Impact of major infrastructure programs					
6	The local people need to build new buildings					
7	Passing heavy vehicles along the way that caused vibration					
8	Absence of Management Plan Policy					
9	Lack of preventative measures					
10	Lack of experienced professionals					
11	Lack of preservation knowledge					
12	Lack of community participation					
13	Use of inappropriate methods					
14	Use of inappropriate materials					
15	Deforestation					
16	Limited funding					
17	Land prices					
4.	**Retention Mechanism Needed to Minimize The Loss of Vernacular Hidmo Houses**					
No	**Variables**	**5**	**4**	**3**	**2**	**1**
1	Training and education					
2	Awareness programs					
3	Appropriate methodology					
4	Management Plan and Strict quality control					
5	Proper installations					
6	Proper routine maintenance					
7	Community participation					
8	Sufficient funding					
9	Tourist exposure					
10	Management involvement					
11	NGOs involvement					
12	Government involvement					
13	Local materials should be used for the construction					
14	Legal framework and dealings with owners					
15	A comprehensive study in architectural preservation practices					
16	The government should give enough compensations and lithe area for the owners of historic sites.					

1. Please write your suggestions._____.

Annex 4: Opinion Poll Questionnaire (Tigrigna Version)

ዳህሰሳዊ መፅናዕቲ ትንተና ስራሕቲ ዕቀባን ፅገናን ክንክን ህድሞ ገዛውቲ መቐለን ከባቢኣን

መሕትት ንመፅናዕታዊ ፅሑፍ ማስተር ብስነ-ጥበባዊ ሓድግታት ዕቀባን ክንክን ማስተር ሳይንስ (M.Sc. thesis)

<u>መሕትት</u>

ዝኸበርኩም ተሳተፍቲ ናይዚ መፅናዕቲ ዋና ዕላማ ኣብ ዕቀባን ሓለዋን ስራሕቲ ፅገናን ህድሞ ገዛውቲ መቐለን ከባቢኣን ዝረኣዩ ፀገማት ፈትሽካ መፍትሒ ሓሳባት ንምትእክካብን ዝተዳለወ መሐተቲ እንትከውን ካባካትኩም ዝርከብ መረዳእታ ነዚ ፅሑፍ ዕላማ ጥራሕ ክምዝውዕል ፈሊጥኩም ሓሳብኩም ብነፃነት ክተካፍሉኒ ይላቦ።

ካብ ክፍሊ ትምህርቲ መፅናዕቲ ስነ-ህንፃን ክንክንን ፅገና ሓድግታት (ላዕለዋይ ትካል ትምህርቲ ዩኒቨርስቲ መቐለ) ነዚ ኣገዳሲ ዝኾነ መሕትት ትምህርታዊ መፅናዕቲ ኣብ ምምላእ ንትግብርዎ ሓገዝ ኣቀዲመ የመስግን።

ያሬድ ዘካርያስ ገ/ማርያም
መፅናዕታዊ ፅሑፍ (M.Sc.)
ከፍሊ ትምህርቲ ሓድጊ ሓለዋን ክንክንን
IPHC, መቐለ ዩኒቨርስቲ
ስ.ቁ: +251912844473
Email: yaredzekarias@yahoo.com

መሕትት ሀ. ሓፈሻዊ ባህርያት መልሲ ወሃብቲ ኣካላት ዝምልከቱ ሕቶታት

1. ፆታ: ተባ ☐ ኣን ☐
2. ኩነታት ሓዳር: በዓል ሓዳር ☐ ሓዳር ዘይገበረ ☐ ዝተፋተሐ ☐
3. ዕድመ: ትሕቲ 20 ☐ ካብ 21-35 ☐ 36-45 ☐ 46-60 ☐ ልዕሊ 60 ☐
4. ስራሕ: ተምሃሪ ☐ ናይ ውልቂ ☐ መንግስቲ ሰራሕተኛ ☐ ካልኣት ስራሕቲ ☐
5. ወርሓዊ መሃያ ብብር: ትሕቲ 1000 ☐ 1100-2000 ☐ 2100-5000 ☐ ልዕሊ 5001 ☐
6. ደረጃ ትምህርቲ: ሀ. ዲፕሎማ ☐ ለ. ዲግሪ ☐ ሐ. ማስተር ☐ መ. ዶግተር ☐
7. ፃናሒት ኣብቲ ከባቢ: 0-5 ☐ 6-10 ☐ ልዕሊ10 ☐
8. ኣብ ፅገና ሓድግታት ህንፃ ዘለካ ተሳትፎ: ትሑት ☐ ማእከላይ ☐ ኣዝዩ ልዑል ☐

መሕትት ለ. በጃኩም ቀፀልቲ ሕቶታት ኣብ ዝስማዕምዕሎም መልስታት እቲ ዝተቀመጠ መመዘኒ ረቂሒ ብምሕራይ ናይ ራይት (√) ምልክት ኣብ ውሽጢ ሳንዱቅ የቅምጡ/ የቅምጣ

1 = ፈፂመ ኣይስማዕማዕን 2 = ኣይተስማዕማዕኹን 3 = ላንጋ ላንጋ 4 = ተስማዕሚዐ
5 = ፈፂመ ይስማዕማዕ

1. ከይዲ ምንቅስቃስ ፅገና ስራሕቲ ህድሞ ገዛውቲ						
ታ.ቁ	ረቂሒ	5	4	3	2	1
1	ካብ እዋን ናብ እዋን ኩነታት እቲ ህድሞ ገዛውቲ መቑለ እናተባላሸወ (እንዳፈረሰ) ይርከብ					
2	እቶም ዝካየዱ ዘለዉ ፅገናታት መዕገብቲ ኣይኮኑን (እኹል) ኣይኮኑን					
3	ኣብ ስራሕቲ ፅገናን ክንክንን ሓድግታት ጥቡቅ ክትትል ደገፍን የድልዮም					
4	እዚ ሐዚ ኣብ ምክያድ ዝርከብ ስራሕቲ ፅገና ንዘላቅነት እቲ ኪነ-ህንፃ ስግኣት እናኾነ ይርከብ					
5	እቶም ጥንታዊ ማዕያ ኣፍደፈገ ህድሞ ገዛውቲ ብሓዱሽ እናተቀየሩ ይርከቡ					
6	እቶም ጥንታዊ መሳኩቲ ህድሞ ገዛውቲ ብሓዱሽ እናተቀየሩ ይርከቡ					
7	ብሰብ ሞያ ፀገናታት እቲ ኪነ-ህንፃ ዘይምህላው					
8	ምስቲ ጥንታዊ ህድሞ ገዛ ዘይመጣጠኑ ትክክለኛ ዘይኮነ ስራሕቲ ፅገና ይካየድ					
2. ተፈጥሮኣዊ መበገሲ ምፍርራስ ህድሞ ገዛውቲ						
ታ.ቁ	ረቂሒ	5	4	3	2	1
1	ምንቅጥቃጥ መሬት					
2	ዝናብ					
3	ራህድን ጠልን					
4	ምቅይያር ኩነታት ፀባይ ኣየር					
5	ኣልጌታትን ሓሰካን					

6	ተክልታትን ዓበይቲ ሱራትን					
7	ዛዕዛዕታን ዝተለጠፉ ስራሕትን					
8	ማይን ውሕጅን					
9	ናይ ኣዕዋፍ ኩስ					
	3. ሰባዊ መበገሲ ምፍርራስ ህድሞ ገዛውቲ					
ታ.ቁ	**ረቂሒ**	**5**	**4**	**3**	**2**	**1**
1	ግንዛበ ጉድለትን ምግላልን					
2	ድኹም ዕገና					
3	ብኽለት ቈድን ጓሓፍን					
4	ፍልሰት ሰብ ናብ ከተማ					
5	ምስፍሕፋሕ መሰረተ ልምዓት					
6	ሓደጋቲ ገዛውቲ ንምስራሕ ምድላይ					
7	በቲ ህንፃ ከበድቲ መካይን ምሕላፍ					
8	ምሕዳራዊ ትልምን ሕግን ዘይምህላው					
9	ትኽክለኛ መስርሕ ዕገና ዘይምህላው					
10	ሕዕረት በዓል ሞያተኛታት ዕገና					
11	ፍልጠት ሕዕረት ዕገና					
12	ተሳትፎ ሕ/ሰብ ዘይምህላው					
13	ሳይነሳዊ ዘይኾነ ሜላ ዕገና ምጥቃም (ብዕንዓት ዘይተሓገዘ)					
14	ከባቢያዊ ናውቲ ዘይምጥቃም					
15	ብርሰት ኣግራብ					
16	ሕዕረት በጀት					
17	ናይ መሬት ዋጋ ምውሳኽ					
	4. ሚዛናዊ መፍትሒ ክኾኑ ዝኽእሉ ሓሳባት					
ታ.ቁ	**ረቂሒ**	**5**	**4**	**3**	**2**	**1**
1	ስልጠናን ትምህርትን					
2	ግንዛበ መዕበይ ስልጠና					
3	ትክክለኛ መስርሕ					
4	ምሕዳራዊ ትልምን ጥቡቅ ዝኾነ ዕሬት መመዘኒ ሕግን					
5	ብቁዕ መገጣጠሚ ኤሌትሪክ					
6	ኣግባብ ዘለዎ ተደጋጋሚ ዕገና					
7	ተሳትፎ ሕ/ሰብ ምፍጣር					
8	እኹል በጀት ምምዳብ					
9	ኣታዊ በዓሕቲ ዓዲ ምፍጣር					
10	ተሳትፎ ሓለፍቲ					
11	ተሳትፎ ገበርቲ ሰናይ					
12	ተሳትፎ መንግስታዊ ትካላት					
13	ንዕገና ከባቢያዊ ናውቲ ምጥቃም					
14	ሕግን ደንብን ቀሪፅኻ ንነበርቲ እቲ ኪነ-ህንፃ ምሃብ					
15	ዘላቅነት ዘለዎ ኣብ ተግባር ዘተኮረ መዕናዕቲ ምክያድ					
16	ንበዓል እቲ ገዛ እኩል ዝኾነ ክፍሊትን ተለዋጢ መሬትን ምሃብ					

Annex 5: FGD Questionnaires and Photos.

1. Explain the situation of preservation practices, construction methods, materials, and forms of vernacular Hidmo houses?
2. Discuss the main causes of the demolition of vernacular Hidmo houses in the study area?
3. What are the major Impacts of vernacular Hidmo houses in the study area?
4. Discourse about the retention mechanisms for preservation and documentation of vernacular Hidmo houses in the study area?

Picture 55: Focal Group Discussion (FGD), With Tigrai Toursim Cultural Beauro **(**TTCB) Expertise.

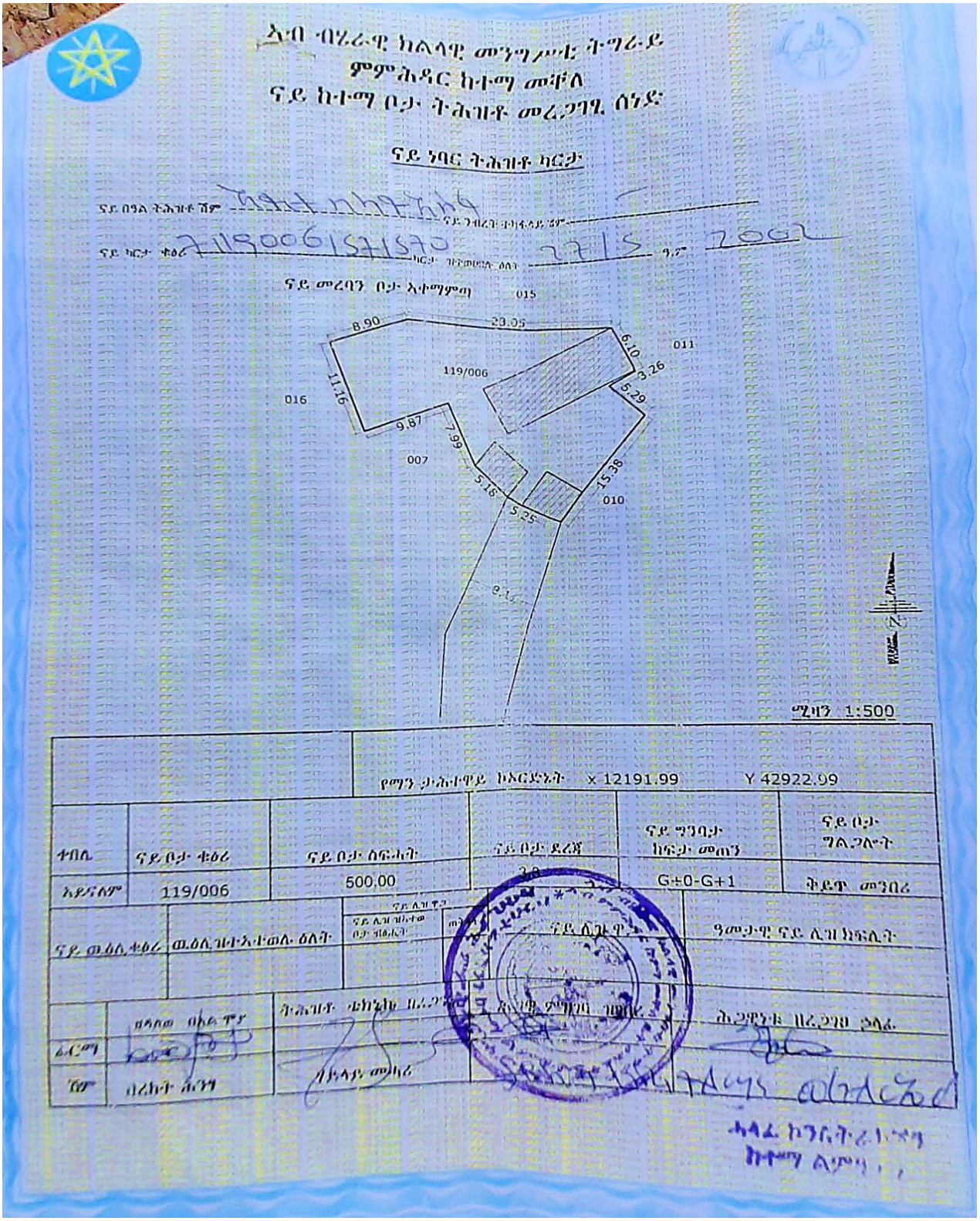
Annex 6: Interview/Inventory Questionnaires Form for Documentation.

INQUIRE	DESCRIPTION
Personal Information	**Gender:** Male ( ) Female ( ) **Marital Status:** Single ( ) Married ( ) Divorced ( ) **Age:** Below 20 year ( ) 21-35 years ( ) 36-45 years () 46-60 years ( ) Above 60 ( ) **Occupation:** Student ( ) Self-employed ( ) Government Employed ( ) Other ( ) **Level of Education:** Below diploma ( ) First Degree ( ) Master's Degree ( ) PhD & above ( ) **Monthly Income in Eth Birr:** Below 1000 ( ) 1001-2000 ( ) 2001-5000 ( ) Above 5001 ( ) **Length of residency:** 0-5 years ( ) 6-10 years ( ) 10 years and above ( )
1. Common Name:	
2. Historic Name:	
3. Designation:	None None None None
4. Country:	
5. Township:	
6. Land Grant:	
7. UTM Coordinate:	
8. Elevation:	
9. Location/ Address:	
10. Surroundings:	___ Street: ___ Scattered Building: ___ Densely Built-up
11. Approximate lot size (in centimeters):	
12. Structure Dimensions (in centimeters):	Stories: Long: Width: Depth:
13. Structure is:	_____ On original site: _____Moved: _____Not known.
14. Architectural Style:	
15. Briefly describe the present physical appearance and condition of the structure:	
16. Alteration or Restoration:	
17. Overall Condition (check one):	__Deterioration: ___Fire: ___Pests: ___Collapse: ___Demolition: ____Vandalism: ____Instruction: ____Other:

18. Needed Maintenance and Repairs:	
19. Related Structures or Outbuildings:	
20. Architect:	
21. Builder:	
22. Architectural Drawings:	
23. Construction Date:	
24. Previous surveys, Sources, and references:	
25. Present Use or Tenants:	
26. Historical Use:	
27. Briefly state historical and architectural importance (include dates, events, and persons associated with the site):	
28. The main theme of the historical resources (if more than one is checked, number in order of importance):	_____Architecture ____Commerce ___Social _____Recreation _____Agriculture ____Technology _____Education ____Arts ___Government _____Mining ____Exploration ____Religion _____Military _____Industry ___Settlement _____Other:
29. Owner:	
30. Recorded by:	
31. Affiliation:	
32. Attachment:	**Photographs:** **Site Location Map:** **Site/ Lot Map:** **Elevation (s):**
33. Architectural Supplement:	___ Stone ____Brick ____Wood ____Concrete ___Mortared ____Unmortared ____Post ____ Pier ____Continuous ____Sill ____Skid ____Other:
34. Cellar Description:	____Pit, line with: ____Wood, ____Stone, ____Concrete: ___Stairs: ___Ground level entrance from the ____Remains of doorway present:
35. Exterior Siding:	
36. Roof:	

37. Ceilings:	
38. Windows:	
39. Doors:	
40. Floors:	
41. Walls and Coverings:	
42. Paint Colors:	
43. Framing:	
44. Fireplaces:	
45. Built-in Features:	
46. Hardware and Fixture:	
47. Nail Type:	
48. Lumber Dimension:	
49. Stone Dimensions, Brands:	
50. Furnishings and Artifacts:	
51. Utilities:	
52. Security System:	
53. Landscaped Vegetation:	
54. Gardens and Garden Furniture:	
55. Natural Vegetation:	
56. Surface Modifications / Earthworks:	____Dam ____Ditch ____Mound ___Depression ____Tunnel ____Well ___Trench ___Terrace ____Embankment ____Pit ___Retaining ___ Road
57. Walls and Fences:	
58. Pavement, Roads, and Walkway:	
59. Soil:	
60. Remarks:	
61. Additional References:	
62. Supplement Recorded By: Date:	

Annex 7: Actual Site Plan of the Study Areas.



C/ቑ. 137
ተ/ቑ 344

ቑፅሪ 54978/53012
ዕለት 12/06/2002

ቤት ማዘጋጃ ከተማ መቐለ
ናይ ቦታ ተጠቃማይነት ምስክር ወረቐት

ሽም ______ ሽም ኣቦ ሓጎ ______

መብርሂ:

ር/መዝገብ ቑፅሪ 53012

ከባቢያዊ ግልጋሎት □ ሰሜን □ ደቡብ □ ኲሓ

ጣብያ 14 ______

ቦታ ቑፅሪ ______

ደረጃ 14-34

ስፍሓት 496.29 ካ/ሜትር

ናይቲ ቦታ ግልጋሎት መንበሪ.

መዋሰኒኡ:

ምብራቕ መንገዲ ______ ምዕራብ ______

ሰሜን ______ ደቡብ ______

☑ ብኪራይ ዝመሓደር □ ብሊዝ ዝመሓደር

ዝርዝር ሊዝ:

ዋጋ ሊዝ ብሜትር ካሬ		ውዕሊ ዘመን	ጠቕላላ ዋጋ ሊዝ	ውዕሊ ዝውድኣሉ ዘመን	ኣፈፃፅማ ክፍሊት		ዓመታዊ ክፍሊት
ስፍሓት	ዋጋ				ብወለድ	ብዘይወለድ	
					□	□	
					□	□	
					□	□	

የማነ ባራኺ ኣረጋዊ
Yemane Baraki Aregawi
ህንፃ መሃንዲስ
Building Engineer
ሽምን ስራሕ ሓላፊነትን

ፊርማ

Printed by Planography Press /Mekelle/