ADDIS ABABA UNIVERSITY

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INFRASTRUCTURE INTEGRATION IN HISTORIC PLACES: CASE OF SHONKE VILLAGE, ETHIOPIA

By

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DECLARATION

I, the undersigned, solemnly declare that this dissertation represents my original work and has not been submitted for a degree at any other university. I have diligently acknowledged all sources of material utilized in this dissertation under the academic standards and guidelines of Addis Ababa University.

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CONFIRMATION

The research completed by Hiwot Ergetie Temechew titled ***"Infrastructure Integration in Historic Places: Case of Shonke Village, Ethiopia"*** was conducted under our supervision and submitted to the examination in partial fulfillment of the requirements for the Master's degree in Infrastructure Planning and Management.

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CERTIFICATION

This is to certify that the dissertation prepared by Hiwot Ergetie Temechew, titled ***"Infrastructure Integration in Historic Places: Case of Shonke Village, Ethiopia,"*** and submitted for the Master of Science degree in Infrastructure Planning and Management, adheres to the university's regulations and meets the required standards

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ABSTRACT

Historic urban development presents unique challenges, the risks of neglect on one hand and over-commercialization on the other, making preservation and modernization a complex task. This study explores how to manage this balance through infrastructure integration in the historic place of Shonke Village. The research employed a single case study design and a mixed-methods approach, utilizing qualitative and quantitative research methods. Primary data were collected through survey, key informant interview, focus group discussion, and transect walks, while secondary data were collected from published and unpublished sources. Non-probability purposive sampling was used to select 89 household heads, 10 key informants, and 7 Focus group discussion participants, ensuring diverse perspectives and representation. Transect walks along four routes provided valuable observations on the village's infrastructure, historic features, and land use patterns, offering insights into the unique opportunities and challenges of the places. The collected data is analyzed using spatial, thematic, statistical, and comparative methods. The study highlights that Shonke Village possesses a rich tangible and intangible cultural heritage with sustainable development potential. However, inadequate infrastructure like water, sanitation, energy, transportation, and ICT threatens heritage and drives resident relocation. Notably, it proposes hybrid renewable energy, eco toilets, and sustainable transportation. Focusing on small targeted interventions that generate ripple effects across social, cultural, environmental, and economic domains, the proposed solutions aim to improve essential services, foster economic growth, attract tourism, and preserve Shonke's cultural heritage. The findings underscore that strategic infrastructure improvement is grounded in a nuanced understanding of a place's cultural values, social needs, physical context, economic vitalities, and environmental considerations. This research contributes to the broader discourse on urban planning in heritage-rich cities, offering a model for harmonizing development with preservation through locally rooted, context-sensitive infrastructure solutions.

Keywords: Integrated infrastructure, Urban Planning, Heritage Preservation, Shonke Village

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AECOM: Architecture, Engineering and Construction Operations and Management.

AI: Artificial intelligence

BIM: Building information modeling

CESP: Comprehensive Energy Solution Planning

CP: Culture Policy

FGD: Focus group discussions

GIS: Geographic Information System

Got: Subdivision of kebele for administrative purpose

Ha: Hectares

HUL: Historic Urban Landscape

ICOMOS: International Council on Monuments and Sites

ICT: Information and Communication Technology

IoT: Internet of Things

IUCN: The International Union for Conservation of Nature

SDGs: Sustainable Development Goals

SHS: Solar home system

STMP: Sustainable tourism master plan

TCM: Traditional Chinese Medicine

TDP: Tourism Development Policy

TYDP: Ten-Year Development Plan

UA: Urban Acupuncture

UCLG: United Cities and Local Governments

UNEP: United Nations Environment Programme

UNESCO: United Nations Educational, Scientific and Cultural Organization

VAT: Value-added tax

WASH: Water, sanitation and hygiene

WB: World Bank

3D: Three-dimensional

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Infrastructure plays a crucial role in the development of historic cities, as it shapes the urban landscape and facilitates the adaptation of degraded or abandoned historic districts to meet the demands of contemporary urban life (UNESCO, Developing historic cities: keys for understanding and taking action; A compilation of case studies on the conservation and management of historic cities., 2014). However, integrating heritage management within infrastructure planning presents complex challenges, often called wicked problems due to their multifaceted and interconnected nature (Fredholm, Dore, & Brorström, Strategic Responses to Wicked Problems of Heritage Management: Experiences from the West Link Infrastructure Project in Gothenburg, Sweden, 2021). Historic settlements have frequently struggled with balancing modernization and preserving their unique cultural identities. This challenge is further exacerbated by factors such as globalization, rapid urbanization, inadequate infrastructure, insufficient funding, climate change, and limited community involvement, all of which contribute to the difficulties in effectively conserving heritage (Olsson & Haas, 2005; Menchawy et al., 2011; Roy & Kalidindi, 2017; UNESCO, 2021; Bayih, 2018).

Nevertheless, Integrated infrastructure aims to bridge the gaps between planning, funding, and delivery, promoting cost efficiency, environmental benefits, and focusing on citizens' needs. It recognizes the synergies between different infrastructure sectors while underscoring the importance of effective planning mechanisms (Hall et al., 2012; Dunning & Taylor Buck, 2017; McClean, 2018). In particular, Planning plays a crucial role in integrating infrastructure and focus on place, ensuring that individual developments are planned as part of a broader picture, resulting in greater value for both the local community and developers (Adams & Watkins, 2014; Williams , 2014).

Shonke village is a 900-year-old settlement and rich in tourism potential with a beautiful geographical landscape, magnificent terracing of farmlands, and impressive vernacular architectural design of houses, but the lack of physical infrastructure remains a major challenge (Ambaye, 2016; Eyassu et al., 2019).

This situation highlights the need for a more integrated approach to conservation and development in historic areas. This study focuses on Shonke Village and explores how holistic planning can preserve cultural and historical integrity while fostering balanced development.

1.2 Problem Statement

The preservation and modernization of historic districts pose a significant global challenge, requiring a careful balance between conserving cultural heritage and accommodating contemporary urban development (Ercan, 2011; Houdek, 2014). This challenge is particularly acute in areas where infrastructural decay and socio-economic stagnation threaten community vitality (Naciye & Rokhsaneh, 2014). Efforts to harmonize architectural integrity with modern functionality often lead to conflicts, risking either over-commercialization or neglect (Feilden, 2007). Stakeholders frequently view development and conservation as conflicting goals, with development perceived as a threat to heritage and conservation as a barrier to economic growth (Thaitakoo, 2006). While the role of heritage in fostering development is acknowledged, especially in Africa (UNESCO, 2018), strategies for achieving a sustainable balance remain underexplored. In Ethiopia, a country rich in heritage resources, these challenges are particularly pressing, as many historic sites face significant risks of damage and neglect, raising urgent questions about their future (Gebreegziabher et al., 2019).

This challenge is further complicated by the ambiguity surrounding the concept of integrated infrastructure (Arts, et al., 2016; McLean J. A., 2018; Saeid et al., 2018). While the idea of integrating infrastructure is widely accepted, a lack of clear definition hinders its practical application, particularly in historic places. This ambiguity makes it difficult to determine how, what, and at what scale integration should occur, further exacerbating the tension between conservation and development.

Therefore, this research focuses on Shonke Village as a case study to address these challenges. It aims to explore how integrated infrastructure can facilitate a sustainable balance between heritage conservation and development.

1.3 Objectives of the Study

1.3.1 General Objective

The study explores the balance between historical preservation and modern infrastructure needs in Shonke Village through infrastructure integration.

1.3.2 Specific Objectives

The following are the study's specific objectives:

- to draw lessons from infrastructure planning in other historic places.
- to identify the unique characteristics of Shonke Village.
- to assess the existing infrastructure of Shonke Village.
- to develop integrated infrastructure for Shonke Village that addresses infrastructure challenges while preserving its cultural heritage.

1.4 Research Questions

1. What lessons can be learned from infrastructure planning in other historic places?
2. What are the unique elements and heritage values of Shonke village?
3. How does existing infrastructure impact heritage value and the community's socio-economic development?
4. How can infrastructure development in Shonke Village be planned to address current needs while minimizing negative impacts on its heritage significance?

1.5 Scope of the Study

This research focuses on integrated infrastructure planning in Shonke Village, examining its implications for both heritage preservation and modernization. It assesses the current state of the village's physical infrastructure, including transportation, water supply, sanitation, energy, and ICT, and how these systems impact the village's historic value while exploring solutions to address these challenges in a historic setting. The study aims to identify strategies for holistic planning that take into account the cultural and physical factors that shape the identity and character of Shonke Village.

1.6. Rationale for Selecting the Study Area

Shonke Village serves as an ideal case study for researching integrated infrastructure in a historic city due to its rich cultural heritage that necessitates a balanced approach to

infrastructure development. The village's current needs for improved infrastructure present a real-world scenario for analyzing how such development can be achieved while preserving cultural heritage. The manageable size of the village facilitates in-depth analysis, and potential collaboration with local stakeholders can enrich the research with valuable local insights.

1.7 Significance of the Study

This research makes a significant contribution to the interconnected fields of urban planning, heritage conservation, and sustainable development. Its core significance lies in demonstrating how infrastructure development and cultural preservation can be harmonized, rather than treated as mutually exclusive objectives, within the specific context of Shonke Village.

- This research contributes to knowledge by providing empirical evidence on how integrated infrastructure can support balanced development in historic settings. It bridges the gap between theory and practice in managing historic urban landscapes and offers a detailed case study on balancing the competing demands of modernization and heritage preservation.
- This research benefits multiple stakeholders. It has practical implications for urban planners, heritage managers, and policymakers. The proposed tailored solutions, which emphasize sustainable infrastructure development while preserving cultural heritage, offer a tangible roadmap for enhancing essential services, stimulating local economic growth (potentially through sustainable tourism), and improving residents' quality of life. This roadmap can be adapted and applied in other similar historic settings. In addition, academics and researchers gain access to a valuable case study that contributes to the theoretical understanding of integrated infrastructure.

1.8 Limitations of the Study

While this research aims to offer valuable insights and a practical framework for integrated infrastructure planning in historic cities, some limitations are important to consider. The framework's generalizability might be restricted as the study focuses primarily on the

unique context of Shonke Village. Applying it to other historic settings with diverse social, cultural, and regulatory landscapes could necessitate adaptations.

1.9 Organization of the Document

The document is organized into five chapters. Chapter One introduces the study, providing background information, outlining the research problem and objectives, explaining the rationale, discussing the significance of the research, and detailing the scope and limitations. Chapter Two reviews the existing literature on integrated infrastructure, infrastructure planning, and historic cities while exploring relevant theories and identifying knowledge gaps. Chapter Three outlines the research methodology, including the research design, data sources, sampling techniques, data collection methods, and data analysis approaches. Chapter Four presents the findings and discussion, interpreting the results, comparing them with prior studies, and addressing the implications of the findings and study limitations. Chapter Five concludes the study by summarizing the key findings and offering recommendations. The final section includes the References and Appendices.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This review aims to identify a theoretical framework and pinpoint the research gap within this field. By synthesizing these elements, the chapter lays the groundwork for understanding the complexities and challenges of integrating modern infrastructure with heritage conservation.

2.2 Integrated Infrastructure

There is no single universally accepted definition of infrastructure (AECOM, 2016). However, different authors and organizations define infrastructure depending on their specific needs and interests. Infrastructure is the circulatory, digestive, and skeletal systems of society, optimized for health, vitality, and longevity (Pollalis, 2016). It refers to the physical and organizational structures necessary for society to function. It acts as a foundation for economic productivity and human well-being by enabling and mediating the flow of goods, information, people, and services, which come in two forms: hard and soft. Hard infrastructure includes physical forms such as energy, transport, water, wastewater, solid waste, information and communication technologies, as well as green and blue infrastructures while soft infrastructure involves the development of human and social capital, such as access to employment, education, healthcare facilities and social services (Hall et al., 2012; Williams, 2014; Brail et al., 2017).

Moreover, according to (Cass et al., 2018; Blundell, 2020), the meaning of infrastructure is based on its ability to connect individuals to the services they provide and therefore any potential changes to the systems that infrastructure connects to, the technologies it uses, or the practices it employs, will change how the infrastructure is framed and viewed. Consequently, infrastructure is in a constant form of flux, it combines physical forms and soft infrastructure and is situated within a place's dynamic activities, it cannot be viewed in isolation from its wider situated context in relation to the built environment, the service it delivers and the people who use it. It is a complex, interconnected system that is closely tied to other systems like the economy, society, nature, and institutions. It should not be viewed as a linear object or approached in a mechanistic manner. The spatial implications of infrastructure are significant, and its various systems are interdependent (Ejigu, 2007).

The concept of integrated infrastructure is widely accepted but lacks a clear definition. It is a flexible and ambiguous term that varies in meaning depending on the context. There has been little analysis and understanding within the academic literature of what the definition of infrastructure integration can be. While there is widespread recognition that integrated thinking could be beneficial, questions surrounding what to integrate, how, and at what scale, are often left unanswered (McLean, 2018). While the rhetoric of infrastructure integration is strong, its practical implementation remains limited (Arts, et al., 2016; Saidi et al., 2018). However, when examining the concept of integration in the context of network and urban planning, it becomes fuzzy, fluid, and open to interpretation, often acting as a meaningless catch-all phrase that conceals power relations within governance frameworks (McLean, 2018). The term has become something of a buzzword that very few people can disagree with, but it has to be situated in particular organizational, resource, and knowledge contexts. Nevertheless, Integrated infrastructure aims to bridge the gap between planning, funding, and delivery to achieve cost efficiency, environmental benefits, and citizen focus. It acknowledges the synergies between infrastructure sectors and highlights the need for effective planning mechanisms (Hall et al., 2012; Dunning & Buck, 2017; McLean et al., 2018). Planning plays a crucial role in integrating infrastructure and focus on place, ensuring that individual developments are planned as part of a broader picture, resulting in greater value for the local community and developers (Adams & Watkins, 2014; Williams , 2014).

2.3 The Role of Infrastructure Planning

Infrastructure plays a crucial role in building sustainable cities, and effective planning is key to ensuring the sustainability of infrastructure. Sustainable cities rely on well-planned critical infrastructure which is so intrinsic to urban life that power, water, transportation, and telecommunications networks (Neuman, 2011). Infrastructure systems provide basic services like energy, water, food, mobility, and information, but they also have regulatory elements, social and cultural implications that should be considered in planning to meet the needs of communities and promote their development. A synergistic approach to infrastructure planning is vital to reducing demand on other systems, optimizing placement, and mitigating negative impacts. This approach involves looking at the bigger picture and prioritizing integrated planning to improve each system (Ejigu, 2007; Pollalis, 2016). There

are two different ways of thinking about infrastructure planning: The developmental approach views infrastructure as something that evolves over time in terms of both its usage and users and recognizes its different intersections that infrastructure facilitates and mediates, while the isolationist approach sees infrastructure as independent of its context and does not recognize its interconnected nature (Cass et al., 2018).

Good infrastructure planning begins with a comprehensive plan that considers the immediate and future impacts of infrastructure on the economy, environment, and quality life of a community. They influence how we travel, where we live and work, and access to basic necessities. Infrastructure can also serve as a guide for directing development towards areas aligned with the goals of the general plan. Extending major infrastructure into underdeveloped areas can facilitate growth and attract developers, aligning with the plan's intentions. Additionally, infrastructure planning should not only focus on new development potential but also assess opportunities to intensify existing development (State of Queensland, 2022). However, infrastructure planning faces several challenges, including conflicting national and local priorities, resource limitations, and funding constraints.

Poor infrastructure management can reduce service quality, while environmental and cultural concerns, climate change, and extreme weather pose risks. Population growth may strain existing infrastructure, and resource conflicts can hinder its maintenance. Addressing these challenges requires careful planning, resource allocation, and proactive strategies to ensure sustainable, resilient, and inclusive infrastructure development (AECOM, 2016).

Different approaches to infrastructure planning offer comprehensive frameworks for achieving sustainable and effective infrastructure development. AECOM offers a comprehensive four-step approach to infrastructure planning, that can be customized to suit the specific context. It emphasizes gathering data on development goals, assessing current infrastructure gaps, prioritizing projects, and ensuring the effective delivery and implementation of infrastructure activities. This approach highlights the importance of stakeholder engagement, local context consideration, and long-term sustainability through careful planning, funding, and maintenance strategies (AECOM, 2016).

On the other hand, UNEP’s International Good Practice Principles for Sustainable Infrastructure emphasize the integration of environmental, social, and economic

sustainability across the infrastructure lifecycle. The document promotes the adoption of integrated, systems-level approaches to sustainable infrastructure planning, delivery, and management. It presents policymakers with guiding principles for integrating sustainability into infrastructure planning from the earliest stages, in such a way that they can be adapted and applied to any specific national context. It helps to move from simply doing infrastructure right to doing the right infrastructure that best meets service needs sustainably. Table 2.1 outlines ten guiding principles that highlight the focus areas and rationale for infrastructure planning and development. These principles are drawn from various case studies with broad geographic representation, spanning multiple sectors and diverse types of infrastructure (UNEP, 2022).

Table 2.1 Good practice for sustainable infrastructure (UNEP, 2022)

SN	Principles	Cases	Objectives
1	Strategic planning	Saint Lucia's National Infrastructure Assessment	Ensure the alignment of infrastructure policies and decisions with global sustainable development agendas
2	Responsive, resilient, and flexible service provision	Digital infrastructure improvements for connectivity and resilience in Afghanistan	To meet actual infrastructure needs, allow for changes and uncertainties over time, and promote synergies between infrastructure projects and systems.
3	Comprehensive life cycle assessment of sustainability	Landscape-scale planning to support conservation, nomadic livelihoods and sustainable development in Mongolia	Including the cumulative impacts of multiple infrastructure systems on ecosystems and communities over their entire lifespans, to avoid "locking in" infrastructure projects and systems with various adverse effects.
4	Avoiding environmental impacts	Water funds to institutionalize nature-based solutions in Ecuador	To make use of nature's ability to provide essential, cost-effective infrastructure services and provide multiple co-benefits for people and the planet.
5	Resource efficiency and circularity	Singapore's green buildings	To minimize infrastructure's natural resource footprint, reduce emissions, waste and other pollutants, and increase the efficiency and affordability of services.

SN	Principles	Cases	Objectives
6	Equity, inclusiveness, and empowerment	Solar for health in Zimbabwe	Through a balance between social and economic infrastructure investment to respect, protect and fulfil human rights and promote well-being, particularly of more vulnerable or marginalized groups.
7	Enhancing economic benefits	The community benefits of Iran's traditional qanat systems	Employment generation and support for the local economy.
8	Fiscal sustainability and innovative financing	Developing wind farms with fiscal sustainability in Austria	To close the infrastructure investment gap within the context of increasingly constrained public budgets.
9	Transparent, inclusive, and participatory decision-making	Balancing national priorities with local concerns through transparency and consultation in chile	Includes stakeholder analysis, ongoing public participation, and grievance mechanisms for all stakeholders.
10	Evidence-based decision-making	Infrastructure data innovations in Malawi	Includes regular monitoring of infrastructure performance and impacts based on key performance indicators and the promotion of data sharing with all stakeholders.

In addition, Colombo et al., (2024) introduce the Comprehensive Energy Solution Planning (CESP) framework, an innovative approach for sustainable energy access in developing countries, aligning with the 2030 Agenda for Sustainable Development as demonstrated in Figure 2.1. Addressing limitations of traditional engineering methods that overlook long-term sustainability and social implications, CESP integrates engineering and social sciences in a cyclic, iterative process. The six phases of CESP include: Context Analysis to understand the project's environment; Resource and Demand Assessment to gather data on available energy resources and needs; Technical Solution Design to identify and size suitable technologies; Business Model Design for project sustainability; Complementary Activities to enhance broader development goals; and Impact Analysis to evaluate outcomes and refine future projects. This multidisciplinary framework ensures a holistic and adaptable decision-making process, making it a practical tool for local planners.

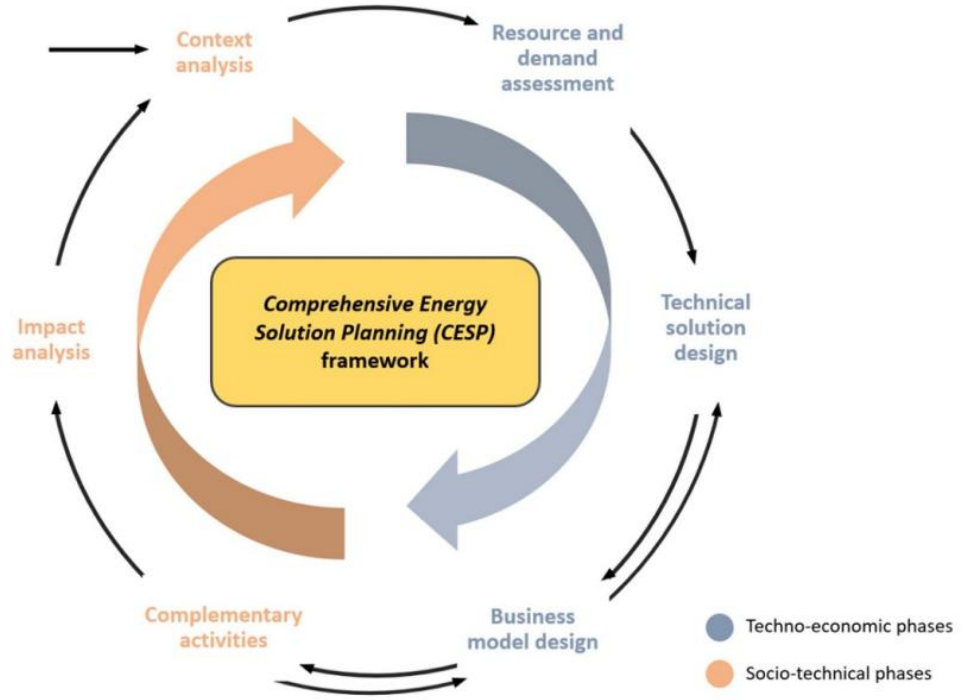

Figure 2.1 Layout of Comprehensive Energy Solution Planning (Colombo et al., 2024)

2.4 Historic Urban Planning

2.4.1 Conservation and Development Paradox

The preservation and modernization of historic districts pose a significant global challenge, requiring a careful balance between conserving cultural heritage and accommodating contemporary urban development (Ercan, 2011; Houdek, 2014). This challenge is particularly acute in areas where infrastructural decay and socio-economic stagnation threaten community vitality (Naciye & Rokhsaneh, 2014). Efforts to harmonize architectural integrity with modern functionality often lead to conflicts, risking either over-commercialization or neglect (Feilden, 2007). Stakeholders frequently view development and conservation as conflicting goals, with development perceived as a threat to heritage and conservation as a barrier to economic growth (Thaitakoo, 2006). Conservation efforts are often limited to a discrete, linear identification, intervention, and completion process. It fails to integrate into broader, dynamic systems that recognize the interconnected and long-term values of resource, usefulness, and community. Consequently, this selective conservation practice has been criticized for significantly falling short of its potential (Rodwell, 2014).

According to Sisay et al., (2023), despite limited research on integrating urban development and cultural heritage management, there is a growing concern regarding heritage preservation and the potential risks associated with urban development. Several factors contribute to the poor performance of heritage conservation projects such as globalization, structural changes, social shifts, rapid urbanization, poorly planned infrastructures, insufficient funding, climate change, ill-conceived and unsustainable tourism, unregulated commercialization, gentrification, lack of traditional knowledge among conservation professionals, corruption, and flawed conservation policies Menchawy et al., 2011; Roy & Kalidindi, 2017; UNESCO, 2021). Additionally, limited community involvement, cultural degradation, government neglect, and a lack of coordination among stakeholders further pose threats to heritage conservation (Bayih, 2018).

In addition, less attention has been paid to probing the complexities of balancing heritage and development, especially in African heritage. Besides the subject of African heritage and its sustainable development has become one of the most discussed issues of late, both within and outside the continent. However, the discussion on sustainable heritage conservation and development cannot be more relevant and timely than on the African continent today. The discussion has not been confined to heritage practitioners but has traversed the traditional boundaries, bringing in the practitioners, academicians, communities, and public and private companies wanting to open up their heritage resources as sources of wealth creation and poverty alleviation, beyond the usual tourism activities. The question of whether heritage can be used for development seems to be no longer contested; the question is how rather than why (UNESCO, 2018).

Likewise, heritage management in Ethiopia is guided by several key regulatory documents designed to preserve cultural heritage while promoting economic growth and development. For instance, the Ten-Year Development Plan (2021–2030) prioritizes infrastructure to drive economic growth in agriculture, manufacturing, mining, and tourism, focusing on transport, clean water, renewable energy, and private sector engagement (Ministry of Planning and Development, 2021). The Sustainable Tourism Master Plan (2015–2025) seeks to position Ethiopia as a top African destination by improving tourism infrastructure and connecting it to sustainable growth and cultural conservation (United Nations Economic Commission for Africa, 2015). The Tourism Development Policy (2009) underscores infrastructure's role in enhancing tourist experiences while supporting marginalized groups through tourism-linked enterprises (Ministry of Culture and Tourism, 2009). The Cultural Policy (2016) stresses protecting cultural heritage within modern development (Ministry of Culture and Tourism, 2016). Despite these regulatory efforts, according to ICOMOS, the Global Heritage Fund, and Kidane-Mariam, as referenced by Gebreegziabher et al., (2019), Ethiopia holds vast potential as a leading tourist destination in Africa due to its rich and diverse cultural and historical heritage. However, various challenges hinder the development of its tourism sector. These include financial constraints, inadequate security, unclear site boundaries, insufficient infrastructure, looting, vandalism, lack of local participation, and the absence of impact assessments.

Moreover, preservation and development efforts are further complicated by social inequalities, political instability, the pressures of mass tourism, unplanned development, neglect, weak economic conditions, and natural disasters. Consequently, many heritage sites face serious damage and their long-term survival is uncertain (Gebreegziabher et al., 2019).

In connection to these broader challenges, Haftamu Aberha (2018) identifies significant challenges in the conservation of the Walled City of Harar, Jugol, a UNESCO World Heritage Site. Among the most pressing issues are inappropriate restoration methods and modern interventions that compromise the authenticity of the city's historic structures, including its walls, gates, and traditional architecture. Rapid population growth has further strained urban infrastructure, leading to overcrowding, illegal constructions, and unregulated development that encroach on and damage the historic environment. Poor integration of modern infrastructure has also caused significant disruptions. For instance, the installation of high telecommunication towers and distorted, intermingled wire cables on electrical poles undermines the visual and aesthetic integrity of the historic quarter. Similarly, the introduction of cobblestone paving in the narrow alleyways has caused water retention issues, leading to rising dampness that accelerates the deterioration of historic structures. Inadequate drainage systems compound the problem, contributing to the decay of the city's defensive walls and altering the visual character of the historic environment. Environmental factors, including erosion and pollution, intensify the decay of architectural heritage, while social challenges, such as informal vendors and unplanned settlements near historic sites, further disrupt the historic fabric. Economic constraints, including limited funding and the absence of financial incentives for preservation, hinder efforts to maintain and rehabilitate historic properties, leaving many in a state of disrepair. Despite these challenges, Haftamu emphasizes the importance of integrated conservation strategies, including coordinated efforts by regional governments and stakeholders to balance heritage preservation with contemporary infrastructure development needs.

Similarly, Teklemariam (2024) explores the challenges and opportunities of integrating historic preservation into the urbanization of Addis Ababa, Ethiopia. Rapid urban growth in the capital has led to the demolition of historic structures, particularly in areas like Piazza, where modernization projects prioritize economic development over heritage conservation. Teklemariam highlights the lack of public awareness regarding the cultural and economic value of preserving historic sites, compounded by weak regulatory frameworks and insufficient enforcement of preservation laws. Uncoordinated urban expansion has resulted in informal settlements and infrastructure projects that threaten the city's historic fabric. Despite these challenges, Teklemariam emphasizes the potential benefits of harmonizing heritage preservation with urban development. By utilizing frameworks like Zerrudo's four-phase heritage conservation approach: awareness, appreciation, protection, and utilization enhanced with tools such as Geographic Information Systems (GIS), sustainable development can be achieved while safeguarding cultural identity.

2.4.2 Historic Urban Landscape Approach

Traditional urban conservation often focused on preserving historic areas in isolation, which led to the displacement of local populations and a loss of cultural identity, while neglected areas faced decay and inadequate services. In response to these challenges, UNESCO introduced the Historic Urban Landscape (HUL) approach in 2011, emphasizing the integration of heritage conservation into broader urban planning. This holistic framework seeks to preserve the distinct identity of historic areas, improve the quality of life for local communities, and promote sustainable development by balancing cultural, social, and environmental considerations.

The Historic Urban Landscape (HUL) approach applies a balanced framework to manage the competing demands of heritage conservation and urban development by fostering clarity and prioritization in decision-making. As outlined in Table 2.2, the recommendation identifies six critical steps to adapt the new instrument to local contexts and ensure its effective implementation (UNESCO, 2011).

Table 2.2 Critical Steps of Historic Urban Landscape (UNESCO, 2011; UNESCO, 2016)

SN	Steps	Description
1	Comprehensive Surveys	Mapping natural, cultural, and human resources of the city
2	Participatory Planning	Using stakeholder consultations to determine values for protection and the attributes embodying these values
3	Vulnerability Assessment	Assessing socio-economic stresses and climate change impacts on identified attributes
4	Integration of Heritage Values	Incorporating urban heritage values and vulnerabilities into the city development framework
5	Prioritization of Actions	Prioritizing actions for conservation and development
6	Partnerships and Management Frameworks	Establishing partnerships and local management frameworks; coordinating activities between public and private sectors

In 2016, an evaluation of preservation efforts in various historic cities using the HUL concept led to the recommendation of four key tools for its implementation: community engagement, knowledge and planning, regulatory systems, and financial tools.

Community engagement tools empower stakeholders to identify key values, articulate aspirations, set goals, and agree on actions for heritage preservation and sustainable development. Knowledge and planning tools provide an understanding of the urban landscape, recognize cultural significance, and assess and monitor changes. Regulatory systems ensure the effective conservation and management of both tangible and intangible aspects of the urban landscape, integrating necessary changes. Financial tools build capacity, support private and public investment, and foster partnerships. For the HUL approach to be successful, it is imperative that these categories are tailored to local contexts and implemented concurrently, creating a holistic strategy that balances the preservation of cultural heritage with the demands of sustainable urban development (UNESCO, 2016).

Perez & Roders (2020) conducted a review of 140 peer-reviewed publication (Perez & Roders, 2020)ns on the Historic Urban Landscape (HUL) approach published between 2008 and 2019. Using the six-step HUL process as a framework, their analysis identified key gaps in HUL implementation and management. Their findings revealed a geographical bias in HUL research, with a concentration in Europe and China and limited representation from the Americas, Africa, and Oceania. A significant weakness identified was the lack of community participation and local partnerships, particularly in steps 2, 4, and 6 of the HUL process. The authors concluded that effective HUL management necessitates individual project evaluation and benchmarking and that ongoing discussions and case studies are crucial for refining the HUL approach and ensuring its successful application.

Furthermore, Yan, (2018) explores the use of the Historic Urban Landscape (HUL) approach in conserving the historic city of Kulangsu, during its World Heritage nomination. The approach redefined Kulangsu as a living settlement rather than merely a historic building, shifting conservation from focusing solely on artistic and historical values to integrating tangible and intangible elements, community participation, and sustainable development goals. The HUL framework improved conservation strategies by addressing the site's dynamic nature, enhancing the built environment, and fostering social and cultural interaction.

2.4.2.1 Elements of Historic Cities

Each city possesses its unique history and contributes to its heritage (Radics, Z., & Pénzes, J. , 2014). However, certain cities are commonly perceived as more historical due to their cultural heritage (Piccinato, 1993) which not only reflects their present state but also holds potential for the future. According to the Operational Guidelines for the Implementation of the World Heritage Convention by the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2021), cultural heritage encompasses monuments, groups of buildings, and sites. Cultural landscapes are defined as properties that represent the interaction between humans and nature, reflecting the evolution of human societies and settlements shaped by natural environments and various social, economic, and cultural factors (UNESCO, 2021).

The historical character of a city encompasses several key elements, including its urban layout characterized by plots and streets, the interplay between buildings and surrounding green areas, and the architectural attributes of structures such as their scale, style, materials, and decoration both inside and out. Additionally, it encompasses the connection between the urban environment and its surrounding landscape, comprising both natural features and human-made interventions. Furthermore, the historical character is shaped by the diverse functions that the city has fulfilled throughout its evolution over time (ICOMOS, 1987).

The HUL approach views the city as a continuous, evolving entity shaped by the layering and interaction of cultural and natural elements over time. It extends beyond the concept of a historic center or architectural ensembles to include the broader urban setting and its geographical context. This encompasses the area's topography, geomorphology, water systems, and natural characteristics, along with both historic and modern built environments. It also considers infrastructure, open spaces, gardens, land use patterns, spatial arrangements, visual and perceptual connections, social and cultural practices, values, economic activities, and intangible heritage linked to identity and cultural diversity. These elements collectively define a city's unique identity and atmosphere, guiding future planning and interventions (UNESCO, 2011).

Although a framework of indicative elements and typologies exists as shown in table 2.3, it must be tailored to accommodate each city's distinct attributes that shape its local and regional identity. Emphasizing attributes that promote harmony and continuity, the framework aims to prevent interruptions in the urban fabric. By acknowledging and conserving these attributes, cities can retain their unique identity and ensure cultural sustainability (UNESCO, 2011; UNESCO, 2020).

Table 2.3 Common elements of historic cities (UNESCO, 2011; UNESCO, 2020; UNEP, 2022)

Category	Attributes
Wider context	Skylines, valleys, hills, and natural features, Interaction with the environment, Hydrology and topography, Views and vistas, Spatial patterns and orientation, Origin of city plan
Urban elements	Axes and city walls, Streetscapes and street sections, Festival routes and markets, Architectural identities and historical layers, Public spaces and distribution of open spaces, Urban water systems and water elements, Materials and building techniques, Street patterns and land-use patterns, Economic activities and social inclusion, Local communities and social groups, Rhythm, interface, and circulation patterns, Flora and fauna, Spiritual and industrial dimensions, Building crafts and infrastructure
Monuments/buildings	Scale, materials, and building techniques, Form and plot setbacks, Colour, textures, and craftsmanship, Design qualities and ornamentation, Height and relationship to green spaces, Volume and relationship of built and open spaces
Intangible cultural heritage elements	Festivals, dance, music, markets, community congregation, sense of ownership, Social mix and cultural diversity, Spirit of place

2.4.2.2 Heritage Value

Heritage value is the foundation of conservation efforts, guiding what and how to preserve cultural and historical assets. It is valued for its archaeological, architectural, historical, scientific, aesthetic, socio-cultural, or ecological significance (UNESCO, 2005). Rodwell (2014), asserted that historic cities possess a valuable asset in their unique cultural identity, embodied by their holistic understanding of the historic urban landscape. This distinctiveness sets them apart from competitors and serves as their key selling point for attracting businesses, residents, and visitors. By recognizing this common ground, conflicts can be resolved, presenting opportunities for long-term success.

When introducing modern functions, including tourism, to historical cities, the valuation of the entire urban layout and its individual components, taking into account both traditional values (historical, artistic, scientific) and utilitarian aspects, becomes essential (Radics, Z., & Pénzes, J. , 2014). However, selecting appropriate new functions for historical sites is challenging, as poor preservation and unsuitable function choices can lead to the degradation of heritage (Hmood, 2019). The challenge lies in balancing these considerations to ensure that the new use meets modern needs while preserving the site's historical and symbolic significance. Yet the authenticity and integrity of spatial units are crucial historical values that should guide the direction and extent of current and future functions while preserving and respecting these values (Radics, Z., & Pénzes, J. , 2014).

Li et al. (2024) investigate the application of the Historic Urban Landscape (HUL) approach to the conservation of traditional Chinese villages. They argue for integrating physical heritage with daily life in heritage value assessments, as current efforts often prioritize material authenticity over usability and cultural elements. Using Tangfang village as a case study, they demonstrate how the HUL approach values rural heritage's landscape, functional, and spiritual dimensions while emphasizing community participation in value assessment. The study concludes that effective heritage conservation requires balancing the interests of multiple stakeholders, considering both material and human values. Experts, grassroots organizations, and universities are crucial for providing guidance, mobilizing resources, and amplifying local voices.

Furthermore, Community engagement is crucial in heritage conservation, prompting discussions about whose heritage is being preserved and necessitating proactive listening to diverse voices while avoiding loaded terminology. By emphasizing common ground and integrating heritage into everyday life, cities can foster social cohesion and achieve core objectives. In an era of globalization, cities must strive for distinctiveness rather than replication. Historic cities should start with their unique inherited qualities. Lose that and all is lost. However, by embracing their inherent qualities, historic cities can thrive economically and stand out in a competitive world (Rodwell, 2014).

2.4.2.3 Vulnerability Assessment

Urban areas, particularly historic centers, are highly vulnerable to natural hazards like floods, storms, and earthquakes, which can cause significant human, economic, and heritage losses (United Nations Office for Disaster Risk Reduction, 2018; Ferreira & Eudave, 2022). Additionally, man-made threats such as wars, mass tourism, and gentrification also negatively impact cultural heritage (Moustafa, 2016; Hernández, et al., 2017). The Historic Urban Landscape (HUL) approach, outlined by UNESCO (2016), provides a framework for assessing and planning resilient historic cities, considering factors like vulnerability to natural events and socio-economic stresses. Preparedness for these risks is crucial to ensuring the long-term sustainability of historic urban areas as highlighted by World Bank (Ferreira & Eudave, 2022).

Ferreira & Eudave (2022) highlight the growing risks to built cultural heritage due to climate change and human activities, stressing the importance of accurate risk assessment to anticipate future challenges. They discuss the use of digital tools, such as GIS and remote sensing, for tasks like vulnerability assessment and damage mapping. While simplified risk assessment approaches can provide preliminary insights and improve decision-making, they may overlook local factors that affect the results. The study also emphasizes the potential of AI to enhance risk models, though better training data is needed to avoid misleading outcomes.

2.4.2.4 Urban Acupuncture as a Strategy for Sustainable Development

Urban acupuncture, a concept derived from Traditional Chinese Medicine (TCM), involves the insertion of fine needles into specific parts of the human body to treat various symptoms, emphasizing the interconnectedness of nature, disease, and prevention. This holistic approach underscores the unity between humans and their environment. In TCM, meridians are channels that carry the vital energy (qi) throughout the body, connecting organs and bodily functions. Applying these principles to urban environments, urban acupuncture views cities as living organisms with vitality, viscera, meridians, and acupoints (Li Y. , 2023).

Marciano, Casagrande, and Lerner, as cited in Daugelaite & Vileniske (2018), describe urban acupuncture (UA) as focusing on precisely localized interventions within the urban fabric to regulate energy flows which encompass ecological, sociocultural, socioeconomic, and information flows in the city as displayed in Figure 2.2. These flows facilitate the city's successful functioning. In this context, the movement and activities of people, ecological processes, and the exchange of information are metaphorically considered the city's energy. At the same time, elements of the urban structure, such as streets, squares, green areas, and buildings, are regarded as the city's organs or viscera.

Figure 2.2 Pocket Parks

(Jolma Architects , 2018)

Vitality represents the essential force that drives healthy functioning in the human body and is necessary for optimal urban development. Meridians, which connect different systems in the body, correspond to city corridor systems essential for survival and growth. Acupoints, the sensitive spots along meridians where vital interactions occur, are paralleled by spatial hubs and significant public activity locations in cities. These vitality points, including landmarks and cultural heritage sites, are critical to a city's overall health and vibrancy (Li Y. , 2023) as illustrated in Figure 2.3.

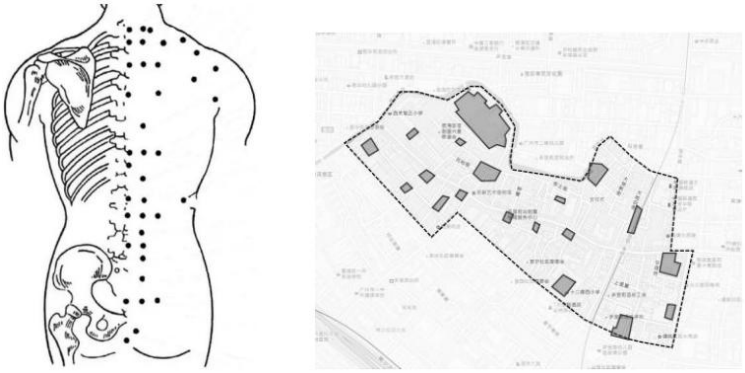

Figure 2.3 Diagram of Human Acupoints (left) and Illustration of Vitality Points (right) (Li Y. , 2023)

Urban Acupuncture (UA) can be applied to address specific urban issues through strategic small-scale interventions targeting city pressure points. These interventions may include developing community spaces to enhance social interaction, revitalizing neglected areas, creating green spaces, implementing environmental initiatives, and making small-scale infrastructural improvements. Such interventions aim to stimulate broader positive changes, contributing to the city's overall health and vitality (Yacoub & Alkinani, 2024). Moreover, cities face challenges in development and preservation, particularly concerning historical environments. Urban acupuncture offers a solution through targeted, quick, and cost-effective changes that positively impact the surrounding environment's social, ecological, economic, and physical aspects (Daugelaite & Vileniske, 2018). This approach aims to revitalize deteriorated areas, create livable and vibrant cities, and rejuvenate neighborhoods lacking adequate infrastructure and services (Yacoub & Alkinani, 2024). As illustrated in Figure 2.4, Urban Acupuncture (UA) is guided by eight essential principles for effective strategy implementation: accurately identifying urban acupoints, promoting small-scale interventions, encouraging immediate action, creating meaningful places, enabling progressive catalysis, adopting a holistic approach, fostering public participation, and emphasizing citizen education (Li Y. , 2023).

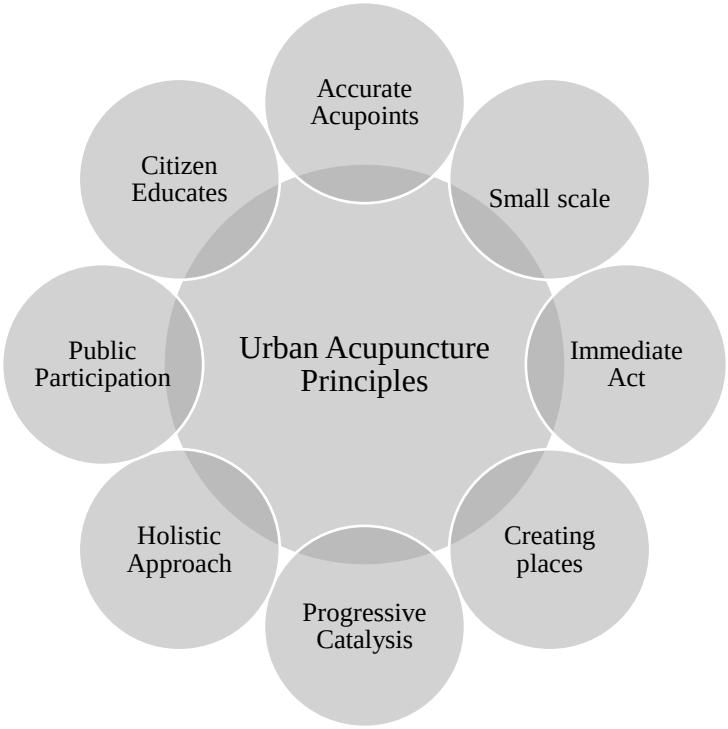

Figure 2. 4 Principles of Urban Acupuncture

Adopted from (Li Y. , 2023)

Rodwell emphasizes that modern interventions in historic urban areas must prioritize integration that respects the scale and design of these quarters, focusing on small-scale mixed-use functions and safeguarding artisan activities to maintain their character and functional proximity. Protecting the historical use of housing is essential for preserving both the physical and social diversity of these neighborhoods, including established communities. Clear objectives and effective conservation policies are necessary to prevent tourism from overshadowing local needs and to ensure sustainability. Transitioning to systems thinking fosters a comprehensive understanding of how various elements interact within a broader context, allowing for the examination of inputs, outputs, and consequences to mitigate unintended outcomes (Rodwell, 2014).

Al-Hinkawi and Al-Saadi draw upon various authors to clarify the tools and methods of urban acupuncture, highlighting its ability to strategically heal the built environment through small, targeted interventions. For instance, Foth explains that urban acupuncture aims to relieve the built environment through strategic healing. Parts of the city function

like a heart, gradually healing the entire urban area through small, targeted interventions that spread their impact. Specific intervention points are identified through thorough environmental, economic, and social analysis with community collaboration. Small-scale interventions create a social stimulus in the urban fabric, addressing local needs and reviving the entire city. Further Casagrande provides successful urban acupuncture examples, such as Bilbao, Spain, where cultural and architectural interventions, including the Guggenheim Museum, revitalized the local economy by attracting international tourism and investment. Similarly, in Curitiba, Brazil, urban acupuncture improved infrastructure through an efficient, eco-friendly public transport system, reducing traffic congestion and pollution while boosting local businesses. These interventions demonstrate urban acupuncture's potential to address urban challenges through integrated solutions. Kanishk highlights the use of urban acupuncture in Kampung, Indonesia, addressing transportation, waste recycling, affordable housing, and public spaces. These interventions created a sustainable, eco-friendly urban environment while preserving traditional values, proving that modern urban interventions can coexist with local culture and heritage (Al-Hinkawi & Al-Saadi, 2020).

2.4.3 Infrastructure Planning in Historic Places

Infrastructure plays a critical role in the development of historic cities, providing the framework for adapting degraded or abandoned districts to contemporary urban needs (UNESCO, Developing historic cities: keys for understanding and taking action; A compilation of case studies on the conservation and management of historic cities., 2014). According to Loopesko (2021), the interconnectedness of cultural heritage and sustainable development, as highlighted by (UNESCO, IUCN, UNEP, ICOMOS and UCLG), thoughtful infrastructure development can revitalize historic areas by preserving their unique architectural and cultural heritage while attracting residents, businesses, and visitors. These sites offer opportunities to test innovative, adaptive solutions through collaboration with scientists, local communities, and stakeholders. Many historic properties incorporate climate-adaptable construction techniques, enhancing resilience to climate hazards while preserving traditional knowledge and promoting socio-economic diversity. Their compact, pedestrian-friendly design encourages non-motorized mobility or

public transit due to narrow roads and limited parking, reducing dependence on motorized transport.

Additionally, historic cities can drive innovation in green infrastructure, employing passive heating and cooling systems that align with local climates and reduce carbon footprints. Culture-based approaches enhance resilience by creating adaptable infrastructure and supporting post-disaster recovery. Loopesko also highlights that as climate change accelerates, shifts in weather patterns will influence energy consumption, necessitating urban models prioritizing energy efficiency and sustainability. Promoting low-carbon energy alternatives, particularly in transportation, is vital given the tourism sector's energy demands. Addressing these challenges requires research into energy-efficient strategies for historic buildings, engaging creative actors to develop educational initiatives, and implementing measures such as energy efficiency certifications, increased financing options, and training tailored to traditional construction methods to support a sustainable and energy-efficient future (Loopesko, 2021).

However, many authors disclose the tension between preserving historic infrastructure and meeting modern urban demands. A study by Fredholm et al., 2021 highlights that heritage management in infrastructure planning is a complex, wicked problem often insufficiently understood in theory and practice. The study emphasizes the paradoxes and dilemmas that arise in heritage negotiations, calling for a more collaborative approach that acknowledges heritage as a dynamic and complex concept. This complexity often leads to discursive conflicts between planners and heritage practitioners, who must navigate competing notions of heritage, its networks, and boundaries. Traditional organizational frameworks make resource allocation challenging despite shifts toward proactive heritage engagement. Similarly, Olsson & Haas (2005) explore the impact of structural change and infrastructure planning on cultural heritage and place sense in Söderhamn, Sweden. They argue that understanding place characteristics and the interactions between people and places over time is essential for sustainable heritage management.

Scheer (2020) underscores the cultural significance of historic streets and blocks, emphasizing their role in fostering community identity and continuity. The Author advocates for adaptive reuse and integration of modern infrastructure while preserving the

character of historic layouts. Scheer highlights the need for context-sensitive urban planning that balances preservation with innovation, ensuring that cities evolve to meet contemporary demands without erasing valuable heritage.

2.4.4 Lessons from Infrastructure Planning in Historic Places

This section presents case studies of three historic sites: Kota Tua (Jakarta, Indonesia), Cajamarca (Peru), and Lalibela (Ethiopia) to provide comparative insights into the challenges and opportunities of infrastructure development within heritage contexts. Each case study explores key lessons regarding the challenges and opportunities associated with infrastructure enhancements while ensuring the preservation of both tangible and intangible cultural assets.

2.4.4.1 Case of Kota Tua

Kota Tua, situated in Jakarta's historic core, encompasses numerous cultural heritage sites dating back to the 17th and 18th centuries. These sites serve as major tourist attractions, playing a significant role in the economic, social, and cultural development of the city. Kota Tua boasts a diverse range of heritage structures, including colonial-era buildings, Chinese-Indonesian residences and temples, Arab-Betawi mosques, and post-independence modernist architecture. Its intangible heritage is equally diverse, with local communities preserving traditions like Keroncong music, influenced by Portuguese culture. Additionally, the harbor of Sunda Kelapa preserves a rich seafaring legacy, with traditional wooden boats still in use by fishermen and sailors, maintaining a connection to the region's maritime history. Despite its cultural richness and potential, Kota Tua faces serious challenges. Neglected infrastructure, utilities, and economic pressures, have led to the destruction of many historically significant buildings. Pollution, flooding, traffic congestion, inadequate waste management, and crime further exacerbate the area's problems, reflecting broader urban challenges within Jakarta (UCLG, 2017).

In 1974, a revitalization program was initiated for Kota Tua, emphasizing the protection of its heritage sites and fostering tourism development. However, infrastructure and service provision remained inadequate, resulting in the deterioration of many buildings. The absence of pedestrian-friendly areas compounded accessibility challenges for residents, worsened by street vendors and parked motorcycles encroaching on sidewalks.

Recognizing the need for holistic improvement, the Jakarta city government launched a comprehensive development plan in 2014. The revitalization of Kota Tua has restored many historic buildings and sparked active preservation efforts for the neighborhood's cultural heritage. Improved accessibility, such as transforming Kalijodo from a red-light district into a public park with recreational amenities, prohibiting vehicles in key areas, enhances tourism and pedestrian experiences. In 2015, foreign tourist arrivals accounted for 25% of the total, showing a substantial 63% increase since 2008. Furthermore, in 2016, Jakarta welcomed approximately 32.67 million domestic tourists, indicating a growing interest in the city as a tourism destination. However, challenges like illegal parking, street vending, and financial constraints in conserving cultural heritage persist (UCLG, 2017).

Shonke Village can draw important lessons from the cases by addressing its current infrastructural shortcomings while leveraging its cultural heritage for sustainable development. In the case of Kota Tua, revitalization efforts demonstrate that heritage conservation and infrastructure improvements must go hand in hand to prevent further abandonment and unlock the village's economic potential. Despite its rich cultural heritage, Kota Tua initially faced issues similar to Shonke's, such as dilapidated infrastructure and economic stagnation. Kota Tua's transformation included making the area pedestrian-friendly, restoring historical buildings, and creating public spaces, like the Kalijodo park, which helped attract tourists and stimulate economic growth, demonstrating the successful adaptation of degraded districts to meet contemporary urban needs (UNESCO, Developing historic cities: keys for understanding and taking action; A compilation of case studies on the conservation and management of historic cities., 2014). The key learning for Shonke here is the importance of upgrading basic infrastructure such as improving roads, utilities, and public spaces while maintaining the cultural integrity of historical sites. Shonke can apply this approach by enhancing its tourism potential through infrastructure improvements tailored to cultural heritage. However, Kota Tua's experience also highlights the challenges of inadequate infrastructure management, such as illegal parking and waste, which Shonke should preemptively address by adopting a strong urban management plan that includes tourism zoning and sustainable visitor management, aligning with Scheer's (2020) advocacy for context-sensitive urban planning that balances preservation with innovation.

2.4.4.2 Case of Cajamarca

The Qhapaq Ñan, or Andean Road System, was inscribed as a World Heritage Site in 2014 for its cultural and historical significance, spanning Argentina, Bolivia, Chile, Colombia, Ecuador, and Peru. Despite its importance, about 34.5 million people in South America, mostly in rural and indigenous communities, lack electricity. These areas are often excluded from grid expansion plans due to low demand, dispersed settlements, and difficult access. To address this, clean energy projects, including solar and wind, have become priorities in the region, utilizing abundant natural resources (UNESCO, 2021).

Within this context, the Luz en Casa (Light at Home) Program in Peru demonstrates the feasibility of rural electrification through renewable energy. The project employs a 5P model, engaging stakeholders such as regulators, co-financers, and municipalities. It uses second-generation solar home systems with storage batteries, offering services like lighting, radio, and mobile charging under an Energy-as-a-Service (EaaS) model, where users pay a monthly fee. Since 2009, the project has provided electricity to 3,910 households in 188 communities over 12 years. Its community-centered approach fosters active user participation, leading to high satisfaction and low default rates. Benefits include extended study and cooking hours at night, environmental gains from reduced CO2 emissions and battery waste, and significant cost savings compared to grid extensions. However, challenges persist in maintenance, repair logistics, and access to skilled technicians, which are critical for the project's long-term success (UNESCO, 2013; Del-Río-Carazo et al., 2022).

The Luz en Casa project in Cajamarca offers a relevant model for addressing Shonke's energy needs through decentralized, community-owned renewable energy systems, providing a cost-effective and sustainable solution for rural electrification and boosting both livelihoods and tourism, reflecting Loopesko's (2021) emphasis on promoting low-carbon energy alternatives in tourism sector’s energy demands. This case provides Shonke with a practical approach to introducing solar energy that is community-owned and managed and ensuring energy access for both residents and tourism activities. Local communities' involvement in installing and maintaining solar systems, as seen in Cajamarca, fosters a sense of ownership and long-term sustainability. Moreover, adopting

this model in Shonke could enhance socio-economic activities like extended hours for local businesses, boosting livelihood and tourism. Shonke should also consider the business model as Luz en Casa employed Energy-as-a-Service, making electricity affordable while ensuring the long-term financial sustainability of the project.

2.4.4.3 Case of St. Lalibela

Lalibela, located 645 km from Addis Ababa in the Amhara Region at an altitude of 2,500 meters, is home to 11 monolithic churches carved from volcanic rock over 800 years ago. Inscribed on the UNESCO World Heritage List in 1978, these churches are connected by underground tunnels and attributed to King Lalibela (1181–1221), who sought to create an accessible "New Jerusalem." Lalibela remains a significant spiritual, historical, and architectural site and a major pilgrimage destination.

In 2000, the World Bank launched the Plan for Accelerated and Sustained Development to End Poverty, prioritizing tourism in Ethiopia. Lalibela received substantial investment to boost tourism revenue and local economic growth, focusing on infrastructure, visitor services, and tourism products. A resettlement plan relocated 2,915 residents from the core area to protect the sacred site, compensating them with improved housing. However, community resistance stemmed from deep connections to the original area. The resettlement, completed in 2015, also contributed to urban sprawl. Between 2007 and 2017, Lalibela's urban population grew at an annual rate of 5.7%, significantly outpacing national averages. The urban footprint expanded by 251% from 1994 to 2014, primarily along main roads and towards the east, despite efforts to manage growth through the 2009 Structural Use Plan. The rise of low-density housing, limited flat land, and inefficient land use further exacerbated urban challenges (Robertson et al.,2017).

From 2000 to 2011, the population living below the poverty line dropped from 44% to 14% (World Bank, as cited in Columbia GSAPP, 2017). Tourism growth has been significant, with annual tourist numbers doubling, driven by a 77% increase in foreign visitors and a 269% rise in domestic tourists. Nearly 200,000 pilgrims also visit annually. This surge has boosted tourism revenue and created employment for around 2,000 people in sectors such as hospitality, guiding, and transportation. Investments in infrastructure, including cobblestone roads, restrooms, and signage, aimed to enhance visitor experiences.

However, these facilities are already deteriorating, with limited year-round use (Robertson et al.,2017).

Rapid construction of hotels and shops has strained local management capacity, with many accommodations remaining underutilized outside peak pilgrimage seasons. Environmental costs, such as land consumption and urban sprawl, have also emerged, while the expected socio-economic benefits lag behind. Additionally, concerns about the aesthetic and structural impact of protective shelters around the churches persist. Many locals find them intrusive and believe they undermine the site's authenticity, disrupt religious rituals, and alter the spiritual atmosphere. Encroaching developments threaten sacred spaces, circulation routes, and traditional experiences associated with Lalibela's intangible heritage, such as religious festivals and processions (Robertson et al.,2017). Despite various conservation efforts, threats such as encroaching construction and inadequate tourism infrastructure continue to challenge its integrity. Some authors highlight the conflict between urban growth and cultural heritage conservation in Lalibela. The development of religious tourism in Lalibela faces various challenges that impede its growth and potential benefits. These challenges include a lack of infrastructure, limited involvement of the local community, the dominance of wealthy individuals, the presence of non-religious activities, poor waste management, theft of heritage items, insufficient government attention, absence of planning, inadequate management of religious festivals, seasonality issues, and persistent problems with hassling and begging (Bayih, 2018; Sisay et al., 2023).

Lalibela's experience underscores the risks of poorly planned urban expansion on heritage sites (Sisay et al., 2023; Menchawy et al., 2011; Roy & Kalidindi, 2017; Bayih, 2018), which is a significant risk for Shonke if infrastructure development isn't carefully managed. In the case of Lalibela, Shonke can observe the balance between preserving cultural heritage and managing urban growth. Shonke must ensure its infrastructure projects do not encroach upon or diminish its historical and cultural assets. Lalibela also provides insights into managing the resettlement of residents from core heritage zones, ensuring their socio-economic well-being through compensatory infrastructure improvements. As Shonke grapples with population relocation and the threat of

urbanization, it can learn from Lalibela’s challenges with maintaining a balance between tourism expansion and protecting the sacred atmosphere of historical sites. Moreover, Lalibela’s experience with rapid population growth and inadequate urban planning shows that Shonke must develop a long-term master plan for urban and tourism growth that preserves the cultural landscape and ensures sustainable economic benefits from tourism. Lalibela's success in linking infrastructure investments to tourism growth such as improved roads, visitor facilities, job creation, and better accommodation highlights the need for Shonke to plan its tourism infrastructure strategically. However, Lalibela also faced challenges with poorly maintained infrastructure and seasonality in tourism, which Shonke can learn to avoid by ensuring that tourism infrastructure remains functional year-round and benefits the local community directly.

Table 2.4 summarizes three heritage development case studies, outlining each location's challenges, implemented strategies, and resulting outcomes.

Table 2.4 Summary of Case Studies

Location	Challenges	Strategies	Results	Lesson	Source
Kota Tua, Jakarta, Indonesia	Neglected infrastructure, pollution, economic pressures	Revitalization plan, infrastructure improvements, focus on tourism	Increased tourism, restored buildings, ongoing infrastructure challenges	Infrastructure development, and cultural heritage preservation should go hand in hand	(UCLG, 2017)
Lalibela, Ethiopia	Rapid urbanization, encroachment on surroundings, inadequate infrastructure, deterioration of visitor amenities	Resettlement plan, tourism infrastructure development	Reduced poverty, increased tourism revenue, infrastructure strain, environmental concerns, urban sprawl	Developing a long-term master plan to balance urban growth	(Robertson et al.,2017) (Bayih, 2018; Sisay et al., 2023)
Luz en Casa Cajamarca, Peru	Lack of electricity access in rural communities	Solar home systems, community engagement, Energy-as-a-Service model	Improved living standards, Improved energy access, reduced CO2 emissions, high user satisfaction	Implementing a sustainable, community-owned infrastructure	(UNESCO, 2021) (UNESCO, 2013; Del-Río-Carazo et al., 2022)

2.5 Conceptual Framework of the Study

The framework for this study incorporates Historic Urban Landscape (HUL) approach and Urban Acupuncture (UA) in Shonke Village focusing on a strategic, holistic method to balance preservation and infrastructure development. The HUL approach unfolds in three key stages: first, an Inventory of Cultural Assets identifies both physical and intangible heritage elements; second, Participatory Planning engages stakeholders to prioritize the preservation of cultural values while accommodating development needs; and third, Vulnerability Assessment evaluates the risks faced by cultural assets due to infrastructure challenges. Running parallel to this process, Urban Acupuncture provides targeted, localized interventions that enhance infrastructure integration while safeguarding heritage. This combined approach seeks to foster sustainable development in Shonke Village while preserving its unique cultural identity as presented in Figure 2.5.

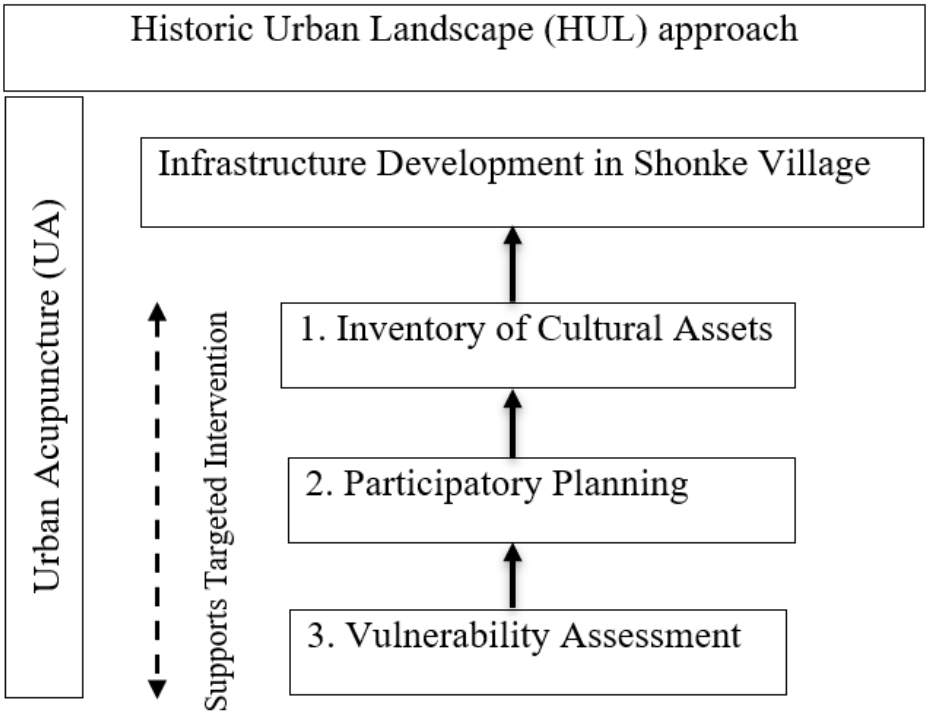

Figure 2.5 Conceptual framework of the study

2.6 Research Gap

The definition and practical application of integrated infrastructure remain ambiguous, lacking clear guidelines on what, how, and at what scale integration should occur (Arts et al., 2016; McLean, 2018; Saidi et al., 2018). This ambiguity is compounded by the tension between conservation and development, often perceived as mutually exclusive, leading to potential economic and environmental stagnation (Thaitakoo, 2006). In Ethiopia, despite abundant heritage resources, challenges exist in leveraging them for sustainable tourism development that benefits local communities, leaving many sites vulnerable to damage (Gebreegziabher et al., 2019). This research directly addresses this gap by providing empirical research focused on understanding and applying integrated infrastructure within the specific heritage context of Shonke Village. Through empirical research, this study will offer evidence-based insights into the challenges and opportunities of infrastructure interventions in historic places, providing valuable guidance for policymakers, planners, and stakeholders. By filling these specific gaps, this research aims to support more informed decision-making and promote sustainable infrastructure development that effectively respects and enhances the cultural heritage of these areas.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter explains the research methodologies used and it covers research design, population and sampling techniques, types of data and instruments of data collection, data collection procedure, and methods of data analysis. Furthermore, the research validity and reliability as well as the ethical considerations are included.

3.2 Description of Study Area

The research area is located in Jirota Kebele, part of Dawachefa Woreda in the Oromia Zone of the Amhara National Regional State as illustrated in Figure 3.1 Shonke is one of the subdivisions known as "gots" in Jirota Kebele for administrative purposes. Shonke is situated approximately 25 kilometers east of Kemise. Artuma Fursi Woreda bounds Shonke in the south, Dewe Harawa Woerda in the north, in the west by Afar region, Toleha "got" in the east. It is located at latitude and longitude of 10°36′52.34″ N and 39°58′22.31″ E respectively. It is characterized by moderate temperatures with an annual average of 18.63 ^{o}c and is found in the watershed of Borkena River, which is one of the tributaries of Awash River. A preliminary energy resource assessment using Homer Pro indicates high solar energy potential of the place, with an average daily insolation of 6.13 kWh/m², peaking in May (6.7 kWh/m²/day) and lowest in August (5.613 kWh/m²/day).

Shonke residents are farmers, cloth weavers, and merchants. Shonke Village was officially designated as a heritage site by the Authority for the Research and Conservation of Cultural Heritages of Ethiopia in April 2013, based on a six-page document that offered only limited information about the settlement as shown in Appendix B.

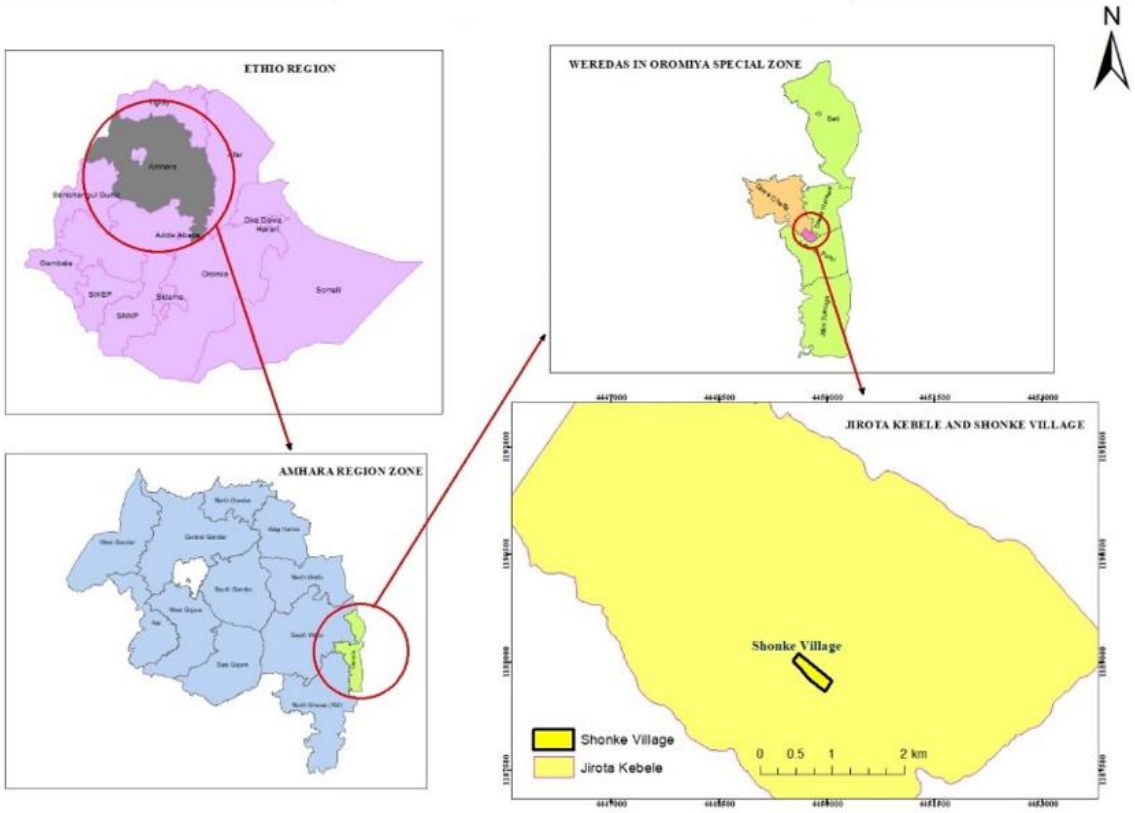

Figure 3.1 Location map of the study area

3.3 Research Design

In this study, a single case study approach is used, as the research is focused on understanding a specific case: how to introduce infrastructure into a historic village while preserving its cultural and historical integrity and allowing for an in-depth examination of the complexities between development and cultural preservation.

Especially, the study employed a combination of descriptive, explanatory, and instrumental case study research designs to investigate integrated infrastructure planning within the historic context of Shonke Village. The descriptive case study is suitable as it allows for a detailed documentation of Shonke's unique characteristics, including its heritage sites, infrastructure, and the needs of the community. This approach is essential for capturing the village's historical significance and understanding the current infrastructure challenges. The explanatory case study is also critical as it helps explain how Shonke's infrastructure issues are shaped by its historical context and how integrated planning can address these challenges. This approach links the village's infrastructure difficulties with broader

concepts of historical preservation and modern development. Finally, the Instrumental case study enables the study to draw lessons from Shonke's experiences and apply these insights to other similar historic locations. This combination of approaches provides a comprehensive framework to describe, explain, and generalize findings, making the research not only relevant to Shonke but also applicable to other historic villages facing similar infrastructure and preservation challenges.

A case study offers the unique advantage of engaging with real-life situations and testing theories in practice (Flyvbjerg, 2004). As Becker (1998) and Gerring (2004) highlight, case studies are particularly useful for examining complex phenomena that operate across multiple levels or are embedded in broader contexts. However, the debate around the generalizability of case study findings is central to this approach. Yin (2014) argues that case studies support analytical generalizations, concluding theoretical propositions rather than populations. This involves testing, modifying, or generating new theoretical concepts based on observations.

3.4 Research Approach

The study employed a mixed research approach, combining qualitative and quantitative methods such as a survey questionnaire (close-ended), semi-structured interviews, transect walks, and focus group discussions. This approach aimed to enhance research validity and provide a comprehensive understanding by expanding insights from one method to another and cross-checking data (Johnson et al., 2007).

3.5 Data Types and Sources

In this study, a combination of primary and secondary data sources was employed. Primary data were gathered through questionnaires, interviews, focus group discussions (FGDs), and the transect walk method to obtain specific site information. Secondary data, on the other hand, were collected from published and unpublished materials, such as journals, government records, and websites. The research utilized resident surveys to collect primary quantitative data, while key informant semi-structured interviews, FGDs, and researcher observations were instrumental in gathering qualitative data as shown in Figure 3.2.

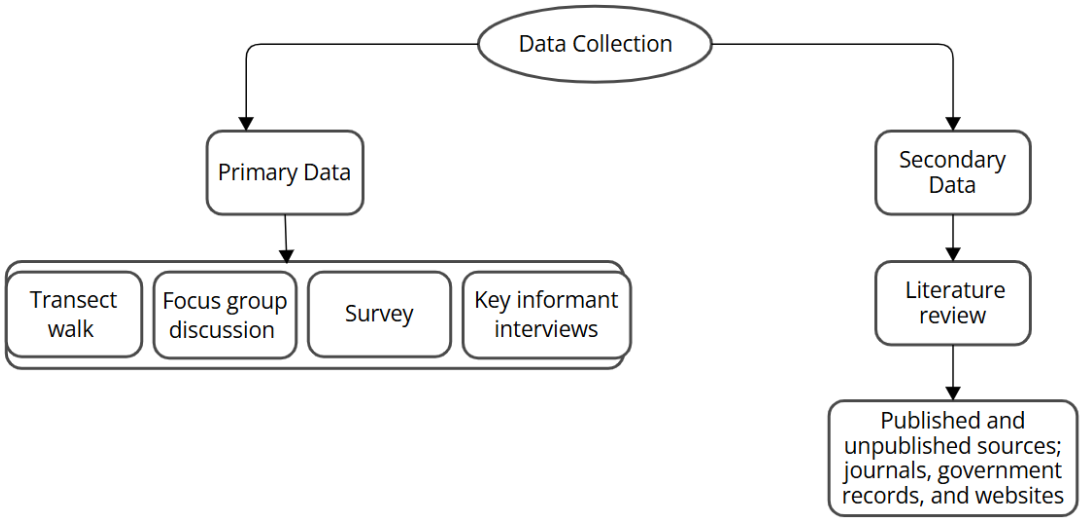

Figure 3.2 Data Types and Sources

3.6 Sampling Design

3.6.1 Sampling Techniques

In this study, non-probability sampling techniques were employed to select samples from the population. Respondents were selected using purposive sampling to ensure that participants were knowledgeable and directly relevant to the study objectives. This method allowed the researcher to focus on respondents most likely to provide valuable insights into the unique characteristics of Shonke Village. Additionally, participants for the focus group discussions from Shonke residents were purposively selected, with equal representation from both sexes. Respondents for the household surveys in Shonke village were also chosen purposively.

3.6.2 Sampling Population

The study population for this research comprised the heads of households in Shonke Village and key informants, including various local government officials. According to data from the Jirota Kebele Administration Office (2023), of the 298 households in the Shonke "got," 143 are located within Shonke Village.

3.6.3 Sampling Size Determination

Due to the area's remote nature and logistical challenges, the survey included 89 heads of households, selected based on their availability and willingness to participate. This represents a significant portion of the total 143 households in Shonke Village. The

purposive sampling approach was deemed appropriate given the need to collect in-depth data from key respondents who could contribute directly to the study's objectives. Efforts were made to ensure diversity among respondents by incorporating both male and female participants to provide a comprehensive understanding of the village's conditions.

Additionally, the researcher purposively selected 10 groups of key informants from Dewa Chefa officials across various departments, including kebele administrator, as shown in Table 3.1. Similarly, 7 key informants were purposively chosen from the residents of Shonke Village, including community leaders and residents of both sexes, to participate in focus group discussions, as depicted in Table 3.2.

Table 3. 1 List of Key Informant Interview Participants

Types of Key Informant Group	Department/office	Number of participants
Local government officials	Water	1
	Health	1
	Energy	1
	Agriculture	1
	Land administration	1
	Transportation	1
	Culture and Tourism	1
	Authority for Research and Conservation of Culture Heritage	1
	Kebele administrators	1
	Shonke village community leader	1
Total		10

Table 3.2 Participants of Focus Group Discussions

Types of participant	Categories	Number of participants	
		Male	Female
Shonke village residents	Community leaders	1	-
	Residents	3	3
Total		7	

3.7 Data Collection Methods

Before data collection began, the research conducted an introductory briefing with community members. This session outlined the assessment's goals of identifying key community needs and resources to guide targeted interventions. It highlighted the importance of community participation and confidentiality, explaining how data would be collected, stored, and analyzed to ensure anonymity. The briefing also described the data collection methods, such as surveys and interviews, and provided a platform for community members to ask questions and express concerns, which the researchers addressed to build trust and engagement, as shown in Appendix B.

3.7.1 Transect Walk

A transect walk is a guided walk along a predefined path (transect) through a community, conducted in collaboration with local residents. The primary objective is to explore and assess both the physical infrastructure and the unique attributes of the area. This process involves careful observation, photography, interviews, listening, and note-taking to document not just the infrastructure but also the distinctive cultural, social, and environmental characteristics that define the community. Through active engagement, participants work together to explore the area's historic significance, natural features, architectural styles, and cultural traditions. The insights gathered are then used to create a transect diagram, which visually maps both the infrastructure and the unique elements of the place. This approach fosters local involvement and generates valuable perspectives on the community's strengths, challenges, and identity, offering a comprehensive understanding of its present conditions and future potential.

The research incorporated transect walks along four predetermined routes, accompanied by residents, with each route taking approximately three hours as illustrated in Figure 3.2. The first route, starting from the Abaye Shonke Sitting Stone, traversed through Shonke Village and ended at the Chilata Water Point, capturing the village's historic elements. The second route, also beginning at the Sitting Stone, led towards Dew Dew, examining the village's outskirts and the transition to the surrounding landscape. The third route commenced at Abila Elementary School, progressed through Bokeke, and reached the Borkena River, revealing the village's hiking potential and the last one is from Kemise

Town to Sert around Bokeke by using Bajaj. By documenting observations along these walks, the research triangulated data and gained a richer understanding of Shonke Village's physical context, particularly regarding the interplay between preserving its unique character and historic features while planning for appropriate infrastructure development to meet its potential.

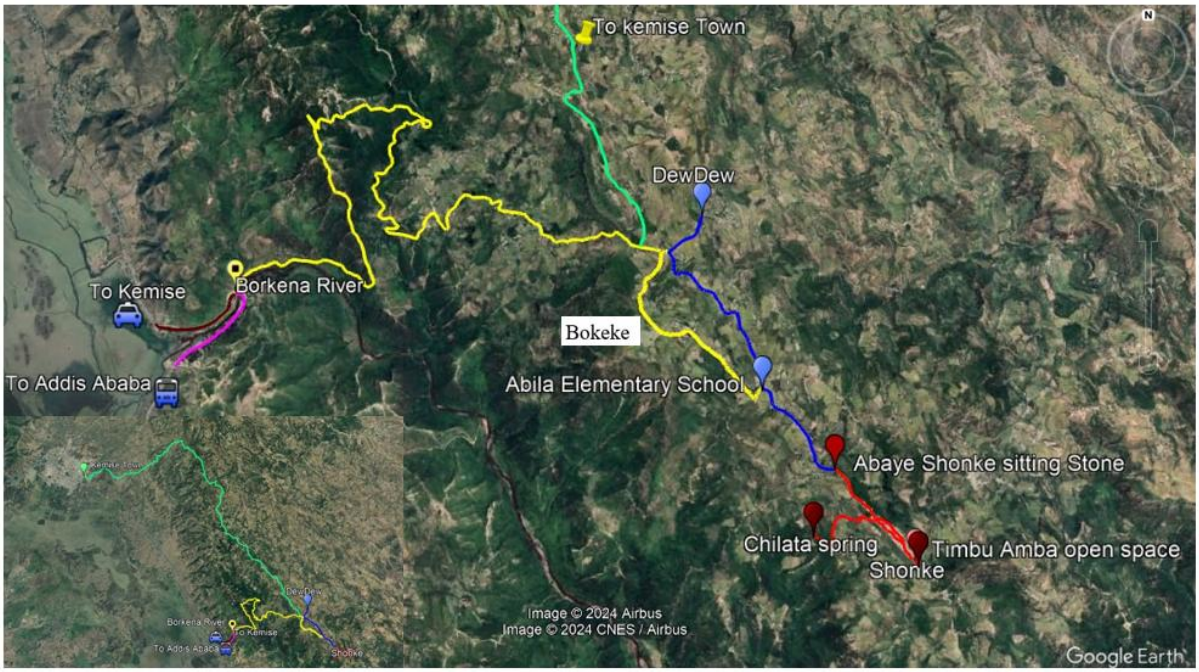

Figure 3. 3 Route plan

3.7.2 Questionnaire

The study utilized a structured questionnaire consisting of closed-ended questions and face-to-face interviews to gather data from households. This approach aimed to quantitatively evaluate the community's prioritization of local needs impacting living and working conditions in Shonke Village over the next decade. A five-point Likert Scale was employed, ranging from (1) strongly disagree/low priority to (5) strongly agree/critical priority. This scale facilitated a systematic assessment of residents' perspectives on various needs within their community.

3.7.3 Key Informant Interviews

The study utilized semi-structured interviews designed to collect detailed qualitative insights about the ongoing challenges related to infrastructure, tourism activities, and

cultural preservation practices within Shonke village. To strengthen the validity of the findings and ensure the accuracy of household responses, the researcher adopted a non-probability sampling approach, intentionally selecting key informants who had pertinent positions, relevant experience, and a deep understanding of the local context.

3.7.4 Focus Group Discussion

One focus group discussion (FGD) was conducted to gather insights from the residents of Shonke Village, including community leaders of both genders. Moderated by a researcher, the 1.5-hour session aimed to assess the unique infrastructure challenges faced by the village. The discussion provided a platform for participants to share their experiences and perspectives, helping to identify key areas for improvement and develop effective strategies to address these challenges.

3.8 Materials and Tools

In this study, the GPS Waypoints mobile application was used during transect walks to collect geospatial data, which was then visualized in Google Earth. ArcGIS software facilitated further analysis and interpretation of this data. Homer Pro is used to assess availability of energy resources in Shonke village. Additionally, Microsoft Excel was employed for organizing and analyzing quantitative data, and supporting statistical analysis to illustrate research findings.

3.9 Method of Data Analysis

3.9.1 Descriptive Statistical Analysis

The research employed a quantitative approach to analyze the challenges faced by the community in Shonke Village. Data were collected through a Likert scale survey, where respondents rated their agreement with various statements on a 5-point scale (from Strongly Disagree to Strongly Agree). This scale allowed for the quantification of subjective opinions and experiences related to key variables.

To analyze the collected data, descriptive statistics were employed, focusing on central tendency measurements. These include frequency distribution and mean values, which provided a clear summary of the respondents' perceptions of the challenges in Shonke Village. The frequency of responses in each category (Strongly Disagree, Disagree,

Neutral, Agree, and Strongly Agree) was recorded for each variable. This helped to visualize how responses were distributed across different levels of agreement. For each variable, the mean was calculated by assigning numerical values to each Likert scale response (1 for Strongly Disagree, 2 for Disagree, 3 for Neutral, 4 for Agree, and 5 for Strongly Agree). The mean value was obtained by multiplying the frequency of responses in each category by the corresponding numerical value, summing the results, and dividing by the total number of respondents. This allowed for a quantitative representation of the average level of agreement for each challenge.

$$Mean = \sum(Fi * Vi)/N \quad \text{.....Equ 1}$$

Where:

Fi= Frequency of responses in category i

Vi= Numerical value of the response category

N= Total number of respondents

Mean of Means serve as an effective tool for comparing the relative importance of the challenges. It allowed the identification of key issues that stood out in terms of respondents' concerns. This approach also provided insights into the overall perception of the village's livability and development potential.

3.9.2 Thematic Analysis

To analyze the data, the study initially involved a thorough review of the information obtained through questionnaires, interviews, focus group discussions, and observations to understand the overarching themes present in the data (Creswell, 2013). Following this, a detailed examination was conducted to uncover nuanced meanings within the dataset. The collected data were then categorized and coded, a process that entailed constant reflection on how the data related to the research questions. Finally, the data were interpreted and discussed in context with each other and in relation to the research questions (McMillan & Schumacher, 2010).

3.9.3 Comparative Analysis

To inform a culturally sensitive infrastructure intervention for Shonke Village, this study employed a comparative analysis of diverse historic infrastructure developments. Cases were selected based on scale, geographic context, focus on tangible/intangible heritage, development approach, and project outcomes. This allowed for a robust exploration of balancing modernization with preservation, generating key insights into recurring trends, challenges, and best practices for informing context-specific recommendations for Shonke.

3.9.4 Spatial Analysis

This study employed spatial analysis to investigate the relationship between the built environment, infrastructure, and cultural heritage in a historic setting. Through mapping and spatial analysis of key features including settlement patterns, transportation networks, public spaces, cultural landmarks, and the surrounding landscape the research sought to inform the development of context-sensitive infrastructure interventions. This methodology facilitated a deeper understanding of how spatial organization impacts community life, access to services, and the preservation of cultural values, ultimately contributing to more sustainable and culturally appropriate development strategies.

3.10 Research Process

The research methodology for developing integrated infrastructure in historic places begins with collecting a variety of data, obtained through transect walks, key informant interviews, focus group discussions, surveys, and literature reviews, encompassing best practice cases, unique area characteristics, and existing infrastructure challenges. Subsequently, data analysis is performed using comparative, spatial, thematic, and descriptive analysis. The outcomes of these processes are used to synthesize lessons from case studies, prioritize community needs, and finally the development of an integrated infrastructure that respects the area's unique heritage values and addresses identified needs. These are illustrated on the following Figure 3.4.

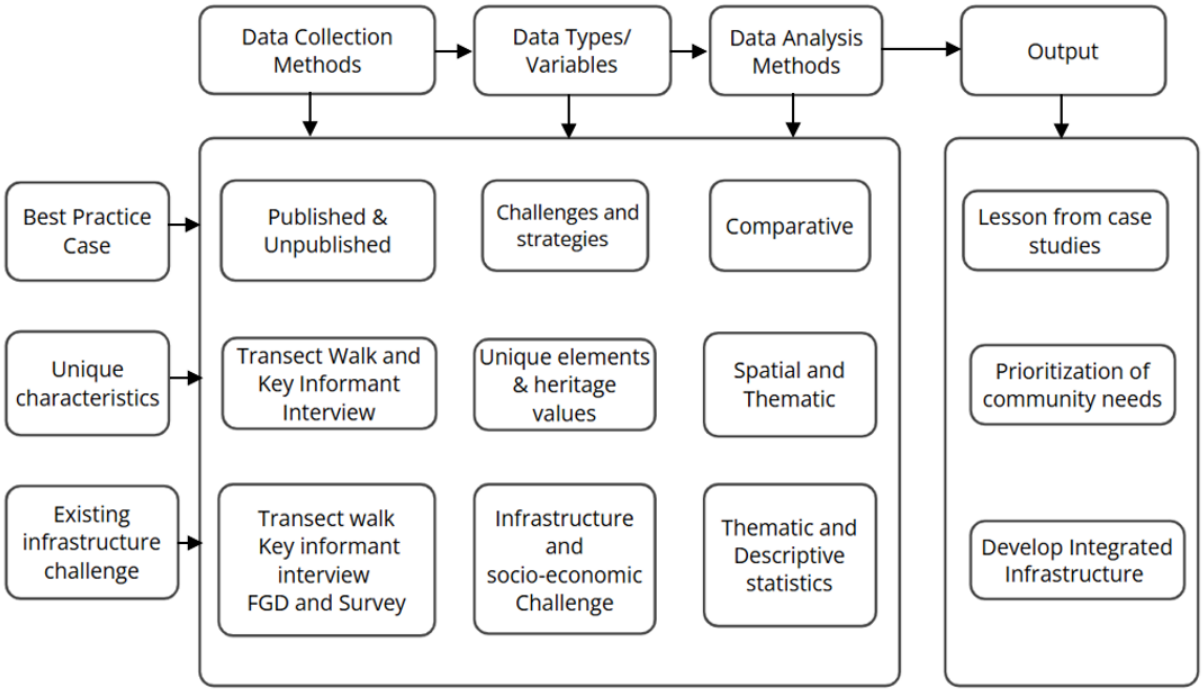

Figure 3. 4 Research methodology flowchart

3.11 Method of data presentation

Chilisa (2012) highlights that interpreting research findings is the final step following data processing and analysis. This phase involves understanding the collected data, whether descriptive or analytical, to uncover patterns and their significance. Essentially, data interpretation enables the researcher to draw conclusions, which are often presented visually through tables, photographs, graphs, and charts, and documented in detail.

3.12 Validity and Reliability of the Instrument

Validity, reliability, and generalization are key criteria for assessing the quality of research. Validity ensures that the research accurately measures what it intends to measure, while reliability ensures consistent results under the same conditions (Bernard, 2000; Anshebo, 2023).

This study ensured validity through triangulation, combining field observations, interviews, FGD, and Survey to minimize bias and provide a comprehensive view of Shonke Village's opportunities and challenges. Expert validation from urban planners and conservationists confirmed the relevance of findings, while key concepts like infrastructure

integration was clearly defined to align with the research objectives. Content validity was achieved by designing data collection tools based on literature and expert input.

To maintain reliability, the study ensured that data collection and analysis procedures were clearly presented and justified, with external evidence from previous studies incorporated to support the approach. Pilot studies were conducted to test research tools such as interview questions and observation checklists, refining methodologies and improving consistency. Furthermore, comparative case studies were used to draw lessons from other historic places with similar characteristics, allowing the findings from Shonke Village to align with broader trends in heritage conservation and infrastructure planning.

Furthermore, to enhance generalization, the study provided a comprehensive description of the research context, methods, and findings, allowing readers to assess the transferability of the results to other contexts (Robson, 2002).

3.13 Ethical considerations

Ethical considerations in this research included maintaining a relationship between the researcher and respondents, refraining from offering any incentives, and confidentiality of information shared by respondents was prioritized, with personal opinions kept strictly for research purposes and not disclosed to others. Participants' confidentiality and anonymity were safeguarded, and efforts were made to prevent any negative consequences from their involvement. All respondents were adults. Throughout the study, previous literature, findings, and related materials were appropriately cited.

CHAPTER FOUR: RESULT AND DISCUSSION

4.1 Introduction

This chapter presents a detailed analysis of the research findings, emphasizing the central themes and questions that shaped the study. It delves into the unique characteristics of Shonke Village, its infrastructure challenges, and its socio-economic context. By combining empirical evidence with existing literature, the discussion underscores the implications for sustainable development while safeguarding the village's cultural identity. Addressing current issues, the chapter provides actionable insights for policymakers, planners, and stakeholders, advocating for a balanced approach to infrastructure development in historic settlements. Furthermore, it evaluates how the findings align with or diverge from established theories and practices in heritage management, offering recommendations for sustainable strategies to preserve Shonke's cultural heritage for generations to come.

4.2 Socio-Demographic Status

4.2.1 Residence Status

The survey data reveals that 54% of respondents both live and work on farmland, while 46% live in Shonke village and work on surrounding farmland as illustrated in Figure 4.1.

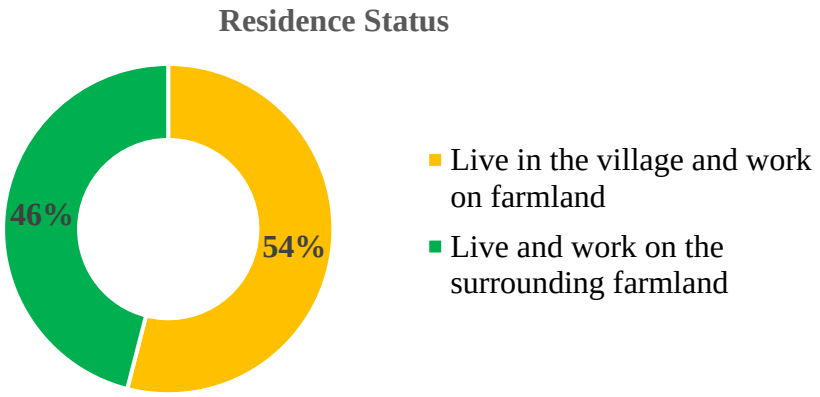

Figure 4.1Residence status

4.2.2 Sex Category

Figure 4.2 shows that females make up 56% of the respondents, while males account for 44%.

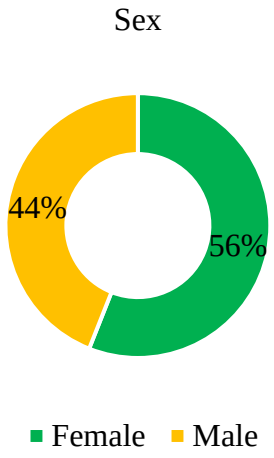

Figure 4.2 Gender Distribution

4.2.3 Age Range

The largest age group, accounting for 34% and 27% of the population, falls within the 55–74 and 35–54 age ranges, respectively, highlighting a significant presence of long-term residents, as shown in Figure 4.3.

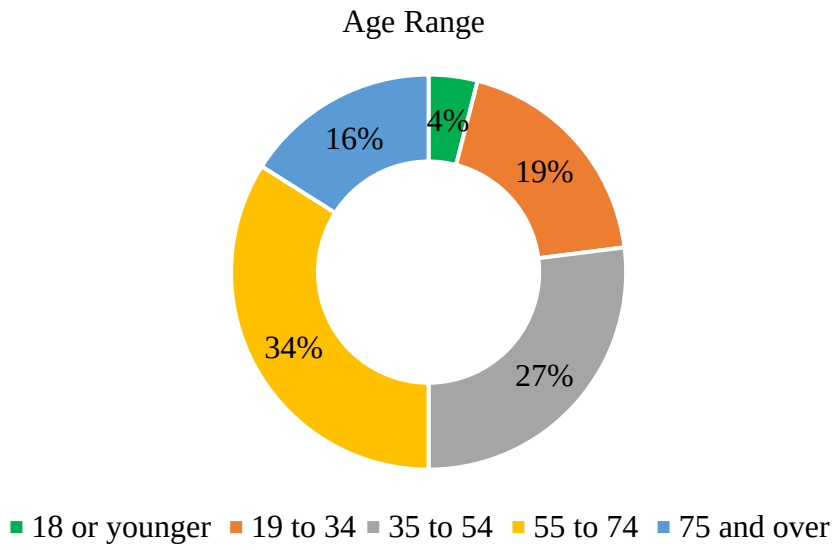

Figure 4.3 Age Range

4.2.4 Educational Background

While all respondents have completed Islamic religious studies, only 15% have completed primary education as shown in Figure 4.4.

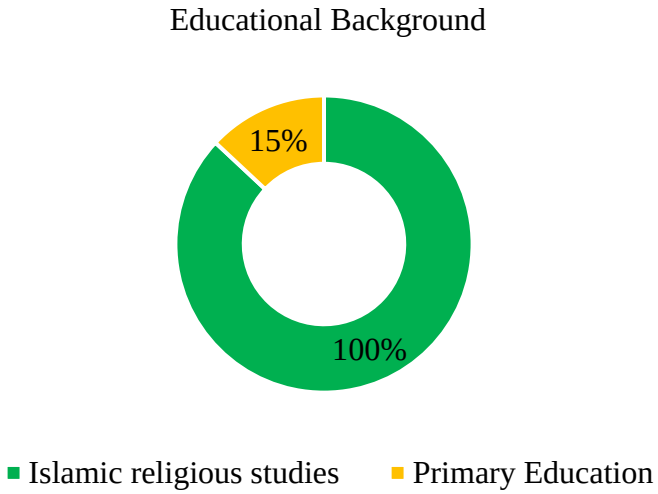

Figure 4.4 Educational Background

4.2.5 Livelihoods

The majority (91%) rely on subsistence farming and livestock rearing for their livelihood, while 9% either lack farmland or require assistance, as depicted in Figure 4.5.

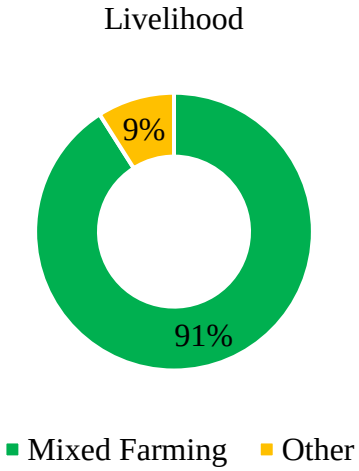

Figure 4.5 Livelihood

4.3 Unique Elements of Shonke Village

Results showed that Shonke village has both tangible and intangible cultural heritage as shown in Appendix C. It displays a distinctive architectural style with stepped row houses resembling a terraced mountain. Crafted from olive tree woods, masonry walls, and soil and gravel-filled flat roofs, offer protection, contrasting with the thatched roofs found in neighboring areas. The layout of the village adheres to Islamic principles, with houses oriented towards the east, as directed by the Quran, or towards the west if an eastward orientation is not feasible. The village's communal areas are neatly structured with regular polygons and enclosed by dry stone walls, featuring at least one access road. Dwellings are strategically positioned along the perimeter, maximizing front yard space for various activities. Shonke village also exhibits a well-structured road network, with two main roads connecting the entry and exit points, known as Gudiba and Timbu Amaba open spaces. Additionally, secondary roads provide convenient access to the main road, individual residences, and communal toilet facilities. Shonke village boasts a well-organized grid road system, a pioneering concept introduced nearly nine centuries ago.

The development of the village centered around three mosques, which served as Quran schools and contributed to Islamic scholarship. The founders of Shonke are highly respected for their role in preserving Islamic manuscripts, earning them the titles "Sheikh Shonke" or "Abaye Shonke." Shonke Village's open spaces foster social interactions, recreational activities, and the preservation of traditions, while the sacred cemetery connects past and present generations, honoring ancestors and preserving their memories.

In addition, Shonke has an altitude range from 1690m- 1980m above sea level which is characterized by its stunning landscapes, making it an ideal spot for trekking and sightseeing. Figure 4.8 illustrates the diverse elevations across Shonke village and surrounding areas including Dewdew, Abela, Bokeke, and Jirota Millennium Park. Trekking routes starting from Borkena River bridge provide opportunities to explore breathtaking scenery. Positioned at the village's highest point, Shonke offers panoramic views of the Shewa mountains and the vast Chafa Valley to the west. Towards the east, visitors can behold expansive lowlands, while to the south lies Artuma Fursi Wereda with

its captivating scenery. The village also showcases the fascinating terracing and farming techniques of the local Argoba community.

Shonke Village also has a strong affiliation with Islam, with mosques serving as symbols of faith and centers for religious activities and community gatherings. The predominant use of the Argobba language in public reflects the village's identity. Traditional practices, such as endogamous marriages arranged by families and the annual Ziyara ritual expressing gratitude for the harvest, showcase the village's rich heritage. Dispute resolution follows a legal system led by the Qadi, applying Sharia law to settle conflicts. Cooperative spirit (Debo), traditional artisanship, cuisine (Woqalimo), and sustainable farming techniques, contribute to the intangiable cultural heritage of Shonke Village. Table 4.1 displays a blend of tangible and intangible elements of Shonke village.

Generally, Shonke village portrays a mixed land use pattern with a significant emphasis on agriculture and cemetery spaces, covering 4.62 ha and 4.35 ha respectively. Open spaces account for 0.48 ha, providing breathing spaces within the village. Residential areas cover 2.52 ha, accommodating the community, while mosque spaces stand at 0.03 ha, symbolizing spiritual sanctuaries.

Roads weave through the landscape with a modest 0.24 ha presence, facilitating connectivity. This intricate blend of land uses defines Shonke village as an urban settlement, Argobba community setting within its 12.25 hectares of land as shown in Figures 4.6 and 4.7.

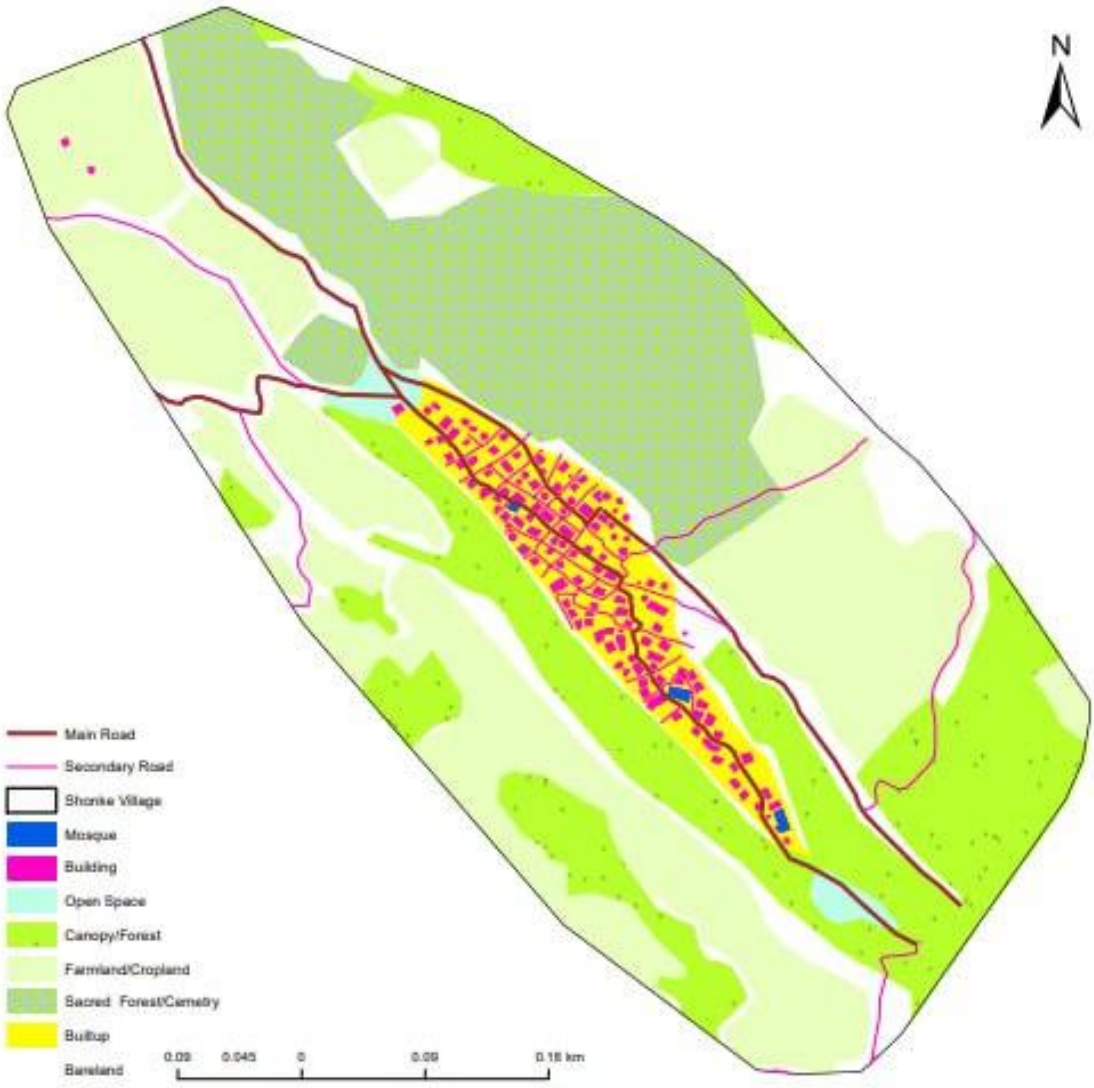

Figure 4.6 Land use summary of Shonke village

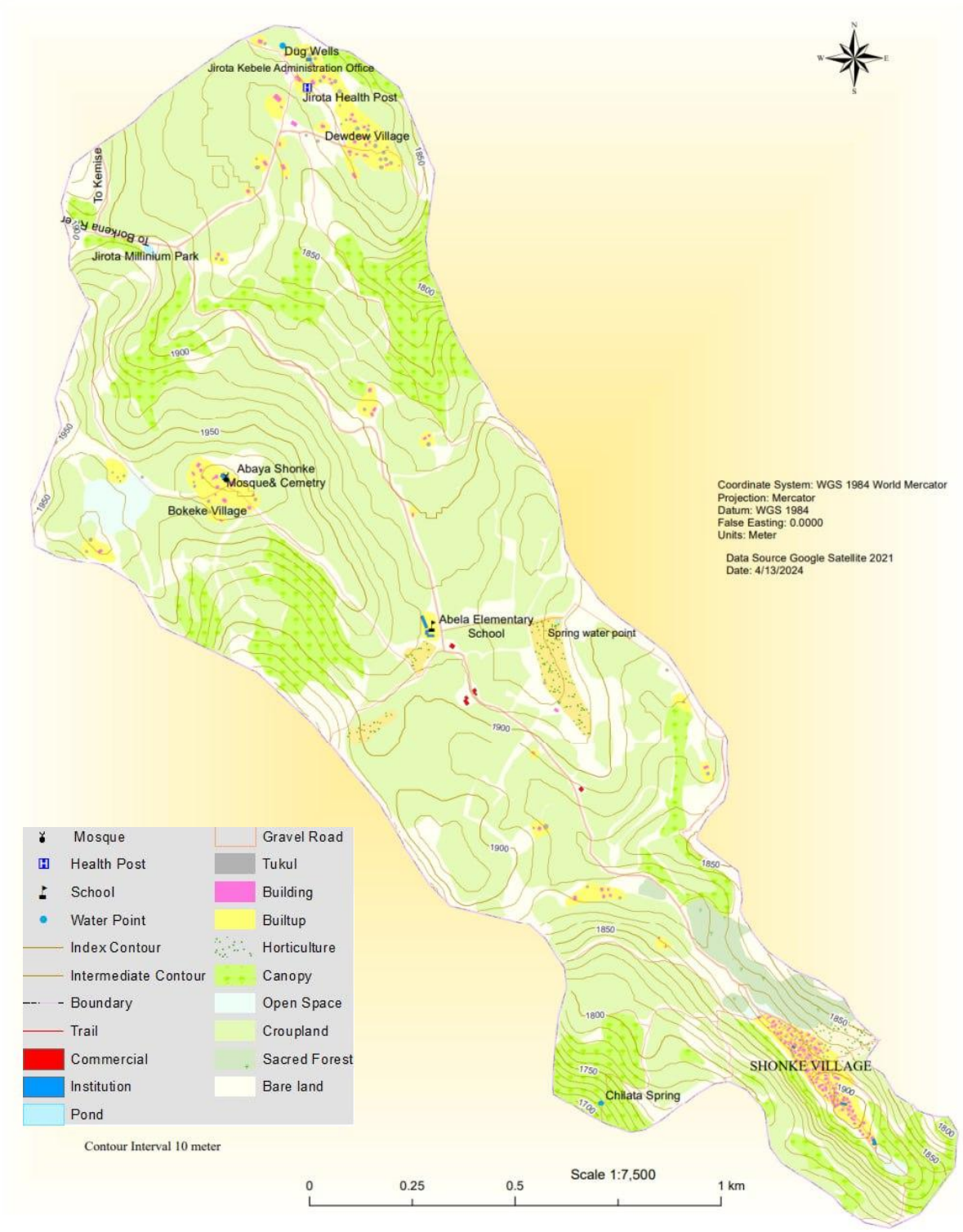

Figure 4.7 Topography map of Shonke Village and its surrounding

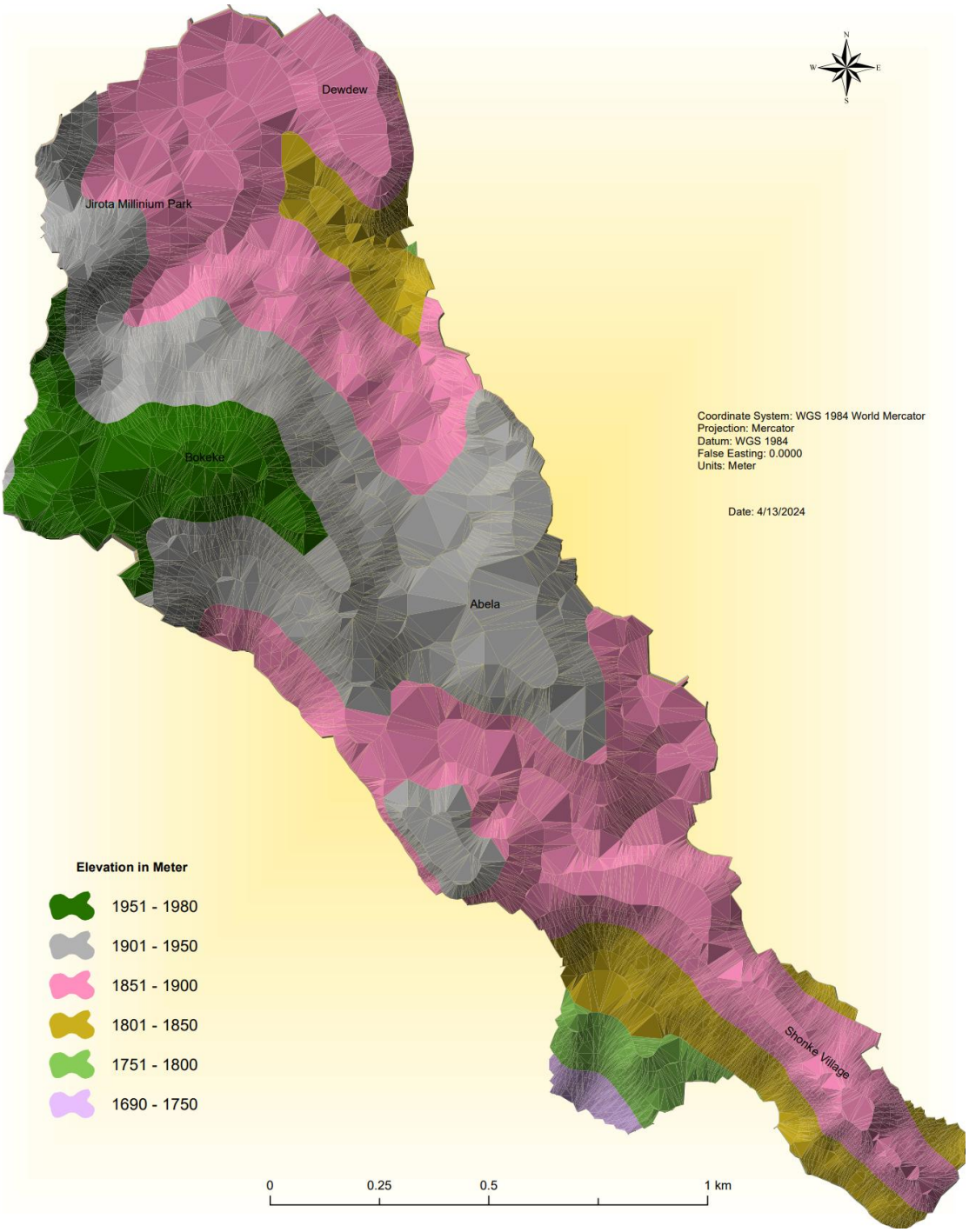

Figure 4.8 3D surface model of Shonke village and surrounding

4.4 Unique Values of Shonke Village

Shonke Village holds cultural, historical, archeological, architectural, and ecological significance. Its vernacular architecture, characterized by unique hilltop settlement patterns and grid road network, demonstrates advanced engineering concepts and historical contributions from nearly nine centuries ago, highlighting its archaeological and architectural value. The Chilata Water Point and communal resilience represent the ecological and socio-cultural significance, particularly in sustaining village life and fostering communal efforts. Mosques and cultural landmarks underscore the spiritual and historical importance, serving as centers for religious activities and community gatherings, preserving Islamic traditions, and ensuring social cohesion. Traditional practices such as Ziara, endogamous marriages, the Qadi arbitration system, and cooperative activities (Debo) enrich the cultural heritage, illustrating community bonding, hospitality, and the preservation of cultural identity. The village's language preservation aids linguistic research and maintains oral traditions, contributing to the scientific study of language evolution. Traditional artisanship, cuisine (Woqalimo), and sustainable farming techniques reflect the aesthetic, culinary, and agricultural heritage, showcasing the community's creativity and environmental adaptation. Table 4.1 shows a summary of the unique elements of Shonke village and its significance.

Table 4. 1 Summary of unique elements of Shonke village and its significance

Categories	Attributes	Significance
Tangible Cultural Heritage	Vernacular architecture and street network	The unique patterns of settlement and house construction on hilltops demonstrate the community's sense of insecurity and their ability to adapt to their surroundings. These dwellings serve as a cultural artifact, showcasing the art, creativity, and defensive nature of the Argobba people, contributing to their architectural language and history. Additionally, their introduction of a grid road network system nine centuries ago highlights their advanced engineering concepts and historical contributions.
	Chilata Water Point	It symbolizes resilience and communal effort, particularly for women, children, and the elderly who undertake the demanding task of fetching water. Its socio-cultural value lies in the shared experience of water collection, while its environmental importance is tied to sustaining life in the village.
	Cultural Landmarks	Mosques serve as symbols of the community's faith, unity, and Argobba people's devotion to Islamic traditions, known for Islamic teaching scholars. It is not just places of worship but also centers for religious activities, community gatherings, and the dissemination of Islamic knowledge. The open spaces provide platforms for social interactions, recreational activities, and the preservation of traditions. The cemetery is a sacred ground that connects past and present generations, symbolizing respect for ancestors and ensuring their memory endures.
	Ziara	Symbolize social bonding, hospitality, and spiritual significance, strengthening community ties and preserving traditions that sustain livelihoods through history.
	Language	Provides insights into the Argobba people's past, including their interactions, migrations, and historical events. It also contributes to linguistic research, aiding in language evolution and typology studies within the

Categories	Attributes	Significance
Intangible Cultural Heritage		Semitic language family. Additionally, the language's preservation helps safeguard oral traditions and fosters community cohesion by maintaining cultural knowledge and strengthening social bonds.
	Endogamy Marriage	Played a pivotal role in the historical preservation of the Argobba community's language and unique cultural identity and ensuring its continuity for future generations, keep their culture unspoiled and untouched.
	Arbitration	Qadi system lies in preservation of traditional administration and religious practices in the village. It has been passed down through generations, serving as a mechanism for conflict resolution, property distribution, and land allocation. By upholding Sharia law and interpreting village affairs, the Qadi system has ensured justice, social order, and the preservation of cultural and religious values within the Argobba community
	Debo	Showcases the community's cooperative spirit and their traditional approach to accomplishing tasks together.
	Traditional Artisanship	Representing the community's artistic expressions, and craftsmanship, and preserving traditional techniques that have been passed down through generations.
	Traditional food	“Woqalimo” represents the culinary heritage of the Argobba people, symbolizing their cultural identity and has a history of provisions during trade and battle, and served during special occasions such as weddings, holidays, and births.
	Traditional Farming	Represents sustainable agricultural practices, adaptation to the local environment, and the preservation of traditional knowledge. Through terracing the community has transformed harsh terrain into productive agricultural spaces, demonstrating resilience and a harmonious relationship with natural resources.

4.5 Assessments of Existing Infrastructure of Shonke Village

4.5.1 Transportation

According to a key informant interview, the existing gravel road along the Kemise town to Shonke village route, constructed in 2006 EC, has not received proper maintenance. The road exhibits several issues that significantly impact its condition and usability. During observations, loose gravel, dust, potential washboarding, and a lack of signage are common problems along the road, as presented in Appendix C.

During focus group discussions, participants emphasized transportation challenges due to difficult terrain and limited public transportation. This isolation hampers access to essential services like healthcare, education, and job opportunities. The lack of reliable transportation also restricts artisans' ability to sell products and forces youth to marry early or migrate for work. Deteriorating roads pose risks to residents' well-being, with limited access to medical services and unsafe travel practices, such as overcrowded trucks and steep climbs on foot as shown in Appendix C.

Further participants highlighted the struggles faced during maternity due to the lack of affordable transportation options

> *" Public transport is unreliable and only available weekly, primarily on market days in Kemise (Thursday). Limited options, such as cargo trucks (ISUZU) and auto-rickshaws (BAJA), force us to rely on costly auto-rickshaws, leading to exorbitant fares for a single trip. This financial burden places significant strain on our families, especially during critical times such as pregnancy and illness when access to proper healthcare is essential."*

Moreover, observation and interviews revealed that Abila Primary School, located 20 minutes from Shonke village, faces many challenges. The school's infrastructure is deteriorating, lacking essential facilities like offices, furnished classrooms, functional toilets, a library, and access to clean water. Despite having 462 enrolled students (47% female, 53% male), none have progressed to higher education. Contributing factors include early marriages, especially among girls, lack of education in students' native language, and a six-hour daily journey on foot to access higher education. During focus group

discussions, transportation availability emerged as a significant issue. Parents often spend up to 10 to 12 hours traveling to Kemise town for market purposes, leaving students responsible for household chores and resulting in missed school days.

4.5.2 Water Supply

During a transect walk, it came to light that the village of Shonke is confronted with an ongoing challenge with access to potable water.

In the neighboring area of Dewdew, there are two protected dug wells available for drinking water. However, only one of them is operational, and unfortunately, it is situated quite far from the Shonke village. The journey to fetch water from this functional well requires a round trip of approximately three hours, and this duration tends to increase for older individuals. The entire Shonke village residents rely on fetching water from a challenging terrain known as Chilata, as demonstrated in Appendix C.

The residents of Shonke village face an arduous task when it comes to accessing water. It is worth noting that this task predominantly falls on women, especially elders and children. They have to climb an elevation equivalent to a 42-story building while carrying 25 liters of water on their backs through challenging terrain. Depending on the household's water needs, they often need to make 2-3 trips to fulfill those requirements. The journey from Shonke village to the water source takes approximately two hours, although this duration may vary based on the age of the individuals making the journey. This demanding uphill walk, spanning approximately 127 meters lower than Shonke village, not only requires physical exertion but also places strain on their overall health, especially for the elderly and children.

During the transect walk, it was noted that the susceptibility of water point to waterborne diseases. It was observed that plastic tanks were directly inserted into the spring water, posing a risk to its quality. Furthermore, people were seen drinking water by immersing their hands, increasing the potential for contamination and the spread of waterborne diseases as shown in Appendix C. The researcher also noted the presence of plastic and plant residue, which likely contribute to water quality degradation. However, a simple visual check with a plastic bottle demonstrated that the water appeared clear.

According to focus group participants,

> *"we women bear the primary responsibility of fetching water from the Chilata source and meeting essential needs like ablution, cooking, drinking, and personal hygiene. However, due to inadequate water supply, we must travel to Borkena river, spending 8 to 10 hours washing clothes."*

Upon transect walk, it was observed that the Argobba communities in and around the village practice rainwater harvesting for their water needs. Most houses have potable rainwater harvesting roofs made of olive wood gutters. Additionally, publicly harvested rainwater ponds are located in Bokeke and Dewa Chefa Woreda Jirota Kebele Millennium Park. However, the water quality in these sources is poor and is mainly used for washing, limited activities, and watering animals as presented in Appendix C.

Shonke Village primarily cultivates crops like sorghum, teff, maize, coffee, chat, honey, spices, pepper, and cereals. However, the community faces significant challenges in agricultural production due to climate change, including drought, insect infestations, and bird damage. The reliance on rainwater and the lack of essential nutrients in the soil, such as nitrogen, phosphorus, sulfur, and boron, further hinder agricultural productivity as shown in Appendix B. The region's rocky and steep landscape limits available arable land, and water scarcity exacerbates the situation. Additionally, the community emphasized that their use of animal dung as fertilizer reflects their limited resources and the pressing need for improved agricultural techniques. However, attempts at rainwater harvesting using geomembrane sheets are hampered by limited access to materials and frequent leakage, resulting in an unreliable water supply crucial for rain-fed agriculture. Consequently, agricultural yields are declining, prompting some residents to migrate in search of better farming opportunities.

Further, villagers expressed the lack of diverse job opportunities beyond farming, impeding economic growth. Untapped tourism potential further limits income sources, prompting some to seek employment and water elsewhere. Additionally, the decline in ancestral knowledge transfer, especially in religious teachings and community values, is attributed to villagers dispersing for livelihoods.

According to a key informant interview with the Dewa Chefa Wereda water supply office, there is currently no piped water supply system in Jirota Kebele, including Shonke village. This has led to a shortage of water supply services in the area. To address this issue, a plan has been proposed to implement a sustainable rural piped water supply system in three kebeles: Gula Tsege, Gula Ketemo, and Jirota. The project aims to improve the living conditions of the rural population by enhancing the quantity, quality, and accessibility of water supply services, as well as improving environmental sanitation to prevent source contamination and ensure safe water supply. The total investment cost for the project, including VAT, is approximately 60.89 million Ethiopian birr. It is worth noting that four years ago, a borehole was drilled to a depth of approximately 242 meters near Kello. However, the construction was halted due to issues related to peace and security, as well as budget constraints. Furthermore, there is some reluctance within the community to make enhancements to the Chilata Water Point, as it is considered a sacred water source, with fears that it might dry up due to human activities. The challenging topography, which includes rocky terrain that requires extensive digging and the need for pumping, poses additional financial burdens on the project.

According to key informant interviews, diarrhea is the leading cause of morbidity in Dewachefa Wereda, as shown in Appendix B. Similarly, in Shonke Village, cases of diarrhea and severe acute malnutrition have been reported, highlighting the health risks faced by the community.

4.5.3 Sanitation

During the transect walk conducted in Shonke village, it was observed that the community primarily relies on traditional shared latrines such as Jegoal or bush latrines/open defecation. Interviews revealed approximately 12 designated latrine areas situated on the southern side of the settlement, contrary to the prayer direction of Meka Medina. One significant issue with these latrines is that except Jegoal, they do not separate solid waste from human waste. Consequently, the area surrounding the latrines emits a strong and unpleasant odor, which poses a health risk to the community as shown in Appendix C.

According to focus group participants,

> *"The absence of adequate lighting at night, coupled with the challenges of both the sunny and rainy seasons, creates discomfort for the community and hinders access to essential facilities."*

According to key informant interviews, the waste management performance in Jirota Kebele is very low, as shown in Appendix B. The interviews also revealed that a previous plan, in collaboration with WASH, to construct public toilets near the Gudiba open space in Shonke village has been neglected.

Further during observations, it was noted that Shonke village has a health post along with an improved latrine located at Dewdew. However, it does not provide essential healthcare services, leading residents to seek medical treatment for serious illnesses in the nearby town of Kemise.

4.5.4 Energy

Based on key informant interviews, Shonke Village residents have adopted solar energy for lighting and rely on firewood for cooking, primarily due to cost savings, safety, and user-friendliness. They have been using solar power for 5-10 years, motivated by recommendations from health authorities and neighbors. However, the main challenge is the gradual degradation of solar batteries, which reduces power quality and capacity, leading to frequent replacements or reduced effectiveness. Additionally, the village's rugged terrain and remote location make connecting to the national grid costly and unlikely in the near future.

During a transect walk, it was observed that women, especially elders and children, are responsible for collecting firewood from farmland and forests located some distance away from their village, as shown in Appendix C.

The interview highlighted that the community depends on biomass for cooking, particularly when preparing "enjera" from sorghum, which is made twice a day and must be consumed fresh to avoid drying out. Coffee is also consumed twice daily, leading to indoor air pollution and smoke discomfort. Moreover, the village lacks affordable grinding

machines, forcing residents to rely on traditional, labor-intensive methods. Grinding machines are available in Abila, 20 minutes away, but they are costly.

According to focus group participants,

> *"Although Shonke village is known for Quran teaching, inadequate lighting challenges both religious and educational activities, hindering students' ability to complete homework and fully participate in religious activities."*

4.5.5 ICT

During FGD, they shared their concerns regarding limited access to ICT devices and cell phones, as one participant expressed:

> *"We have a significant digital divide in our village, especially among the young. Only a few have smartphones. Most of us rely on basic phones."*

They further highlighted the negative impact of poor phone call quality and unreliable mobile phone coverage on their community. Specifically, concerns were raised about the potential risks during emergencies, where delayed access to emergency services could have severe consequences. Moreover, participants pointed out that limited coverage areas for mobile phone signals within the village hinder communication and impede access to crucial information.

Overall, Shonke Village's infrastructure has steadily deteriorated due to insufficient maintenance and investment, failing to keep pace with contemporary needs as summarized in Table 4.2.

Table 4.2 Summary of challenges of infrastructure in Shonke Village

Infrastructure	Existing condition	Challenges
Transportation	Poorly maintained gravel roads; unreliable public transport (cargo trucks (ISUZU) and auto-rickshaws (BAJAJ), occasional vehicles (4-wheel drive cars, and motorcycles) as shown in Appendix C.	Limited access to services, Unsafe travel, Economic isolation
Water supply	Long distances to unprotected water sources and poor rainwater harvesting practices, Difficult terrain as presented in Appendix C.	Waterborne diseases, Physical strain, Reduced agricultural productivity
Sanitation	Reliance on traditional/shared latrines, Poor waste management, Lack of lighting as shown in Appendix C.	Health hazards, environmental pollution, reduced appeal for tourism
Energy	Dependency on firewood, Degrading solar batteries, Limited access to electricity from the national grid as illustrated in Appendix C.	Financial strain, Indoor pollution, Physical strain Health risks, Deforestation
ICT	limited network coverage, unreliable internet connectivity, Limited access to ICT devices	Restricts tourism promotion, cultural preservation and economic growth , Limit communication and access to information

4.6 Socio-Economic Condition of Shonke Village

Interviews revealed that some residents had been replacing traditional roofs with tukul structures, and economic hardships forced others to demolish their homes and relocate to farmland areas. However, observations conducted by researchers in May and December 2023 indicate a positive shift. The number of tukul structures and house demolitions has noticeably decreased compared to previous years, reflecting active conservation efforts by the Dewachefa Wereda Culture and Tourism Office. In total, 29 houses have been demolished, while 17 houses have been replaced with tukul structures due to residents' financial constraints preventing construction with olive trees. Additionally, 26 houses requiring maintenance have been addressed, and in total 64 houses have been reconstructed or maintained, as shown in Appendix B. Moreover, eight houses are currently under construction.Additionally, key informant interview highlighted that, the development of a land use plan for the surrounding community in DewDew, initiated in 2004 E.C. This plan outlines designated zones for institutions, residential areas, commercial activities, and industrial development, ensuring effective village management while safeguarding its integrity and distinctive identity, as detailed in Appendix B.

Key informant interviews highlighted that, despite the village receiving 224 tourists between 2019 and 2022, its tourism potential remains largely untapped. This has resulted in negative impacts on the local communities and has hindered the village's growth. Additionally, the village faces limited access to infrastructure, budget constraints, and the current peace and security situation in the surrounding area, all of which further complicate the development of tourism in Shonke Village, as detailed in Appendix B.

4.7 Shonke Village need Assessement

Based on observations, focus group discussions, and key informant interviews, several common themes emerged regarding the challenges faced by Shonke Village, which directly impact both the daily life and economic activities of its residents, as illustrated in Table 4.3. In addition, a needs assessment was conducted using a 5-point Likert scale to prioritize the top five challenges affecting the village's living and working environment. The survey results reveal that the most critical concern is limited access to reliable and clean water (mean rating: 4.60), followed by inadequate transportation (4.02) and lack of clean and

affordable energy (3.65). Socio-economic issues, such as the lack of employment opportunities (2.47) and neglect of heritage preservation (1.82), are also recognized but considered less urgent compared to infrastructure-related challenges. These findings highlight the significant impact of both infrastructure deficiencies and socio-economic factors on the village's overall vitality, with a mean rating of 3.31, emphasizing the need for urgent intervention and infrastructure improvement, as illustrated in Table 4.4.

Table 4.3 Comprehensive Challenges of Shonke Village

S/No	Challenges of Shonke Village for Living and Working
1	Inadequate transportation (unmaintained gravel road, unsafe road conditions, lack of signage, and lack of affordable transportation options)
2	Limited ICT (limited network coverage, unreliable internet connectivity, and Limited access to ICT devices)
3	Limited access to reliable and clean water
4	Inadequate Sanitation Facilities
5	Lack of clean and affordable energy
6	Inadequate school and healthcare facilities
7	Lack of employment opportunities
8	Youth outmigration and resident relocation
9	Vacant and deteriorating dwellings
10	New buildings that don't match the existing character of the neighborhood
11	Lack of tourist facilities
12	Neglect of heritage preservation
13	Climate change and its impact on agriculture
14	Safety and Security

Table 4. 4 Shonke Village Need Assessment

Variables	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total		Mean	Mean of Mean
Challenges of Shonke Village for Living and Working	F	%	F	%	F	%	F	%	F	%	F	%		
Lack of employment Opportunities	10	11.2	37	41.6	34	38.2	6	6.7	2	2.2	89	100	2.47	3.31
Limited access to reliable and clean water	0	0.0	0	0.0	0	0.0	36	40.4	53	59.6	89	100	4.60	
Inadequate transportation	9	10.1	5	5.6	8	9.0	20	22.5	47	52.8	89	100	4.02	
Neglect of heritage preservation	47	52.8	19	21.3	17	19.1	4	4.5	2	2.2	89	100	1.82	
Lack of clean and affordable energy	0	0.0	14	15.7	26	29.2	26	29.2	23	25.8	89	100	3.65	

4.8 Infrastructure Integration in Shonke Village

This study examines how infrastructure development can balance historic preservation and modern needs in Shonke Village through the Historic Urban Landscape (HUL) approach and Urban Acupuncture (UA) principles. It begins with identifying Shonke Village's unique elements: natural, cultural, and human resources as a basis for preservation. This aligns with the Historic Urban Landscape (HUL) concept, which views urban areas as layered expressions of cultural and natural values, encompassing both tangible and intangible aspects of the human environment (ICOMOS, 1987; UNESCO, 2011; UNESCO, 2020; UNEP, 2022). Understanding the dynamic relationship between people and place is also key to sustainable heritage management (Olsson & Haas, 2005). Furthermore, this research engages local stakeholders through surveys, interviews, and focus groups to prioritize community needs, heritage values, and socio-economic factors for informed infrastructure planning, as Shonke community prioritizes water access, transportation, energy, heritage preservation, and employment. This participatory approach aligns with HUL applications in Kulangsu (Yan, 2018) and Tangfang Village (Li et al., 2024), which emphasize integrating community participation and intangible heritage into daily life to balance material preservation with cultural and functional values. This directly addresses the weakness identified by Perez & Roders (2020) regarding the lack of community participation and local partnerships in HUL implementation.

Additionally, this study reveals Shonke village's vulnerabilities, encompassing economic hardships driving traditional home abandonment, climate change impacts on agriculture, degraded infrastructure like gravel roads and unreliable transport, drinking water contamination, health risks from traditional energy, and the challenges posed by the terrain around water points, alongside a digital divide; this vulnerability assessment pinpoints critical risk areas unique to Shonke, enabling comprehensive contextual understanding that informs targeted village development strategies, balancing cultural heritage preservation with modern needs. This aligns with Ferreira & Eudave's (2022) emphasis on the importance of incorporating urban heritage values and vulnerabilities into the city development strategies (UNESCO, 2011; UNESCO, 2016).

The proposed targeted interventions include solar-powered water pumping systems, hybrid renewable energy, eco-toilets, sustainable transportation, and digital connectivity, as summarised in Table 4.5.

Table 4.5 Proposed Infrastructure

SN.	Infrastructure	Proposed Infrastructure Intervention
1	Transportation	Sustainable Transportation: Road upgrades (Kemise to Shonke), promoting walking, hiking, and public transportation
2	Water Supply	Solar-Powered Water Pumping System
3	Sanitation	Eco-Toilets
4	Energy	Hybrid Renewable Energy Systems
5	ICT	ICT centers powered by renewable energy

Shonke village's infrastructure development prioritizes a strategic "acupoints" approach, favoring targeted, small-scale interventions over disruptive projects. This involves identifying key areas like critical road sections, open spaces, vernacular buildings, water points, and traditional practices, where focused improvements can trigger cascading positive impacts across social, economic, cultural, and environmental dimensions.

Upgrading the Kemise to Shonke road serves as a critical point, directly boosting local trade by improving market access for farmers and artisans. This intervention reduces travel time and costs, enhancing profitability. Simultaneously, promoting walking and hiking leverages Shonke's natural beauty, creating tourism income. Improved public transportation enhances social mobility, granting residents access to jobs and education in neighboring towns. Environmentally, this strategy reduces reliance on private vehicles, minimizing carbon emissions. Crucially, the maintenance of the gravel road will prioritize the use of locally available resources, such as naturally occurring aggregates and soil stabilization techniques, ensuring cost-effectiveness and community involvement. Additionally, upgrading key village nodes such as Gudiba and Tibu Amba open spaces would strategically place infrastructure, like public taps, and solar panels fostering

multifunctional areas that serve as hubs for community gatherings, recreation, and cultural performances.

Implementing solar-powered water pumps at existing water points providing immediate and reliable water access. This supports small businesses that require water, such as food processing and crafts. It also reduces waterborne diseases and frees up time, particularly for women and children. Environmentally, it minimizes fossil fuel reliance and promotes sustainable water management, all while reducing the need for extensive pipeline construction.

Deploying eco-toilets in strategic locations within the village, with respect for religious and cultural norms and leveraging local resources and techniques, serves as a crucial acupoint for sustainable development. This approach generates compost for agricultural use and biomass energy for outdoor lighting, particularly at night. It significantly improves hygiene, minimizes water consumption and pollution, and integrates seamlessly with the village's vernacular architecture. Emphasizing community involvement in the design, construction, operation, and maintenance of these eco-toilets maximizes local benefits and ensures long-term sustainability.

Repurposed buildings in Shonke Village can become dynamic hubs for community gatherings, religious activities, cultural events, local markets, and homestays by integrating improved lighting and cooking facilities powered by hybrid renewable energy systems. Utilizing locally available solar and biomass resources, these systems will provide reliable energy for lighting, communication, and essential services, supporting small businesses, reducing dependence on fossil fuels, and fostering new economic opportunities. This transformation will enhance living conditions, expand educational access, and strengthen social cohesion while minimizing carbon emissions and promoting energy independence. A community-driven approach to infrastructure operation and maintenance will create local jobs and ensure long-term sustainability. Additionally, the system’s scalability allows for energy extensions to schools and productive activities, leveraging off-grid technologies to reduce costs associated with expanding the national grid, particularly given the village’s rugged terrain. This approach also minimizes the need for extensive electric pole installations, which could disrupt the village’s scenic landscape and traditional character.

ICT centers powered by renewable energy serve as vital information hubs, providing access to online markets, education, and government services while fostering entrepreneurship and digital literacy. They also support the preservation of religious teachings, such as the Quran, and safeguard the Argobba language, crucial for this minority ethnic group. Environmentally, renewable energy minimizes carbon emissions and promotes sustainable technology use, ensuring long-term accessibility and cultural preservation.

Each intervention demonstrates a holistic approach, considering the interdependencies between energy, water, sanitation, transportation, and information access. These projects prioritize community involvement, resource optimization, and environmental sustainability, while simultaneously boosting the local economy, improving social well-being, and preserving cultural heritage, ensuring that modern needs are effectively balanced with the protection and enhancement of Shonke's unique character for present and future generations.

These infrastructure improvements are thoughtfully designed to respect the village's existing context and cultural heritage. This approach ensures that contemporary needs are met while maintaining and enhancing the village's distinctive character. By focusing on small-scale initiatives, the plan emphasizes the preservation of traditional values, the adaptive reuse of existing structures, and the promotion of sustainable, context-sensitive infrastructure. This approach aligns with (Rodwell, 2014; Daugelaite & Vileniske, 2018; Al-Hinkawi & Al-Saadi 2020; Loopesko, 2021; Li, 2023; Yacoub & Alkinani, 2024).

Overall, the findings demonstrate that effective integration requires more than simply introducing modern infrastructure; it demands a holistic understanding of the interconnected cultural values, social needs, physical context, economic vitalities, and environmental considerations of the place. The study's key contribution lies in articulating five crucial criteria for evaluating and implementing infrastructure projects in historic contexts: 1) Culturally Sensitive: enhancing and protecting existing cultural values, practices, and built forms, integrating them into the design and implementation of new infrastructure; 2) Socially Equitable: addressing the diverse needs of all residents, ensuring equitable access to improved services, and promoting social cohesion and well-being; 3) Physically Appropriate: minimizing disruption to the historic fabric and landscape,

respecting the existing spatial organization and visual character; 4) Economically Sustainable: supporting local livelihoods, promoting long-term economic viability, and creating opportunities for local participation in infrastructure development and maintenance; and 5) Environmentally Sound: minimizing environmental impact, promoting resource efficiency, and enhancing ecological integrity. These criteria provide a practical lens for planners, policymakers, and local communities to assess proposed interventions and ensure they contribute to a harmonious relationship between modernity and historical integrity. By adhering to these five dimensions, communities can avoid the pitfalls of insensitive development that erodes cultural heritage and fails to address social needs, and instead create a future where both modernization and preservation. This research shows that infrastructure development should not be isolated but woven into the existing culture, economy, society, and environment, as highlithed by (Ejigu, 2007; UNESCO, 2011; AECOM, 2016; Cass et al., 2018; Blundell, 2020; UNEP, 2022; Colombo et al., 2024).

Thus, this research contributes to the theoretical framework by combining HUL with Urban Acupuncture, creating a pragmatic, and flexible model for heritage conservation adaptable to various historical settings. It explores how to integrate modern infrastructure into heritage sites without compromising their significance, using Shonke Village as a case study. By addressing key unanswered questions of how; what, and at what scale (McLean, 2018; Saidi et al., 2018), the study fills the gap in understanding and applying integrated infrastructure in heritage contexts, offering both theoretical and practical contributions as shown in Table 4.6. It clarifies the concept of infrastructure integration in the context of historic places and provides a roadmap for its practical application, especially in complex environments like Shonke Village. Consequently, this study defines integrated infrastructure in the context of historic places as the development and management of interconnected infrastructure systems that respect, protect, and enhance the area's cultural and historical significance. This holistic approach considers the interdependencies between different infrastructure sectors (energy, water, sanitation, transportation and ICT) and their relationship with the surrounding environment, society, economy, and cultural heritage. It emphasizes coordinated planning and delivery of infrastructure services to achieve multiple benefits, including cost efficiency, resource optimization, environmental

sustainability, improved quality of life, and the preservation and enhancement of cultural heritage. This approach moves beyond siloed planning to consider the broader context and long-term impacts of infrastructure projects on both present and future generations that effectively balance modern needs with the protection and enhancement of cultural heritage.

Table 4.6 Infrastructure Integration in Shonke Village

How					
What				Scale	
Inventory		Value	Vulnerability	Infrastructure	Acupoint
Tangible	Vernacular architecture and street network (Including hiking route) Chilata Water Point Cultural Landmarks (Mosques, Openspace, Cemetery)	Archaeological Architectural Spiritual Historical Aesthetic Scientific Socio-Cultural Ecological	Degradation of gravel roads Difficult access and risk of contamination of water sources Underutilization of Space Climate change Soil erosion and deforestation Traditional energy sources and digital divide Lack of funding Economic hardship	Road upgrades, Reliable public transportation, Promote walking and hiking Hybrid renewable energy, Solar Pumping, Solar-powered ICT hubs, Eco-toilets	Critical sections of gravel road; Kemise to Shonke and Shonke to Borkena River (Hiking route), Gudiba and Timbu Amba Open Space Vernacular houses and Mosques, Chilata Water Point
Intangible	Ziara, Language Endogamy marriage Arbitration, Debo Traditional Artisanship Traditional food Traditional Farming				Traditional practices, knowledge and local resources in infrastructure design

CHAPTER FIVE: CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

This chapter concludes the research by summarizing key findings and evaluating how well the study has addressed the research objectives outlined in Chapter One. Based on the findings, this section also presents recommendations intended to improve performance and guide future development in the area. The detailed presentation of these outcomes and recommendations is covered in the following sub-sections, offering a comprehensive wrap-up of the research.

5.2 Conclusions

Shonke Village exemplifies a living cultural landscape that profoundly reflects the unique identity of the Argobba people through its tangible and intangible heritage. This study underscores the importance of integrating a comprehensive understanding of these cultural attributes in infrastructure planning for historic sites. It emphasizes the need for careful consideration of the values that define such places. When developing infrastructure in historic areas like Shonke Village, it is crucial to prioritize the preservation and enhancement of these defining characteristics, ensuring that the development protects, strengthens, and respects the place's heritage rather than undermining it.

Furthermore, Shonke Village is confronted with inadequate infrastructure that impacts the quality of life of its residents, hindering both socio-economic development and the preservation of its cultural heritage. Critical issues such as limited access to clean water, inadequate sanitation, unreliable energy, poor transportation, and limited ICT. These challenges not only compromise the well-being of residents by exposing them to health risks and environmental degradation but also contribute to the threat of village abandonment and the long-term viability of the community. The situation calls for urgent, culturally sensitive infrastructure interventions that address these needs while preserving the village’s unique heritage and ensuring its future prosperity.

This study also underscores that infrastructure planning in historic places requires a comprehensive approach, where infrastructure development, cultural preservation, and tourism management work harmoniously. Key lessons include: the critical need for context-specific solutions tailored to the unique characteristics of each site; the importance

of genuine stakeholder participation throughout the planning and implementation process; the necessity of long-term integrated planning that ensures the preservation of cultural assets alongside modern infrastructure development; and the potential of community-driven approaches. By carefully considering these lessons, historic places like Shonke Village can leverage infrastructure development to unlock their full potential while safeguarding their invaluable cultural heritage for future generations.

This study further concludes that infrastructure integration offers a crucial roadmap for harmonizing development and preservation in heritage sites like Shonke Village. It demonstrates how modernization can enhance, rather than erode, a community's unique heritage by moving beyond simply introducing new infrastructure. The integrated approach focuses on seamlessly weaving modern elements into the village's existing cultural, economic, social, and environmental fabric, thereby promoting its long-term vitality. This framework underscores strategic infrastructure improvement must be grounded in a nuanced understanding of a place's specific cultural values, social needs, physical context, economic feasibilities, and environmental considerations. By carefully considering these interconnected factors, the integrated infrastructure approach ensures that modernization respects and reinforces the existing character of Shonke Village, contributing to a sustainable, resilient, and inclusive future. It offers a model for other heritage sites seeking to balance the demands of progress with the preservation of their irreplaceable cultural assets.

5.3 Recommendations

Based on the findings of the study, the following recommendations are proposed to guide the overall infrastructure development of Shonke Village while preserving its rich cultural heritage.

- Comprehensive documentation of tangible and intangible cultural heritage is needed to pursue national registration, which is essential for effective preservation and informed planning.
- Prioritize the most critical infrastructure needs identified by the community that considers ripple effects on the village’s vitality.

- Governments and local authorities must establish clear policies and regulations for infrastructure development within heritage contexts like strategic land-use zoning to protect cultural zones, manage growth, and enforce building regulations to prevent sprawl and environmental damage.
- Establish a multi-stakeholder platform for collaboration between community members, local authorities, government agencies, NGOs, and other stakeholders involved in the development of Shonke Village. This platform prioritizes community participation, cultural heritage preservation, and strong partnerships; and promotes Sustainable financing through local investment and innovative funding. Ensure community participation in all stages of infrastructure project planning, design, implementation, and maintenance to foster ownership and long-term sustainability. Provide training and capacity-building programs for residents to operate and maintain new infrastructure systems, ensuring local expertise and long-term project success.
- Develop an Integrated Infrastructure Master Plan that outlines a long-term vision for infrastructure development, explicitly considering the cultural, economic, social, and environmental context of Shonke Village.
- Incorporate cultural heritage considerations into all infrastructure designs, for protecting, preserving, and promoting identified cultural assets, using locally sourced materials, traditional building techniques, and repurposing of buildings that harmonize with the existing village character.
- Implement infrastructure projects in a phased approach, prioritizing urgent needs, and allowing for adaptive management based on community feedback and lessons learned.
- Implement climate-responsive infrastructure and sustainable technologies in the development of historic places, ensuring environmental resilience, cultural preservation, and long-term efficiency.

5.4 Future Research Directions

Building on the thesis ***"Infrastructure Integration in Historic places: Case of Shonke Village, Ethiopia,"*** future studies could explore the following areas:

- Conduct comparative studies between Shonke and other historic places to identify common challenges and develop broader strategies for infrastructure integration in similar contexts.
- Evaluate the long-term effects of proposed infrastructure on local economies, cultural preservation, social and environmental sustainability to provide valuable insights for sustainable urban development and to guide effective policy-making.
- Explore the role of technologies such as Geographic Information Systems (GIS), Building Information Modeling (BIM), and the Internet of Things (IoT) in improving the planning, management, and monitoring of infrastructure projects in historic cities.
- Assess the effectiveness of community engagement in urban planning to ensure developments are culturally sensitive, socially inclusive, and aligned with local needs and values.

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Appendices

Appendix A : Questionnaire

Dear respondent,

I am Hiwot Ergetie, a postgraduate student at the School of Built Environment, Addis Ababa University, Department of Infrastructure Technology and Management (ITM), in the program of MSc in Infrastructure Planning and Management. I am conducting a research study titled “Infrastructure integration in Historic places: Case of Shonke Village, Ethiopia." The objective of this study is twofold. Firstly, I aim to assess the challenges that infrastructure poses to the livability of Shonke Village. By understanding these challenges, we can identify areas for improvement and enhance the quality of life for the community. This will involve examining the existing infrastructure, prioritizing neighborhood needs and assessing their adequacy in meeting the needs of the residents. The responses collected will provide insights into the specific infrastructure needs and potential areas for improvement, guiding future interventions and development plans for the village. Secondly, I seek to identify and analyze the potential challenges and opportunities presented by the unique characteristics of Shonke Village. This will include an assessment of community demographics, understanding the cultural and historical significance of the village, and examining the historic fabrics of the place.

Your participation in this survey is of great importance, and I assure you that your responses will be treated with the utmost confidentiality. The information you provide will be used solely for the analysis of this research, and your honest and genuine answers are highly appreciated.

If you have any questions or concerns, please feel free to contact me, the principal investigator, using the following contact details:

Phone number: 0942114396

Email: hiwotergetie16@gmail.com

Thank you for your invaluable time and cooperation in responding to the following questions. Your input will greatly contribute to the success of this study and equitable development of the village.

I. Transect walk

The objective of the Transect Walk is to observe and the physical, social, and cultural aspects of Shonke Village. The collected data will contribute to a better understanding of the village's unique characteristics, infrastructure requirements, and opportunities for development and cultural preservation.

Date:
Started time:
Finished time:
Start Point:
End Point:
Route Description: (a detailed description of the route, including any significant landmarks, areas of interest, or specific sections to be observed).

During the Transect Walk, the following methodology is followed:

1. Visual Observations: Participants will carefully observe and document the physical features, architectural styles, building materials, and land uses along the route.

2. Note-Taking: Detailed notes will be taken to record significant observations, including infrastructure conditions, public spaces, community facilities, and any notable characteristics or challenges observed.

3. Photography: Photographs will be taken to visually document key aspects of the village, such as street scenes, buildings, cultural artifacts, and community interactions.

4. Interaction with Community Members: Participants engage in conversations with local residents, artisans, shopkeepers, or community leaders to gain insights into the social fabric, cultural practices, and community needs

Aspect	Observation/Note/	Photo	Discussion Points
Architecture and Built Environment	Architectural style and materials used	Unique or historical structures	Significance and uniqueness, Preservation efforts and challenges
Public Spaces and Land Use	Public squares, parks, gathering areas	Community spaces, landmarks	Utilization and importance of these spaces
Infrastructure and Services	Condition of infrastructure	Water, sanitation electricity, transportation, ICT	Adequacy of services
Natural Environment	Surrounding landscape, vegetation, natural features	Unique or environmentally significant areas	Community's relationship with the environment, conservation
Local Economy and Livelihoods	Types of economic activities, agriculture, crafts, tourism	Local markets, shops, workshops	Livelihoods, economic challenges, development potential
Social and Cultural Aspects	Social dynamics, community organizations, cultural practices	Cultural events, festivals, ceremonies	Community values, traditions, cultural heritage preservation

II. Focus group discussion

Date:
Time:
Location:
Participants numbers:

a) Road Infrastructure

1. Discuss the existing transportation infrastructure and its impact on community members' connectivity of basic services.
2. Are there any safety concerns related to road infrastructure that affect the daily lives and activities of the community?
3. How frequently do available transportation operate in the village? Are there any specific schedules or timetables? Are there any challenges or limitations in terms of transportation services reliability and availability?
4. How affordable are these transportation options for the residents of Shonke village?

b) Water

1. How does the quality and accessibility of water sources impact the community's in Shonke Village?
2. How reliable is the water supply in Shonke village? Are there any issues with intermittent supply or seasonal variations? Are there any alternative water sources or water storage mechanisms in place?

c) Sanitation

1. How does the accessibility and quality of sanitation infrastructure impact the overall well-being of the community members in Shonke village? Are there any health concerns or risks associated with the current sanitation infrastructure in Shonke village? If yes, please specify the challenges you have encountered.
2. Are there designated areas or facilities for proper waste disposal and management within your village? If yes, Are there gender-inclusive and accessible for people with disabilities and elderly community members?

d) Energy

1. What are the challenges faced by community members in accessing reliable energy sources for their daily activities?
2. How accessible and affordable are existing energy sources and cooking technologies in your villages?Have you encountered any challenges in using them?

e) ICT

How does the accessibility and reliability of ICT infrastructure, including internet connectivity and mobile phone coverage, hinder the community's livelihood? Are there any specific challenges regarding internet connectivity, phone call quality, and coverage areas in Shonke Village that impact communication and access to emergency services during critical situations?

III. Key Informant Interview:

1. How effective is the existing infrastructure in Shonke Village in meeting the unique needs of the local communities' overall well-being?
2. Can you identify any socio-economic challenges hindering Shonke Village's preservation?

3. Are there any collaborations with relevant stakeholders to address the infrastructure needs in Shonke Village? If so, how are they contributing to the improvement of infrastructure? Have there been any challenges related to coordination among different stakeholders in addressing the infrastructure needs of Shonke Village?
4. Are there any specific development projects planned or ongoing initiatives to enhance the infrastructure in Shonke Village?
5. Have any properties in the village been officially recognized and inscribed as cultural heritage? If so, which properties? Is there an official database of cultural heritage resources maintained by the local authority or heritage conservation authorities? If so, which are the significance?
6. Can you please provide information on any ongoing active tourism activities in Shonke Village, as well as the revenue generated from tourism? Additionally, are there any specific limitations associated with engaging in community-based tourism in Shonke Village? How can Shonke Village leverage its unique characteristics?

IV. Household Survey

i. Background

1. What best describes you?

I live in Shonke village and work on farmland	
I live and work on the surrounding farmland	
None of the above (please explain)	

2. What is your age?

18 or younger	
19 to 34	
35 to 54	
55 to 74	
75 and over	

3. What is your gender?

Female	
Male	

4. How long have you lived or worked in Shonke Village?

Less than 2 years	
2 - 5 years	
6 - 10 years	
11 - 20 years	
Over 20 years	

5. what is the highest degree or level of school you have completed? (optional)

Elementary School (grade 1-8)	
High School (grades 9- 10)	
Preparatory school (grade 11-12)	
College/university	
Religious education	
Other	

6. What are your main livelihood? Please select from the following options:

Housewife	
Farmer	
Religious teacher	
Crafts and small-scale businesses	
Livestock rearing	
Tourism activity	
Merchant	
Other	

ii. Shonke Village Need Assessment

1. Please rate the following significant challenges that Shonke Village may face in terms of living and working in the next 10 years using the Likert scale provided: (5 = Strongly Agree (SA), 4 = Agree (A), 3 = Neutral (N), 2 = Disagree (D), 1 = Strongly Disagree (SD)).

What are the five most significant challenges that Shonke Village will face in terms of living and working

S/ No	Challenges of Shonke Village for Living and Working	Ratings					If your rate is less than 3, please give your justification
		5	4	3	2	1	
1	Inadequate transportation (unmaintained gravel road, unsafe road conditions, lack of signage, and lack of affordable transportation options)						
2	Limited ICT (limited network coverage, unreliable internet connectivity, and Limited access to ICT devices)						
3	Limited access to reliable and clean water						
4	Inadequate Sanitation Facilities						
5	Lack of clean and affordable energy						
6	Inadequate school and healthcare facilities						
7	Lack of employment opportunities						
8	Youth outmigration and resident relocation						
9	Vacant and deteriorating dwellings						
10	New buildings that don't match the existing character of the neighborhood						
11	Lack of tourist facilities						
12	Neglect of heritage preservation						
13	Climate change and its impact on agriculture						
14	Safety and Security						
15	Other (please specify)						

Appendix B: Documents

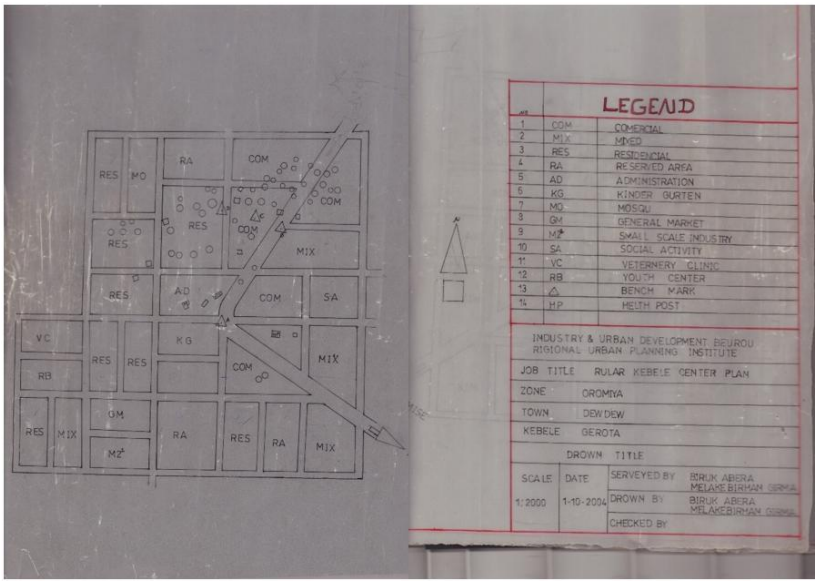


Figure 5.1 Land use plan of DewDew

(Dewachefa Wereda land administration office, 2023)

Figure 5.2 Religious activity at the biggest mosque of Shonke Village

https://www.youtube.com/watch?v=8-Pp8ou-bfk&t=853s

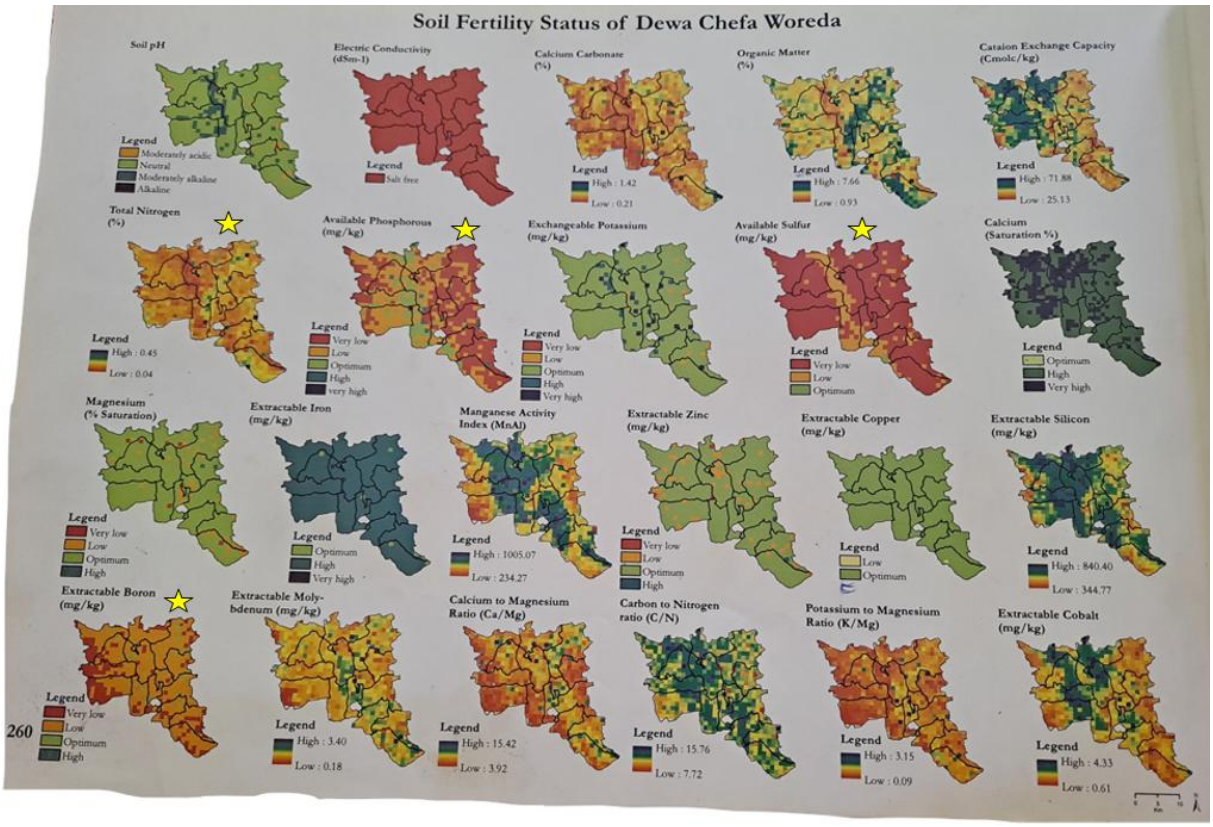


Figure 5.3 Soil fertility status of Dewachefa Woreda

(Soil fertility status and fertilizer recommendation Atlas of Amhara National Regional State Dewachefa Agriculture administration office, 2016)

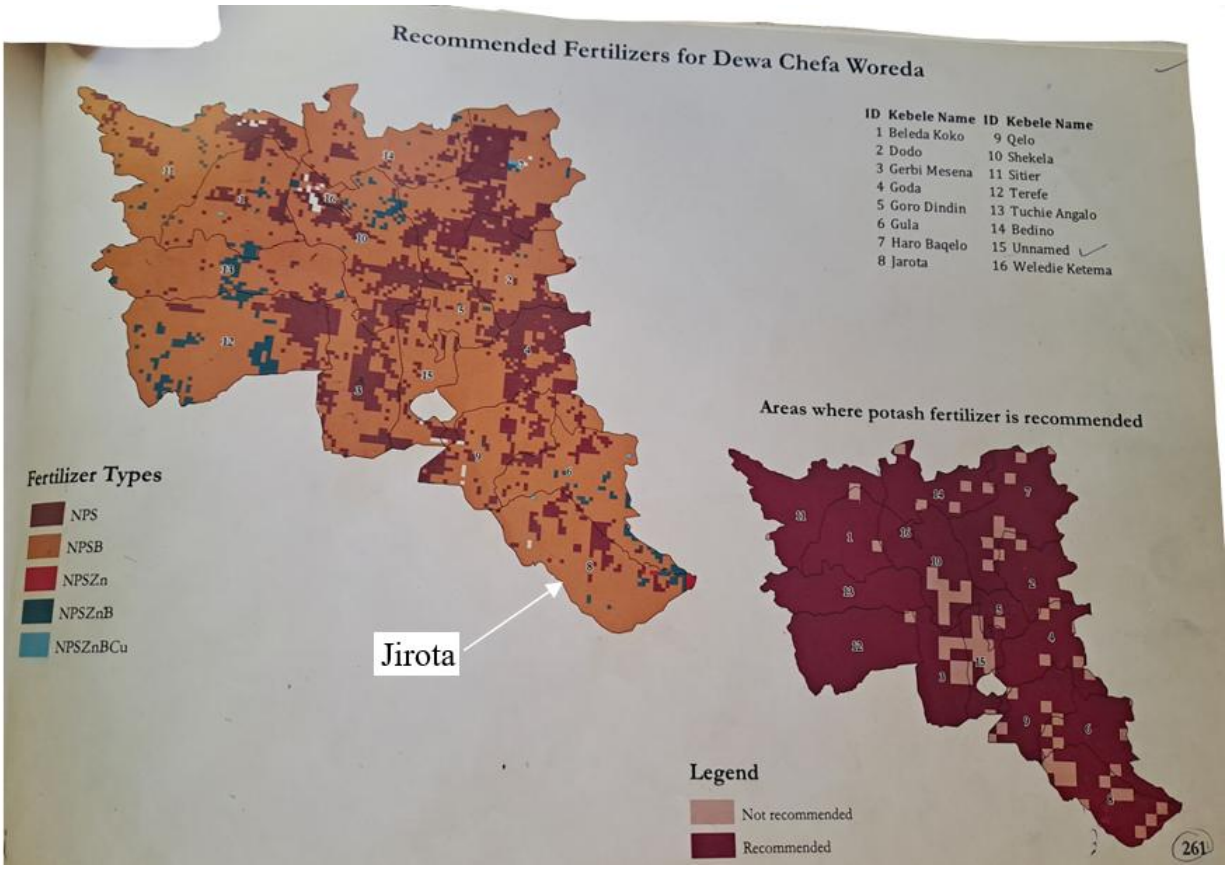


Figure 5.4 Recommended fertilizer for Dewachefa Woreda

(Soil fertility status and fertilizer recommendation Atlas of Amhara National Regional State Dewachefa Agriculture administration office, 2016)

የማይንቀሳቀሱ ቅርሶች መመዝገቢያ ቅጽ 02

1.የቅርሱ መለያ

1.1 ስም በአማርኛ ----[illegible]----

በአካባቢ ቋንቋ(መጠሪያ)--------------

1.2 ምድብ

I	II	III2	VI
✓			

1.3 አድራሻ

ቅርሱ የሚገኝበት ቦታ ስም ----[illegible]----ክልል----[illegible]----

ልዩ ዞን/ልዩወረዳ [illegible] ወረዳ [illegible] ቀበሌ [illegible]

የቤት ቁጥር---–---

1.4 አገልግሎቱ

ሀ.የቀድሞ----[illegible]----

ለ. የአሁን ----[illegible]----

1.5 የቀድሞ መለያ ቁጥር/ካለ---–---

1.6 መለያ ቁጥር---ET-AM-DC-I-004

2. <u>ባለቤት</u>

2.1 የቅርሱ ባለቤት/ተቋም/ ስም

የሕዝብ	የመንግሥት	የሃይማኖት	የግል
✓			

ሌላ ካለ ተለይቶ ይጠቀስ-------------------------------------

2.2 የቅርሱ ባለቤት /ተቋም/ ስም----[illegible]

1

2.3 የካርታ መረጃ ---

ጂ.ፒ.ኤስ 03°58:41.8---ምስራቅ-10° 37:061---ሰሜን

ሜ.ከባህር ወለል በላይ----1931 ሜ-----

3. <u>ታሪክ</u>

3.1. ቅርሱን ያሠራው/የሰራው/ያገኘው ግለሰብ /ተቋም/ ስም--[illegible]

3.2. ቅርሱ የተሠራበት ጊዜ /ዘመን/----[illegible]

3.3. የቅርሱ እድሜ የታወቀበት ዘዴ

ሀ. በግምት-------------- ለ.በትክክል-------------------

ሐ. በአንፃራዊ ---✓---------------

3.4. የቅርሱ ሁኔታ [illegible]

3.5 የቅርሱ መጠን/ልኬት/

ቁመት-------------- ሳ.ሜ/ሜ ወርድ--116----ሳ.ሜ/ሜ/ኪ.ሜ

ርዝመት--278-ሜ/ኪ.ሜ ዲያሜትር----------ሳሜ/ሜ ውፍረት-----------ሳሜ/ሜ

ቅርፅ-------------ስፋት-32243ሜ²/ኪ.ሜ²

3.6. የተሰራበት ቁስ------[illegible]

2

3.7 የቅርሱ መግለጫ:- [illegible]

3.8. ቅርሱን ተደናቂ የሚያደርገው

እድሜ	የአሰራር ጥበቡ	የተሰራበት ቁስ	ሌላ
✓	✓		

ተለይቶ ይብራራ [illegible]

3.9.የቅርሱ ጠቀሜታ [illegible]

3.10.ቅርሱ አሁን የሚገኝበት ሁኔታ

ጥሩ	ደህና	የተጎዳ	ያልተሟላ
✓			

ቅርሱ የተጎዳ /ያልተሟላ/ ከሆነ በዝርዝር ይገለፅ-------------------------

3

3.11. ለቅርሱ ደህንነት አስጊ ሁኔታ

አለ	የለም
☐	☑

ካለ ተለይቶ ይጠቀስ--

3.12 የተደረገለት የእንክብካቤ /የጥገና/ ሥራ

አለ	የለም
☐	☑

የጥገና ስራ ካለ፡-

የጥገናው ምክንያት ---

ያከናወነው አካል ---

የተከናወነበት ቀን/ዓ.ም. --

ጥገና የተደረገለት ጊዜ ብዛት--------------------------------------

3.12.1 የተደረገለት የእንክብካቤ /ቅድመ ጉዳት እንክብካቤ / ሥራ

በጣም ጥሩ	ጥሩ	መካከለኛ	ዝቅተኛ	በጣም ዝቅተኛ
☐	☐	☐	☐	☐

ተለይቶ ይብራራ--[illegible]----
------[illegible]--------

3.13. ቅርሱ አሁን በባለቤትነት በሚያስተዳድረው አካል መተዳደር

የጀመረበት ጊዜ/ቀን--[illegible]

4

3.14. የቅርሱ ተደራሽነት

በጣም ጥሩ	ጥሩ	መካከለኛ	ዝቅተኛ	በጣም ዝቅተኛ	የለውም
☐	☐	☐	☐	✓	☐

ተለይቶ ቢብራራ [illegible]

3.15. ተጨማሪ ማስታወሻ [illegible]

4. ተዛማጅ መረጃዎች

መጽሐፍ	ፎቶግራፍ/ስላይድ/	ካርታ	መዝገብ	ፐላን
✓	✓	☐	☐	☐

ሌላ ካለ ተለይቶ ይጠቀስ

4.2 የአፈ ታሪክ መረጃ

አለዉ	የለዉም
☐	✓

ካለ ተለይቶ ይጠቀስ

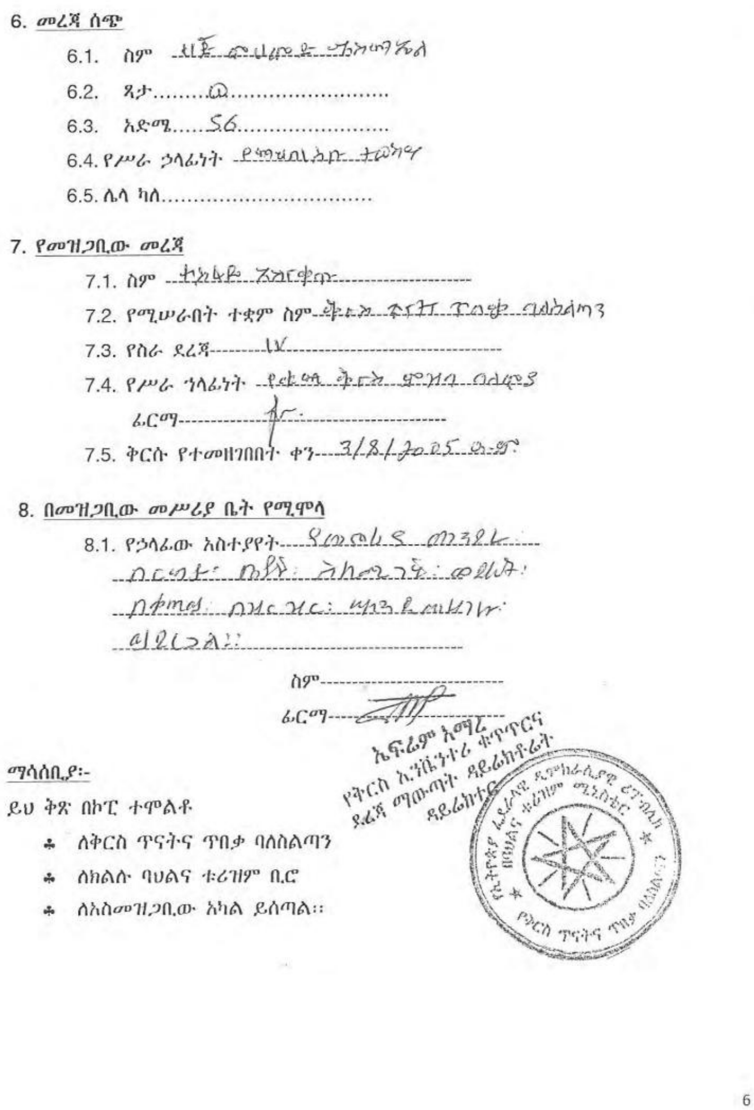
5. የቅርሱ ጠባቂ

5.1. ስም [illegible]

5.2. የሥራ ኃላፊነት [illegible]

5.3. ፊርማ [illegible]

5



6. መረጃ ሰጭ

6.1. ስም

6.2. ጾታ.........ወ.........................

6.3. እድሜ.....56.......................

6.4. የሥራ ኃላፊነት

6.5. ሌላ ካለ................................

7. የመዝጋቢው መረጃ

7.1. ስም

7.2. የሚሠራበት ተቋም ስም

7.3. የስራ ደረጃ--------IV--------------------------------

7.4. የሥራ ኃላፊነት

ፊርማ--

7.5. ቅርሱ የተመዘገበበት ቀን---3/8/2005 ዓ.ም

8. በመዝጋቢው መሥሪያ ቤት የሚሞላ

8.1. የኃላፊው አስተያየት

ስም----------------------------

ፊርማ----------------------------

ኤፍሬም አማረ
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ዳይሬክተር

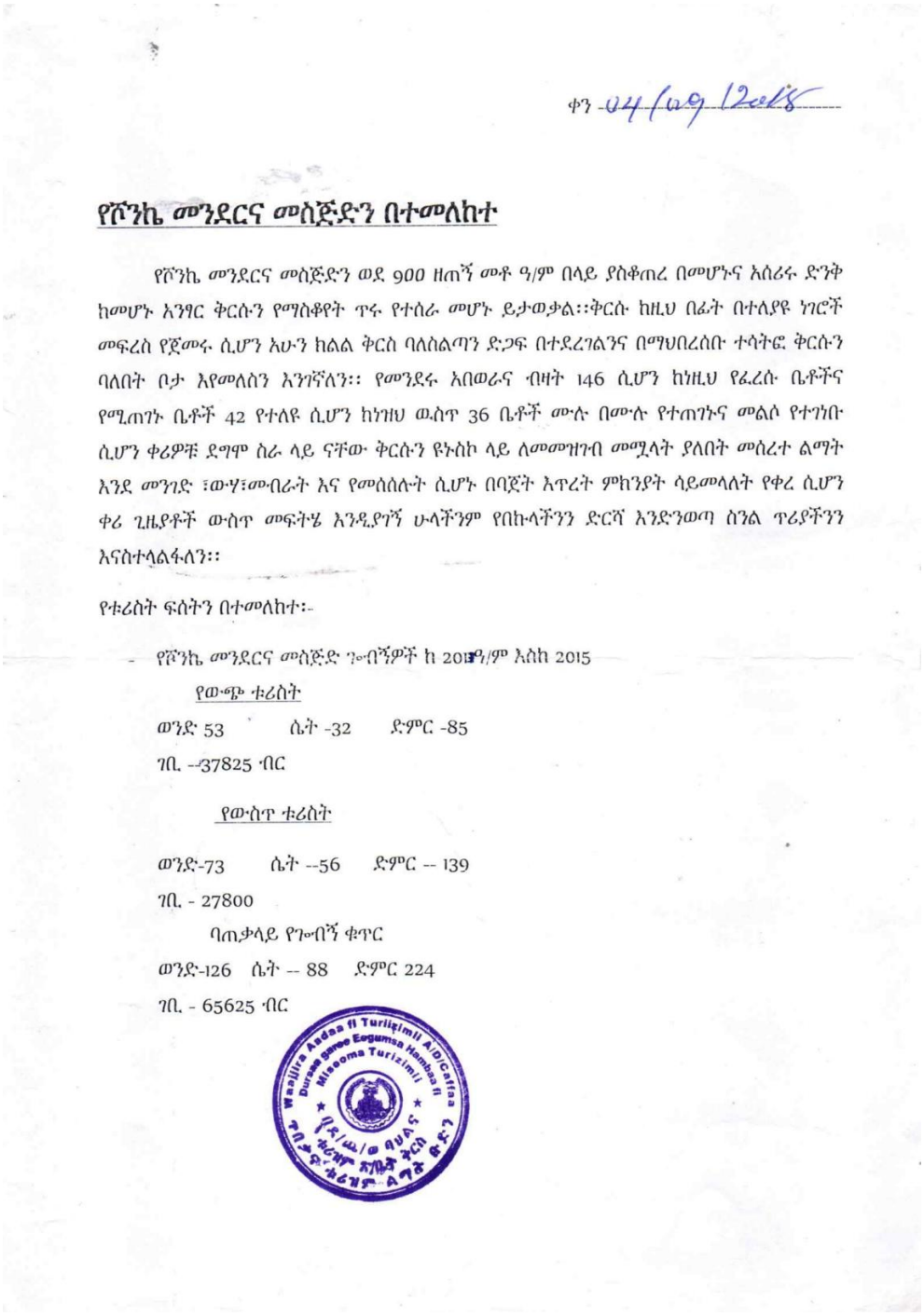
ማሳሰቢያ፡-

ይህ ቅጽ በኮፒ ተሞልቶ

- ለቅርስ ጥናትና ጥበቃ ባለስልጣን
- ለክልሉ ባህልና ቱሪዝም ቢሮ
- ለአስመዝጋቢው አካል ይሰጣል፡፡

6

Figure 5.5 Heritage registration certificate for Shonke Amba
(Research and Conservation of Culture Heritage)



ቀን 04/09/2018

የሾንኬ መንደርና መስጅድን በተመለከተ

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የቱሪስት ፍሰትን በተመለከተ፡-

- የሾንኬ መንደርና መስጅድ ጉብኝዎች ከ 2013 ዓ/ም እስከ 2015

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  ወንድ-126 ሴት -- 88 ድምር 224

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Figure 5.6 Shonke village tourist arrival

(Dewachefa culture and tourism)

Dewachefa, Solid & Liquid waste Management Performance by kebele, 2016 EFY 1st Quarter.

SN	Kebele/HP	PLAN	Solid Waste Managment Performance		Liquid Waste Management Performance	
			#	%	#	%
1	Gerbi	1073	922	86%	922	86%
2	Shakela	1996	1968	99%	1968	99%
3	Woledi	973				
4	Qoladi	1736	1569	90%	1569	90%
5	Teref	1068	837	78%	1053	99%
6	Abeloshi	599 ~~1667~~	340 1177	57% +135%	450 1503	75% 174%
7	Gobeya	1302	1302	100%	1283	99%
8	Tuche	1251	1233	99%	1222	98%
9	Gur	1553	822	53%	1151	74%
10	Ademe	801	380	47%	310	39%

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Dewachefa, Solid & Liquid waste Management Performance by kebele, 2016 EFY 1st Quarter.

SN	Kebele/HP	PLAN	Solid Waste Managment Performance		Liquid Waste Management Performance	
			#	%	#	%
11	Bilida	1239	1128	91%	1128	91%
12	Selama	1180	1312	111%	1312	111%
13	Lafto	1722	1308	76%	1308	76%
14	Dirma	1702	1333	78%	1333	78%
15	H/Bakelo	1634	724	44%	751	46%
16	H/Gobensa	1944	1065	55%	807	42%
17	serte	1388	556	40%	632	46%
18	Jaranio	2062	807	39%	801	39%
19	Erensa	1432	557	39%	537	38%
20	Bilacha	1211	972	80%	911	75%

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Dewachefa, Solid & Liquid waste Managment Performance by kebele, 2016 EFY 1st Quarter.

SN	Kebele/HP	PLAN	Solid Waste Managment Performance		Liquid Waste Management Performance	
			#	%	#	%
21	Kello	2332	1959	84%	1959	84%
22	Dindin	849	790	93%	717	84%
23	Dodo	3390	561	17%	561	17%
24	Chiret W.	984	297	30%	115	12%
25	Gula	979	128	13%	169	17%
26	Ketemo	1310	58	4%	48	4%
27	Jirota	1533	170	11%	102	7%
	Woreda	39242	23098	59%	23119	59%

12/12/2023

Dewachefa Health Office M & E

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Figure 5.7 Dewachefa solid waste management performance

Figure 5.8 Dewachefa top diseases of Morbidity

Dewachefa Wereda 2016 population profile

SN	Facility (kebele)	Total Population	Male	Female	House Hold
1	Gerbi	4615	230274	2312	1073
2	Shakela	8582	428265	4300	1996
3	Woledi	4182	208700	2095	973
4	Qoladi	7464	372442	3739	1736
5	Teref	4592	229136	2301	1068
6	Abeloshi	2577	128614	1291	599
7	Gobeya	5599	279370	2805	1302
8	Tuche	5378	268351	2694	1251
9	Gur	6678	333227	3346	1553
10	Ademe	3444	171865	1726	801
11	Bilida	5329	265919	2670	1239
12	Selama	5076	253296	2543	1180
13	Lafto	7404	369442	3709	1722
14	Dirma	7317	365096	3666	1702
15	H/Bakelo	7024	350506	3519	1634
16	H/Gobensa	8361	417193	4189	1944
17	serte	5969	297840	2990	1388
18	Jaranio	8866	442398	4442	2062
19	Erensa	6156	307204	3084	1432
20	Bilacha	5209	259918	2610	1211
21	Kello	10028	500406	5024	2332
22	Denden	3652	182212	1829	849
23	Dodo	14575	727294	7302	3390
24	Chiret W.	4233	211235	2121	984
25	Gula	4210	210097	2109	979
26	Ketemo	5632	281026	2822	1310
27	Jirota	6591	328881	3302	1533
	Woreda	168742	8420207	84540	39242

Male = Total - # Female

Figure 5.9 Dewachefa Wereda 2016 population profile

Table 5.1 Northeastern tourist route of Amhara (Visit Amhara Tourist guide book, Amhara Culture and Tourism Bureau, 2021)

No	Name of place	Distance	Referenced city	Name of place	Distance	Referenced city/town
1	Debre Birhan	130 km NE	Addis Ababa	**SHONKE VILLAGE**	25 km	Kemise
2	Angolela	10km W	Debre Birhan	Dessie city	401 km NE	Addis Ababa
3	Ankober	40 km E	Debre Birhan	Dessie Museum		
4	Aliyu Amba	12 km	Ankober	Geta Ambessa (Lord lion)	12 km SE	Kombolcha
5	Abdul Resirsul-Abdul Na	8 km W	Aliyu Amba	Jima Nigus	37 km	Dessie
6	Gosh Meda, Kundi and Wof Washa Forest	30 km	Debre Birhan	Boru Meda	20km NW	Dessie
7	Menz Guassa Protected Area	107 km	Debre Birhan	Borena Sayint Worehimno national park	196 km W	Dessie
8	Salayish Weapon Warehouse	50 km	Debre Birhan	Tedbabe Maryam	228 km	Dessie
9	Abune Melke Tsedek Monastery	224 km	Addis Ababa	Mekdela Amba	157 km W	Dessie
10	Goze Mosque	93 km	Debre Birhan	Gishen Debre Kerbe	80 km NW	Dessie
11	Stelae-Tikil Dingayoch	21 km W	Ataye	Lake Hayik Logo	30 km N	Dessie

No	Name of place	Distance	Referenced city	Name of place	Distance	Referenced city/town
12	Bati and Senbete open market	40 km E and 263 km	Kombolcha and Addis Ababa	Hayik Estifanos Monastry		
13	Awoytu hot spring	4 km	Senbete	Yisma Nigus	60 km	Dessie-Woldya
14	Turusina Mosque	7 km E	Kemise-Kombolcha	Abune Yosef	62 km NE	Lalibela
15	Jemedo Maryam Monastery	70 km	Woldiya	Meqet Community Tourism Site	245 km	Bahir Dar
16	Rock-hewn church of Lalibela			Hidmo bet (house)		
17	Neakuto Leab	6 km SE	Lalibela	Meskele Kristos	5 km S	Lalibela
18	Bilbala Village	30 km	Lalibela	Fertata (a tree used as a cave)	14 km W	Sekota
19	Yimrehane Kristos	42 km	Lalibela	Debre Hamelmal Bahir-Kidane Mihret	50 km	Sekota
20	Genete Maryam	22 km SE	Lalibela	Ziye Abo Monastery	86 km SW	Sekota

Figure 5.10 Community Briefing for Shonke Village Need Assessment

Figure 5.11 Some of the restored houses of Shonke village

(Dewa Chefa Culture and Tourism Office)

Appendix C Observation

Figure 5. 12 Existing Transportation Challenges

Figure 5.13 Existing Water Supply Challenges

Figure 5.14 Existing Energy Challenges

Figure 5.15 Existing Sanitation Challenges

Figure 5.16 Vacant billboards around cemeteries

Figure 5.17 Displaced households and farming compound

Figure 5.18 Demolished house during December observation

Figure 5.19 New reconstructed house

Figure 5.20 Front and backyard of Shonke village vernacular house

Figure 5.21 Some activities on the house and on top of the roof

Figure 5.22 Shonke Village's trail




Figure 5.23 Panoramic view of Shonke Village and its surrounding

Figure 5.24 Researcher coffee time at Bokeke Seids' house

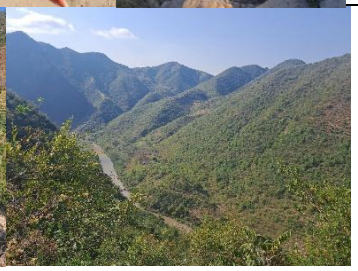
Figure 5.25 Chat market around Abila Elementary School

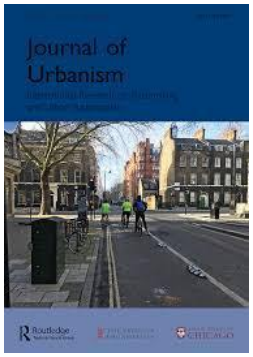
Figure 5. 26 Peace and security challenges at Chefa (Kemise to Addis Ababa route)

Figure 5. 27 Shonke Village to Borkena Bridge hiking route

Table 5.2 Observation of some of the Unique elements of Shonke Village

Aspect	Observation
Vernacular architecture and street network	
Mosques	
Cemetery	
Open space	
Traditional food	

Aspect	Observation
Traditional Artisanship	 
Traditional Farming	 
Village Sightseeing	  
Panoramic View of a hiking route	  



Journal of Urbanism: International Research on Placemaking and Urban Sustainability

Infrastructure Integration in Small Historic Cities: Case of Shonke Village, Ethiopia

Hiwot Ergetie Temechew , Zegeye Chernet Mamo, Tesfaye Hailu Bekele

Appendix D: Publishable Ready manuscript

A publication-ready manuscript has been submitted to the Journal of Urbanism: International Research on Placemaking and Urban Sustainability and is in progress.

Integrated Infrastructure in Small Historic Cities: Case of Shonke Village, Ethiopia

Hiwot Ergetie Temechew, Zegeye Chernet Mamo, Tesfaye Hailu Bekele

Chair of Appropriate Building Technology, Ethiopian Institute of Architecture, Building Construction and City Development (EiABC), Addis Ababa University (AAU); Emerging Cities Lab, Chair of Architecture and Design, Ethiopian Institute of Architecture, Building Construction and City Development (EiABC), Addis Ababa University (AAU); Emerging Cities Lab, Chair of Infrastructure Design & Construction, Ethiopian Institute of Architecture, Building Construction and City Development (EiABC), Addis Ababa University (AAU)

ABSTRACT

Urban development in historic cities in Ethiopia like Shonke Village presents unique challenges in balancing modern infrastructure needs with cultural heritage preservation. This study explores the application of Integrated Infrastructure to manage this balance effectively. Utilizing a mixed research approach, the research gathered empirical data through surveys, transect walks, key informant interviews, and focus group discussions among local stakeholders. The study identifies significant infrastructure deficiencies in water, sanitation, energy, transportation, and ICT that threaten the cultural landscape and contribute to resident relocation. Notably, it proposes hybrid renewable energy, eco toilets, and sustainable transportation. Focusing on small targeted interventions that generate ripple effects across social, cultural, environmental, and economic domains, the proposed solutions aim to improve essential services, foster economic growth, attract tourism, and preserve Shonke's cultural heritage. The findings underscore that strategic infrastructure improvement is grounded in a nuanced understanding of a place's cultural values, social needs, physical context, economic vitalities, and environmental considerations. This research contributes to the broader discourse on sustainable urban planning in heritage-rich cities, offering a model for harmonizing development with preservation through locally rooted, context-sensitive infrastructure solutions.

KEYWORDS
Integrated infrastructure, Sustainable Urban Planning, Historic Cities, Cultural Heritage Preservation, Context-Sensitive Solutions, Shonke Village

1. INTRODUCTION

1.1 Background of the study

The preservation and modernization of historic districts pose a significant global challenge, requiring a careful balance between conserving cultural heritage and accommodating contemporary urban development (Ercan 2011; Houdek 2014). This is further exacerbated by

factors such as globalization, rapid urbanization, inadequate infrastructure, insufficient funding, climate change, and limited community involvement, all of which contribute to the difficulties in effectively conserving heritage (Olsson and Haas 2005; Menchawy, Aly and Hakim 2011; Roy and Kalidindi 2017; Bayih 2018; UNESCO 2021). This challenge is particularly acute in areas where infrastructural decay and socio-economic stagnation threaten community vitality (Naciye & Rokhsaneh, 2014). Efforts to harmonize architectural integrity with modern functionality often lead to conflicts, risking either over-commercialization or neglect (Feilden, 2007). Stakeholders frequently view development and conservation as conflicting goals, with development perceived as a threat to heritage and conservation as a barrier to economic growth (Thaitakoo, 2006). This is further complicated by the ambiguity surrounding the concept of integrated infrastructure (Arts, et al. 2016; McLean 2018; Saeid Saidi, Lina Kattan, and Poornima Jayasinghe 2018). While the idea of integrating infrastructure is widely accepted, a lack of clear definition hinders its practical application, particularly in the context of heritage conservation and development. This ambiguity makes it difficult to determine how, what, and at what scale integration should occur, further exacerbating the tension between conservation and development.

Although infrastructure plays a crucial role in the development of historic cities, as it shapes the urban landscape and facilitates the adaptation of degraded or abandoned historic districts to meet the demands of contemporary urban life (UNESCO, Developing historic cities: keys for understanding and taking action; A compilation of case studies on the conservation and management of historic cities., 2014), integrating heritage management within infrastructure planning presents complex challenges, often called wicked problems due to their multifaceted and interconnected nature (Fredholm, Dore, & Brorström, Strategic Responses to Wicked Problems of Heritage Management: Experiences from the West Link Infrastructure Project in Gothenburg, Sweden, 2021). Nevertheless, Integrated infrastructure aims to bridge the gaps between planning, funding, and delivery, promoting cost efficiency, environmental benefits, and focusing on citizens' needs. It recognizes the synergies between different infrastructure sectors while underscoring the importance of effective planning mechanisms (Hall, et al. 2012; Dunning and Buck 2017; McLean 2018). In particular, planning plays a crucial role in integrating infrastructure and focus on place, ensuring that individual developments are planned as part of a broader picture, resulting in greater value for both the local community and developers (Adams and Watkins 2014; Williams 2014).

Sustainable Historic Urban Planning

Historic settlements often face challenges in balancing modernization with preserving their unique cultural identities, particularly in Africa, where heritage conservation and development complexities are underexplored. The sustainable development of African heritage has become a timely and significant issue, engaging diverse stakeholders, including practitioners, academics, communities, and public and private sectors, who view heritage as a potential tool for wealth creation and poverty alleviation beyond tourism activities (UNESCO, 2018). In Ethiopia, key regulatory frameworks such as the Ten-Year Development Plan (2021–2030), the Sustainable Tourism Master Plan (2015–2025), the Tourism Development Policy (2009), and the Cultural Policy (2016) emphasize the integration of infrastructure, tourism, and cultural preservation.

Despite these regulatory efforts, according to ICOMOS, the Global Heritage Fund, and Kidane-Mariam, as referenced by Gebreegziabher et al. (2019); Even though Ethiopia possesses rich cultural and historical heritage with immense tourism potential, its development is hindered by financial constraints, inadequate security and infrastructure, looting, and lack of local participation. Social inequalities, political instability, unplanned development, and natural disasters further threaten heritage sites. Consequently, many heritage sites face serious damage and their long-term survival is uncertain (Gebreegziabher et al. 2019). Specific case studies, such as Aberha (2018) analysis of the Walled City of Harar and Teklemariam (2024) study on Addis Ababa, highlight issues like inappropriate restoration methods, unplanned urbanization, weak regulatory enforcement, and lack of public awareness. For example, in Harar, modern interventions and poor infrastructure integration compromise the city's historic authenticity, while in Addis Ababa, rapid urban growth threatens historic structures like those in Piazza where modernization projects prioritize economic development over heritage conservation. Both cases underscore the importance of integrated conservation strategies that balance heritage preservation with contemporary urban development.

Shonke village is a 900-year-old Argobba settlement known for its unique architecture (Stitz 1973; Ambaye 2016), and is part of a key halal tourism route due to its historical Islamic significance (Ahmed & Akbaba, 2021). It was one of the prominent Islamic education and Sufi order centers in the 19th century, where distinguished Sufi saint scholars, resided permanently and taught many

Muslim scholars. About 20 generations have lived in the village, but residents now say half of the village's estimated households have left in search of farmlands down the hill.

This situation highlights the need for a more integrated approach to conservation and development in historic areas. Therefore this study focuses on Shonke Village as a case study to explore how holistic planning can preserve cultural and historical integrity while fostering balanced development. It utilizes Historic Urban Landscape (HUL) approach and Urban Acupuncture (UA) to guide sustainable infrastructure development in Shonke Village. This framework guides the integration of infrastructure with heritage preservation in Shonke Village through three sequential steps: Inventory of Cultural Assets to identify key heritage elements, Participatory Planning to engage stakeholders in prioritizing preservation goals, and Vulnerability Assessment to evaluate risks from socio-economic pressures and climate change. Urban Acupuncture complements these steps with targeted interventions addressing specific challenges, enhancing each phase and ensuring a strategic balance between modern infrastructure and cultural heritage conservation.

MATERIALS AND METHODS

The research area is located in Jirota Kebele, part of Dawachefa Woreda in the Oromia Zone of Amhara National Regional State as shown in Figure 1. Shonke is about 25 kilometers east of Kemise town and is bordered by Artuma Fursi Woreda to the south, Dewe Harawa Woreda to the north, the Afar region to the west, and Toleha to the east. Its geographical coordinates are 10°36′52.34″ N latitude and 39°58′22.31″ E longitude and known for its rugged mountainous landscape. This area features a moderate climate with an average annual temperature of 18.63°C and is located within the watershed of the “Borkena” River, which is a tributary of the Awash River. In April 2013, Shonke was designated as a heritage site by Ethiopia's Authority for Research and Conservation of Cultural Heritages based on limited documentation.

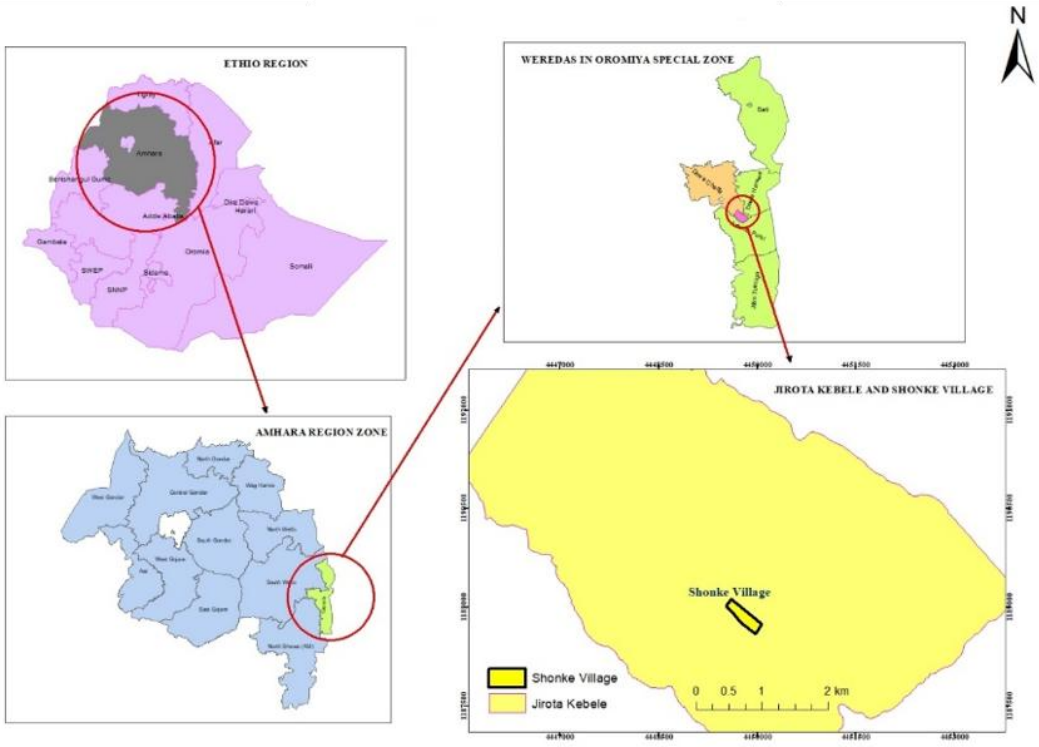


Figure 1 Location map of the study area

The research employed a single case study design and mixed-methods approach, utilizing qualitative and quantitative methods to ensure a comprehensive understanding of the study area. Primary data were collected through surveys, semi-structured interviews, focus group discussions (FGDs), and transect walks, while secondary data were sourced from published and unpublished materials, including government records and academic journals. Non-probability purposive sampling was used to select 89 household heads, 10 key informants, and 7 Focus group discussion participants, ensuring diverse perspectives and representation. Transect walks along four routes provided valuable observations on the village's infrastructure, historic features, and land use patterns, offering insights into the unique opportunities and challenges of the places. The collected data is analyzed using spatial, thematic, and statistical methods. Additionally, a comparative analysis of three selected peer cases was conducted to inform culturally sensitive recommendations for Shonke Village, exploring trends, challenges, and best practices for balancing modernization with heritage preservation.

2. RESULTS AND FINDINGS

3.1 Unique Elements of Shonke Village

Shonke Village stands out as an exemplary living cultural landscape that showcases the Argobba people's unique identity through its tangible and intangible cultural heritage. The village is distinguished by its stepped-row houses constructed using olive wood, dry stone walls, and flat roofs filled with soil and gravel. These structures adhere to Islamic design principles and are arranged along a well-defined grid road system established approximately nine centuries ago. This network links key entry and exit points through the Gudiba and Timbu Amaba open spaces, facilitating movement and communal interaction. Religious landmarks, such as the three mosques, highlight Shonke's deep Islamic roots, symbols of faith and centers for religious activities and community gatherings and the pivotal role of its founders in preserving Islamic manuscripts, earning them respect as "Sheikh Shonke" or "Abaye Shonke." The village's communal areas provide spaces for social interactions and the preservation of traditions. The sacred cemetery connects past and present generations, honoring ancestors and preserving their memories.

Shonke's geographical setting, with elevations ranging from 1690 to 1980 meters above sea level, provides striking landscapes ideal for trekking and sightseeing as illustrated in Figure 2. Visitors can enjoy panoramic views of the Shewa Mountains, the Chafa Valley, and adjacent lowlands, alongside observing the community's traditional terracing and agricultural methods. The predominant use of the Argobba language in public spaces reflects the village's identity. Traditional practices, such as endogamous marriages arranged by families, the annual Ziyara ritual, and the cooperative spirit of Debo, are integral to the community's way of life. The Qadi-led dispute resolution system, applying Sharia law, underscores the village's adherence to Islamic principles. Traditional artisanship, cuisine (Woqalimo), and sustainable farming techniques further enrich Shonke's intangible cultural heritage.

Spanning 12.25 hectares, Shonke Village exhibits a mixed land use pattern, integrating agricultural zones, sacred cemeteries, residential areas, communal open spaces, and mosques, connected by a modest road network. This intricate spatial organization exemplifies a harmonious urban settlement that respects its cultural heritage while addressing modern development needs as shown in Figure 3.

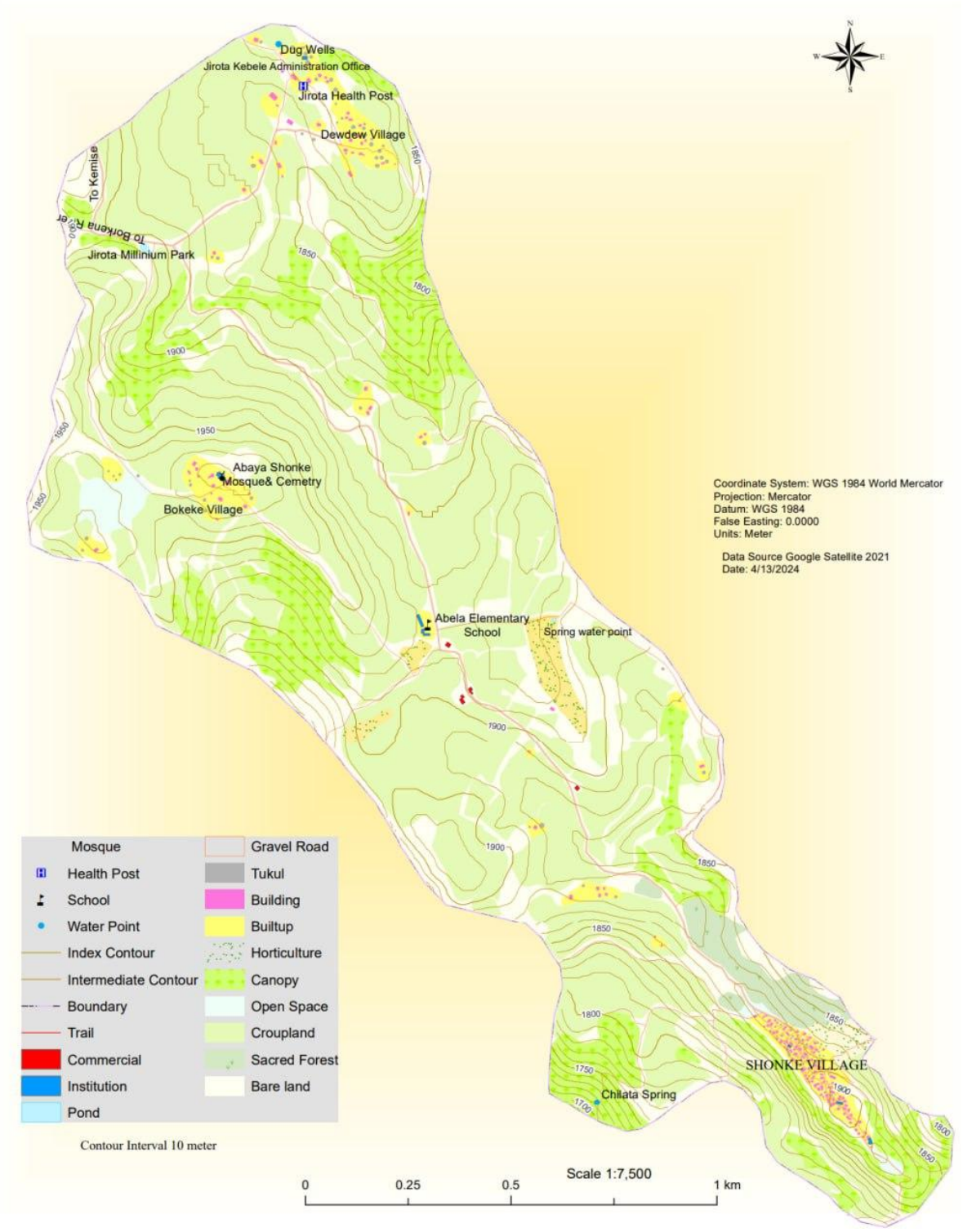


Figure 2 Topography map of Shonke Village and its surrounding

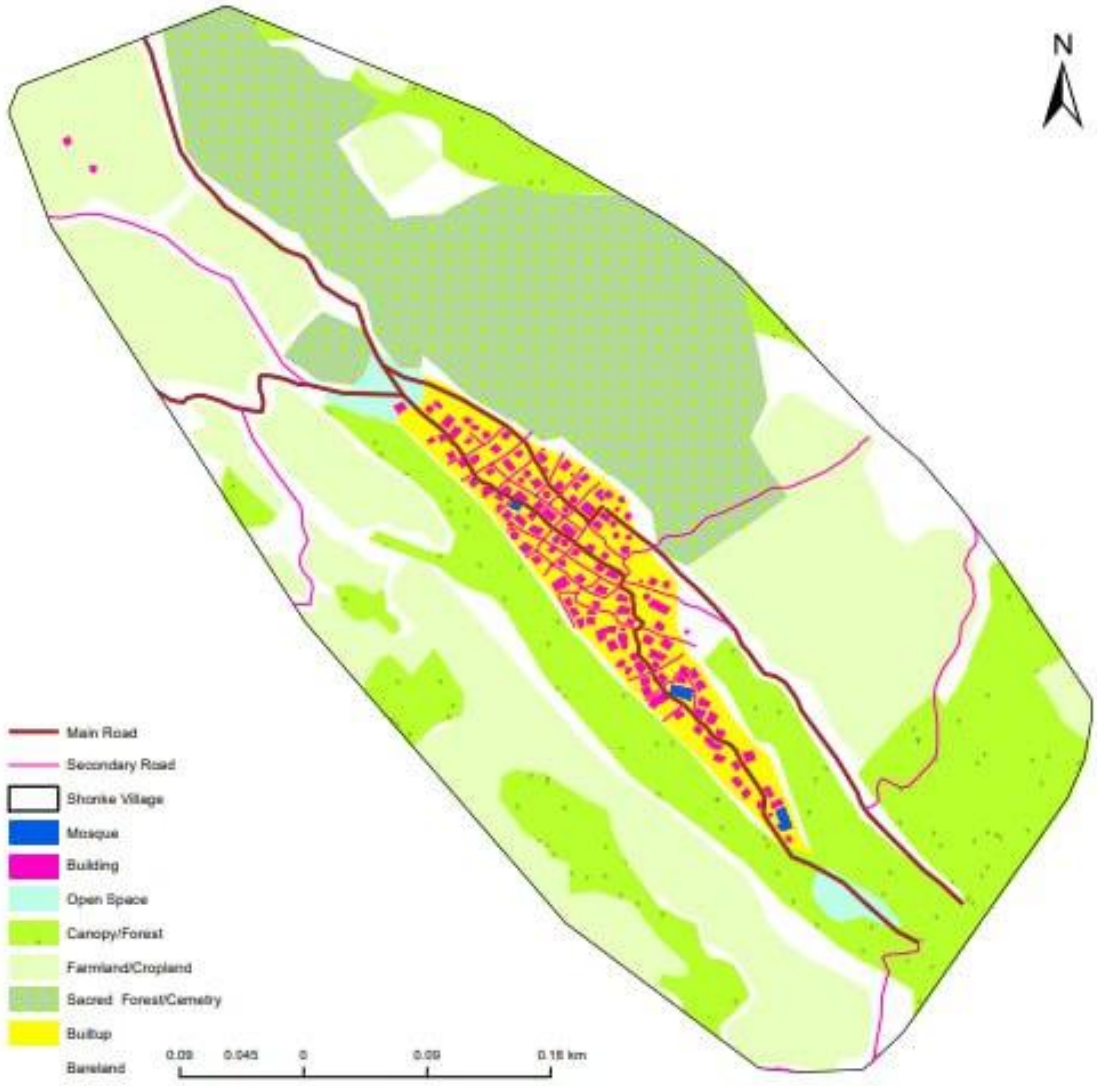


Figure 3 Land use summary of Shonke village

3.2 Unique Values of Shonke Village

Shonke Village holds cultural, spiritual historical, archeological, architectural, and ecological significance. The village's vernacular architecture, with its distinctive hilltop settlements and ancient grid road network, stands as a testament to the Argobba people's remarkable adaptability and engineering prowess. These unique dwelling patterns, constructed from locally sourced materials like olive wood and dry stone, reflect a deep understanding of the local environment and a history of resilience. The Chilata Water Point and communal resilience represent the ecological

and socio-cultural significance, particularly in sustaining village life and fostering communal efforts.

Mosques and cultural landmarks underscore their spiritual and historical importance, serving as centers for religious activities and community gatherings, preserving Islamic traditions, and ensuring social cohesion. Traditional practices such as Ziara, endogamous marriages, the Qadi arbitration system, and cooperative activities (Debo) enrich the cultural heritage, illustrating community bonding, hospitality, and the preservation of cultural identity. The village's language preservation aids linguistic research and maintains oral traditions, contributing to the scientific study of language evolution. Traditional artisanship, cuisine (Woqalimo), and sustainable farming techniques reflect the aesthetic, culinary, and agricultural heritage, showcasing the community's creativity and environmental adaptation.

3.3 Assessment of Infrastructure Challenges of Shonke Village

3.3.1 Transportation Challenges

Shonke Village faces significant transportation challenges that substantially impact the community's daily life and overall development. The gravel road between Kemise town and Shonke Village, constructed in 2014, suffers from severe deterioration due to lack of maintenance, presenting issues such as potholes, erosion, dust, poor drainage, and insufficient signage. These conditions make the road difficult to use and unsafe, particularly during harsh weather. Focus group discussions highlight that the challenging terrain and limited public transportation exacerbate the village's isolation, restricting access to essential services like healthcare, education, and job opportunities. This isolation forces residents to endure long, arduous journeys to nearby towns and limits economic opportunities by restricting the movement of goods and people. For instance, artisans struggle to sell their products, and youth face early marriage or migration due to limited local opportunities. The deteriorating road conditions also pose health risks, especially for pregnant women who must rely on expensive and unsafe transportation options to reach healthcare facilities. Additionally, transportation issues contribute to low school attendance rates, as students must travel long distances on foot, often missing school to assist with household chores.

3.3.2 Water Supply Challenges

The main water source, Chilata, lies 127 meters below the village and is accessed through a strenuous two-hour uphill walk, often undertaken by women, children, and the elderly. This arduous journey significantly impacts their health, especially when multiple trips are required daily. Contamination risks, including plastic tank insertion into the spring, hand immersion, and visible plastic and plant residues compromise water quality. Although residents practice rainwater harvesting using roofs and ponds, the water remains of poor quality, primarily used for non-potable purposes like washing and watering animals. The lack of a reliable water source affects daily life and agriculture, with water scarcity, droughts, insect infestations, and soil nutrient deficiencies limiting crop production and pushing some residents to seek better opportunities elsewhere. Although plans for a sustainable rural piped water system are in progress, budget constraints and security concerns have hindered their implementation. The community also faces health risks, as diarrhea and malnutrition were reported in November 2023.

3.3.3 Sanitation Challenges

Shonke Village faces significant sanitation challenges, particularly in terms of waste management and latrine access. The community largely relies on traditional shared latrines, including Jegoal and bush latrines/open defecation, with around 12 designated latrine areas on the southern side of the settlement. One critical issue with most of these latrines is the failure to separate solid waste from human waste, resulting in unpleasant odors and health risks for the community. This situation is exacerbated by difficult terrain, particularly for elderly residents, who face steep slopes and inadequate lighting, making it hard to access the latrines, especially at night. According to the Dewa Chefa Wereda Health Office, only 11% of solid and 7% of liquid waste were properly managed in Jirota Kebele during the first quarter of 2023, posing severe health and environmental risks. Although a WASH plan was proposed to construct public toilets near the Gudiba open space, the initiative has yet to be implemented.

3.3.4 Energy Challenges

Shonke Village has made strides in adopting solar energy for lighting, with most residents using solar power for lighting and charging electronic devices, including phones, for the past 5-10 years. This shift has been motivated by the cost savings of solar energy compared to traditional kerosene lamps and the improvement in indoor air quality, as solar energy eliminates the discomfort caused

by smoke from firewood and lamps. However, a major challenge highlighted by residents is the degradation of batteries used for storing solar energy. Over time, these batteries lose their capacity, leading to decreased power quality, and residents must frequently replace them or deal with reduced functionality, causing inconvenience.

In addition to using solar energy, residents continue to rely on firewood for cooking, which presents challenges. Women, especially the elderly and children, must collect firewood from distant farmland and forests. This task is time-consuming and physically demanding. Cooking practices further contribute to indoor air pollution, particularly due to the common practice of making “enjera” and brewing coffee, which produce significant smoke and discomfort. The lack of affordable grinding machines is another issue, as residents must rely on traditional manual grinders, which are labor-intensive and time-consuming. A participant from the focus group discussion also expressed concerns about the impact of poor lighting on religious activities. Shonke village is renowned for its Quran teachings, but the lack of proper lighting in the designated areas for Quran learning hinders students’ ability to complete homework and engage in educational activities.

3.3.5 ICT Challenges

Shonke Village faces notable ICT challenges, with limited access to modern devices, particularly smartphones, leaving most residents reliant on basic phones. This digital divide is especially felt among the younger generation, who struggle to access online education, services, and information. Additionally, poor mobile phone coverage and unreliable call quality create significant barriers to communication, particularly in emergencies where timely access to help could be critical.

Overall, Shonke Village's infrastructure has steadily deteriorated due to insufficient maintenance and investment, failing to keep pace with contemporary needs as summarized in Table 1.

Table1 Summary of challenges of infrastructure in Shonke Village

Infrastructure	Existing condition	Challenges
Transportation	Poorly maintained gravel roads; unreliable public transport (cargo trucks (ISUZU) and auto-rickshaws (BAJAJ), occasional vehicles (4-wheel drive cars, and motorcycles).	Limited access to services, Unsafe travel, Economic isolation
Water supply	Long distances to unprotected water sources and poor rainwater harvesting practices, Difficult terrain.	Waterborne diseases, Physical strain, Reduced agricultural productivity
Sanitation	Reliance on traditional/shared latrines, Poor waste management, Lack of lighting.	Health hazards, environmental pollution, reduced appeal for tourism
Energy	Dependency on firewood, Degrading solar batteries, Limited access to electricity from the national grid.	Financial strain, Indoor pollution, Physical strain Health risks, Deforestation
ICT	limited network coverage, unreliable internet connectivity, Limited access to ICT devices	Restricts tourism promotion, cultural preservation and economic growth, Limit communication and access to information

3.4 Socio-Economic Condition

Interviews and observations conducted in 2023 reveal a complex socio-economic landscape in Shonke Village. Some residents have been replacing traditional roofs with

tukul structures, while economic hardships have forced others to demolish their homes and relocate to farmland. However, recent data show a positive shift, with the number of tukul structures and house demolitions decreasing due to conservation efforts by the Dewachefa Wereda Culture and Tourism Office. As of the end of 2024, 29 houses have been demolished, 17 replaced with tukul structures, and 26 houses requiring maintenance have been addressed, totaling 64 homes are maintained and eight houses are currently under construction.

Furthermore, Despite the village receiving 224 tourists between 2019 and 2022, with 38% international and 62% domestic, Shonke's tourism potential remains underutilized. This coupled with limited infrastructure, budget constraints, and peace and security issues, continues to hinder the village's growth and negatively impacts its residents.

3.5 Shonke Village Needs Assessment

The needs assessment conducted in Shonke Village using a 5-point Likert scale unveiled the top five priorities for the community, combining infrastructure and socio-economic concerns. Access to potable water emerged as the most critical issue with a mean rating of 4.60, followed by transportation at 4.02 and reliable energy access at 3.65. While employment opportunities were rated at 2.47 and cultural preservation at 1.82, they were perceived as less urgent compared to infrastructure needs. These priorities collectively emphasize the significant impact of inadequate infrastructure and socio-economic challenges on the village's vitality, reflected in the overall rating of 3.31, indicating the residents' view of living and working conditions in the village as moderately challenging.

2.6 Lessons from Case Studies

Analyzing peer case studies in Kota Tua, Lalibela, and Cajamarca provides valuable insights that offer diverse perspectives on balancing modernization with heritage preservation as shown in Table 2.

Table 2 Lessons from Case Studies

Location	Challenges	Strategies	Results	Key Takeaway
Kota Tua, Jakarta, Indonesia	Neglected infrastructure, pollution, and economic pressures	Revitalization plan, infrastructure improvements, focus on tourism	Increased tourism, restored buildings, ongoing infrastructure challenges	Heritage conservation and infrastructure improvements must go hand in hand. Adopt tourism zoning and strong urban management.
Lalibela, Ethiopia	Rapid urbanization, encroachment on surroundings, inadequate infrastructure, deterioration	Resettlement plan, tourism infrastructure development	Reduced poverty, increased tourism revenue, infrastructure strain, environmental concerns, urban sprawl	Balance infrastructure growth with heritage preservation. Develop long-term urban and tourism growth plans
Luz en Casa Cajamarca, Peru	Lack of electricity access in rural communities	Solar home systems, community engagement, Energy-as-a-Service model	Improved living standards, Improved energy access, reduced CO_2 emissions, high user satisfaction	Community-owned and managed decentralized renewable energy systems. Ensure community involvement

3.6.1 Proposed Infrastructure Solution in Shonke Village

The proposed solutions address Shonke's most pressing infrastructure needs through targeted interventions, including solar-powered water pumping systems, renewable energy, eco-toilets, sustainable transportation, and digital connectivity, as shown in Table 3. The proposed infrastructure interventions are guided by Historic Urban Landscape (HUL) approach and Urban Acupuncture (UA) principles. These initiatives are designed to create

a ripple effect, positively impacting the social, cultural, economic, and environmental dimensions of village life.

Table 3 Proposed Infrastructure Solutions

SN.	Infrastructure	Proposed Infrastructure Solution
1	Transportation	Sustainable Transportation: Road Upgrades (Kemise to Shonke), promoting walking, hiking, and public transportation
2	Water Supply	Solar-Powered Water Pumping System
3	Sanitation	Eco-Toilets
4	Energy	Hybrid Renewable Energy Systems
5	ICT	ICT centers powered by renewable energy

3. DISCUSSION

This study explores how infrastructure is developed while preserving the historic fabric is coexist the balance between historical preservation and modern infrastructure needs in Shonke Village, guided by the Historic Urban Landscape (HUL) approach and Urban Acupuncture (UA) principles. The study prioritizes identifying Shonke Village's unique elements: natural, cultural, and human resources as a basis for preservation. This aligns with the Historic Urban Landscape (HUL) concept, which views urban areas as layered expressions of cultural and natural values, encompassing both tangible and intangible aspects of the human environment (ICOMOS 1987; UNESCO 2011; UNESCO 2020; UNEP 2022). Understanding the dynamic relationship between people and place is also key to sustainable heritage management (Olsson & Haas, 2005).

Furthermore, this research engages local stakeholders through surveys, interviews, and focus groups to understand community needs, heritage values, and socio-economic factors for informed infrastructure planning. While traditional housing restoration is ongoing, the community prioritizes water access, transportation, energy, cultural preservation, and employment. This participatory approach aligns with HUL applications in Kulangsu (Yan, 2018) and Tangfang Village (Li, Wang, & Li, 2024); which emphasize integrating community participation and intangible heritage into daily life to balance material

preservation with cultural and functional values. This directly addresses the weakness identified by (Perez & Roders, 2020). regarding the lack of community participation and local partnerships in HUL implementation.

Additionally, the study identifies potential risks, such as the economic hardships that have led to the demolition and abandonment of traditional homes, climate change on agricultural production and soil erosion due to the sloppy nature of the land, safety risk, and accessibility due to the degradation of the gravel road and unreliable transportation, contamination risks to water sources, and health risk due to traditional energy and challenging terrain of water point, and digital dividend in the village. This vulnerability assessment helps pinpoint critical areas most at risk from current infrastructure challenges, highlighting imminent threats to historic resources and opportunities for integrating resilient and sustainable infrastructure solutions. This comprehensive contextual understanding informs broader village development strategies, ensuring an integrated and sustainable approach to preserving Shonke Village's cultural heritage while meeting its modern needs. This aligns with (Ferreira & Eudave, 2022); which emphasis on the importance of accurate risk assessment for cultural heritage facing climate change and human activities; incorporating urban heritage values and vulnerabilities into the city development strategies (UNESCO 2011; UNESCO 2016).

The targeted interventions are designed to address specific opportunities and challenges identified through the HUL process. Primarily, it prioritizes small-scale, strategic interventions rather than large, disruptive projects, focusing on key acupoints within the village. These are critical sections of gravel road: Kemise to Shonke and Shonke to Borkena River (Hiking route), Gudiba and Timbu Amba open Space, Vernacular houses and Mosques, Chilata Water Point, Traditional practices, knowledge and local resources.

Secondly, infrastructure interventions are designed to have a catalytic effect across multiple dimensions of village life. Specifically, renewable energy empowers ICT centers: bridging the digital divide, enhancing access to information and opportunities and directly addressing the immediate need for water access through solar-powered water pumping, this improves access to clean water and energy, positively impacting community well-being, livelihoods and environmental stewardship. Additionally, modern infrastructure, such as

improved lighting and cooking facilities, can transform repurposed buildings into vibrant hubs for community gatherings, cultural events, local markets, and potential homestays. These initiatives foster social cohesion, drive economic activity, preserve the village's cultural heritage, ensuring a sustainable and inclusive future. On the other hand, improved sanitation enhances public health and reduces environmental pollution, and contributes to agricultural productivity. Improved transportation: road upgrades, promoting walking, hiking and public transportation enhances connectivity with the surrounding neighborhoods, facilitate access to markets and essential services, and create new recreational opportunities. Additionally, upgrading key village nodes such as Gudiba and Tibu Amba open spaces would strategically place infrastructure, like public taps, fostering multifunctional areas that serve as hubs for community gatherings, recreation, and cultural performances. Thirdly, It is deeply rooted in community participation, ensuring that local voices are heard and local knowledge is integrated throughout the process. This is achieved through participatory planning, the use of local resources, and the establishment of community-based operation and maintenance infrastructure systems. Finally, infrastructure improvements are designed to respect the existing context and cultural heritage of the village. These offer a strategic approach that meets contemporary needs while honoring and enhancing the village's distinctive character. These small-scale initiatives focus on preserving traditional values, repurposing existing structures, and promoting sustainable and context-sensitive infrastructure. This approach aligns with (Rodwell 2014; Daugelaite and Vileniske 2018; Al-Hinkawi and Al-Saadi 2020; Loopesko 2021; Li 2023; Yacoub and Alkinani 2024).

Overall, the findings demonstrate that effective integration requires more than simply introducing modern infrastructure; it demands a holistic understanding of the interconnected cultural values, social needs, physical context, economic vitalities, and environmental considerations of the place. The study's key contribution lies in articulating five crucial criteria for evaluating and implementing infrastructure projects in historic contexts: 1) Culturally Sensitive: enhancing and protecting existing cultural values, practices, and built forms, integrating them into the design and implementation of new infrastructure; 2) Socially Equitable: addressing the diverse needs of all residents, ensuring equitable access to improved services, and promoting social cohesion and well-being; 3)

Physically Appropriate: minimizing disruption to the historic fabric and landscape, respecting the existing spatial organization and visual character; 4) Economically Sustainable: supporting local livelihoods, promoting long-term economic viability, and creating opportunities for local participation in infrastructure development and maintenance; and 5) Environmentally Sound: minimizing environmental impact, promoting resource efficiency, and enhancing ecological integrity. These criteria provide a practical lens for planners, policymakers, and local communities to assess proposed interventions and ensure they contribute to a harmonious relationship between modernity and historical integrity. By adhering to these five dimensions, communities can avoid the pitfalls of insensitive development that erodes cultural heritage and fails to address social needs, and instead create a future where both modernization and preservation. This research shows that infrastructure development should not be isolated but woven into the existing culture, economy, society, and environment, as highlighted by (Ejigu 2007; UNESCO 2011; AECOM 2016; Cass, Schwanen and Shove 2018; Blundell 2020; UNEP 2022; Colombo et al. 2024).

Thus, this research contributes to the theoretical framework by combining HUL with Urban Acupuncture, creating a pragmatic, and flexible model for heritage conservation adaptable to various historical settings. It explores how to integrate modern infrastructure into heritage sites without compromising their significance, using Shonke Village as a case study. By addressing key unanswered questions of how; what, and at what scale (McLean 2018; Saeid Saidi, Lina Kattan, and Poornima Jayasinghe 2018); the study fills the gap in understanding and applying integrated infrastructure in heritage contexts, offering both theoretical and practical contributions as shown in Table 4. It clarifies the concept of infrastructure integration in the context of historic places and provides a roadmap for its practical application, especially in complex environments like Shonke Village.

Consequently, this study defines integrated infrastructure in the context of historic places as the development and management of interconnected infrastructure systems that respect, protect, and enhance the area's cultural and historical significance. This holistic approach considers the interdependencies between different infrastructure sectors (energy, water, sanitation, transportation and ICT) and their relationship with the surrounding

environment, society, economy, and cultural heritage. It emphasizes coordinated planning and delivery of infrastructure services to achieve multiple benefits, including cost efficiency, resource optimization, environmental sustainability, improved quality of life, and the preservation and enhancement of cultural heritage. This approach moves beyond siloed planning to consider the broader context and long-term impacts of infrastructure projects on both present and future generations that effectively balance modern needs with the protection and enhancement of cultural heritage.

Table 4 Integrated Infrastructure in Shonke Village

<table>
<tr><td colspan="6">How</td></tr>
<tr><td colspan="4">What</td><td colspan="2">Scale</td></tr>
<tr><td colspan="2">Inventory</td><td>Value</td><td>Vulnerability</td><td>Infrastructure</td><td>Acupoint</td></tr>
<tr><td>Tangible</td><td>Vernacular architecture and street network (Including hiking route)
Chilata Water Point
Cultural Landmarks (Mosques, Open space, Cemetery)</td><td rowspan="2">Archaeological
Architectural
Spiritual
Historical
Aesthetic
Scientific
Socio-Cultural
Ecological</td><td rowspan="2">Degradation of gravel roads
Difficult access and risk of contamination of water sources
Underutilization of Space
Climate change
Soil erosion and deforestation
Traditional energy sources and digital divide
Lack of funding
Economic hardship</td><td>Road upgrades, Reliable public transportation, Promote walking and hiking
Hybrid renewable energy, Solar Pumping, Solar-powered ICT hubs, Eco-toilets</td><td>Critical sections of gravel road; Kemise to Shonke and Shonke to Borkena River (Hiking route), Gudiba and Timbu Amba Open Space
Vernacular houses and Mosques, Chilata Water Point</td></tr>
<tr><td>Intangible</td><td>Ziara, Argobba Language
Endogamy Marriage
Arbitration Debo
Traditional Artisanship
Traditional food
Traditional Farming</td><td></td><td>Traditional practices, knowledge and local resources in infrastructure design</td></tr>
</table>

4. CONCLUSION

This study concludes that integrating modern infrastructure into historic settings like Shonke Village requires a holistic understanding of a place and context-sensitive intervention that balances contemporary needs with heritage preservation. By combining the Historic Urban Landscape (HUL) approach with Urban Acupuncture principles, the research proposes targeted, small-scale interventions including sustainable transportation, solar-powered water systems, eco-toilets, and hybrid renewable energy designed to address specific local needs while minimizing disruption to the existing cultural fabric. The findings underscore that strategic infrastructure improvement is grounded in a nuanced understanding of a place's cultural values, social needs, physical context, economic vitalities, and environmental considerations. Future research could explore comparative studies with other historic cities, evaluate the long-term impacts of implemented infrastructure solutions, investigate the role of technologies like GIS and BIM in infrastructure developments, and assess the effectiveness of community engagement in culturally sensitive urban planning.

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Appendix E: Book Chapter

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