Addis Ababa University

College of Technology and Built Environment

School of Built Environment

Department of Urban and Regional Planning

Urban Acupuncture as a Strategy for Regenerating Vacant Spaces in Slum Neighborhoods to develop green infrastructure: in the case of *'Golla Sefer'*, Addis Ababa, Ethiopia

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Addis Ababa, Ethiopia

This thesis is submitted to the Addis Ababa University College of Technology and Built Environment, School of Built Environment, and to the post of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Master of Science in Environmental Planning and Landscape Design.

Title: **Urban Acupuncture as a Strategy for Regenerating Vacant Spaces in Slum Neighborhoods to Develop Green Infrastructure**

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Declaration

I declare that this thesis prepared for the partial fulfillment of the requirements for the degree of Master of Science in Environmental Planning and Landscape Design entitled "**Urban Acupuncture as a Strategy for Regenerating Vacant Spaces in Slum Neighborhoods to Develop Green Infrastructure: in the Case of *'Golla Sefer'*, Addis Ababa"** is my original research with the close advice and guidance of my adviser. I also declare that this thesis has not been presented in any university, and all sources I have used have been indicated and acknowledged using complete references, and that the work is fully consistent with the academic integrity standards of originality.

Author: Kidus Deribe ID **GSR/9692/14**

Signature: _____

Date: _____

Certification

Here I state that **Kidus Deribe** has carried out this research work on the topic entitled Urban **Acupuncture as a Strategy for Regenerating Vacant Spaces in Slum Neighborhoods to Develop Green Infrastructure: in the case of *'Golla Sefer'***, under my supervision, and it is sufficient. I approve that this thesis be accepted as fulfilling the thesis requirement for the MSc Degree in Environmental Planning and Landscape Design.

Solomon Benti (PhD)

Signature: _____ Date: _____

Approval sheet

We, the members of the board of examiners, certify that we have read and thoroughly evaluated the M.Sc. thesis entitled: **"Urban Acupuncture as a Strategy for Regenerating Vacant Spaces in Slum Neighborhoods to Develop Green Infrastructure: The Case of 'Golla Sefer', Addis Ababa".** This thesis was submitted by **Kidus Deribe** in partial fulfillment of the requirements for the degree of **Master of Science in Environmental Planning and Landscape Design**.

We have examined the candidate during the thesis defense and recommend that the thesis be accepted as meeting the requirements of the university regulations for the degree.

Advisor

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ABSTRACT

Addis Ababa's fast population growth has brought attention to the lack of easily accessible urban green spaces, especially in slum neighborhoods like Golla Sefer. Through small-scale interventions that target stress points to improve social, environmental, and economic aspects, Urban Acupuncture (UA) emerges as a viable and successful strategy to address this issue. The goal of this study is to create a viable conceptual framework that UA can use to revitalize the Golla Sefer slum. The study identifies sensitive vacant spaces, assesses the spatial status of green infrastructure as it stands today, and chooses suitable UA interventions. It emphasizes important factors like safety, inclusivity, walkability, and community involvement in public areas. The findings point to major difficulties in managing built-up areas, preserving vegetation, and restoring usability in public parks. In order to improve communal space management, the study emphasizes the value of resident involvement, cooperation with local government, and educational initiatives. It highlights the necessity of inclusive, multipurpose public areas that support a range of activities and encourage social contact. It also emphasizes how important it is to design pedestrian-friendly and accessible infrastructure, locate common areas close to green spaces, and incorporate sustainable practices. By tackling these problems, UA can build thriving, welcoming, and sustainable urban spaces that will improve Golla Sefer residents' quality of life. For developers, policymakers, and urban planners working toward sustainable urban regeneration, this research provides useful information and tools.

Keywords: Green infrastructure, Slum neighborhoods, Small-scale interventions, Sustainable practices, Urban Acupuncture (UA), Urban regeneration

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List Of Acronyms And Abbreviations

- AACA: Addis Ababa City Administration
- AHP: Analytical Hierarchy Process
- CBO: Community Based Organization
- MCA: Multi-Criteria Analysis
- NGO: Non-Governmental Organization
- SDG: Sustainable Development Goals
- SNI: Safety Net Initiative
- UA: Urban Acupuncture
- UGI: Urban Green Infrastructure
- UN: United Nations
- UR: Urban Regeneration
- WOA: Weighted Overlay Analysis

Local Terms

'Ketena'	District
'Kebele'	is the old name of a district under local administration.
'Sefer'	Neighborhood
'Wereda'	A district under local administration.

1. CHAPTER ONE: INTRODUCTION

1.1. Background

Urban population rates are rising, and fresh approaches for regeneration are needed, involving an assessment of the urban environments in question before implementing design interventions. Urban deterioration, which happens when a formerly functional area of a city slips into ruin, is caused by rapid and unregulated urbanization (TADESSE, 2021).

Urban Green Infrastructure (UGI) is acknowledged as an ecologically friendly and cost-effective remedy (Benedict, 2002). UGI has been suggested as a solution to provide city residents with several benefits by connecting a network of green spaces (Mahon, 2002). Parks, open areas, playing fields, pocket spaces, small incidental green spaces, and community gardens (Mansor, 2011). (UGI) is about the functions that nature provides for urban and the surrounding populations, such as stormwater management, supporting community health and well-being, and creating vibrant urban environments that enhance local biodiversity (Nurse, 2017).

Urban Acupuncture (UA) has shown greater efficiency and success than large-scale reconstruction. Adaptable design solutions are being explored as cost-effective and socially focused approaches, improving quality of life with limited budgets and resources, particularly during economic downturns (Solà-Morales, 2004).

One of the interventions that have been used to treat the stress points of an urban environment is “Urban Acupuncture”, Acupuncture is a well-known Chinese medical procedure in which a specific point on a body is found to be a potential source of stress that may result in pain or discomfort (Han, 2004). Once this spot has been identified, a needle will be used to treat it, causing the entire body to relax. Consequently, this concept has been applied to relieve the main stress points of urban areas. The goal of urban acupuncture (UA) is to influence the urban structures of cities' outdated and abandoned locations (M Faizi, 2020). it ultimately aims to repurpose and restore these urban spaces into their setting (Casagrande, 2020). The concept of "triple bottom line" emphasizes the balance of social, environmental, and economic aspects for

sustainable development. It considers the challenging quantification of equality and the environment. (UA) with its minimal financial investment, presents an advantageous paradigm for urban regeneration, prioritizing social and environmental viability in the design process (Bergman, 2013).

The selection of intervention points in (UA) requires examining the triple bottom line elements, consulting with communities and designers, and understanding the contributions of social, environmental, and economic pillars to sustainable regeneration (Elhameed Nassar, 2021). This holistic approach emphasizes the importance of considering the impact on all three pillars for inclusive urban development (Al-Hinkawi & Al-Saadi, 2020).

There are certain requirements that must be fulfilled when selecting urban acupuncture (UA) techniques and sites. Taking into account both spatial and socio-spatial factors, a filtering framework has been created to direct the implementation of (UA) in big cities. While socio-spatial aspects concentrate on inclusivity, sociable engagement, and livability, spatial aspects include walkability, safety, accessibility, comfort, and aesthetics (Vidal, D.G., Barros, N., 2020). The framework takes into account aspects of public space and citizen interaction while using principles and strategies to identify intervention points. It provides a foundation for successful (UA) design and stimulates implementation-related conversations (Hyun-Jae Nam, 2021).

In terms of social dimensions, (UA) promotes meaningful change without disrupting social norms while mending institutions and repairing relationships to revitalize cities. Public spaces improve quality of life and spur economic growth. Locals are empowered by community-led initiatives (Fung, 2012).

For urban living to be financially balanced, there must be a robust economy and financial dedication. (UA) is a locally and socially targeted approach that promotes equity and collaboration (Chan, 2017). Urban areas are revitalized by integrated interventions and cultural policies, while a return to nature enhances quality of life and reduces industrial demands (Christiansen, 2009).

Environmentally speaking, urbanism theory (UA) focuses on reorganizing a city's energy through small-scale designs to optimize impact, protect natural resources (Kanaani, 2022). Enhance the quality of life for citizens impacted by large-scale developments and population growth (Peng, 2021). Understanding the potential of urban acupuncture is essential for sustainable urban planning and development since these areas act as hubs for social, economic, and environmental regeneration (Leone, F., Hasan, A, 2023).

In-depth studies of the requirements and experiences of marginalized communities are lacking in the literature on Addis Ababa's public spaces and urban green infrastructure. Inclusive and sustainable urban development is hampered by the lack of attention paid to comprehending their viewpoints and including them in planning procedures (Hailu w, 2016).

Additionally, there is a need for more empirical research to evaluate the effectiveness of interventions in improving the quality and accessibility of these spaces, as existing studies are often theoretical rather than empirical, and the effectiveness of innovative design approaches like Urban Acupuncture in Addis Ababa (Birru, 2014). More research is needed to evaluate the ecological benefits of green infrastructure, analyze resource consumption, and explore strategies for enhancing environmental sustainability in urban communal spaces (Wang, 2018).

Lastly, there is insufficient attention to social equity and inclusivity in the existing literature. Even though social engagement and inclusivity are stressed as being important in urban development, more research is required to fully analyze the social equity implications of Addis Ababa's public spaces and urban green infrastructure (Gelan, 2021). This entails researching the spaces' inclusivity and accessibility for various social groups, evaluating the effects of interventions on community involvement and social cohesion, and investigating tactics for fostering fair access and involvement in urban green infrastructure and public areas (Ayele, 2022).

In the rapidly growing and compact slum neighborhoods of Addis Ababa, residents face significant challenges and lack access to various infrastructures, including green infrastructure.

The development of green infrastructure in the study area as a slum neighborhood has been neglected, depriving residents of the numerous benefits it provides.

1.2. Problem Statement

Addis Ababa's fast population growth is causing the horizontal built environment to become denser, and housing to expand (Abebe, M.and Megento, T., 2016). The current situation shows that there is a lack of accessible urban green infrastructure for the city's residents, even though the city had suggested elements of this type in earlier structural plan revisions (Azagew, S. and Worku, H., 2020).

Since the city's green infrastructure is patchy and undeveloped, one of the major problems with Addis Ababa's lack of integrated GI is the dearth of green spaces in the inner cities (Fetene, A. and Worku, H., 2013).

The city assigns low priority to addressing issues related to urban open space. The city prioritizes infrastructure and commercial growth over urban open spaces, leading to fragmented, poorly maintained green areas with limited accessibility and environmental benefits (Mensah, 2014).

The city also needs proper urban open spaces and green parks in the city. The city lacks well-designed open spaces and green parks, limiting recreation, environmental benefits, and social interaction. Proper planning is needed for accessibility. (Jensen, F.S. and Koch, N.E, 2004).

Unplanned and left-over spaces in slum areas without facilities are used as garbage disposal areas due to the public's low attitude towards them, leading to environmental and community impact (Anguluri, R. and Narayanan, P, 2017).

The absence of a comprehensive assessment of the common open spaces' size, location, and ownership limits their potential as community meeting spots. This affects the community experience by making it more challenging to provide fair accessibility and make room for a range of activities (Zewdie, M., Worku, H, 2021).

The environment lacks walkability due to inadequate footpath conditions and unsuitable surfaces. This hampers safe and enjoyable walking experiences, limiting active transportation options and overall well-being (TUFA, 2019). The accessibility to communal spaces lacks ease and inclusivity due to inadequate road access, insufficient parking, and a lack of comprehensive footpaths, limiting their potential as inclusive gathering places (Tesfaye, 2014). The development of vibrant and sustainable community environments is hampered by the design of common areas, which does not consider their proximity to green spaces or connections to surrounding gardens and parks (Cirolia, 2021).

Convenience, community involvement, and recreational opportunities are hampered by the lack of multifunctionality of the current common areas (Eshetu, S.B., Yeshitela, 2021). Accessibility, quality of life, and residents' sense of belonging are all hampered by communal spaces that lack multiple uses. Social relationships, cultural pride, and community involvement are all weakened when there are no designated venues for community heritage celebrations (Birru, 2014).

Environmental conditions, housing unit suitability, amenities, and quality of life are all at risk when comprehensive assessments are not conducted in common areas (Nuriye, 2020). The absence of inclusivity assessments weakens social cohesion and limits access, especially for green frontage, elders, and individuals with disabilities (Seifu, 2021).

To encourage community involvement and strengthen social ties, conduct inclusive assessments and create common areas that meet a range of social needs. Lack of inclusive assessments leads to poorly designed public spaces, weakening social ties. Well-planned common areas can foster community engagement and meet diverse social needs (Tadesse, 2021).

The absence of thorough instruction and training programs for residents regarding the upkeep of common areas prevents them from actively participating and makes the environment less pleasant and clean (Tesfay, 2016).

The well-being and sense of safety of residents are also jeopardized by the absence of a thorough assessment of surface maintenance, drainage systems, and nighttime lighting in common areas (TUFA, 2019).

Slum communities' lack of focus on environmental sustainability, especially green infrastructure, is a serious issue for several reasons (French, M.A. and Lalande, C, 2013). Slum areas, occupying significant urban land and housing large populations, face social, economic, and environmental challenges, worsened by urban inequality and unpreparedness for ecological change (Nenweli, 2015).

1.3. Objective of the study

1.3.1. General Objective

The general objective of this research is to develop a sustainable conceptual framework for urban acupuncture to regenerate the slum neighborhood in Golla Sefer, Addis Ababa city.

1.3.2. Specific Objectives

- To map the current spatial status of the *'Golla Sefer'* about green infrastructure development.
- To identify the sensitive vacant spaces in *'Golla Sefer'* for urban acupuncture interventions.
- To determine the type of urban acupuncture interventions suitable for sustainable slum neighborhood development.

1.4. Research Questions

- How the current spatial status of the *'Golla Sefer'* look like in relation to its green infrastructures?
- Which vacant spaces of the study area are suitable for urban acupuncture interventions?
- Which types of urban acupuncture interventions are better suited to ensure sustainable neighborhood development?

1.5. Scope of the study

1.5.1. Spatial scope

The geographical scope of the research is in Golla Sefer which is situated on the West side of Churchill Avenue and near to the Tewodros Square in the Lideta sub-city of Addis Ababa, Ethiopia. It covers about 34 hectares of land.

1.5.2. Thematic Scope

The thematic scope of this research centers on the application of Urban Acupuncture (UA) to improve the availability and quality of green infrastructure within the Golla Sefer slum in Addis Ababa. Spatial Assessment identifies and prioritizes suitable locations for UA interventions based on factors such as proximity to existing green spaces, accessibility, and population density. Physiological Evaluation Assessed the impact of UA interventions on the livability, safety, and inclusivity of public spaces within Golla Sefer. Social Engagement Investigated the role of community participation and collaboration with local government in implementation. Environmentally integrated sustainable design principles into UA interventions to enhance the green spaces.

1.6 Limitation of the Research

This research faces several key limitations. Empirical evidence on the effectiveness of interventions like Urban Acupuncture (UA) and Urban Green Infrastructure (UGI) in Addis Ababa's specific context, particularly slums, is scarce, as existing studies are often theoretical rather than data-driven. Understanding the needs of marginalized communities regarding public spaces and UGI is insufficient, limiting inclusive design.

1.7 Significance of the study

This study is important for several reasons. First of all, by offering a thorough framework for putting urban acupuncture theory and principles into practice, it benefits the field of urban design, developers, and policymakers. In addition to offering useful insights and resources for

developing inclusive and sustainable urban environments, this framework can promote cooperative and gradual urban regeneration concepts in slum neighborhoods and other urban areas devoid of green spaces. Second, by integrating socio-spatial analysis and assessing the quality of urban environments, it fills a gap in the literature. As a result, urban acupuncture interventions are more effective and relevant to the local community. Thirdly, its offers researchers and policymakers a model for revitalizing neglected and stressed urban spaces.

1.8. Organization of the research

In the first chapter, the introductory section, the research overview is presented, including the study's history, issue statement, objective, research questions, methods, importance, scope, and limits. The literature review on pertinent subjects is covered in the second chapter, while the study area is described in the third. The research findings are further discussed in the fourth chapter, which also includes an analysis and closing thoughts. Lastly, a strategic framework and proposals for the long-term transformation of Golla Sefer were provided in the fifth chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1. Definition of terms and concepts

2.1.1. Green Infrastructure

Planned connectivity of open green spaces is known as "green infrastructure," and it involves both naturally occurring and controlled green areas in both urban and rural contexts (Zbigniew J Grabowski, 2022). It consists of a network of public areas that serve as formal parks, gardens, forests, greenways, canals, street trees, and open spaces in the countryside (Cameron & Blanuša, 2016). In addition to its physical benefits (such as carbon sequestration, biodiversity preservation, water infiltration, storage, and drainage), green infrastructure has also been connected to psychological advantages (Loan Diep & David Dodman, 2019).

2.1.2. Urban Acupuncture

Urban acupuncture can be a heuristic or a metaphor. The expression comes from traditional Chinese medicine and describes the planning of actions that "stimulate the nervous system of the metropolis with minute interventions that might have a catalytic effect on the organism as a whole" (J Beardsley, 2008). It is titled "Small interventions that cause a ripple, not substantial development," and it highlights the importance of consistently implementing "concrete" interventions while enacting change that extends beyond the actual physical interventions being made (L Kaye, 2011).

Beyond small changes, interventions should have lasting impacts on the city. They can model sustainability transitions, improving environmental and social conditions through urban greening and public space enhancements (M Casagrande, 2020) .

2.1.3. Urban Regeneration

Urban regeneration (UR) helps to solve problems such as the lack of identity of a residential area, the lack of public spaces, and high urban density, which makes it impossible to widen roads, green areas, and plant trees along the sidewalks (McGuirk, 2014). It is usually about the revitalization of distressed urban areas like historic sites and the renovation of public areas (E Tousi, 2022)..

2.1.4. Vacant Spaces

It is all land that is unused or abandoned for a longer period, including undeveloped land, emergent ecologies, recently demolished buildings, agricultural land that has stopped being farmed, brownfields and other contaminated sites, and land that is home to long-term abandoned structures (Jeremy Németh, 2014).

2.1.5. Facilitation

The process of assisting people or groups in achieving a common goal without imposing, dictating, or manipulating a result. Through facilitation, people or groups are given the freedom to solve their own problems or design solutions to problems that have been recognized (Marcus, 2007).

2.2. Theoretical Review

2.2.1. Theories of Slum Development

- Modernization

This classical development theory views slums as transitional phases in the path toward modern urbanization. It assumes that economic growth and industrialization eventually absorb informal settlements (Sai, Ramakrishnan, & Rao, 2015).

Modernization theory explains slum development as a transitional phase in the process of urban growth and economic development. It suggests that slums emerge due to rapid urbanization and that eventually disappear as cities modernize, industrialize, and improve infrastructure and governance. The theory emphasizes top-down planning and formal development as solutions to slum problems (S L Jasim, 2021).

- Urban informality

The urban informality school challenges traditional views by recognizing slums as complex, dynamic systems that operate outside formal regulations but fulfill essential social and economic functions. It highlights the adaptive strategies of residents and the role of informal economies in urban survival. This approach advocates for policies that engage with informality constructively rather than attempting eradication (Herrle & Fokdal, 2011).

- Right-Based Approaches

Grounded in human rights frameworks, this school emphasizes the right to the city (Henri Lefebvre, David Harvey). It advocates for legal recognition, participatory planning, and equitable access to services. It's often used by grassroots movements and NGOs to push for inclusive urban policies (Hickey & Mitlin, 2009).

Rights-based approaches to slum development focus on the human rights of slum dwellers, particularly the right to adequate housing, security of tenure, and access to services. This perspective emphasizes participation, empowerment, and social justice, arguing that slum

upgrading and development should be driven by the needs and rights of residents rather than solely by economic or planning imperatives (Wambua Leonard Munyao, 2013).

2.2.2. Theories of Green Infrastructure

Green Infrastructure (GI) is rooted in ecological urbanism and sustainability science**,** emphasizing the integration of natural systems into urban planning. Scholars like Ian McHarg and Frederick Steiner have contributed to GI's theoretical foundation, advocating for landscape-based urban planning to enhance resilience and biodiversity (Mell, 2010).

- Biophilic Urbanism

Biophilic urbanism integrates natural systems into urban design to enhance well-being, biodiversity, and resilience. Stephen Kellert expanded this into practical frameworks for architecture and planning, emphasizing both direct (e.g., vegetation) and indirect (e.g., natural materials) experiences of nature (Phillip James Tabb, 2020).

Biophilic Urbanism is rooted in the concept of biophilia, which posits that humans have an innate affinity for nature. This theory advocates for integrating natural elements into urban environments to improve human well-being, biodiversity, and ecological resilience. It emphasizes the creation of green spaces, green roofs, urban forests, and water bodies within cities to foster a harmonious relationship between urban dwellers and nature (Hargroves, Desha, & Newman, 2012).

- Landscape Urbanism

Landscape Urbanism views the landscape as the foundational element of urban design, prioritizing ecological processes and spatial patterns over purely architectural concerns. It promotes the use of natural systems such as water flow, vegetation, and topography as frameworks for urban development. This theory supports flexible, adaptive urban forms that respond to environmental dynamics and encourage sustainable land use (Waldheim, 2012).

It emphasizes ecological processes, flexibility, and horizontality over rigid zoning. It's particularly influential in post-industrial and rapidly urbanizing contexts where adaptive reuse and ecological restoration are key (Duany & Talen, 2013).

2.2.3. Urban Acupuncture

Tactical and classical urban acupuncture

Coined by Finnish architect Marco Casagrande, this theory draws from Chinese medicine, targeting small, strategic interventions to release urban "stress." Tactical urbanism (e.g., pop-up parks, street murals) aligns with this by using low-cost, community-driven actions to catalyze broader change (Pagones, 2021).

Urban acupuncture is a metaphorical and practical approach to urban intervention that targets small, strategic points in the city to trigger positive systemic changes. Classical urban acupuncture focuses on physical, often architectural or infrastructural, interventions in key locations to revitalize neighborhoods. Tactical urban acupuncture emphasizes temporary, community-led, and low-cost actions that promote social engagement and incremental urban improvements (M Bandeira, 2021).

Ecological/smart city Urban Acupuncture

This emerging strand blends ecological design with digital tools. It focuses on data-informed micro-interventions like green roofs, bioswales, or sensor-driven public spaces to enhance urban metabolism and resilience. It's especially relevant in smart city frameworks aiming for sustainability and livability (Yimeng, 2015).

This contemporary school integrates ecological principles and smart technology into urban acupuncture practices. It seeks to enhance urban sustainability by combining green infrastructure with digital tools such as sensors, data analytics, and foster resilient urban ecosystems. This approach aligns with smart city initiatives aiming for adaptive, responsive, and ecologically sensitive urbanism (W Muthanna, 2024).

2.2.4. Green Infrastructure Principles

Three key principles related to green infrastructure are highlighted to explore its potential beyond technical considerations and to distinguish it from related ideas.

Key Principles (Simplified)

- **Multi-functionality:** Land uses integrate social, ecological, and economic functions, addressing high population density and limited space (Andersson & Barthel, 2014).
- **Interlinkages:** Green hubs connect via corridors, forming basin-level infrastructure while fostering socio-institutional integration (Prof Priti Parikh, 2013).
- **Exchange:** Infrastructure systems create reciprocal connections, using green spaces to facilitate movement and interaction (Golubiewski, 2012).

2.2.5. Green Infrastructure in Informal Settlements

In informal settlements, UGI improves living conditions and lowers the risk of flooding and erosion while being protected by locals, guaranteeing mutual sustainability (O. Adegun, 2017). By providing inclusive solutions, green infrastructure preserves ecosystems and fills in service gaps that urban populations find difficult to access (Borie & Ziervogel, 2019).

Micro-interventions near waterways boost urban agriculture, restore rivers, and create sustainable green networks. Local agriculture enables flexible solutions (J Mulligan, 2016).

Green infrastructure's broader impacts remain unclear, especially socio-politically. While often beneficial, it separates technology from social dynamics, influencing urban sustainability policies (T Matthews, 2014).Green infrastructure in slums risks worsening vulnerabilities. Urban areas are distinct yet interconnected, with community identities and citizen actions varying citywide (Buijs, 2016).

In developing nations, vacant land that is owned by the public or privately and is not used for settlement purposes is used to create informal settlements (N Alsayyad, 2014). The area's

proximity to streams, wetlands, and steep slopes makes it unsuitable for residential construction (Bryceson, 2012)

By farming alongside ecosystems, residents of informal settlements engage in urban agriculture, which improves ecological and community resilience. This includes communal gardens and pot/yard planting (Viljoen, 2012). Green infrastructure in informal settlements can be introduced through strategic interventions or socio-ecological systems like roof gardens to reduce runoff and drainage demands (Z Hennings, 2012).

Wetlands and other forms of green infrastructure link small-scale initiatives to larger-scale effects. By retaining runoff, treating water, and facilitating urban farming, multipurpose wetlands lessen the need for centralized sewage plants (Carina Weingaertner & Åsa Moberg, 2014).

The relationship between urban green infrastructure and informal settlements has been explored, and it also shows opportunities for climate change adaptation and mitigation in cities (SE Gill, 2010). Ecological infrastructure offers affordable, multifunctional solutions, addressing climate-driven gaps and strengthening resilience in low-income urban areas (Lyytimäki & Sipilä, 2009).

2.3. Methodological Review

2.3.1. Approaches of Urban Acupuncture

Urban acupuncture's approach is related to trends in sustainable development as it usually starts with the idea of reorganizing a city's energy through the most basic interventions on an environmental, social, and economic level (Al-Hinkawi & Al-Saadi, 2020). One of the fundamental goals of "acupuncture" in urbanism is the development of social interaction. An urban intervention resembles therapy in that it concentrates on time and public space while simultaneously seeking approval from the general populace (Malvina A Apostolou, 2018).

Urban acupuncture is, therefore, a sensitive intervention in informal cities connecting natural systems with urban social consciousness (Kabas Abdul Hameed Salman, 2021). It uses simple, low-cost techniques to stimulate key urban points, revitalizing the city and creating positive ripple effects across its divisions (Salman, 2021).

2.3.2. Principles of urban acupuncture

Small scale

Urban acupuncture seeks to revive cities by making modest adjustments that have a significant impact on the urban fabric. “Small-scale interventions on the urban fabric to create transformation and ripple effects on the broader urban environment"(Casagrande, 2020).The goal of this strategy is to have a significant influence with a modest pilot project, in which its intervention must be used at small sizes (Aysel Yavuz, 2021) .

Strategic positioning

The interventions should be well-planned and placed such that there is a likelihood they "restore an unwell spot's vital signs" and have positive spillover effects (J Lerner, 2014). Intervention sites are usually selected after conducting an environmental, economic, and social review of the larger setting through engagement with the community then, the revitalization of the entire city is sparked by the treatment and recovery of its constituent components at key areas (Foth, 2008).

Synergy

The intervention needs to be coordinated with other things. More than just one intervention should be influenced by how the improved built environment interacts with the residents. It should affect the area both physically and socially. Effects from the output should exceed those from the input (M Casagrande, 2020b).

Inspirational

Urban acupuncture interventions should motivate users and locals to take an active role in the restoration of their environment and city. Sustainable changes to a place should encourage people to take an active role in making their surroundings better and should inspire them to become more conscious of their surroundings (J Lerner, 2014).

The Social catalytic

"Good Urban Acupuncture is about pulling people out to the streets into green areas and providing meeting spots, letting the city become a catalyst of interactions amongst individuals," says one practitioner (Couceiro da Costa, 2017).

People participation

The city's inhabitants serve as its users, experts, and eyes. They can identify the areas of a city that require mending, and they encourage and enable others to get involved as well (Casagrande, 2020). The concept centers around the idea that people should be involved in and use the space, "thus attaining social enhancement within a setting of a more localized and community approach" (Malvina Apostolou, 2015).

Table 2.1: Urban Acupuncture Strategy

Urban Acupuncture strategie
Reuse of existing resources
Redefine the aesthetic of urban element, create urban identity
Achieve diversity and inclusive, connect citizen yet allow for individuality
Redefine Open space; increase potential
Reuse and recycling of resources; redefine spaces rather than replace
Confirm the sentimental value of vegetation, human and natural relationship
Adapt and open design; flexible spaces
Connectivity and gradual design

2.3.3. Sensitive spot selection

- Steps to select the right open space

The interconnection and long-term success of existing cities depend on the characteristics of spatial and community linkages, but Nassar's framework stands out for the way it implements an approach employing the ideas and techniques of urban acupuncture (UA) to find the right pinpoint (Nassar, 2021).

The following principles are what an effective acupuncture point must possess (the constant), and each principle is carried out by at least two different approaches (the variables), each of which will be different at various sites (Al-Hathloul, 2006). Nassar's "filtering framework" is used to determine the sensitive areas where these concepts and tactics should be used to determine whether UA is appropriate for a certain site.

The filters function like a funnel, going from general site requirements to more detailed ones. The sensitive area is assessed in the filter utilizing the important elements of public space, which effortlessly filters to the strategy choice. The factors, tactics, and principles come together to provide a specific place for intervention and a suggested beginning point for a discussion on what the acupuncture point's design may involve (Nassar, 2021).

The three steps to select urban fabrics for the interventions as an urban acupuncture:

Step 1: Selecting the best development Center This mostly includes the historic center, which primarily consists of the metro line network and bus lines, which are meant to connect all other urban areas (Al-Hathloul, 2006).

Step 2: Urban Catalyst and Mixed-Use Areas

At this stage, highly mixed-use regions and the development center that needs significant improvement, mostly in slum areas, should be selected (A Klingmann, 2021).

Step 3: Selecting the sensitive spot

The selection of sensitive spots will be carried out following the elements shown in the (Table under 2.2), which highlights the filters that ought to be applied in order to select the ideal human-

centered open space. Displays the urban development pattern as a result, highlighting the most sensitive areas that could be treated using the urban acupuncture method. This mainly focuses on filter 3 and 4 on the table under 2.2 (A Klingmann, 2021).

2.3.4.Filtering framework to apply Urban Acupuncture Approach

A filtering framework is used to choose an appropriate site where urban acupuncture as a concept may be applied in a city or any other. A summary of the five filters is shown in the table below.

Table 2.2: Framework for the sensitive spot 1

Framework for sensitive spot selection and filtering by using the Urban Acupuncture method

Filter 1 Choosing an appropriate development center		
Bring in investment	Priority-oriented districts for transit	Most densely populated

Filter 2 Choosing mixed-use and Urban Catalyst districts		
Mixed-use neighborhoods	Various urban street layouts	Available via public transportation

Filter 3 Evaluating the chosen districts to choose the most suitable one			
Density of Population	Rate of Development	Green Spaces	Buildings Catalyst
Multi-purpose distribution	Public Services readily available	Street layout	Rate of violence and crime

Filter 4 Selecting the sensitive spots			
Delightful	Inclusive	Sociable	Livable
Walkable	Safe	Accessible	Comfortable

Filter 5 Choosing a successful strategy				
Current resources	Urban aesthetic aspects	Both inclusiveness and diversity	Building visibility	Redefinition of Open Space
Recycling of materials	Worth of vegetation	Graduate design	Adaptive open Design	Shared Management

(Source: Nassar, 2021)

- Parameters and categories for Selecting the sensitive spot

There are three major categories: **Space, Environment, and Society.**

Space This first category includes four divisions: Size, spatial identity, surfaces, and focal point (Table 2.3).

Table 2.3: Space and sub-categories

Sub-categories	**Parameters**
Size	The exact size of the small park should be determined based on anticipated activities and user preferences to ensure a comfortable and enjoyable experience.
Spatial	is shaped by determining the function, incorporating innovative design, offering variety and choice, maximizing play value, and creating adaptable spaces.
Surfaces	Transform walls into vertical lawns, add texture to the floor, create a leafy canopy for the ceiling, and avoid blank walls along the perimeter to enhance the space.
Focal point	Incorporate focal points and well-defined edges for a visually engaging and balanced space.

(Source : M Sinou, 2013)

Seymour asserts that a small pocket park should be 15 by 30 meter in size. Another source contends that a park's precise size should be chosen following the activities that are planned (M Sinou, 2013). Key characteristics include a focal point, variety, and easy access. In urban settings, vine-covered walls can enclose a park, trees, and vegetation can act as a "ceiling," and the ground should have texture and pattern interest (WN Seymour, 2003). Blank walls surrounding a space's perimeter should be avoided, and instead, water features, gazebos, or other landscape features can be added to create a focal point (M Sinou, 2013).

- **Environmental Aspects**

This is the second category, which further be separated into Environmental Performance and Location and Linkage (Table 2.4).

Table 2.4 Environmental Aspects

Environmental Performance	Maximize shade, use eco-friendly features, provide environmental education, explore aquatic habitats, and ensure ample lighting for a sustainable space.
Location & linkage	Utilize vacant sites, locate near greenways and housing, prioritize pedestrian flow, connect to other facilities, and ensure seamless park user flow.

(Source : M Sinou, 2013)

There may be eco-friendly elements in the part. The amount of natural shade should be increased as much as possible. One of the characteristics that is highly advised is adequate artificial nighttime lighting.Creating pocket parks in unusual places like rooftops, building facades, foyers, and vacant lots requires creativity. A greenway should be adjacent to the park, allowing smooth movement of visitors between the two (M Sinou, 2013). The entire area needs to be connected to other communal, cultural, and recreational institutions (R Shiffman, 2016), and also to a wider network of pedestrians (M Sinou, 2013)

- **Society**

Users, Accessibility, Amenities/Activities, Public Art, and Safety and Maintenance are the five subcategories that make up the third category, Society (Fors, 2015).

Table 2.5: Society and sub-categories

Users	Design inclusive play spaces, prioritize comfort and social interaction, involve the neighborhood, and achieve goals of fitness, social adjustment, and neighborhood betterment.
Accessibility	Ensure easy accessibility, inviting entrances, and convenient pedestrian access,

	and consider non-traditional locations for communal spaces.
Amenities-activities	Provide individual seating, amenities, playgrounds, open areas, diverse activities, ample seating, and opportunities for public art to activate and enhance public spaces.
Safety & maintenance	Prioritize supervision and maintenance, create buffers from cars, ensure equitable access, eliminate barriers to the street, and reduce maintenance requirements.

(Source : M Sinou, 2013)

Along with deciding the space's functions and uses, potential users' identities must be taken into account (M Sinou, 2013). Physical health, social adjustment, moral and mental development, and community improvement are only a few examples of potential goals (EC Guggenheimer, 2016).

Neighborhood participation in park design is preferred. The area should be welcoming, with multiple access points and opportunities for social interaction. Accessibility means no obstacles for pedestrians and flexibility in the area. (M Sinou, 2013).

In terms of facilities, play structures and play areas must be adaptable and built for the local population (R Schiffman, 2016). Zion argues that modern benches should be replaced with individual seats (RL Zion, 2015). The design can incorporate amenities like drinking fountains, bike racks, garbage cans, and chances for public sculpture or art (R Shiffman, 2016), (M Sinou, 2013). For pocket parks to remain sanitary and secure, supervision and upkeep are also necessary. The elimination of any onerous space maintenance requirements is also preferred (M Sinou, 2013).

Filtering Framework for Selecting Urban Acupuncture Points

Strengths and weaknesses may help guide the choices made during the design and development phases. In addition to the one discussed above, the following framework attempts to offer simple, efficient methods and guidelines for choosing appropriate locations for Urban Acupuncture while eliminating areas with low potential. Nassar discusses the essential elements of a human-

centered public space, which are broken down into the spatial and socio-spatial aspect categories (Figure 2.5) (Nassar, 2021).

A. Spatial Aspects

Tabel 2.6: Spatial Aspects

Aspects	Explanation
Delightful	Urban environments' aesthetic values
Comfortable	Provides a variety of standing and sitting activities
Safe	The impression of being safe from traffic and crime.
Accessible	easily accessible all day long
Walkable	City streets are pedestrian-friendly and simple to navigate.

B. Socio-spatial aspects

Table 2.7: Socio-spatial aspects

Livable	These are areas that are often used and active during the day and at night.
Inclusive	Encourages welcoming activities
Sociable	Engagement of both active and passive users

(Source: Nassar, 2021)

A. The spatial aspect:

Walkability

i. **Walkability** evaluates how well communal spaces support walking by assessing the current state of walkways based on three standards.

ii. **Current condition of footpaths**: This standard evaluates footpath condition and quality, checking for cracks, uneven surfaces, or damage that may pose hazards or discomfort to pedestrians (BANDA, 2018). By examining the current condition of footpaths, improvements can be made to ensure they are safe and well-maintained (Angelo, 2023).

iii. **Material of footpaths**: This standard evaluates the comfort, slip resistance, and durability of walkway materials (Bowman, 2012). Choosing the right materials for walkways can improve the experience of pedestrians and make public areas more walkable overall.

iv. **Pedestrian-friendliness of footpaths**: This standard measures how easily pedestrians can navigate footpaths, evaluating obstructions, overgrown vegetation, or inadequate signage that can impede walking (Der Walt, 2020). Assessing the pedestrian-friendliness of footpaths helps identify areas where improvements can be made to create obstacle-free and user-friendly walkways (Paykoç, 2019).

Assessing these three standards improves communal walkability, ensuring safe and comfortable pedestrian navigation (Southworth, 2005). Improving conditions, choosing suitable materials, and promoting pedestrian-friendliness create more accessible and enjoyable walking environments (Baobeid, 2021).

v. <u>Accessibility</u>

- This study evaluates community space accessibility by considering main road access, car access, and the footpath network (Moura, 2017). The study analyzes the ease of reaching communal spaces from main roads and the availability of collector roads connecting them to the transportation network (Porta, 2006).
- <u>Main road access</u>: This category assesses collector roads' accessibility and the ease with which one can get to common areas from main roads (Bain, 2012). Collector roads ensure easy access to public areas and smooth traffic flow by connecting local streets to major transportation hubs (Sharifi, 2019). By evaluating main road access, the transportation network's integration and connectivity of public areas are determined, guaranteeing smooth accessibility (Cheng, 2015).
- <u>Car access</u>: Assessing local roads that connect to public areas and making sure that the road infrastructure is well-planned and maintained for easy vehicle movement are critical components of evaluating car access (Sichitiu, 2008). The evaluation also takes into account whether there are enough parking spots in the common areas to accommodate

automobiles (Asplund, 2021). Those who depend on private vehicles can easily access and use the community spaces if there is adequate car access (Bardhi, 2012).

- Footpath network: the footpath network category evaluates the accessibility, upkeep, and connectivity of sidewalks for secure walking routes (O'Donnell, 2008,). In addition to encouraging walking as a form of transportation, a well-established network of walkways guarantees pedestrian safety (Alshammari, 2022). It promotes active participation by making it comfortable for people with mobility impairments or assistive technology to move around public areas (Martins, 2012).

vi. Multifunctionality

This topic, which is broken down into four categories, looks at how common areas are used for different purposes:

- Daily activities: This category evaluates how well-suited public spaces are for routine tasks like laundry and drying. Its main objective is to assess whether these locations have facilities or spaces that are specifically designed to support these activities (Spurling, 2013).
- Gardening: The assessment of communal spaces for gardening entails determining whether any specific areas or features are in place to facilitate the development of green spaces, like gardens. The possibility of residents gardening in the common areas is taken into account in this category (van der Jagt, 2017).
- Playground: One of the most important factors is whether there is enough room in common areas for kids to play. When evaluating this category, one must ascertain whether there is sufficient space and suitable facilities to establish secure and entertaining play areas for kids in the common areas (Boschmann, 2008).
- Parking: The evaluation of parking entails determining how many parking spots are available for vehicles in the common areas (Marsden, 2006). This category takes into account whether there are designated parking areas or enough space to meet the parking needs of locals and guests (Lin, T., Rivano, H, 2017).

The Social and Physiological Aspects

Sociable active and passive user

Livable well-used and activated spaces day and night

- Welcoming green frontage: Having enough space in the common area to welcome green frontage According to (Marcus, 2007) The welcoming green frontage category assesses entrances to ensure that they are inclusive. It comprises evaluating the landscaping, signage, seating, and overall design (Main, 2010). Enhancing the entrance's visual appeal makes everyone feel welcome (Imrie, 2003).
- Use of the place by the elderly: This category assesses how well senior citizens are served by public spaces(Rikli, 2013). It takes into account amenities for the comfort and inclusivity of older adults, as well as accessible seating, easy mobility, and mild gradients (Burton, 2006.). Establishing age-friendly areas enables senior citizens to unwind, interact with others, and enjoy their environment (Carroll, 2020).
- This category evaluates how well public areas serve people with disabilities (Hall, 2010). It involves evaluating pathway accessibility, ramps, tactile paving, and accessible amenities. (Mwanik, 2022). People with disabilities can navigate, participate, and feel like they belong in public areas thanks to inclusive facilities (Prandi, 2023).
- Taking care of these areas emphasizes how crucial it is to design welcoming and inclusive public areas for everyone (Skinner, 2008). A more welcoming and pleasurable atmosphere is produced for everyone by improving entrances, attending to the needs of the elderly, and installing accessibility features (Burton, 2006.).

Opportunity to educate the public on the utilization of open space

Three essential elements are highlighted in the degree of education given to occupants of communal areas:

- Vegetation Management: This course teaches locals how to take care of the trees and plants in the community (Lewis, 2006). To help residents maintain the sustainability and

health of the communal greenery, it includes instructions on watering, pruning, fertilizing, and general plant care (VanDerZanden, 2010).

- Recycling: Educating people about appropriate recycling techniques entails spreading knowledge, encouraging conscientious waste management, and offering instructions on how to separate recyclables (Bolaane, 2006). Teaching locals how to recycle makes public areas more sustainable and environmentally friendly (Babaei, 2015).
- Area Maintenance: Training on open space upkeep covers maintaining communal areas (Marcus, 2007). This includes guidance on litter management, cleanliness, regular maintenance, and other practices to ensure the communal spaces' cleanliness and appeal (Victorian Stormwater Committee, 2000). Empowering residents with maintenance skills ensures communal spaces are well-maintained and enjoyable for everyone (Gopalakrishnan, 2020).
- Education and training on vegetation management, recycling, and maintenance foster a sense of ownership and responsibility among residents (McCaffrey, 2011). This enables them to actively participate in the care and improvement of their shared

<u>Collaboration between local administration and community to improve the Open spaces</u>

- Provision of Materials: Highlights admin-community collaboration in material provision for communal space development (Bedimo-Rung, 2005). The administration supports the community by providing planting pots and structures, enhancing communal areas' aesthetics and functionality (Linn, 2007). By supplying materials, the administration and community improve and maintain communal spaces (Berkes, 2000).
- Provision of Plants and Trees: Highlights collaborative plant/tree contributions to enhance communal spaces (Lewis, 2000). Administration-provided greenery enhances communal areas, promoting biodiversity, aesthetics, and a pleasant atmosphere through collaboration. (Beatley, 2009).

Recognition: Recognizing community efforts (e.g., rewards, certificates) fosters collaboration in communal space development/maintenance (Israel, 2001). Recognition motivates continued involvement and fosters ownership/pride in communal spaces (Manzo, 2006). Recognizing

community efforts strengthens administration-community bonds, fostering collaboration that improves communal space sustainability (Jamal, 2009).

Inclusivity

- Welcoming green frontage: Assesses entrance design for welcoming, inclusive communal spaces serving diverse groups (Marcus, C.C. and Francis, C, 2000). Evaluates landscaping, signage, seating, and aesthetics to enhance entrances' appeal and inclusivity for diverse users (Oduncu, 2020).
- Use of the place by the elderly: Assesses communal spaces' accommodation of elderly needs. Examines accessible seating, movement ease, gentle gradients, and amenities promoting elderly comfort/inclusivity (Burton, 2006.). Age-friendly communal spaces support elderly relaxation, socialization, and engagement (Carroll, 2020).
- Disability access: Assessing accommodations in communal spaces (Hall, 2010). Evaluates pathway access, ramps, tactile paving, and amenities for disabilities (Mwanik, 2022). Facilities that are inclusive guarantee that people with disabilities can participate, navigate, and feel at home in public areas (Vincent, 2017).
- By addressing these categories, we can create welcoming, inclusive spaces for a variety of groups (Skinner, 2008). Access for people with disabilities, senior-friendly architecture, and inclusive green entrances create a warm and inviting community (Null, 2013).

Safety

the security of public areas, with an emphasis on four major assessment areas.

- Maintenance of hard surfaces: In public areas, evaluate and maintain hard surfaces such as asphalt, rocks, and concrete (Jahren, 2007). To avoid mishaps, look for cracks, potholes, or other dangers (Posirisuk, 2022).
- Maintenance of soft surfaces: Assess the maintenance of the green spaces in public areas (Fors, 2015). To avoid risks, keep gardens, lawns, and soft surfaces maintained (Robbins, 2012).

- Drainage: In order to avoid flooding in public areas, inspect the drainage system (Cotterill, 2020) (Kreder, 2016).
- Nighttime lighting: Evaluate nighttime visibility for safety with proper lighting.Safety hazards and slick surfaces are avoided with proper drainage (Boyce, 2019). Examine the functionality, coverage, and positioning of the lighting fixtures (Hightower, 2001).

2.3.5. Urban acupuncture framework and tools

Facilitation workshop

Facilitation guides discussions to achieve a goal by gathering input from participants, while teaching and training focus on delivering structured material from the instructor. Facilitators encourage open exchange without controlling decisions or outcomes (A Kolmos, 2008).

1. **Context Analysis:** Examine site conditions using a bottom-up approach, considering people, place, and local resources (M Casagrande, 2020b).
2. **Objective Setting:** Define goals based on diagnostics, ensuring collaborative solutions between experts and the public (M Sinou, 2013).
3. **Vision Development:** Create a clear vision, determine intervention type, and engage stakeholders for public involvement (Jin-Ling Tang et al., 2006).
4. **Pilot Implementation:** Experts use local expertise to build a flexible intervention, testing its community impact (Jin-Ling Tang et al., 2006).
5. **Outcome Evaluation:** Conduct periodic wellness checks, adjust interventions as needed, and maintain adaptability for urban evolution (J Lerner, 2014).
6. **Outcome:** Conduct regular wellness checks, analyze findings, and assess community impact. Adjust interventions as needed to stay adaptable to urban evolution (M Casagrande, 2020a).

2.3.6. Sustainable Development Goals

A list of 169 Sustainable Development Goals (SDGs) Objectives contains a definition for each of the 17 SDGs. It is agreed that 232 different Indicators would be used to monitor progress toward these Objectives. Below is a list of all the definitions (G Halkos, 2021).

Table 2.8:Sustainable Development goals 1

Goal 11 Sustainable cities and communities

Making cities and human settlements inclusive, safe, resilient, and sustainable is the focus of Goal 11. Nowadays, cities are home to more than half of the world's population. Seven out of ten individuals are predicted to reside in urban areas by the year 2050. Cities are the main contributors to economic growth, accounting for more than 80% of global GDP (J Manuel, 2021).

According to the UN, there are solutions to solve the difficulties cities encounter so they can maintain their growth and prosperity while maximizing resource efficiency and lowering pollution and poverty. The cities of opportunity we see in the future will provide access to essential services, electricity, housing, transportation, and other necessities (J Manuel, 2021).

10 Goals and 15 Indicators for Sustainable Development Objectives have been established by the UN. 11. Goals define the objectives, and Indicators are the measures used to gauge whether these Objectives are being reached.

The indicators for the Goal -Sustainable cities and communities

Target 11.2: Affordable and sustainable transport systems

- UN definition: Improve road safety, particularly by expanding public transportation, and make sure that everyone has access to safe, affordable, accessible, and sustainable transportation systems by the year 2030. Pay particular attention to the needs of those who are most at risk, such as women, children, people with disabilities, and the elderly.

Sustainable Development Goals Indicator 11.2.1

- Public transport access
- **Definition:** The percentage of the people, broken down by sex, age, and those with disabilities, who have easy access to public transportation is shown in indicator 11.2.1.
- **Goal**: By 2030, guarantee that everyone has access to sustainable, affordable, safe, and accessible transportation networks (H Vaidya, 2020).

Target 11.3: Inclusive and sustainable urbanization

- UN definition: Enhance global human settlement planning and management capability by 2030, with a focus on achieving inclusive and sustainable urbanization.

SDG Indicator 11.3.1

- Urban planning management
- Definition: The percentage of cities with a regular, democratic civil society participation structure in municipal planning and administration is represented by indicator 11.3.2.
- **Goal**: By 2030, all nations should have increased ability for participatory, integrated, and sustainable human settlement planning and management (H Vaidya, 2020).

Target 11.4: Protect the world's cultural and natural heritage

SDG Indicator 11.4.1

- Protecting cultural heritage

Definition: The total amount (public and private) per capita spent on the preservation, protection, and conservation of all cultural and natural assets is represented by indicator 11.4.1.

Goal: By 2030, intensify your efforts to defend and preserve the world's cultural and natural legacy.

Target 11.5: Reduce the adverse effects of natural disasters

- UN definition: With a focus on safeguarding the underprivileged and those in vulnerable situations, greatly reduce by 2030 the number of fatalities, the number of those impacted, and the direct economic losses as a percentage of the world's gross domestic product.

SDG Indicator 11.5.1

- Deaths and injuries from natural disasters
- **Definition:** These indicators track mortality rates, internally displaced people, and the overall number of people impacted by natural catastrophes.
- Goal: Reduce the number of fatalities and those directly impacted by natural disasters by a considerable amount by 2030 (H Vaidya, 2020).

Target 11.6: Reducing adverse environmental impacts in cities through improved air and waste management

- Goal: By 2030, cities' adverse per capita environmental impact will be reduced by paying special attention to air quality and municipal and other waste management.

- "Solid waste collection involves storing, handling, and transporting waste from households, businesses, and hospitals to treatment or disposal sites. It also includes tasks like street sweeping and maintaining cleanliness in public areas."

2.4. Conceptual Review

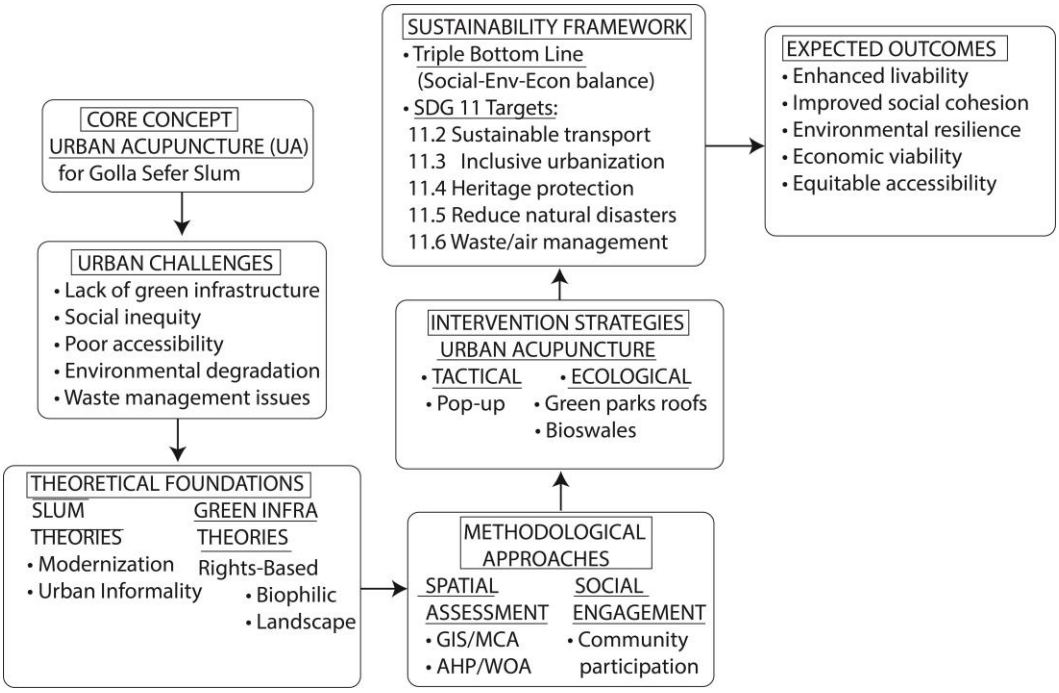


Figure 2.1:Conceptual Review

2.5. Contextual Background

Case Study: Urban Acupuncture in African Cities

The liquid urbanity of African cities—such as Accra, Kinshasa, Kumasi, and Kisangani—is defined by the continuous movement of people, products, and cultural exchanges. These cities defy strict classification and thrive instead thanks to multi-programmed, flexible spaces that conflate public and private, permanent and temporary, and formal and informal domains. The inability of traditional Western architectural paradigms to address these dynamics has led to a move toward approaches that value flexibility, improvisation, and community involvement (B

Cultmatrix, 2009). This philosophy is supported by urban acupuncture, which emphasizes micro-interventions that enhance dormant potentials in the urban environment.

This strategy is best exemplified by the work of Studios Kabako, a performing arts collective headed by Congolese choreographer Faustin Linyekula. Studios Kabako uses decentralized cultural centers as "acupuncture points" to promote artistic expression and social healing in Kisangani, a city damaged by colonialism, war, and economic neglect (B Cultmatrix, 2009). The project revitalizes abandoned buildings, engages marginalized neighborhoods, and establishes forums for local and trans-local discourse by distributing three interconnected hubs throughout the city: Makiso, Simi Simi, and Lubunga. Decentralizing cultural production, refuting Kinshasa-centric narratives, and enabling communities to recover their urban identity are the goals of these interventions.

In a similar vein, Müller's "listening kumasi" project in Ghana experimented with transient interventions, like installations made of red fabric, to uncover hidden spatial and social dynamics. The project demonstrated how small gestures could momentarily reshape urban interactions by mapping "energy nodes" in Kumasi's streets and markets, highlighting the catalytic potential of small-scale actions (B Cultmatrix, 2009).

However, there are still difficulties, especially in maintaining such programs. While the transient nature of interventions raises concerns about long-term effects, Studios Kabako's reliance on foreign funding highlights the conflict between local goals and global dependencies. However, a framework for navigating urban space that respects the natural fluidity of African cities is provided by urban acupuncture. It presents art and architecture as collaborative practices that transcend social boundaries, elevate underrepresented voices, and reframe cities as dynamic, living things rather than as static disciplines.

CHAPTER THREE: Research and Methods

3.1. Description of Study Area

This research was conducted in Addis Ababa, Ethiopia, in the Lideta sub-city, particularly in a slum neighborhood called 'Golla Sefer', which covers about 34 hectares. As it is indicated on Figure 3.1, the study area is located in the inner city, and a river passes through the study area. The area is near landmarks such as Churchill Avenue and Tewodros Square. High-density built-up slum settlements with many small vacant spaces highly characterize the area. Golla Park, which is a public park, is part of the study site.

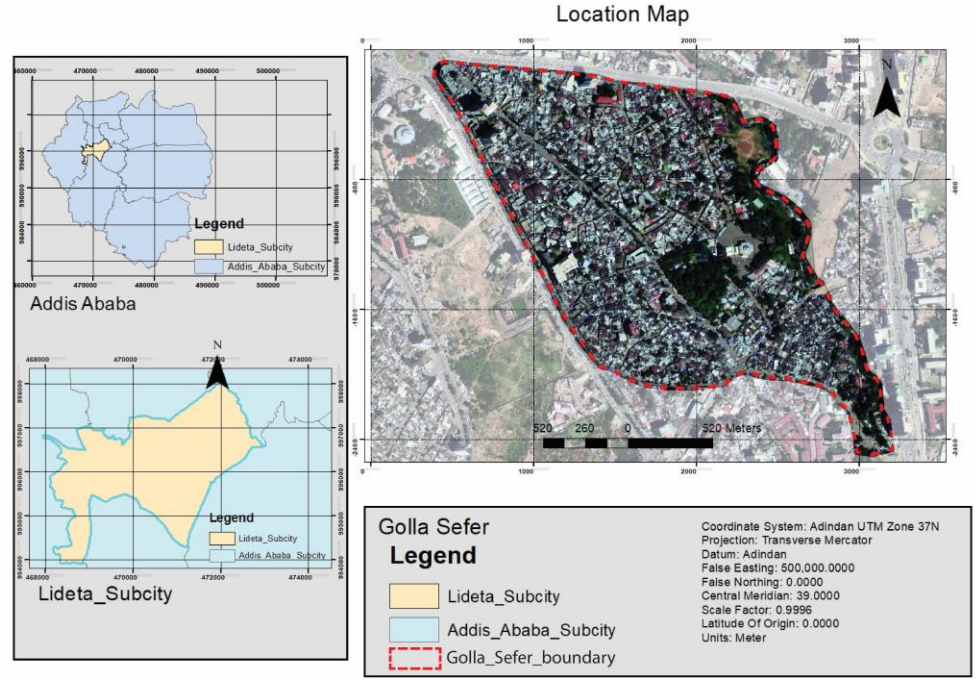


Figure 3:1: Location map (The location of Golla Sefer, Addis Ababa, Ethiopia) 1

3.1.1. Natural characteristics of the study area

The research focuses on the following three elements that better characterize the site.

I. **Water bodies:** A river passes through the study area and retaining walls were constructed along the riverbank.

II. **Green Areas:** The study area contains three (3) major green areas.

- **Golla Park,** the Golla Michael church's neighborhood green park, which is open to the public, makes up the majority of this neighborhood.
- **Natural and planted vegetation:** There are various vegetation types within different parts of the study area, along the river embankments, in individual plots, and in other open places.
- **Street side trees:** Although very limited and inconstant in their existence, some trees were planted on the main road and inner street of the site.

III. **Landforms:** The third element that describes the natural attributes of the study area is its topography and landform. The area is covered with steeper slopes along the riverbanks and moderate slope classes in the other part of the study site.

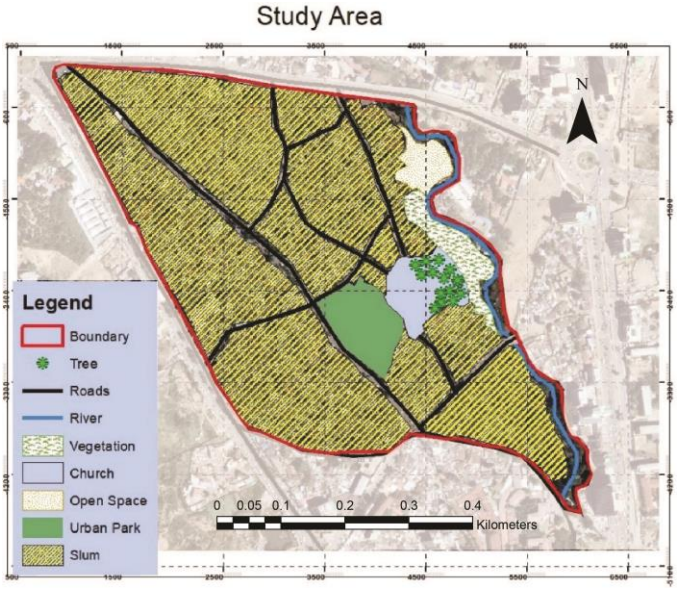


Figure 3.2: Study Area (Map of Site Description of Golla Sefer)

3.1.2. Built-up characteristics of the study area

The study area is situated in the Lideta sub-city, which is one of the sub-cities located in the inner city of Addis Ababa. The study area is characterized by slum settlements that contain dilapidated and dense built-up spaces. The site also varies hierarchies of road infrastructures, ranging from twisting, narrow, and bottlenecked local streets to Asphalted collector roads. In addition, the site encompasses different-aged utility lines, including stormwater storage drainage lines.

3.2. Research design

Descriptive Approach: This involves observing and documenting current conditions without manipulating variables. The study uses GIS maps, site conditions, and spatial metrics (e.g., population density, vegetation coverage, and slope gradients) to describe the existing state of green infrastructure, vacant spaces, and socio-spatial dynamics.

Exploratory Approach: This focuses on investigating potential solutions or understanding perceptions. The study employs focus groups, interviews, and participatory methods to explore community-driven solutions, such as small-scale green projects, and to understand how people perceive communal spaces.

Explanatory Approach: This links causes and effects by analyzing relationships between social and spatial factors. The study applies the Analytical Hierarchy Process (AHP) and design principles to evaluate intervention suitability based on social needs (e.g., safety, inclusivity) and spatial factors (e.g., slope, accessibility).

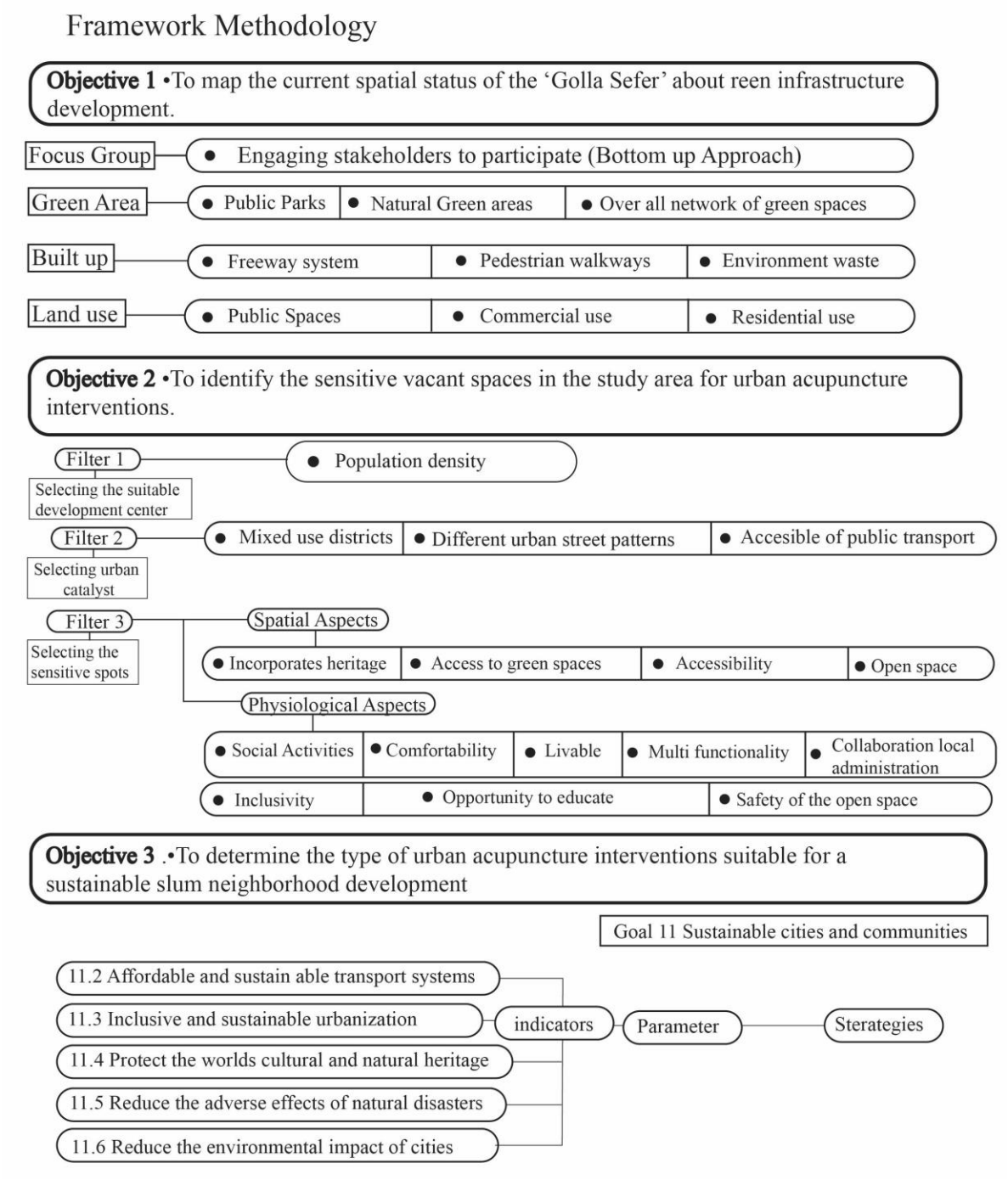


Figure 3.3: Framework Methodology

3.3. Data types

Primary Data: The study gathered firsthand insights through various methods, including interviews with residents and stakeholders, to understand their perspectives on vacant spaces. Site observations were conducted to assess the condition of green infrastructure. Field notes and photographs provided additional documentation, enriching the contextual understanding of urban spaces. Additionally, focus group discussions helped identify critical "sensitive spots" that required intervention, ensuring that community perspectives were incorporated into the study's findings.

Secondary Data: To supplement primary research, the study relied on existing data sources that provided broader spatial and demographic context. Google Earth's satellite imagery was utilized for spatial analysis, offering visual insights into land use and infrastructure. Nortek maps contributed information on topography and road networks, aiding in accessibility assessments. Reviews of scholarly publications and reports helped frame the study within established research findings. Additionally, population statistics from the Lideta sub-city administration were integrated to enhance the analysis, ensuring that socio-spatial dynamics were accurately represented.

3.4. Sources of Data

Primary and secondary data were collected from Woreda 7, where the Golla Sefer is located, Lideta sub-city, and Opinions and perceptions were gathered from the major stakeholders (Residents) of the Golla Sefer. Secondary data, such as satellite images, Road network, and contour data, were compiled from the Nortek map of the Woreda. Note-taking during the field investigation of existing green areas was also the primary data source. Moreover, secondary data were also collected from the precedent research that had been conducted in the site and its surroundings.

3.5. Sampling design and Sampling size

The data collection was designed to encompass every block to cover the study area and have evenly dispersed data coverage. To collect the qualitative and quantitative data required for the study, the questionnaires are also given to residents, with a minimum of three to five questionnaires each for communal areas that are surrounded by multiple households. Yemane's formal was used to identify the primary formula for the sample size. The total number of persons living within a 5-meter radius of the communal spaces is entered into the Yemane formula, and the result is then divided by the number of people who will be questioned. The population as a whole is 6290. This figure is factored into the Yemane calculation, which yielded a sample size of 376. Data was collected from households surrounding communal spaces, with one person interviewed per household. With 68 communal spaces and a total sample size of 376, five individuals were interviewed per space.

The **Yamane formula** for determining sample size is:

[n = \frac{N}{1 + N(e^2)}]

Where:

- (n) = sample size
- (N) = population size (6290)
- (e) = margin of error (commonly 5% or 0.05)

Now, applying the formula:

[n = \frac{6290}{1 + 6290(0.05^2)}]

[n = \frac{6290}{1 + 6290(0.0025)}]

[n = \frac{6290}{1 + 15.725}]

[n = \frac{6290}{16.725}]

[n \approx 376]

3.6. Method of Data Collection and Tools

Primary data were collected through participatory and observational tools to capture localized conditions. Site checklists assessed physical and social features, while cameras documented communal spaces. GIS (ArcGIS) supports spatial mapping and socio-spatial analysis. Interviews were voice-recorded for accuracy, and focus groups with Wereda 7's beautification office identified key intervention points for urban acupuncture. Structured questionnaires reached participants across Kebele housing, riversides, open areas, and street-side public spaces.

Secondary data were collected through a comprehensive literature review involving scholarly articles, technical reports, policy manuals, and planning frameworks. These sources provided both theoretical grounding and a broader contextual understanding of the issues explored, enhancing the robustness and relevance of the study's findings.

Objective 1: Determining the specific areas' current state in relation to green infrastructure

Engaging Stakeholders to Participate

Phase 1: Identifying Sensitive Spots

The focus group, in collaboration with the beautification office of Wereda 7, identified sensitive spots based on their impact and significance as gathering points, initiating the urban acupuncture process for regenerative intervention. Participants were selected from various areas, including Kebele houses, open vulnerable areas, riverside areas, and street-side public places.

Phase 2: Presenting the Context to Participants

Participants were presented with photos depicting the current state of the vacant areas in Golla Sefer, providing a visual understanding of the problems and setting for further discussion.

- Mr. Hebtamu Senayi, a member of the cultural center.
- Mr. Getachew Sema, is involved in the SafetyNet.
- Mr. Daniel, a worker in the cultural center.
- Mr. Adamu Zeleke, a worker at a shop.
- Mrs. Medenet Gebru, a worker in the local administration.
- Mrs. Zirofizi Taru, a street vendor.
- Mrs. Meskerem Gefatu, a street vendor.

Figure 3.4: Workshop Photos.

Phase 3: Diagnosis and Solution Development

Participants were educated on the principles of urban acupuncture and given examples of community-driven solutions from their neighborhood. They were encouraged to propose site-specific solutions aligning with urban acupuncture principles.

Phase 4: Pilot Development

A pilot project was initiated based on the proposed solutions, allowing for adjustments and modifications based on community feedback. The intervention was small-scale, adaptable, and aimed at continuous improvement.

Phase 5: Outcome Evaluation

The intervention was evaluated, resource needs were identified, and proposed hypotheses to address community challenges were validated. Action plans and conceptual sketches were created to guide further implementation.

Figure 3.5 : Workshop Photos.

Major keys and tools used in the workshop

Table 3.1:Major key and tool used 1

	Phase	Key Steps & Tools	Explanation
1	**Selected site**	**Tools**: Workshops on Selection of Sensitive Spots.	Identify sensitive spots and site assessment
2	**Present the current context**	**Tools**: Workshop and Public Interviews	Present site conditions, consider factors, and conclude People, Place, and Potential.
3	**Diagnose and propose.**	**Tools**: Workshops, Public Survey, and Analysis.	Engage the public in UA-guided discussions for community-driven, small-scale solutions.
4	**Pilot Development**	**Tools:** workshop, encourage the public to participate, educate, and	Utilize local knowledge and resources for interventions. Stakeholder engagement in goal-

		volunteer.	setting.
5	**Outcome**	**Tools:** Data collection, Observation, and Survey.	Document the intervention for evaluation. Reflect, document, re-evaluate, and adjust for improvement.

Table 3.2:Determining the current areas 1

Categories	**Data to be collected**	**Source of data**	**Methods of data collection**	**Instruments used**	**ArcGIS tools**
Green Area	-Current condition of Public Parks. -Natural Green areas are mostly vegetation that grows on the site. -Overall network of green spaces.	- Field study of green space and its surrounding area.	-Site observation -Mapping -Taking pictures	-Observation -Checklist -Google Earth -Base map -Camera	AHP Excel Tool Feature to Raster Reclassify Weighted Overlay
Built up	-Freeway and pedestrian walkways provide access to green areas. -Environmental waste that is affecting the green areas in the site.	-Nortek map from A.A city. -Field study of green space. -Satellite photo of the site.	-Site observation -Extracting specific data from the Nortek map -Mapping -Taking pictures	-ArcGIS AutoCAD -Observation -Google Earth -Base map -Camera	AHP Excel Tool Feature to Raster Reclassify Weighted Overlay

Objective 2: To identify the sensitive points of open areas for urban acupuncture Intervention

Table3.3: identify the sensitive point 1

Categories	Data to be collected	Source of data	Methods of data collection	Instruments used	ArcGIS toos
Population density	- The population of the block.	-Documentation of population from the Lideta Sub-city wereda 7.	-Interview -Reviewing -Documents	-Questionnaire -Google Earth -Base map \ - Scanner	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Accessible public transport	- Main road access points and their connectivity to communal spaces.	-Nortek map from A.A city -Interview	-Site observation -Interview - Mapping -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay

Spatial Aspects

Table 3.4: Spatial Aspects 1

Categories	Data to be collected	Source of data	Methods of data collection	Instruments used	ArcGIS tools
Incorporate Heritage	Collect usage data, gather resident feedback, and assess the impact of the designated space.	-Nortek map from A.A city. -Site visit -Satellite photo of the site. -Primary data with the people that live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay

Multi-functional	Collect utilization data, gather community feedback, and measure impact on quality of life.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Access to green space	Collect proximity data, track usage patterns, and gather community perception.	-Nortek map from A.A city. -Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Open space	Collect open space data, assess activities, and analyze accessibility.	-Nortek map from A.A city. -Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Walkable	Assess footpath conditions, select suitable materials, and gather pedestrian feedback to improve walkability.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay

Socio-spatial aspects

Table 3.5: Socio-spatial aspects 1

Categories	Data to be collected	Source of data	Methods of data collection	Instruments used	ArcGIS tools
Livable	Collect data on built structure condition, smell evaluation, and noise levels to ensure living quality standards in communal spaces.	-Nortek map from A.A city. -Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Inclusive	Collect data on green frontage, elderly suitability, and accessibility to create inclusive communal spaces.	-Nortek map from A.A city. -Site visit -Satellite photo of the site. -Primary data with the people that live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Social activities	Collect data on space utilization, resident engagement, and social interactions to evaluate communal spaces.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay

		space.			
Collaboration with administration	Collect data on community gardening, biodiversity, and community feedback to enhance communal spaces and well-being.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Opportunity to educate the public	Collect data on program participation, knowledge assessment, and environmental impact for evaluating communal space maintenance programs.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay
Safety	Collect data on surface maintenance, drainage systems, and nighttime lighting for safer and improved communal spaces.	-Nortek map from A.A city. - Site visit -Satellite photo of the site. -Primary data with the people who live inside the communal space.	-Site observation - Mapping - Interview -Taking pictures	-Questionnaire -Voice recorder -Observation	- AHP Excel Tool - Feature to Raster - Reclassify -Weighted Overlay

To identify key parameters of urban acupuncture in green infrastructure development

Table 3.6 :To identify key parameters 1

Categories	Descriptions
Data Collection & Preparation	- **Primary Data:** To determine the factors that influence site selection, conduct interviews with professionals in urban planning. - **Secondary Data:** Use ArcGIS and Google Earth to collect spatial data, such as land use, vegetation, and the distance to roads and vacant areas. - **Tools**: Use spatial software like GIS for visualization and mapping.
Variable Identification	There are three main categories: - **Spaces**: surfaces, focal points, size, and spatial identity. - **Environmental:** Location linkage, eco-friendly features, and shade. - **Social:** facilities, safety, inclusivity, and accessibility.
Variable Quantification	- Establish metrics for every variable, such as size in square meters and accessibility through access points. - Employ standardized rating systems, such as the 1–5 rating system for environmental performance.
Coding Scheme Development	- Assign variables suitability ratings (S1–S5), where S1 denotes high suitability and S5 denotes unsuitability.
Data Coding & Spatial Mapping	- Use the coding scheme for field data, such as observational surveys and questionnaire answers. - Created thematic maps using ArcGIS by entering coded data (e.g., accessibility, environmental performance). - Use a color-coded scale (1–5) to visualize the various suitability levels.
Multi-Criteria Analysis (MCA)	- **Weighting:** Use the Analytical Hierarchy Process (AHP) to assign weights to criteria (for example, walkability = 15%, vegetation cover = 15%).

	- **Reclassification:** Standardize criteria maps into five classes by converting them to raster format. - **Weighted Overlay:** Prioritize locations for the development of green infrastructure by combining reclassified layers.
Site Prioritization & Decision-Making	- Create a composite suitability map that shows the best places to use acupuncture in cities.

Variable Quantification

Table 3.7 :Variable Quantification 1

Variable	**Metric**	**Method**
1. **Size**	Square meters	Measure the total area covered by green infrastructure development, encompassing parks, community spaces, and designated areas within the project site.
2. **Spatial Identity**	Number of functional zones	Determine which specific areas—such as green corridors, gathering places, recreational areas, and cultural zones—are included in the green infrastructure development.
3. **Environmental Performance**	Rating scale (e.g., 1-5)	Through the evaluation of energy efficiency, water management techniques, green technology use, and adherence to eco-friendly building materials, assess the infrastructure's sustainability and environmental impact.
4. User Accessibility	Number of access points	To assess user accessibility, count the number of entry and exit points in the green infrastructure development, such as walkways, gates, entrances, and connections to neighboring areas.
5. Safety Measures	Specific criteria evaluation	Examine the safety features included in the development, including the presence of security guards, emergency response systems, lighting, hazard signage, and general maintenance guidelines that guarantee user safety.

By quantifying these variables utilizing the specified metrics and methods, you can systematically measure and assess critical aspects of urban acupuncture in green infrastructure development within slum neighborhoods. This quantification process will furnish structured data for analysis and comparison, facilitating the evaluation of the project's effectiveness and impact.

Coding Scheme Development

Here is a potential coding scheme based on the variables and metrics outlined in the document: Specific to the communal space evaluation of Gollar Sefer.

The parameters of the evaluation of the communal space with in Golla Sefer

Table 3.8 : Coding Scheme Development 1

Variable	Metric	Coding Scheme
1. **Space**: -Multi-functionality -Incorporates heritage - Open Space Size	Number of functional zones and Square meters	**Highly suitable (S1)** This criterion highlights how well-designed parking lots, playgrounds, and common areas improve the neighborhood's well-being. To preserve cultural heritage and improve the general standard of living in the community, it emphasizes the significance of keeping heritage sites and small common areas in top condition.
		Suitable (S2): Well-developed communal spaces, playgrounds, and parking areas benefit the community. Maintained heritage spots and small communal spaces are also in good condition
		Moderate suitable (S3): Communal spaces, playgrounds, and parking areas need improvements for better support. Heritage spots and medium-sized communal spaces that are in fine condition.
		Poorly suitable (S4): Inadequate spaces lacking essential features like gardens, playgrounds, and parking areas. Heritage spots without support for heritage activities are unsuitable. Large public areas are also deemed unsuitable.
		Unsuitable (S5) This criterion centers on the lack or insufficiency of parking lots, playgrounds, and common areas—all of which are critical to the welfare of the community. The neglect or inadequate upkeep of heritage sites and small communal areas is also taken into account, suggesting a disregard for the preservation of cultural heritage and public recreation areas.
2. **Environmental Performance**: - Walkability - Livable well used - Collaboration with local administration	Rating scale (1-5)	**Highly suitable (S1)** This criterion emphasizes the value of public areas that prioritize walkability by maintaining well-kept walkways, and fostering pedestrian-friendly settings. It highlights the existence of green areas that contribute to the livelihoods and general well-being of locals. In order to promote community involvement and sustainable practices, it also values cooperation with local government, which includes giving materials and acknowledgment as well as teaching

- Opportunity to educate		about plant management and area maintenance.
		Suitable (S2): Community space emphasizes walkability with well-kept pathways, provides green areas that support locals' livelihoods, works with local government by donating resources and acknowledging them, and offers instruction on how to maintain plants and the area.
		Moderate suitable (S3): Although the walkways in public areas are in good shape, the walking materials could use some work. There are people with incomplete education who lack continuity, and there are some areas with noise and odor issues that need to be addressed.
		Poorly suitable (S4): Poor walkways and distracting walkway materials are problems in public areas that make it difficult for people to move around. Some places are devoid of basic infrastructure, which results in unpleasant noises and sanitary smells. Furthermore, some people in these settings are not getting the required awareness or education.
		Unsuitable (S5) This criterion draws attention to public areas that are unwalkable because of badly maintained walkways that make it difficult for people to move around. It also takes into account the lack of green areas that would otherwise improve the livelihoods and general well-being of the local population. Furthermore, it concentrates on community areas that do not interact with local government, failing to offer tools, acknowledgment, or educational programs for plant care and site maintenance, thereby restricting community engagement and sustainability initiatives.
3, Social - Accessibility - Inclusivity - Safety of the open space	Number of access points	**Highly suitable (S1)** This criterion highlights communal spaces that provide seamless access from main roads and convenient parking facilities for cars, enhancing accessibility. In order to foster inclusivity, it places a strong emphasis on connected walkways, well-kept green frontages, and accessibility for people with disabilities. It also emphasizes maintaining both hard and soft surfaces, providing sufficient lighting for night vision, and guaranteeing safety and utility protection in the common areas, all while fostering a friendly and useful atmosphere for all guests.
		Suitable (S2): Cars can park in communal areas that are easily accessible from major roads. In order to ensure utility protection, they have well-maintained green frontages, connected walkways, accessible areas for people with disabilities, nighttime visibility with sufficient lighting, and maintenance of both hard and soft surfaces.

		Moderate suitable (S3): Communal spaces near main roads face obstacles and lack utilities for car access. They need maintenance for improved comfort for elderly and disabled individuals, upkeep for surfaces, better night lighting, and utility enhancements.
		Poorly suitable (S4): Communal spaces isolated from roads or cars exhibit poor conditions, discomfort, deteriorating surfaces, inadequate lighting, and damaged drainage systems needing significant improvements.
		Unsuitable (S5) This criterion focuses on public areas that are difficult to get to from major thoroughfares and do not accommodate cars, which causes inconvenience for guests. It takes into account neglected green frontages, poorly connected walkways, and restricted accessibility for people with disabilities, which leads to exclusion. Insufficient illumination and poor maintenance of both hard and soft surfaces result in poor night vision, which endangers people's safety and jeopardizes utility protection in public areas.

The parameters of the evaluation of the Golla Sefer context

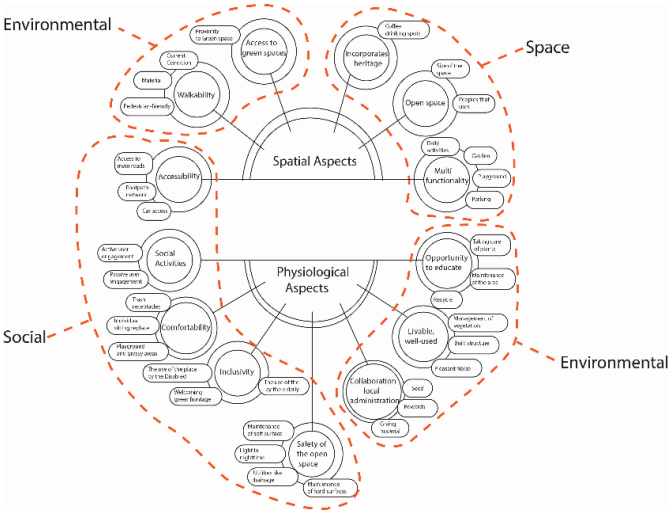
Table 3.9: Evaluation of Golla Sefer 1

Criteria	Sub-criteria	Score	Factor suitability rating	Percent of importance	ArcGIS tools
Flooding risk	Very Good Good Fine Poor Very poor	1 2 3 4 5	Highly suitable Suitable Moderate suitable Poorly suitable Unsuitable	10%	-Fill (Hydrology Toolset) -Flow Direction -Flow Accumulation -Slope -Raster Calculator -Reclassify -Weighted Overlay
Proximity of vacant spaces	0-5 5-10 15-20 20-25 25 and greater	1 2 3 4 5	Highly suitable Suitable Moderate suitable Poorly suitable Unsuitable	10%	-Reclassify -Dissolve - Buffer

Stream	0-15 15-25 25-35 35-45 45 and greater	5 4 3 2 1	Unsuitable Poorly suitable Moderate suitable Suitable Highly suitable	10%	-Fill -Flow Direction -Flow Accumulation -Raster Calculator -Stream Order -Stream to Feature -Reclassify
Walkability	0-5 5-10 15-20 20-25 25 and greater	1 2 3 4 5	Highly suitable Suitable Moderate suitable Poorly suitable Unsuitable	15%	-Raster to Polygon -Dissolve - Buffer -Reclassify
Road type	Collector Local Narrow Local Foot Path	1 2 4 5	Highly suitable Suitable Poorly suitable Unsuitable	5%	-Fill - Flow Direction -Reclassify
Land Use	-Manufacturing, Storage, and Road network -Commercial -Administration, Health and Transport Terminal -Education, Mixed Residential -Green, Open Space, Recreation, Religious Institution, Residential, and River.	5 4 3 2 1	Unsuitable Poorly suitable Moderate suitable Suitable Highly suitable	15%	-Add Field -Symbology (Categorized) -Reclassify
Vegetation cover	- High Vegetation Cover - Medium Vegetation Cover - Low Vegetation Cover	1 3 5	Highly suitable Moderate suitable Unsuitable	15%	-NDVI Calculation -Reclassify -Raster to Polygon -Dissolve -Add Field -Calculate Geometry -Intersect -Field Calculator -Symbology

Data Coding

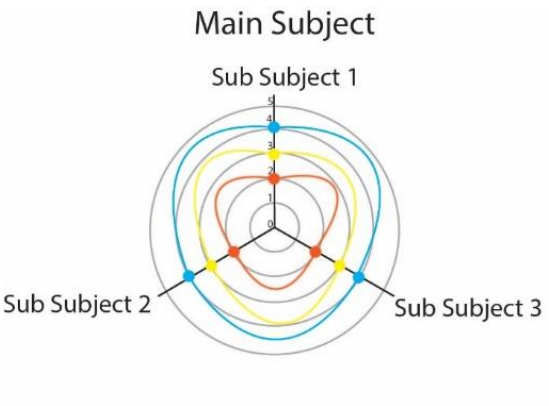
Selecting the sensitive spots



The selection of vulnerable areas depends on the regeneration type. The graphic highlights two aspects: spatial, focusing on area occupation and activity impact, and physiological.

The analysis uses on-site questionnaire data to assess residents' responses and understand Golla Sefer's environmental conditions.

Figure 4.1 : Urban Acupuncture Diagram 1



The image shows a survey rating system evaluating inhabitants' responses and the common area, with subcategories scored from 0 (very poor) to 5 (very good).

Figure 4.2. Rating Technique 1

Data Coding A scale of 1 to 5, where 1 represents high suitability and 5 represents unsuitability, was used to evaluate the common areas in Golla Sefer. Numerous factors, such as multifunctionality, heritage incorporation, open space size, walkability, livability, cooperation with local government, educational opportunities, accessibility, inclusivity, and safety of the spaces, were evaluated using the coding.

Spatial Mapping. The coded data were input into the ArcGIS software to perform spatial analysis. Each coded dimension was spatially linked to communal spaces, creating distinct thematic maps for each aspect. A color-coded scheme (1–5) was used to visually represent the suitability levels, enabling a clear interpretation of spatial patterns. These maps provide an integrated visualization of the strengths and weaknesses across the different evaluated dimensions, aiding in identifying priority areas for intervention.

Weighting and Overlay (Multi-Criteria Analysis)

Selecting urban green spaces involves evaluating sustainability factors like multifunctionality, heritage integration, walkability, livability, accessibility, inclusivity, safety, and local government cooperation. The assessment uses a Weighing and Overlay technique, assigning weighted values to reclassified layers based on their importance in determining flood susceptibility, ensuring a balanced evaluation.

The data is standardized by converting criterion maps to raster format, reclassifying into five classes (1–5), and using linear scale transformation for consistency. The Analytical Hierarchy Process (AHP), a methodical approach to decision-making, is used to estimate weight. In order to assign precise weights to the criteria maps using a three-step AHP process, pairwise comparisons are conducted to ascertain the relative importance of each factor.

Weighted Overlay Analysis (WOA), a weighted overlay technique, is used to analyze standardized criteria maps as part of the site selection process. The weighted results of this analysis method are used to identify and rank suitable locations for urban green spaces, ensuring that the selection process is impartial, data-driven, and aligned with the intended urban planning objectives. Assessment criteria evaluate flooding risk, visibility, streams, vacant spaces, slope, walkability, roads, land use, and vegetation, with weighted suitability scores for informed decision-making.

Multi-criteria Analysis Reclassified layers are superimposed using a weighted overlay technique as part of the methodology. Each factor is given a weight according to how important

it is thought to be in determining flood susceptibility. The evaluation is standardized by converting maps to raster format, categorizing them into five classes (1–5) for uniform assessment, and applying linear scale transformation to ensure consistency.

The Analytical Hierarchy Process (AHP) helps prioritize criteria through pairwise comparisons and assigns weights for urban green space selection. These weights are applied in a Weighted Overlay Analysis using standardized maps, allowing for a data-driven, systematic, and sustainability-focused site selection process.

Sustainable cities and communities

Table 3.10. Sustainable cities 1

Goal 11: Sustainable cities and communities	- Target 11.2: Affordable and sustainable transport systems - Target 11.3: Inclusive and sustainable urbanization - Target 11.4: Protect the world's cultural and natural heritage - Target 11.5: Reduce the adverse effects of natural disasters - Target 11.6: Reducing adverse environmental impacts in cities through improved air and waste management.

3.7. Method of Data Analysis

The study utilized various data analysis techniques to ensure reliable and comprehensive results. **Spatial analysis** was conducted using slope analysis, vegetation mapping, and ArcGIS overlay techniques to assess geographic and environmental factors. **Multi-criteria analysis**, including the Analytical Hierarchy Process (AHP) and Weighted Overlay, was applied to evaluate the suitability of intervention locations. **Qualitative analysis** involved thematic coding of interview responses, focusing on key themes such as heritage, safety, and inclusivity. **Triangulation** was employed to enhance reliability by cross-verifying findings from observations, interviews, and

literature. **Quantitative analysis** included statistical quantification of variables such as accessibility metrics and population density. A **5-point rating system** was used to standardize the assessment of intervention locations. Finally, **mixed-methods integration** combined spatial maps with coded social data to generate a well-rounded and insightful analysis of the study's findings.

3.8. Validity and Reliability

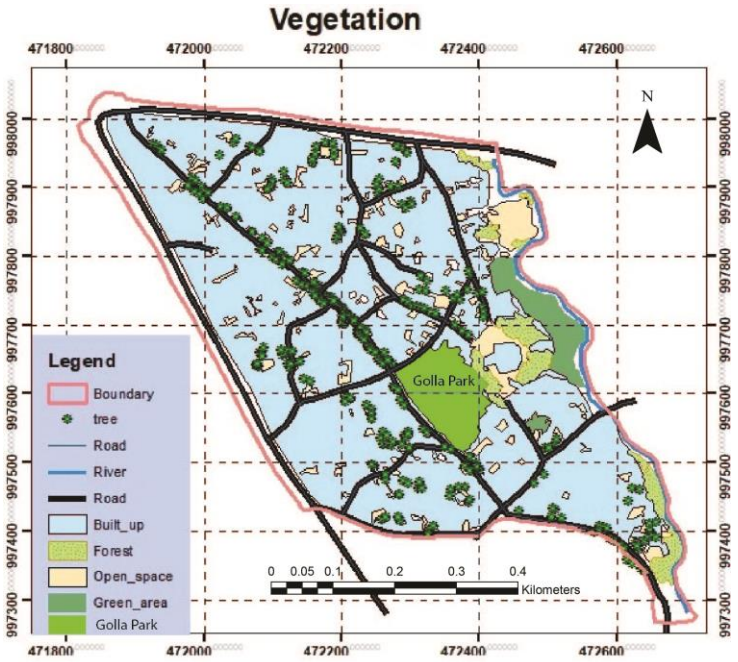
The study ensured **validity** by employing triangulation, which involved cross-verifying data from multiple sources, including interviews, observations, and literature. Participatory validation was also conducted through stakeholder workshops to ensure the findings were relevant and aligned with community needs. To guarantee **reliability**, standardized tools such as GIS software, the Yamane formula, and the Analytical Hierarchy Process (AHP) were consistently utilized. Additionally, systematic protocols, including structured observation checklists and coding schemes, were followed to maintain accuracy and consistency throughout the research process.

CHAPTER 4. RESULTS AND DISCUSSION

4.1. The Spatial Status of Green Infrastructure in Golla Sefer

4.1.1. Green spaces in relation to Golla Sefer

The major goal of these assessments is to the value of the existing green spaces, particularly in connection with the common space that provides benefits to the populace, and to determine the situation as it stands.



Green infrastructure in the slum areas is scattered and lacks connectivity. Some trees are planted along **Golla Sefer**, but inner streets have little greenery and poor maintenance. Community efforts have created small green spaces using recycled materials, but overall accessibility remains limited. Strengthening green corridors and improving tree care would help.

Figure 4.1. Vegetation Map 1

Numerous efforts are being made to raise the status of public spaces like green areas in the Golla sefer in the form of a safety net program initiative. The safety net program has coordinated the involved people from Golla Sefer. Based on the document taken from the wereda Local government, residents have worked together on several projects under this program since 2022 to improve small spaces.

This initiative has been carried out in a variety of locations, including street-side tree planting and the creation of small open areas. To investigate the current status of green spaces in Golla

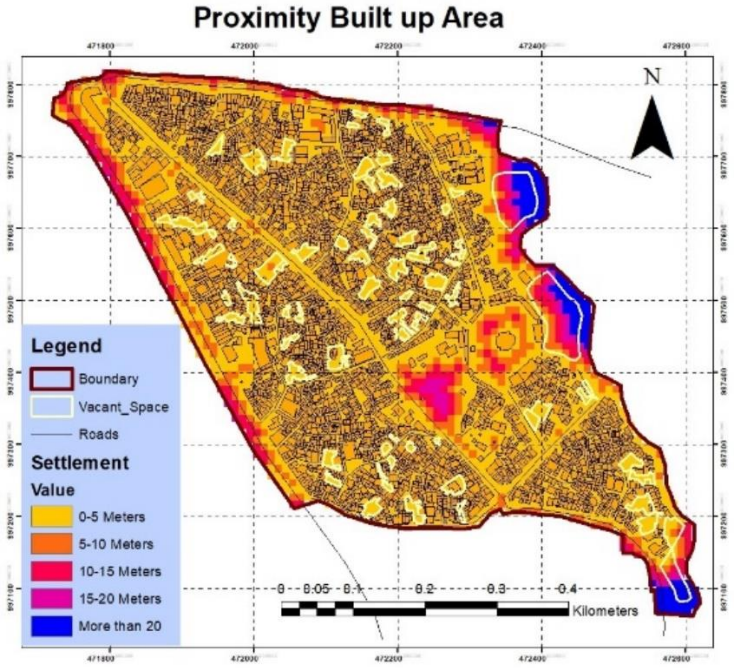
Sefer, the residents near the green areas were asked whether or not the green areas had continued maintenance. This helped to know whether any monitoring or maintenance, as part of the management, has been done after the project's completion at the places that were chosen for the program

4.1.2. Public Parks

The public park is located in the center of Golla Sefer. 30 % of the participants agreed that the residents use the park, while the rest thought that the park is not on the level of providing services to them. Currently, the park is under renovation and is not serving to its full potential. Different designs are incorporated for the public park to enhance a quality service that will potentially be provided to the residents who live in the area and around.

Figure 4.2. Golla Sefer Park 1

4.1.3. Built up



The Settlements - Open spaces proximity analysis was made to assess and select small open areas that may need interventions so that many people will benefit if they are properly managed. This assessment was based on the distance of the open areas to the built-up spaces.

Figure 4.3. Proximity Built up 1

The "Proximity Built-up Area" map analyzes the spatial relationship between open or vacant spaces and adjacent residential areas within a defined region. It employs a color-coded gradient to visually represent varying distances from built-up zones, ranging from the closest proximity (0-5 meters) to the farthest (over 20 meters), with a legend explicitly defining these distance categories.

The map also depicts contextual features such as roads and boundaries. Its primary purpose is to identify and prioritize small open spaces situated very near populated areas as potential sites for community-focused interventions; the underlying rationale is that the positive impact of managing or developing such spaces is significantly greater the closer they are to residents. This analysis serves as a strategic tool for targeting resources towards open spaces where improvements would yield the most immediate and substantial benefit to the surrounding community.

4.1.4. Land Use

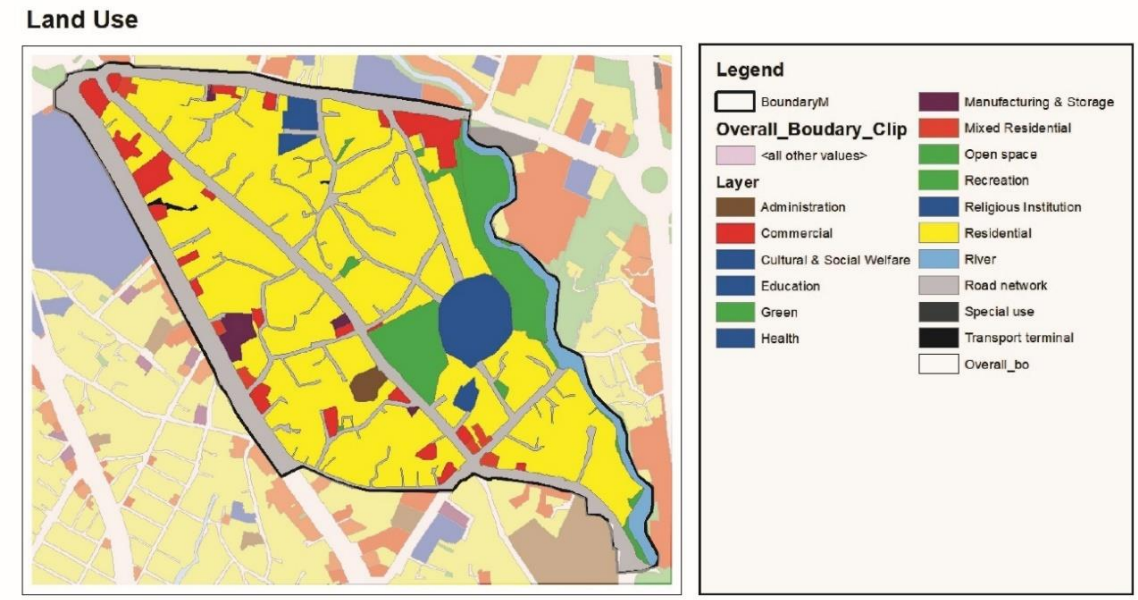


Figure 4.4. Land use 1

Table 4.1:Land use

Administration	**0.57%**
Commercial	**4.86%**
Education	**0.66%**
Green	**4.37%**
Health	**0.65%**
Manufacturing & Storage	**0.98%**
Mixed Residential	**0.79%**
Open space	**0.92%**
Recreation	**2.94%**
Religious Institution	**3.34%**
Pure Residential	**54.76%**
River	**3.23%**
Road network	**21.80%**

The land use map reveals that residential zones dominate Golla Sefer (54.76%), creating intense population density with severely limited communal spaces (green areas: 4.37%; open spaces: 0.92%; recreation: 2.94%). This imbalance directly informs the study's urban acupuncture objectives: it forces interventions to *maximize hyper-local opportunities* within residential clusters. Vacant or underutilized pockets become critical targets for inserting communal functions—such as pocket parks, playgrounds, or community gardens—that serve immediate residents.

4.2. The sensitive vacant spaces for urban acupuncture interventions

4.2.1. Suitable development center

The highest population densities are found in **Block 1 and Block 2**, suggesting **intensified land use and concentrated development**. Lower-density areas, such as **Block 4**, may have more open spaces or lower residential demand. These density patterns play a crucial role in **urban planning, infrastructure investment, and environmental sustainability**, enabling the creation of a well-balanced, livable city.

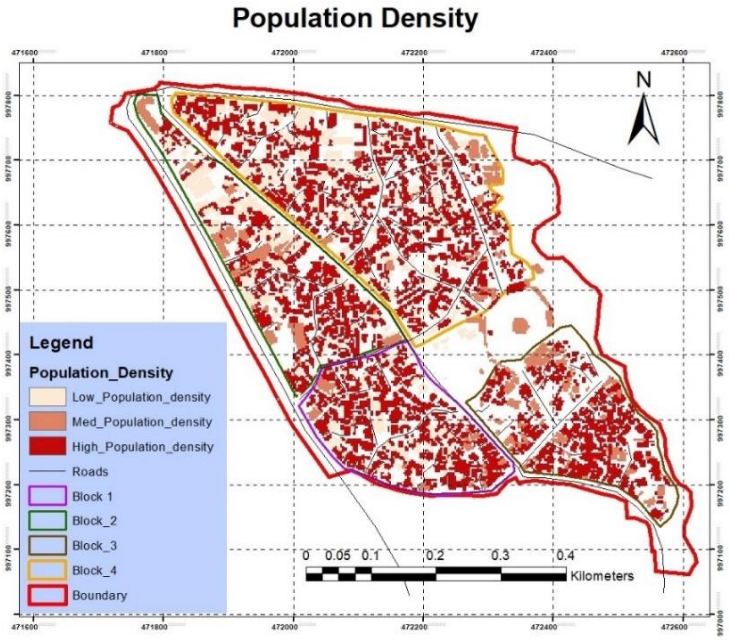


Figure 4.5. Population Density 1

Table 4.2. Population Percent 1

Density zone	Overall population	Overall Area	Population Density
Block 1	997	6.71 ha	236.8
Block 2	1,296	8 ha	235.6
Block 3	2,235	12.87 ha	215.5
Block 4	765	6.42 ha	195.15
Total	**6,290**	**34 Ha**	

4.2.2. Selecting an urban catalyst

The major catalysts identified are the streets of the area and access to public transport services, which are illustrated as follows:

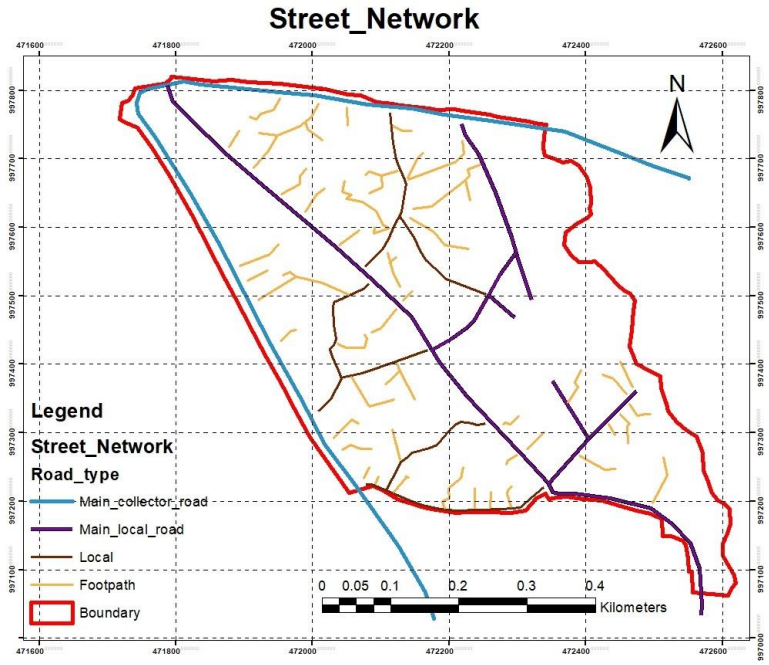


Figure 4.6. Street Network 1

The analysis of the condition and patterns of the road network of the study area, as shown on the map, indicates that collector roads that connect to the city's main roads are in good condition, making them highly suitable for the intervention. In contrast, the majority of local roads are narrow, dead ends, and in poor condition, making them a poor state for intervention. The footpaths are in extremely poor condition and are not well connected, making them unsuitable for the intervention. The above assessment was mainly done by observation of the site, with cross-checking on the standard stated in the methodology.

4.2.3. The sensitive spots

4.2.3.1. Accessibility within the communal space

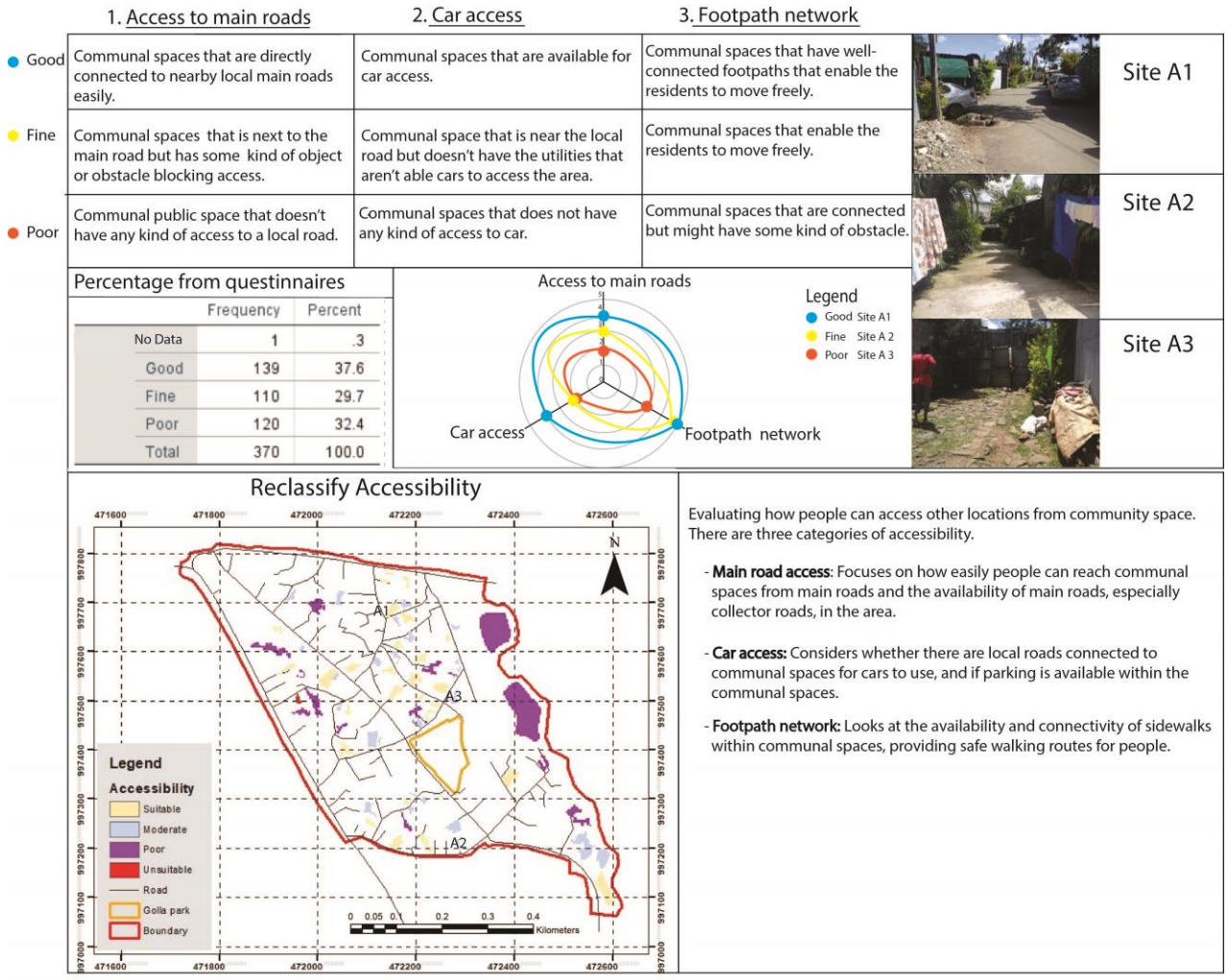


Figure 4.7. Accessibility of communal spaces 1

The figure illustrates accessibility in a public area, emphasizing the network of footpaths, main road access, and vehicle access. Yellow indicates good accessibility, light purple indicates fine accessibility, and dark purple indicates poor accessibility. Three sites (A1, A2, and A3) are compared across these categories in a radar chart. Responses to the questionnaire are summarized in Figure 4.9: Accessibility was rated as good by 37.6%, fair by 29.7%, and poor by 32.4%. It involves determining whether important roads are present. While the footpath network

evaluates sidewalk connectivity and accessibility for safe walking routes, car access takes into account the availability of local roads to reach communal areas. These assessments guarantee inclusive and simple access to common areas.

4.2.3.2. Walkability within the communal space

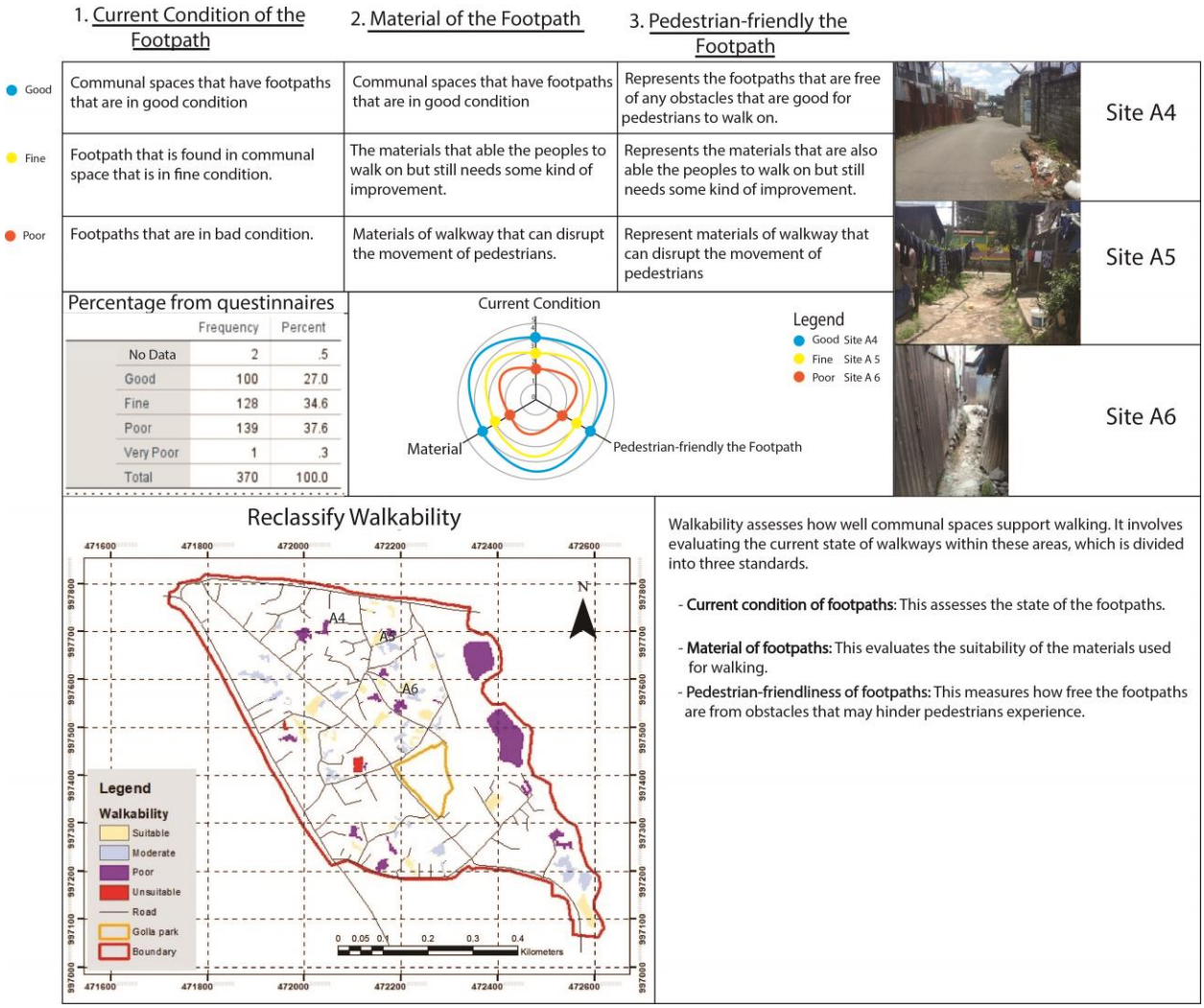


Figure 4.8 . Walkable communal space 1

The Figure illustrates how walkable public areas are, emphasizing the material, condition, and pedestrian-friendliness of walkways. Five categories Very Suitable, Suitable, Moderate, Less Suitable, and Not Suitable—are used to group areas. Three sites (A4, A5, and A6) are compared

across these categories in a radar chart. Responses to the questionnaire are summarized in Figure 4.10. Walkability was rated as fine by 34.6%, very poor by 23.2%, and poor by 37.6%. A walkable environment is defined by several elements that make it accessible and appealing to pedestrians. Clear signage, enough pedestrian crossings, well-maintained sidewalks, sufficient lighting, and cozy features like benches and rest areas are some examples of these elements. Enhancing the walking experience also requires smooth, well-paved walkways that are clear of hazards and impediments.

4.2.3.3. Heritage within the communal space

- Traditional ceremonial spots

The availability of common areas for customary activities that promote social interaction among residents is the main focus of this. Building strong ties between communities requires having spaces set aside for social events like coffee ceremonies and other traditional gatherings. This could be a separate outdoor communal space, a shared kitchen, or a comfortable nook, depending on the preferences and resources available.

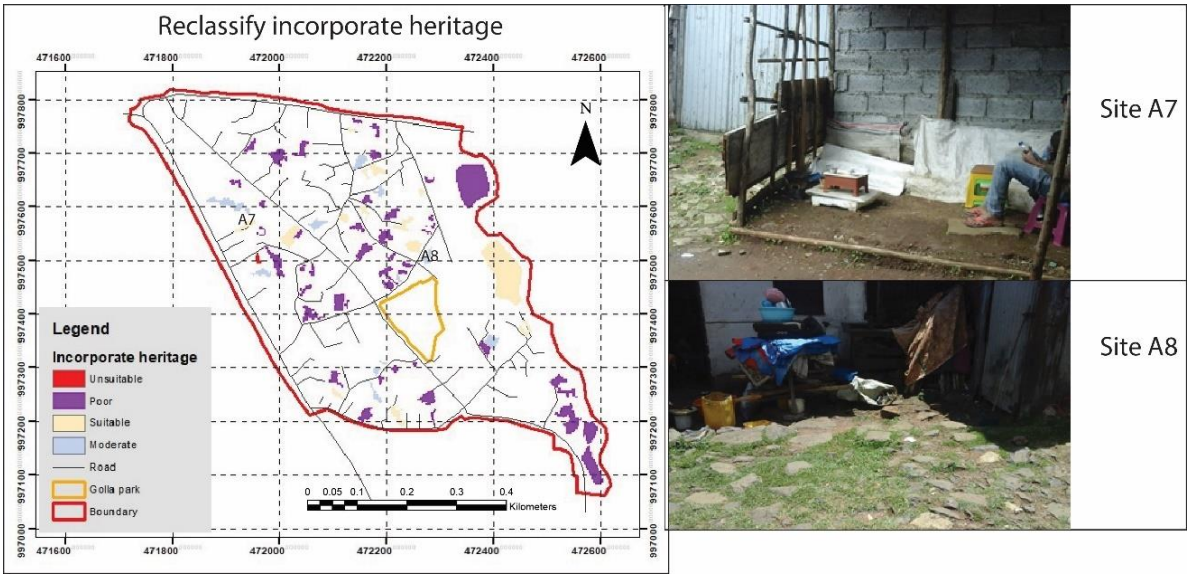


Figure 4.9. Incorporate Heritage 1

4.2.3.4. Access to green spaces

- Proximity to green spaces

In the It is crucial to think about the locations of common areas in relation to nearby green spaces and the connections between them when creating vibrant and sustainable community settings. As a result, the proximity to a green space examines how far the public area is from the nearest green spaces, like parks, gardens, or open spaces. To make life easier for residents

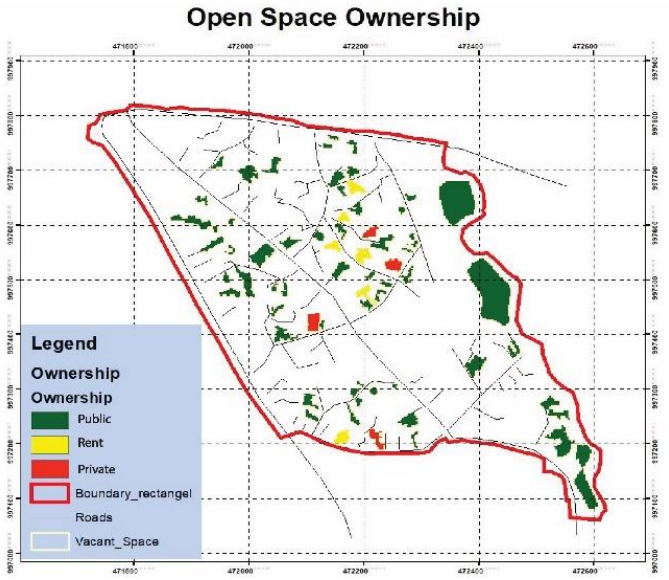


Figure 4.10. Open space ownership 1

4.2.3.5. Open space in the communal areas

In acupuncture interventions for communal areas, the analysis of open spaces is crucial. The size of the spaces is important to accommodate various activities and meet the demands of residents. The location of community spaces plays a significant role in attracting neighborhood participation and interaction. Ownership determines the accessibility of open spaces, with publicly owned areas considered good, shared spaces in rental compounds classified as fine, and open spaces within private homes rated as poor in terms of public use.

4.2.3.6. Multi-functionality within the communal space

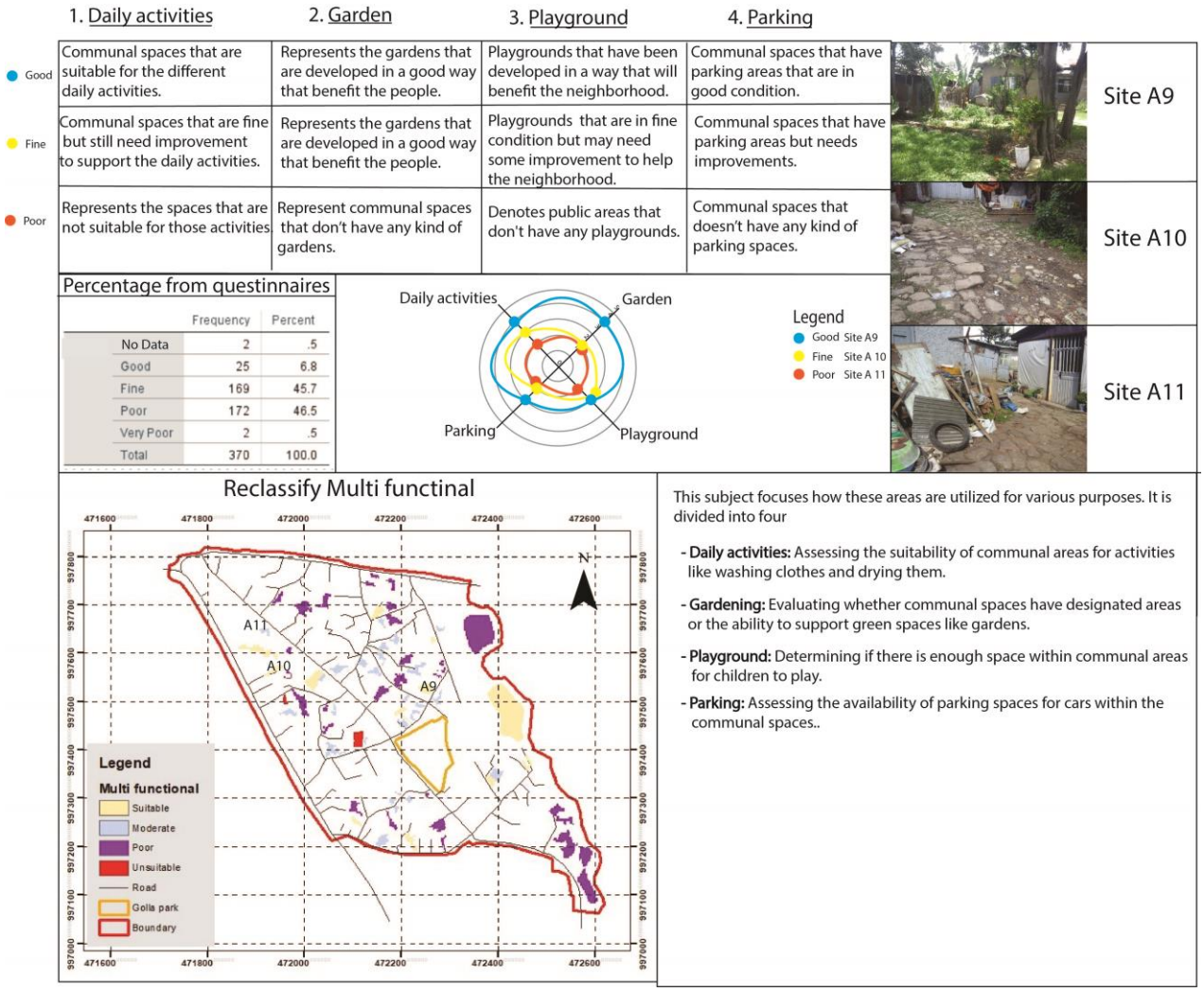


Figure 4.11. Multi-functional space 1

The land use classifications on the figure are suitable (yellow), fine (orange), poor (red), and no data (grey). The marked sites are A9, A10, and A11. The study focuses on parking, playgrounds, gardening, and daily activities. According to Figure 4.13, 20.5% of the areas were very poor, and 46.5% are poor. These features are contrasted for the three locations on a radar chart. Multipurpose common areas provide convenience, community interaction, and leisure opportunities for a variety of uses, including everyday activities, gardening, playgrounds, and parking. These areas improve people's quality of life and create a feeling of community by

providing features like green spaces, sports facilities, and seating areas.Golla Sefer's public areas accommodate a variety of uses, including both big, active events like weddings and funerals and more intimate, passive ones like neighborhood meetings. This flexibility promotes inclusivity and ties to the community.

Figure 4.11.1 Photo of multi-functional 1

4.3. Physiological Aspect

4.3.1. Inclusivity within the communal space

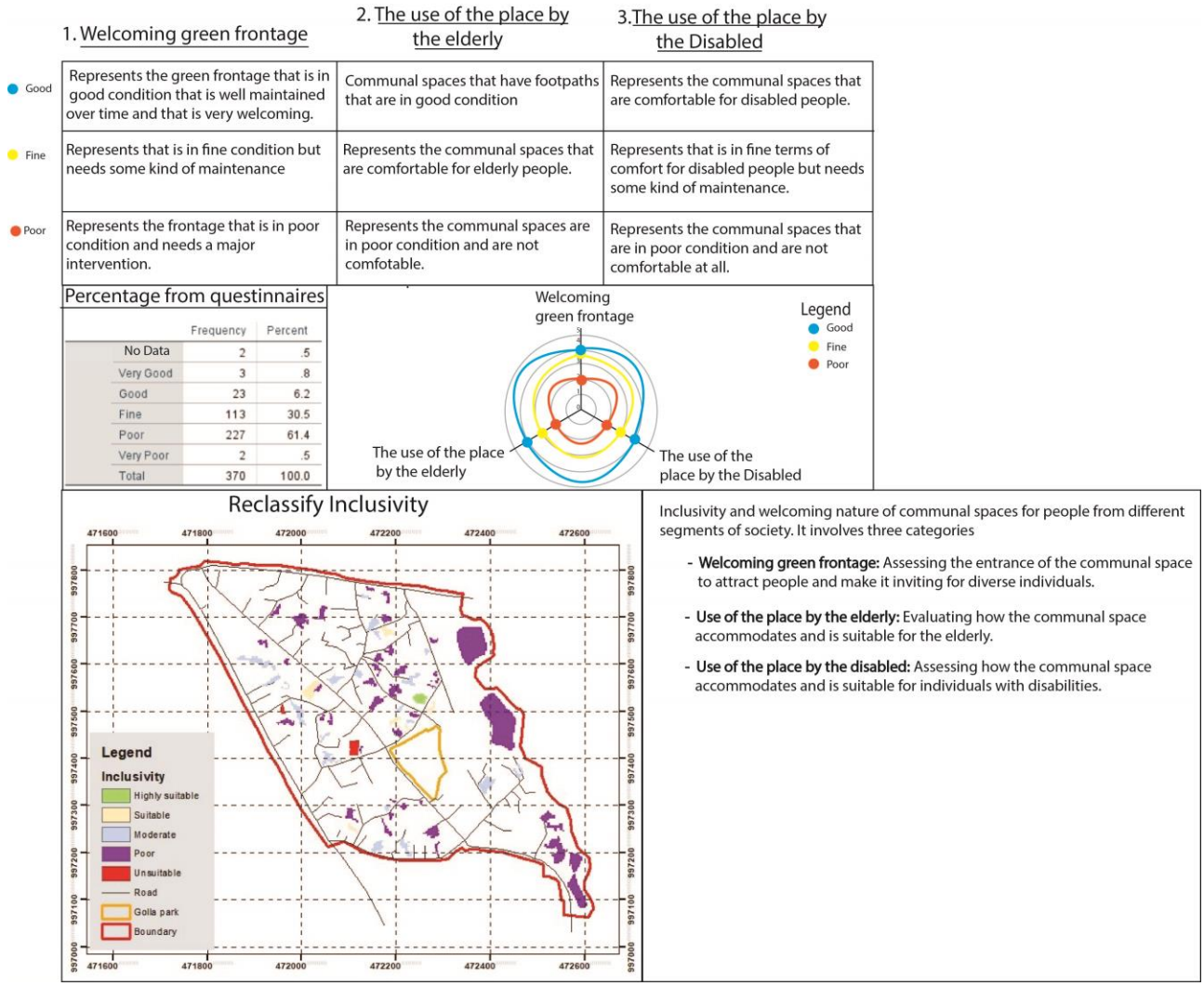


Figure 4.12 : Inclusivity 1

With an emphasis on welcoming green frontage that is utilized by the elderly and the disabled, the map demonstrates how inclusive public areas are for all societal groups. Color-coded areas are classified as moderate, highly suitable, and slightly suitable. The figure summarizes questionnaire responses, with 30% rating inclusivity as good, 33% as fine, and 20% as poor. A radar chart compares these categories for various sites. Three factors are considered: whether the area is suitable for the elderly, accommodates people with disabilities, and whether the

welcoming green frontage will draw a diverse range of people to the entrance. Common areas can be made more welcoming, inclusive, and pleasurable for everyone in the community by addressing these categories.

4.3.2. Opportunity to educate the public of Golla Sefer

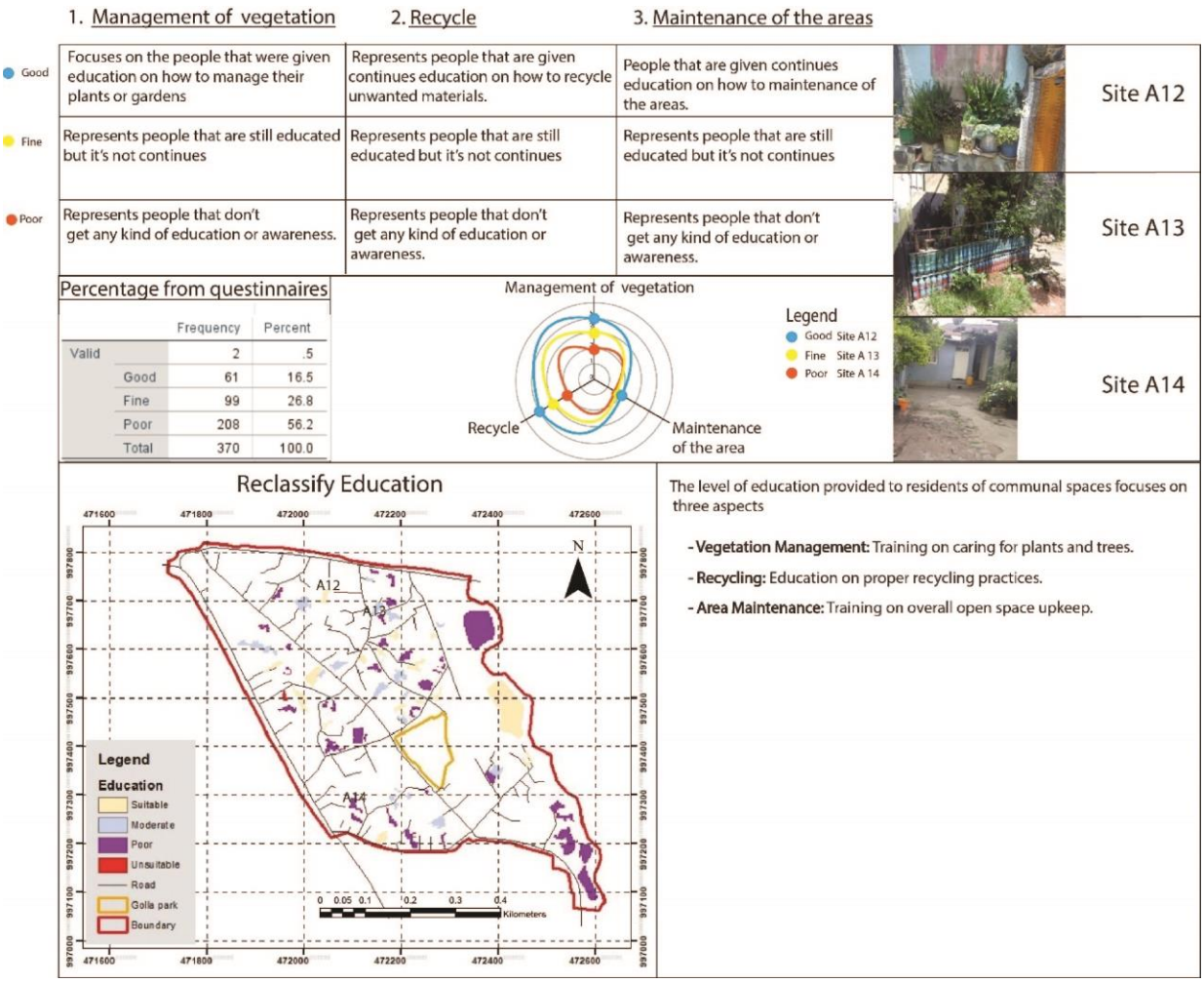


Figure 4.13. Opportunity to educate 1

Color-coded as Suitable, Moderate, Poor, Fair, and Good, the "Reclassify Education" map displays the educational attainment of a region. It has coordinates, a scale bar, and a north arrow. The picture emphasizes area maintenance, recycling, and vegetation management. According to a Figure summarizing questionnaire responses, 20% thought education was poor, 33% thought it

was fine, and 30% thought it was good. These features are shown on a radar chart for sites A12, A13, and A14. Residents are taught about communal spaces with an emphasis on area maintenance, recycling, and vegetation management. Residents gain knowledge and become responsible stewards of the common areas they live in as a result of this education.

4.3.3. Collaboration between local administration and the public

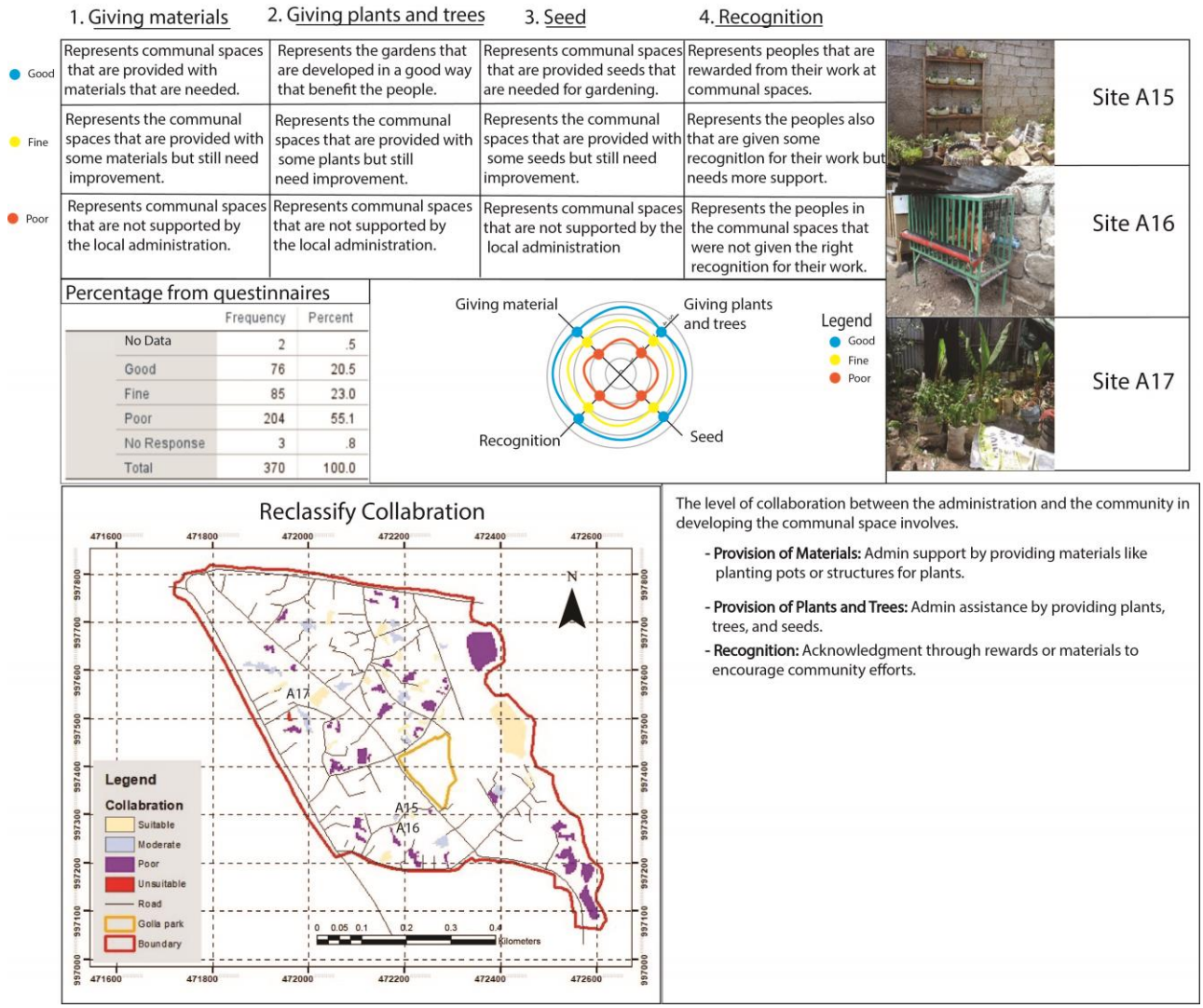


Figure 4.14. Collaboration local admin 1

The project assesses how well the community and administration work together to create common areas. Collaboration levels are indicated by color-coded regions and designated

locations (A15, A16, and A17). Giving materials, plants and trees, seeds, and recognition are all evaluated in the image. According to a table, 20% thought collaboration was poor, 33% thought it was fine, and 30% thought it was good. A radar chart illustrates these features for each of the three locations. By improving gardening initiatives, encouraging biodiversity, and supplying resources, plants, and recognition, the administration helps the community.

4.3.4. Livable quality within the communal space

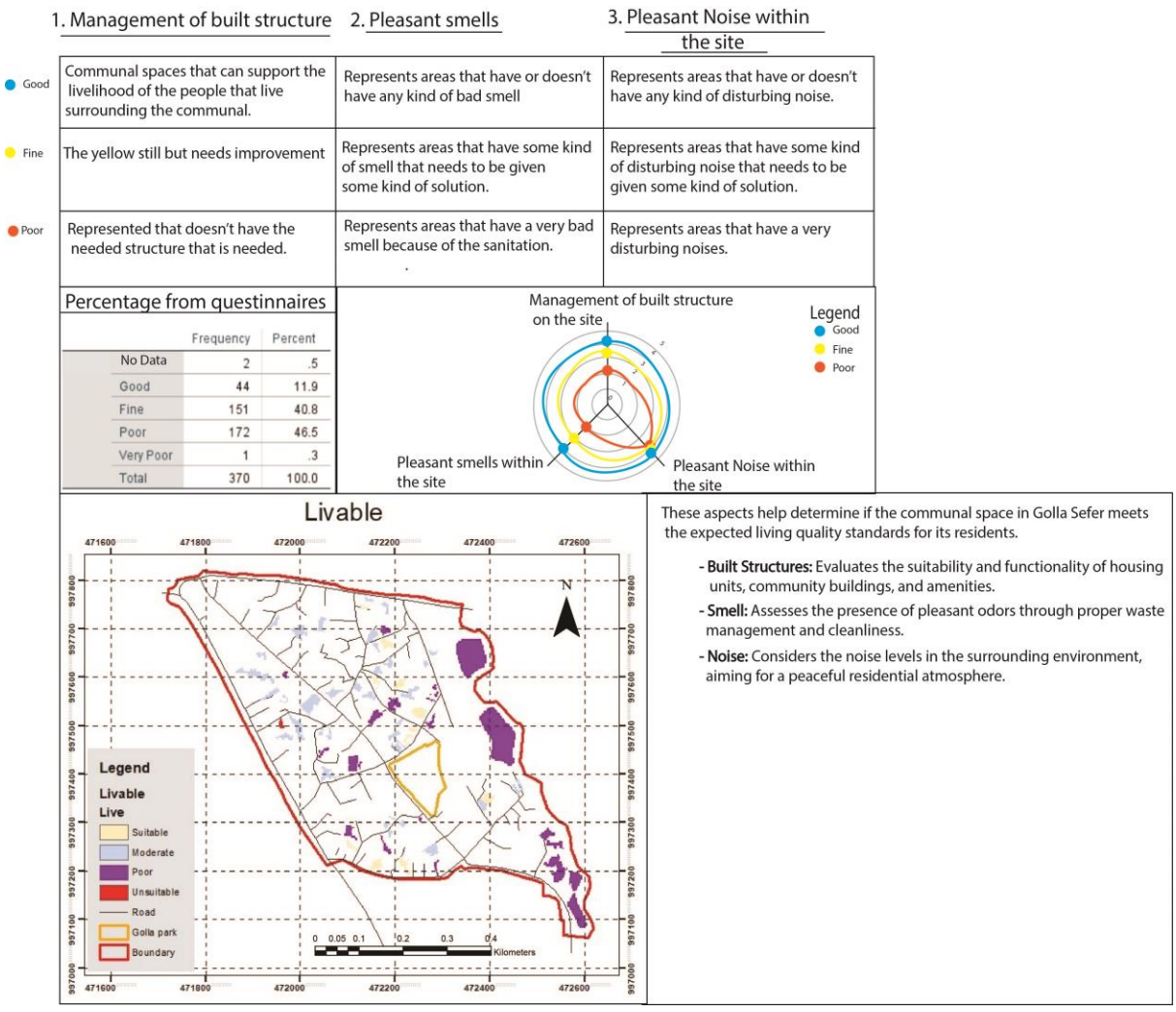


Figure 4.15. Livable quality 1

Golla Sefer's communal areas are livable, with an emphasis on well-maintained buildings, pleasant noises, and pleasant scents. Suitable (white), moderate (yellow), poor (purple), and very

poor (red) are the color-coded areas. A table compiles questionnaire answers, and a radar chart contrasts these features for various locations: Living conditions were rated as poor by 46.5%, fine by 40.8%, and good by 11.1%. Golla Sefer's built structures, noise levels, and odors are evaluated to see if the common area satisfies the residents' expectations for living quality. It evaluates the amenities and housing units' suitability and functionality, manages waste effectively to eliminate offensive odors, and takes noise levels into account to create a calm residential environment. By concentrating on these elements, the assessment guarantees that the common area offers inhabitants secure, cozy, and pleasurable living circumstances.

4.3.5. Safety within the communal space

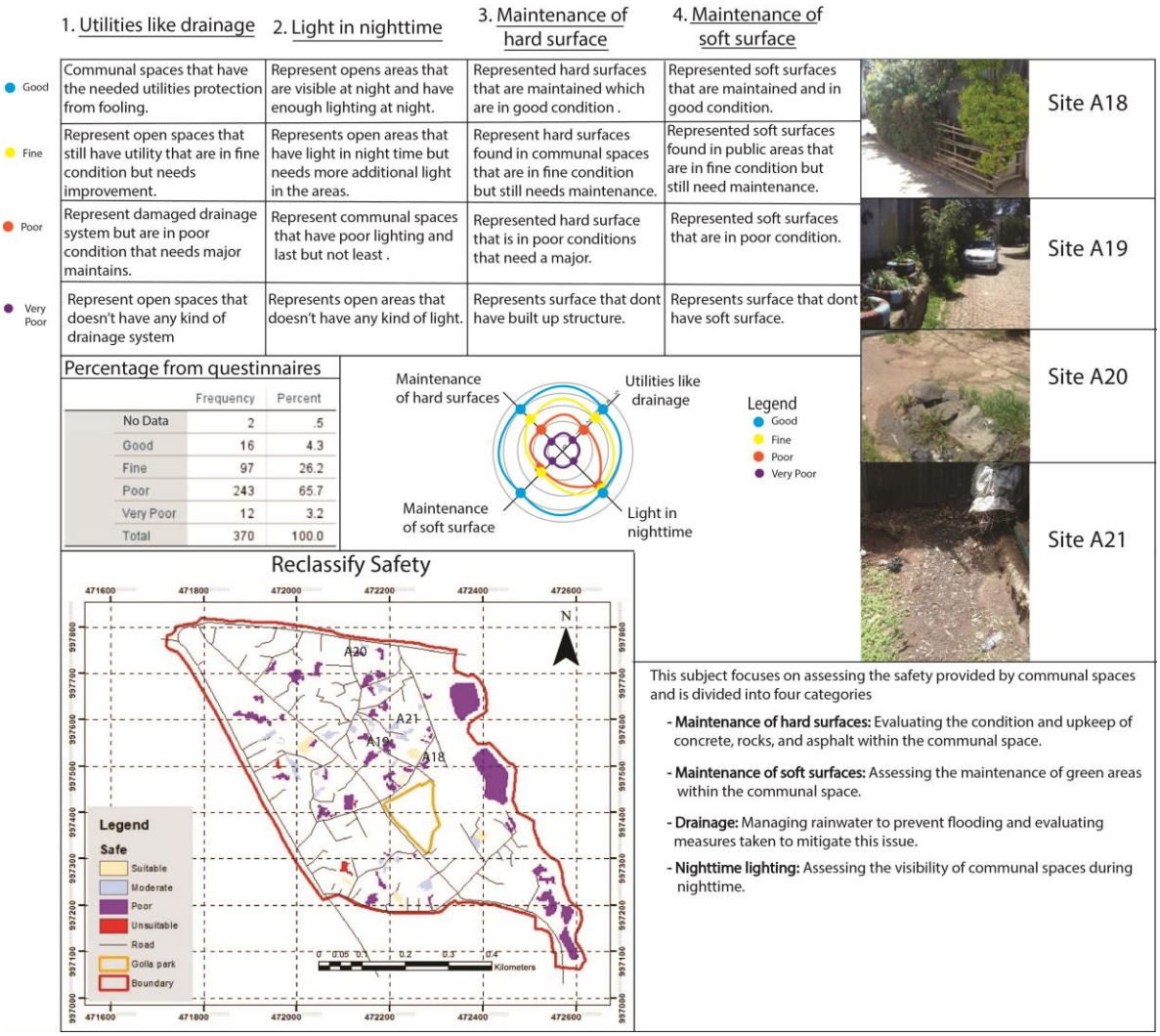


Figure 4.16. Safety 1

Drainage, nighttime lighting, hard surface maintenance, and soft surface maintenance are the four areas in which the image evaluates the safety of communal spaces. Four sites' photos, a chart displaying the results of the questionnaire, a radar chart visualizing the conditions, and a table with conditions rated from Good to Very Poor are all included. The spatial distribution of these conditions is displayed on a map called "Reclassify Safety."

In order to maintain safe conditions, safety primarily focuses on maintaining hard surfaces like asphalt and concrete. For a fun and risk-free experience, soft surfaces like lawns and green spaces must be maintained. Adequate nighttime lighting improves visibility and fosters a sense of security, while appropriate drainage systems are assessed to prevent flooding.

4.3.6. Criteria and sub-criteria for multi-criteria suitability analysis

All the above maps were mainly generated through a multi-criteria suitability analysis. A multi-layered, multi-criteria suitability analysis method was deployed to identify appropriate areas for the acupuncture intervention.

The layers included in the multi-criteria analysis are: Flooding risk assessment, Visibility, Proximity to vacant spaces, stream network analysis, Slope, Walkability, Road types, Land use, and vegetation cover. The suitability values of different factors were overlaid to identify the suitable areas that need urban acupuncture interventions:

Land use reclassification Land use map color-codes suitability: green (1) for education, residential, and green spaces; yellow (3) for administration/health; orange (4) for commercial; red (5) for manufacturing/storage. Rivers (blue) and communal areas are prioritized, contrasting with mixed-use and industrial zones.

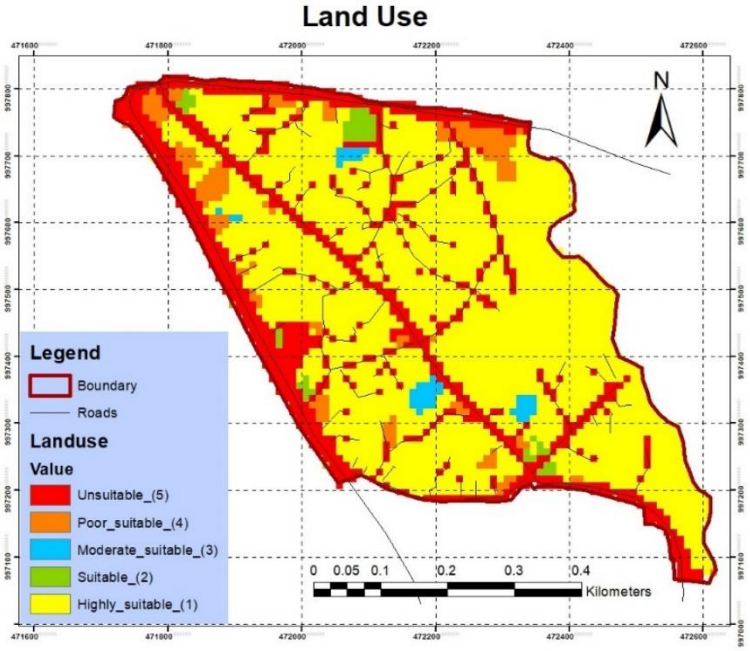


Figure 4.17. Reclassified Land use 1

4.3.6.1. Reclassified Land Use

Communal spaces are typically necessary for residential space because people need it for a variety of activities. As a result, the highest rating is given to them based on references from various types of literature, making them highly suitable. In contrast, mixed use and services are seen as suitable, while manufacturing or activities that are related to that are seen as unsuitable.

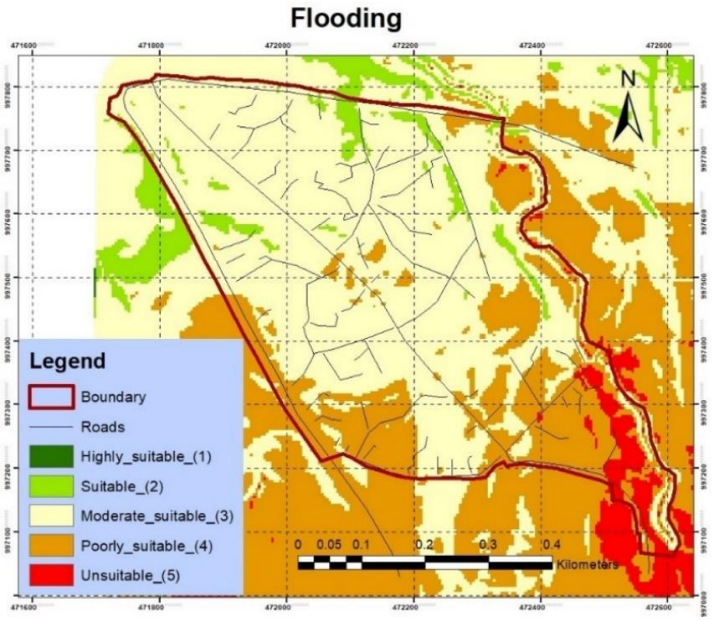


Figure 4.18. Reclassified Flooding 1

4.3.6.2. Reclassified flooding

The first factor is flood-prone area analysis. According to the analysis, communal spaces at danger of flooding are deemed unsuitable for acupuncture intervention, but the spaces with a medium or low risk of flooding are deemed moderate and suitable for acupuncture intervention. hectares (63.88%), Poorly Suitable areas span 7.24 hectares (22.49%), and Unsuitable areas.

account for 1.00 hectares (3.13%).

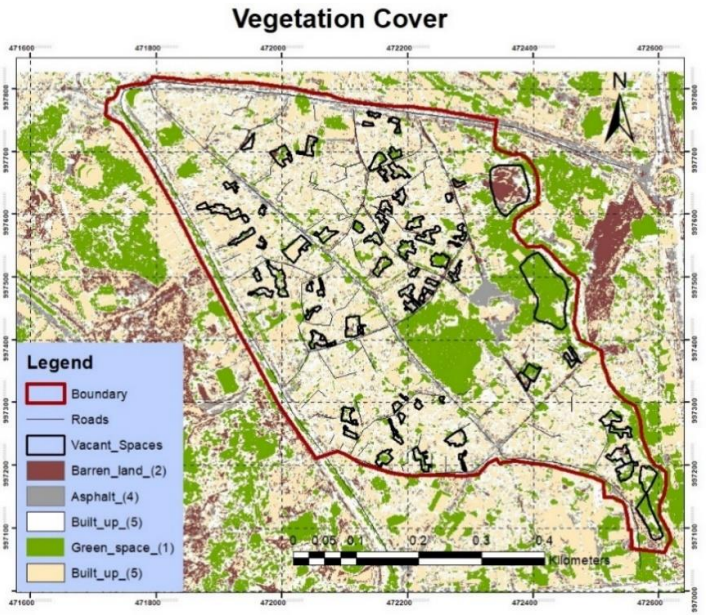


Figure 4.19. Reclassified Vegetation 1

4.3.6.3. Reclassified Vegetation

The third aspect to identify the areas for urban acupuncture intervention is vegetation mapping and the availability of roads. Areas with high vegetation cover are highly suitable for intervention, while medium and low vegetation cover are thought to be moderate and unsuitable, respectively. High-quality roads are prioritized for urban acupuncture and linked to communal spaces.

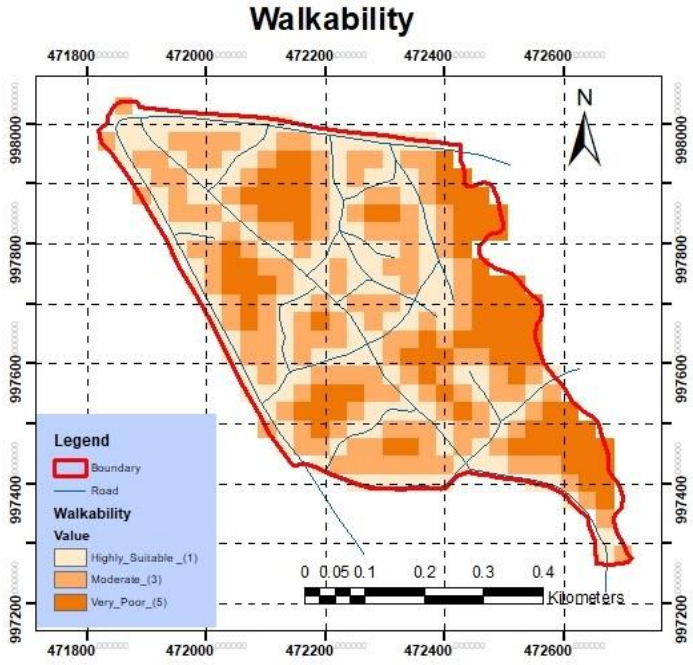


Figure 4.20. Reclassified Walkability 1

4.3.6.4. Reclassified Walkability

Walkability is also an important aspect of creating useable communal spaces. Local roadways that allow people to enter and exit common spaces and give the space a greater purpose are necessary for the intervention to be successful.

According to the analysis, a commonplace within 5 meters is highly suitable. it is usually called a walkable distance, while 10 and 15 meters are moderately suitable, and anything over that is regarded as poor and unsuitable. This map, titled "Walkability," depicts various levels of walkability within a specific area, using color-coded categories: Highly Suitable (41.18%, dark orange), Moderate (37.21%, light orange), and Very Poor (21.61%, yellow).

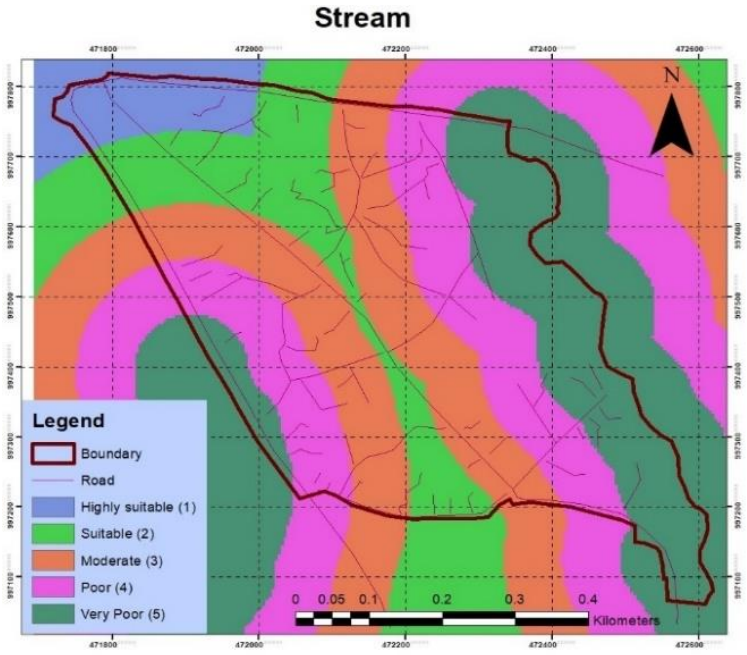


Figure 4.21. Reclassified Stream 1

4.3.6.5. Reclassified Stream

The image on the side shows the range of an area that are way from the surrounding river and stream that are suitable for development. Starting from the river and within in 15 meters of the surrounding area of the river, that area is unsuitable for any kind of development concerning communal spaces. While 15 to 25 meters of the areas is poorly suitable.

25 to 30 is moderately suitable and 35 to 40 is suitable for developing communal spaces that can give services for the residents of the area.This map, titled "Stream," illustrates the suitability levels for development around a stream using color-coded categories: highly suitable (green), suitable (orange), moderate (yellow), poor (pink), and very poor (purple). The suitability scores are: highly suitable - 2.08 (6.12%), suitable - 5.89 (17.36%), moderate - 8.92 (26.24%), poor - 8.32 (24.45%), and very poor - 7.67 (22.59%), covering a total area of 34 hectares.

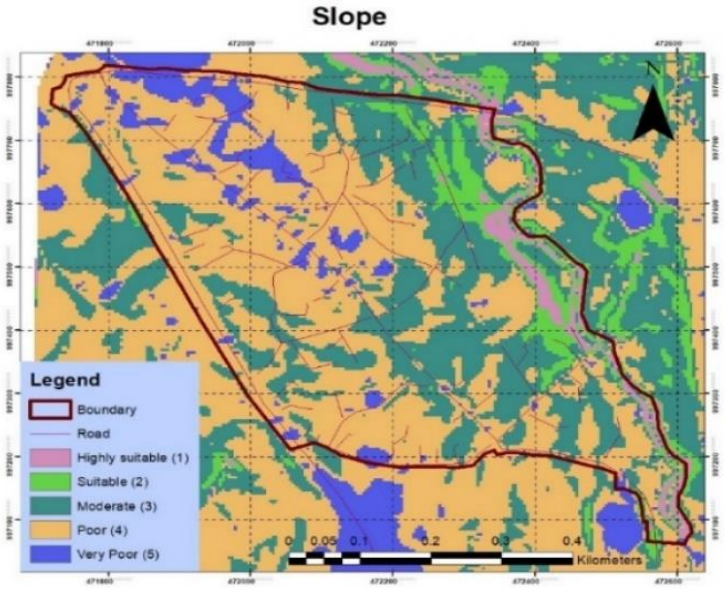


Figure 4.22. Reclassified Slope 1

4.3.6.6. Reclassified Slope

When it comes to reclassified slopes the areas that have an elevation between 0 to 5 are highly suitable while 5 to 10 percent of elevation is considered to be suitable and 15 to 20 percent of elevation is considered moderately suitable.while greater than 20% is considered to be poorly suitable and unsuitable.

This map, titled "Slope," illustrates different levels of slope suitability for development using color-coded categories: Highly Suitable (3.44 hectares, 10.12%), Suitable (3.21 hectares, 9.44%), Moderate (1.35 hectares, 3.98%), and Poor (3.56 hectares, 10.46%).

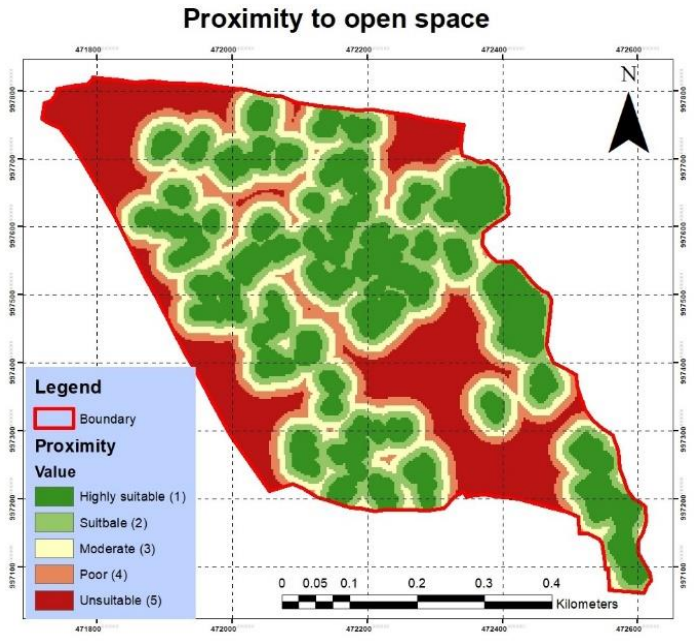


Figure 4.23. Reclassified Proximity 1

4.3.6.7. Reclassified Open space

This map shows the proximity of vacant areas reclassified this study to connect different communal spaces to develop a well-coordinated green infrastructure within the neighborhood. Communal spaces with a close proximity of 5 meters of each other are considered to be highly suitable, while within 10 meters.

It is considered suitable, and beyond that is considered moderate and poorly suitable. This map, titled "Proximity to Open Space," highlights the suitability levels for developing green infrastructure within a neighborhood. It uses a color-coded system to show different proximity values: Highly Suitable (1.13 hectares, 3.33%), Suitable (1.60 hectares, 4.70%), Moderate (9.66 hectares, 28.42%), Poor (19.39 hectares, 57.05%), and Very Poor (2.21 hectares, 6.49%).

4.3.7. Map of sensitive points of open areas for urban acupuncture intervention

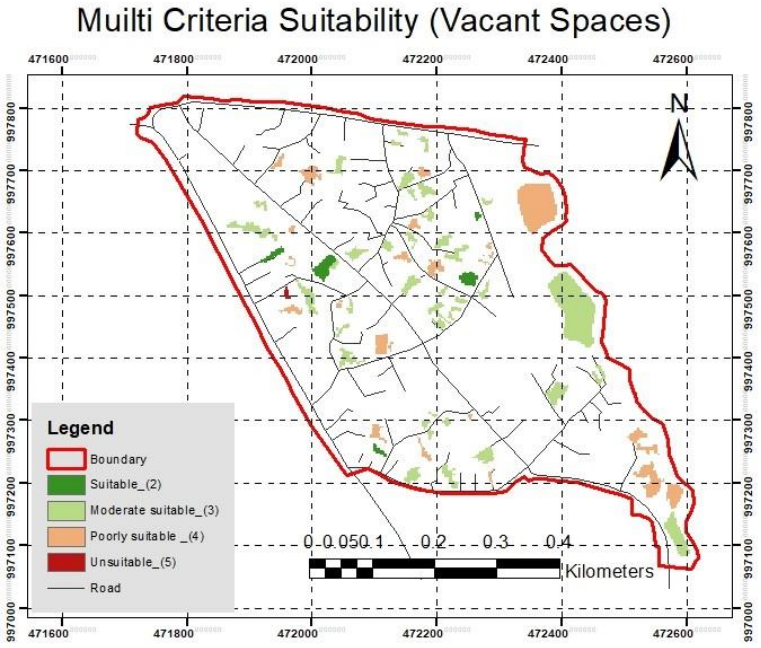
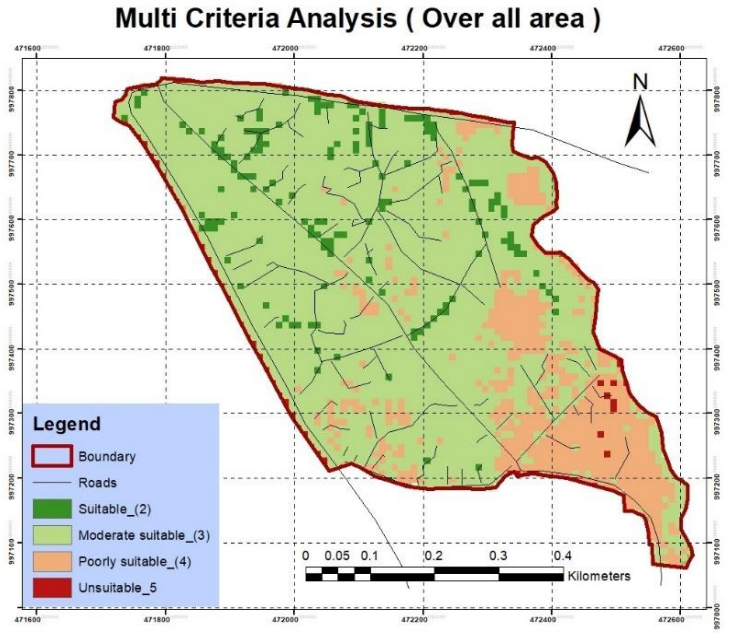


Figure 4.24. Multi . C (vacant space) 1

Multi-criteria suitability (MCS) analysis was used to generate the maps. Factors such as accessibility, walkability, availability of communal spaces, inclusivity, education, collaborative development, quality of built structures, and safety were considered. These evaluations ensure easy access, inclusive design, community engagement, and a safe and enjoyable environment in communal spaces.



A multi-criteria suitability (MCS) analysis was used to identify suitable areas for acupuncture intervention. Factors such as flooding risk, visibility, proximity to vacant spaces, vegetation cover, road quality, and slope were considered. Communal spaces were highly suitable, while flood-prone areas and poor visibility were unsuitable.

Figure 4.25. Multi . C (Over all area) 1

High vegetation cover and good road quality were deemed suitable. Proximity between communal spaces determined suitability.The map's numerical values indicate: Suitable - 1.2 hectares (3.71%), Moderate - 17.2 hectares (50.72%), Poor - 15.3 hectares (45.29%), and Unsuitable - 0.12 hectares (0.36%) out of a total area of 34 hectares.

4.4. DISCUSSION

The majority of green spaces are dispersed throughout the impoverished area. This demonstrates that the slum region lacks a structured or linked green infrastructure that may offer the local population essential amenities. (Nassar, 2021). Tree planting initiatives along Golla Sefer's main road show promise, but a comprehensive strategy is required. To accommodate a variety of activities and age groups, green spaces and public areas should take into account features, seating, lighting, vegetation, and accessibility (Stangel, 2023).

Regular tree planting efforts in Golla Sefer have been hindered by poor protection and maintenance, especially on the local inner streets. Evaluation, documentation, and resident involvement in recycling and water conservation are essential for an effective maintenance program. Efforts are needed to involve residents in practices like recycling and water conservation while implementing a comprehensive maintenance and management plan for the long-term sustainability of the green area (Sandström, 2006).

By recycling and repurposing materials, such as plastic bottles, for planting trees and flowers, the community contributes to improving the area's beauty while addressing environmental concerns. In exchange, the administration offers additional benefits, aiming for sustainable common areas and addressing garbage management. The main goal of this strategy is still to design green spaces and common areas using sustainable practices, such as water efficiency, renewable materials, green infrastructure integration, and ecologically friendly maintenance methods (Kibert, 2016).

Despite the lack of open space in the congested slum area, utilizing any available open space for the benefit of the community is crucial, especially considering its proximity to residential neighborhoods. However, the current reality often falls short of this ideal, as public spaces intended for the general public are limited. The literature on public areas and amenities highlights the value of thoughtfully designed public areas that improve residents' quality of life, well-being, health, and social interaction, such as parks, plazas, playgrounds, and community centers (Honiball, 2020).

The existing station near Golla Sefer in the area lacks design elements that promote social integration among the local population. While slum areas often develop organically, there are exceptions where social integration has been prioritized, resulting in communal spaces that benefit nearby neighbors. The literature on Social Integration emphasizes the importance of establishing areas that facilitate communication, teamwork, and a sense of identity within the built-up area to foster a lively and welcoming community and facilitate relationships between residents, businesses, and institutions (Nassar, 2021).

In a densely populated neighborhood with limited open spaces, utilizing available areas through the practice of urban acupuncture becomes crucial to benefit the community. However, progress in this regard has been slow, despite efforts to involve the public in discussions considering local social and environmental factors. The literature on Contextual Sensitivity emphasizes the importance of designing the built-up area with consideration for the community's cultural, sociological, and environmental characteristics. It should reflect the unique character of the neighborhood or district and seamlessly integrate with the existing built environment (Abul Abdullah, 2016).

Residents and their common areas may be greatly impacted by interventions in these neighborhoods, such as urban acupuncture. Engaging the public and putting resource-efficient and waste-management strategies into practice are essential steps in the pursuit of sustainability. Reducing environmental impacts and improving resource efficiency in the built-up area can be achieved by implementing energy-efficient systems, water-saving strategies, waste management plans, green building practices, and renewable energy sources, according to the literature on sustainable infrastructure.

Interventions in impoverished, densely populated neighborhoods can provide access and benefits to the community, making urban acupuncture suitable for such areas. The economically active and lively population of Golla Sefer has the potential to contribute to significant neighborhood-wide effects. The book on Density of Population emphasizes that development centers should be located in areas with sufficient population density to foster community involvement and economic activity, enabling dynamic and sustainable development (Nassar, 2021).

Consideration of population density is vital in urban planning, with resource allocation tailored to high-density and low-density areas. Mixed land uses and essential services enhance the quality of life, fostering a vibrant environment and attracting visitors (Li, 2023).

Context-specific design strategies are necessary due to varying densities in the city, as a one-size-fits-all approach would not be suitable. Customized resource allocation based on land value, employment prospects, and resident attraction can optimize development. The literature on Sustainability emphasizes prioritizing sustainable practices such as waste minimization, renewable energy, green infrastructure, energy-efficient buildings, and climate adaptation plans in development centers (Leone, F., Hasan, A, 2023). Thoughtfully planned public spaces like parks, plazas, and squares foster leisure activities, social interaction, community events, and a sense of community and belonging (Nassar, 2021).

Assessing accessibility comprehensively reveals the current state of walkways and roadways in public areas. Identifying areas for improvement is crucial to ensure simple and inclusive access, considering main road access, automobile access, and pedestrian networks. Accessing public areas in Golla Sefer is difficult because of blocked or inadequate local roads. For fair access, the literature on accessible design places a strong emphasis on barrier-free walkways, wheelchair-accessible facilities, and inclusive architectural features (Wagle, 2020). Based on universal design principles, accessible space design should include features like appropriate signage, accessible walkways, and equitable access to facilities to accommodate all users, regardless of age, size, or ability (Bordas Eddy, 2017).

Improving collector road connectivity and main road access close to public areas can make movement easier and promote increased use of common areas. Improving car access requires having well-constructed neighborhood roads and enough parking spaces. Accessing public areas in Golla Sefer is made more difficult by the strain on the main local road, which doubles as a collector road, and its poor upkeep. The significance of unique landmarks, public artwork, and thoughtfully designed public spaces in enhancing the neighborhood's identity and overall character is emphasized in literature on creating a sense of place (Chao, 2022) . Investing in footpath networks is crucial for safe and accessible walking pathways in Golla Sefer. Existing

pathways need improvement to meet requirements while incorporating universal design principles for better communal spaces (Null, 2013). Continual improvement through evaluations, feedback loops, and upgrades is essential to meet changing accessibility standard (De Lange, M. and De Waal, M, 2019.).

A pedestrian-friendly environment must have well-designed and maintained walkways, pedestrian crossings, conspicuous signage, suitable lighting, and cozy amenities (Figliozzi, 2014). A dedicated pedestrian walkway on the main road, comfortable walking surfaces on inner local roads, and prominent signage, maps, seating, public art, and interactive elements to improve the walking experience are all necessary improvements for Golla Sefer (Gibson, 2009). Stakeholders, transportation authorities, and urban planners must work together to upgrade infrastructure and implement safety measures like pedestrian crossings, better sidewalks, and sufficient lighting (World Health Organization, 2023).

While pedestrian-friendly design prioritizes safety, comfort, and convenience through accessible crossings, well-maintained sidewalks, and adequate lighting, walkable urban areas rank connectivity first with direct pathways and clear navigation (Cervero, R. and Guerra, E, 2017).

Golla Sefer's placement of public areas adjacent to green spaces encourages sustainable living and easy access to the outdoors. According to the literature on distance, residential areas and green spaces should be ten to fifteen minutes away on foot or by bicycle (El-Husseiny, M. and Seyam, S, 2023).In order to fit more people into a smaller amount of physical space, high-density urban areas might need smaller, more frequent green spaces. (Nassar, 2021).

Preserving and maintaining existing green spaces is crucial to ensure ongoing accessibility and benefits for the community. In Golla Sefer, efforts have been made to protect certain regions near rivers, with buffer zones to separate development areas. Agricultural areas near the river rely on it as a water source. When assessing proximity to green spaces, it's important to consider physical barriers like busy roads or natural obstructions and take steps to reduce or remove them, such as building underpasses or pedestrian bridges (Narandžić, T. and Ljubojević, M, 2022) .

Multifunction communal spaces in Golla Sefer improve community well-being by accommodating gardening, playgrounds, parking, and diverse activities. Designated spaces and issue resolution are needed, emphasizing flexibility, and compatibility, and fostering social interaction for community cohesion.(Papazoglou, M.P. and Van Den Heuvel, W.J., 2006) .

Multifunctional communal areas make the most of the limited amount of urban space by means of effective design, planning, and shared amenities (Keijzer, 2021). Participation from the community guarantees that spaces satisfy local needs and promote a sense of ownership. The longevity and environmental advantages of common areas are increased through effective management, sustainable practices, and community-led projects (Ling, T.Y. and Chiang, Y.C., 2018).

Creating public spaces that actively promote social involvement and interaction is essential. Open plazas, community gardens, and sports grounds can be designed to encourage active participation in social activities such as sports, festivals, and communal gardening, fostering community ties and a sense of belonging (Nassar, 2021).

Larger, more adaptable spaces should be incorporated into public spaces to accommodate a variety of activities and promote social interactions. Additionally, engaging features like bike lanes and pedestrian-friendly streetscapes should be included to promote active commuting and unplanned social interactions (Cervero, R., Guerra, E, 2017).

Create welcoming public areas with lots of seating, places for people to congregate, and features like drinking fountains. To promote spontaneous conversations and passive social interaction, include picnic areas, cozy seating arrangements, and natural elements (Abid, 2016). Community involvement ensures that areas meet local needs and fosters a feeling of pride. Create hospitable public spaces that meet the needs of the neighborhood's residents, including the elderly and those with disabilities. Despite some discomfort, the elderly continue to use Golla Sefer's communal spaces, despite the fact that their designs do not prioritize them. Common areas' lifespan and environmental benefits are increased through efficient management, sustainable practices, and community-led projects. Social interaction and shared experiences are also promoted by planning

planned events and integrating cultural areas like outdoor performance spaces and public art exhibit(Casanova, H. and Hernandez, J. eds., 2015).

Create hospitable public spaces that meet the needs of the neighborhood's residents, including the elderly and those with disabilities. Despite some discomfort, the elderly continue to use Golla Sefer's communal spaces, despite the fact that their designs do not prioritize them. To promote inclusion, common spaces should be designed with universal design principles in mind, taking into consideration the needs of individuals with disabilities. This involves incorporating tactile elements, clear signage, and adjustable features to guarantee usability for a wide range of skills and abilities (Null, 2013).

In Golla Sefer, there is a need for more instruction and training on plant management and caring for common areas. While initiatives educate residents on recycling, maintenance is primarily carried out by residents, with limited guidance from the local government.

Organizing workshops, seminars, and educational programs in common areas enables residents to gain knowledge about a range of topics, including sustainable practices, responsible facility use, and skills relevant to group activities (Wates, 2014). Curiosity, lifelong learning, and a closer bond with nature are encouraged by designing learning spaces and providing workshops and demonstrations on interests and skills (Edensor, T., Leslie, D., Millington, S, 2009).

Knowledge-sharing and community discussions on subjects pertinent to the needs and interests of the area are facilitated by public programming in common areas, such as educational events and guest speakers (Casanova, H. and Hernandez, J. eds., 2015). Including regional specialists as presenters or workshop leaders offers distinctive viewpoints and insights (Hoogduyn, 2014). Teaching about recycling promotes waste reduction and sustainable behaviors while ensuring regulatory compliance and the community's welfare and adherence to local laws and policies (Abu Bakar, A.I., Abas, M.A., Muhamad, 2022).

Collaborative projects and maintenance instruction empower residents, while information distribution and academic collaborations enhance educational opportunities in communal spaces.

In Golla Sefer, the local government is actively providing residents with planting pots and other materials to support the transformation of communal areas into green spaces.

In Golla Sefer, the local administration promotes planting in communal areas by providing residents with seeds and plants. Depending on how the spaces are developed, different types of vegetation may be available, with actively participating apartments receiving preference. Residents are rewarded with certificates, prizes, or supplies, such as live animals like chickens, for exceptional accomplishments in maintaining the common areas.

Effective engagement and feedback are fostered by the establishment of open lines of communication between the local government and public gathering locations. Accessible channels of communication for common areas are established through dedicated contact with people or departments (Chen, J., Chen, T, and Vertinsky, I, 2013).

Planning communal spaces in Golla Sefer entails cooperation between the community and the local government. Joint decisions are made to create policies and initiatives through meetings and workshops, encouraging participation and shared responsibility (Margerum, 2011). In the management of community spaces, accountability and cooperation are encouraged by clearly defined roles and responsibilities between the general public and local government. For productive cooperation, formal partnerships, agreements, or volunteer programs can specify precise contributions and promote shared accountability (Chan, 2017).

Golla Sefer promotes pride, ownership, and ongoing participation in upkeep and enhancement of common areas by rewarding and recognizing community involvement (Lauber, T.B., Decker, D.J. and Knuth, 2008). Monitoring, acknowledgment, and capacity building empower community engagement and drive the development of communal spaces. (Iaconesi, S., Persico, O., Iaconesi, S., 2017).

To guarantee a high standard of living in common areas, it is essential to assess Golla Sefer's built environment, noise levels, and odors. The well-being of inhabitants is improved by adequate housing, useful amenities, and community structures. Including natural and green

elements encourages rest and a sense of connection to the surroundings (Fredericks, J., Caldwell, G.A., Foth, M, 2019). By putting in place effective waste management systems, offensive smells are reduced. A clean and welcoming environment is maintained through routine cleaning and maintenance. Reducing noise levels fosters a peaceful home atmosphere (Abid, 2016). These actions improve communal areas' livability and inhabitants' quality of life (Lastra, A. and Pojani, D., 2018.).

The upkeep of hard surfaces, drainage systems, soft surfaces, and nighttime lighting are important factors to take into account when evaluating the safety of Golla Sefer's public areas. To give residents safe and pleasurable experiences in the common area, these spaces are meticulously assessed and maintained. To provide a safe environment for walking and other activities, hard surfaces must be regularly inspected and repaired, including cracks, potholes, and unevenness.

Golla Sefer's communal spaces' solid surface maintenance varies; while privately owned spaces are typically kept up, some communal areas are not. Soft surface conditions also differ, with some common areas in good condition and private complexes placing a higher priority on maintenance. The interior of public areas is usually well-lit at night, but inner streets require better illumination. Nonetheless, the community has installed nighttime lighting in the majority of common areas for their use.

Well-maintained infrastructure in communal spaces is crucial, including regular maintenance and inspections of amenities like play equipment, walkways, and seating areas (Bain, L., Gray, B. and Rodgers, D, 2012). For the comfort and safety of users, make sure that soft surfaces are safe and kept up, and provide restrooms that are well-lit and secure (Potter, 2003).Promote safety in communal areas through education, training, proper drainage, and accessible safety equipment(Kendrick, D., Young, B., Mason-Jones, A.J., 2013). Adequate nighttime lighting is essential for visibility and promoting a sense of security in public areas (Crouch, S., Shaftoe, H., 2014).

CHAPTER 5: Urban Acupuncture Interventions

A number of environmental, spatial, and social factors must be taken into account when evaluating unoccupied areas for intervention. Important environmental factors include the spaces' location and connectivity, their state, and the surface that covers them. A focal point's existence and the character of the areas that complement the intervention are also crucial elements. Safety, the activities taking place in the empty spaces, society, and the The possibility of drawing users through intervention is an important consideration.

Involving stakeholders, educating them about urban acupuncture, and creating a site-specific solution should all be part of the site selection process. Local knowledge needs to be utilized for a flexible intervention, and documentation of spatial aspects helps for further evaluation. The condition of public parks and other natural green areas, including vegetation growth, should be thoroughly assessed. Access to green areas through freeways and pedestrian walkways needs to be considered, which also requires assessing the impact of environmental waste. Urban land use (mostly public spaces, commercial, and residential) and other potentially impacting their surrounding green areas should be examined.

When selecting a suitable development center within a slum area, two filters ought to be applied. The first filter considers population density to identify areas with a higher concentration of people in need of intervention. In order to draw people and guarantee simple access to the chosen location, the second filter concentrates on choosing an urban catalyst, taking into account mixed-use neighborhoods, street layouts, and easily accessible public transportation. Both spatial and physiological factors are taken into account when choosing settings for regeneration interventions that target vulnerable areas. Enhancing the quality of life and establishing a sense of community in these areas requires incorporating heritage, developing multipurpose communal areas, granting access to green spaces, assessing open spaces, making sure they are accessible, and encouraging walkability. Socio-spatial factors are essential for assessing and improving public areas. This includes ensuring livability by meeting quality standards, promoting inclusivity, facilitating social

activities, collaborating with the administration, providing educational opportunities, and prioritizing safety measures. These considerations contribute to creating pleasant, inclusive, engaging, and secure communal spaces for residents.

In general, this research suggests that the strategy for urban intervention in terms of acupuncture in slum areas better focuses on Goal 11: Sustainable cities and communities and its six indicators.The strategy emphasizes community engagement, participatory planning, and sustainable practices to address slum conditions and enhance sustainability.

Table 5.1:Sustainable Development Goal 1 1

SDG-11	Explanation
Target 11.2: Affordable and sustainable transport systems	<u>Improving Accessibility and Connectivity in Golla Sefer's Public Spaces:</u> - Evaluate and enhance accessibility in public areas while taking roads, walkways, and universal design principles into account. - Improve collector road connectivity and main road access to facilitate easier mobility. - To encourage accessible and safe pedestrian routes, make investments in walkway networks. <u>Improving Access to Green Spaces in Golla Sefer:</u> - For convenience, place common areas close to green spaces. - Engage stakeholders in cooperative efforts to successfully incorporate green areas. - Make sure there are enough green areas spread out across the neighborhood. - Preserve and keep up the green areas that already exist. - Resolve physical obstacles by constructing pedestrian bridges or underpasses as part of infrastructure upgrades. <u>Improving Walkability in Golla Sefer's Communal Spaces:</u> - Pathways should be maintained and upgraded to provide comfortable walking surfaces. - Main roads should have designated pedestrian walkways. - Use clear signage and navigational maps. - Offer facilities like interactive elements, public art, and seating. - Improve sidewalks, add pedestrian crossings, and install enough lighting

	to increase safety precautions.
Target 11.3: Inclusive and sustainable urbanization	<u>Promoting Inclusivity within Communal Spaces in Golla Sefer:</u> - Create public areas using universal design principles to meet the needs of senior citizens and people with disabilities. - For improved usability, include adjustable features, tactile elements, and clear signage. - Make sure that all of the common areas have accessible walkways, benches, and facilities. - Make parking and public transportation easily accessible to people with mobility impairments. - By adding hospitable green features, like accessible gardens or seating areas, communal areas can become more inclusive overall. <u>Creating Multi-Functional Communal Spaces in Golla Sefer:</u> - Make common areas multipurpose by designing them to support parking, playgrounds, gardening, and other activities. - Engage the community in the planning phase to guarantee that areas are suitable for local requirements. - Use shared facilities and effective design solutions to make the best use of available space. - Adopt sustainable initiatives and appropriate management techniques for long-term gains. <u>Educating the Public about Golla Sefer through Communal Spaces:</u> - Create programs to teach and train locals how to maintain and care for the vegetation in public areas. - Offer educational materials and programs that emphasize appropriate waste management techniques for recycling and waste disposal. - Provide maintenance training so that residents can take an active role in maintaining common areas. - Plan classes, seminars, and workshops on environmentally friendly methods, prudent facility use, and group activities. - Plan public programming that encourages knowledge sharing and covers pertinent subjects with special guests. - To improve educational opportunities, work together with community organizations, academic institutions, and local experts.
Target 11.4: Protect the	<u>Incorporate Heritage in Golla Sefer:</u> - Collect feedback from the community to determine the traditional

world's cultural and natural heritage	activities that people prefer. - Evaluate and design suitable spaces for the ceremonial spots. - Set aside funds for upkeep and development. - Involve community members in planning and design. - Plan cultural activities and events in the appropriate locations. - Encourage usage through communication and community involvement. - Ensure flexibility and adaptability for different traditions. - Create a system of upkeep and cleanliness maintenance. <u>Creating Public Spaces that Promote Social Involvement and Interaction in Golla Sefer:</u> - To promote social engagement in events like sports, festivals, and communal gardening, open plazas, community gardens, and sports fields should be designed. - Construct bigger, more adaptable spaces to accommodate a variety of activities and promote social contact. - To promote active commuting and unplanned social interactions, include bike lanes and pedestrian-friendly streetscapes. - To encourage impromptu discussions and passive social interaction, provide lots of seating and gathering spaces that are open to everyone. - To improve the aesthetics and usability of public areas, incorporate natural features, cozy seating arrangements, picnic areas, and conveniences like drinking fountains. - To promote engaged social interactions and shared experiences, plan events and include cultural spaces like outdoor performance spaces and public art exhibits. - Encourage collaboration among citizens, community organizations, and urban planners to make sure events and spaces suit local tastes and needs.
Target 11.5: Reduce the adverse effects of natural disasters	<u>Ensuring Safety in Communal Spaces in Golla Sefer:</u> - Regularly inspect and maintain hard surfaces, paying attention to potholes, cracks, and uneven areas to ensure safe walking and activities. - Monitor and upkeep soft surfaces, such as lawns and green spaces, to guarantee a safe and pleasurable outdoor experience. - Improving nighttime lighting in public areas, like inner streets, will increase visibility and promote a feeling of security. - To ensure their functionality and safety, play equipment, walkways, and seating areas should all undergo routine maintenance and inspections. - Provide restrooms that are secure, easily accessible, and equipped with safety precautions, sufficient lighting, and routine maintenance.

	- As part of your safety education and awareness campaigns, offer workshops, training sessions, and content distribution on topics like fire safety and disaster preparedness. - Flooding can be avoided and proper operation ensured by installing suitable drainage systems. - In public areas, make safety supplies like fire extinguishers and first aid kits easily accessible. <u>Collaboration between Local Administration and the Public in Golla Sefer's Communal Spaces:</u> - Offer residents resources and assistance, such as planting pots, seeds, and plants, to help turn common areas into green spaces. - In order to promote a sense of pride and community ownership, acknowledge residents' efforts in maintaining common areas with certificates, prizes, or tokens of appreciation. - Create accessible points of contact for efficient participation and feedback by establishing open lines of communication between the local government and public areas. - Encourage cooperative planning and decision-making procedures by forming committees, workshops, or meetings with community and local government representatives. - Using official agreements, partnerships, or volunteer programs, specify the roles and responsibilities of the general public and the local government in upholding and overseeing common areas. - Use resources and knowledge to support cultural festivals, wellness programs, and educational courses through joint programming and events between the local government and public areas. - Establish monitoring and evaluation systems to guarantee responsibility and direct future choices. - Offer training and capacity-building opportunities for the general public and local government to actively engage in the management of public areas and make contributions.
Target 11.6: Reducing adverse environmental impacts in cities through	<u>Strategic Plan for Green Space Development in Golla Sefer</u>: - Prioritize small-scale interventions and identify areas that require improvement. - Improve tree-planting initiatives by involving the community and maintaining them. - Encourage cooperation for maintenance initiatives and sustainable practices. - When developing green spaces, follow the rules of urban design.

improved air and waste management.	<u>Strategic Plan for Enhancing Public Spaces in Golla Sefer:</u> - Repurpose open areas to create community centers, parks, and plazas. - Create public areas that encourage integration and social interaction. - Involve the community in the process of making decisions. - Consider the context when designing and incorporating the concepts of urban acupuncture. - Adopt waste management and resource-efficient procedures. <u>Ensuring Livable Quality within Communal Spaces in Golla Sefer:</u> - Verify that the built environment meets livability standards by evaluating its operational amenities and housing conditions. - Incorporate green and natural elements, such as parks or gardens, to enhance relaxation and a feeling of connection with the environment. - Installing efficient waste management systems will help to maintain cleanliness and lessen unpleasant smells. - Regularly cleaning and maintaining common areas will help to maintain a tidy and friendly atmosphere. - Lower noise levels in residential areas by putting appropriate rules and design into place. - Involve locals in the evaluation and improvement processes by using surveys or community consultations.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

In conclusion, Addis Ababa's varied population densities require a tailored approach to urban development planning and resource allocation. Certain treatments, such as public urban acupuncture, offer promising opportunities for improvement. Context-specific planning is crucial, as is adapting plans to each area's unique needs and opportunities while promoting inclusive and sustainable urban growth.

The evaluation of public transportation accessibility and access in public areas offers important information for Golla Sefer's infrastructure development and urban planning. We can improve transportation connectivity and guarantee simple access to public areas by identifying problem areas and putting targeted interventions in place. Prioritizing infrastructure investments and allocating resources effectively are made possible by dividing the study area into zones according to accessibility. To create inclusive and easily accessible environments, it is essential to improve the footpath network, main road access, and vehicle access. By giving these factors top priority, we can encourage equitable access, encourage active mobility, and improve Golla Sefer's general livability.

The assessment of elements that contribute to a pedestrian-friendly environment and closeness to green spaces emphasizes how crucial careful urban planning and stakeholder collaboration are. Communities can improve accessibility, encourage active transportation, and raise general quality of life by making investments in well-planned infrastructure, amenities, and pedestrian-friendly features. Furthermore, connecting common areas with surrounding green spaces promotes sustainable and healthful lifestyles and offers easy access to nature.To find appropriate sites and guarantee the incorporation of green spaces, cooperation between urban planners, landscape architects, and community stakeholders is crucial. The long-term availability and advantages of these places depend heavily on ongoing preservation and maintenance initiatives. Communities can establish dynamic, inclusive, and sustainable settings that put their citizens' happiness and well-being first by giving priority to these factors.

The assessment of multipurpose public areas and the recognition of physiological requirements in public areas underscore the significance of establishing inclusive and dynamic spaces that improve the standard of living in communities. Common areas foster convenience, social interaction, and a feeling of community by offering facilities and areas that support a range of activities. For successful implementation and upkeep, cooperation between residents, community organizations, and urban planners is essential. In a similar vein, planning public spaces to support a range of activities and establishing welcoming spaces encourages social interaction and strengthens community ties. We can build inclusive, well-used public areas and communal spaces that improve well-being and strengthen a sense of community by giving the community's varied needs and preferences top priority.

Creating inclusive and welcoming communal spaces requires a comprehensive approach that considers the needs and preferences of diverse individuals. Designing spaces with a welcoming green frontage, accessibility features for the elderly and individuals with disabilities, and inclusive amenities promotes a sense of belonging and enhances community engagement. By prioritizing inclusivity and involving individuals from diverse backgrounds, communal spaces can be thoughtfully tailored to meet specific needs, fostering a strong sense of belonging and inclusivity for all community members.

In order to provide residents with comfortable and safe surroundings, it is essential to evaluate the safety of common areas. It is possible to prevent accidents, maintain hazard-free conditions, and improve visibility by evaluating drainage systems, hard and soft surfaces, and nighttime lighting. The safety and wellbeing of people utilizing public areas are enhanced by routine inspections, repairs, and upkeep. To identify and resolve possible safety issues, cooperation between local government agencies, residents, and community organizations is essential. By putting safety first, public areas can create a vibrant and safe community where people can participate in a variety of activities with confidence.

6.2. RECOMMENDATION

It is advised that small-scale interventions be given priority in order to enhance Golla Sefer's green spaces and common areas. A comprehensive strategy should be adopted, taking into account accessibility, amenities, seating, lighting, and vegetation. The long-term viability of these areas will be guaranteed by improving maintenance procedures and enlisting locals in recycling and water-saving initiatives. Creating distinctive public areas that encourage environmental stewardship requires cooperation between the government and the populace. The community's overall sustainability will be enhanced by highlighting sustainable practices like recycling, water conservation, and the use of renewable resources.

To create a lively and livable community in the built-up area, it is crucial to maximize the amount of open space that is available, design for social integration, practice urban acupuncture, and promote sustainability through resource-efficient practices and renewable energy sources.

Establishing appropriate development centers in Golla Sefer requires taking population density into account and placing them in locations that encourage economic activity and community involvement. Incorporating essential services and a variety of land uses into these centers improves the quality of life and draws tourists. Efficient development is ensured by tailored resource allocation based on elements like land value and resident attraction. It is essential to prioritize sustainability through green infrastructure, renewable energy, and waste reduction.

Furthermore, creating well-planned public areas like parks and plazas encourages community building and social interaction. In order to increase accessibility in public areas, evaluate and improve roads and walkways, apply universal design principles, build pedestrian networks, establish a feeling of place with public artwork and landmarks, and continuously assess and improve accessibility based on user feedback.

Enhancing walking surfaces, constructing designated pedestrian walkways, putting up clear signage and maps, offering comfort amenities, and enhancing pedestrian safety measures are all crucial to making Golla Sefer's public areas more walkable. Walking will become a preferred

form of transportation as a result of these policies, which will encourage safe and practical walking. Likewise, to improve access to green areas, It is advised to take into account the area's proximity to green spaces, make sure that they are distributed equally, adjust to high-density areas, maintain existing green spaces, and remove any physical obstacles. By ensuring that locals have easy access to nature, these projects will foster a lively and sustainable community.

In Golla Sefer, it is advised to design for flexibility, guarantee function compatibility, engage the community, maximize space utilization, and apply sustainable management techniques to create multipurpose communal areas. These tactics will satisfy the various needs of the inhabitants while optimizing the areas' usability and functionality. Furthermore, to encourage social engagement and communication in public areas, Designing adaptable spaces, incorporating active transportation infrastructure, offering lots of places to sit and congregate, incorporating natural elements, involving the community, planning scheduled events, and creating cultural spaces are all recommended. These actions will build lively, welcoming public areas that promote social interaction and fortify ties within the community.

It is advised that Golla Sefer's public areas be made more inclusive by implementing universal design principles, integrating welcoming green elements, tactile elements, clear signage, community engagement, awareness-raising, and partnerships with disability organizations. These steps give everyone a sense of belonging and guarantee that common areas are inclusive and accessible to people of all abilities. It is also recommended to plan workshops and educational programs, schedule public programming and guest speakers, facilitate hands-on learning opportunities, offer maintenance training, and disseminate information in order to raise public awareness of Golla Sefer. These programs encourage knowledge-sharing and sustainable practices within the community, empower locals to actively participate in group activities, and cultivate a culture of learning.

In Golla Sefer, cooperation between the public and the local government is essential to fostering inclusivity. Collaborative planning and decision-making should be promoted, and open lines of communication should be established. Residents' contributions should be acknowledged and rewarded, and roles and responsibilities should be clearly defined. Initiatives for capacity-

building, monitoring, and resource support ought to be put into action. Evaluating the built environment, adding green elements, managing waste effectively, maintaining regular cleaning, addressing noise levels, and interacting with residents are all part of improving the livable quality of communal areas. Maintaining surfaces, enhancing nighttime lighting, upholding infrastructure maintenance, safety instruction, and drainage systems are all necessary to ensure safety. These actions create safe and welcoming public areas in Golla Sefer, improve community well-being, and cultivate a sense of belonging.

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APPENDICES

Appendix A: Mapping Sensitive Vacant Spaces for Urban Acupuncture Interventions in the case of Golla Sefer, Addis Ababa, Ethiopia

Abstract

In this study, the Golla Sefer area's sensitive vacant spaces are identified for urban acupuncture interventions. As the number of people living in cities increases, creative and effective methods like Urban Acupuncture (UA), which targets particular stress points in the urban fabric, provide flexible and affordable solutions for urban regeneration. In order to identify sensitive spaces, this study uses a thorough mapping and analysis methodology that takes into account both spatial and socio-spatial factors like walkability, accessibility, inclusivity, safety, and multifunctionality. GIS mapping, site visits, questionnaires, interviews, and observations are some of the techniques used to collect data. The results highlight how crucial community involvement, effective planning, and cooperation from regional stakeholders are to the successful execution of UA interventions. The potential to turn abandoned urban areas into lively, useful places is demonstrated by pilot projects and follow-up assessments. By using socio-spatial analysis and autoethnography as methods for comprehending cultural contexts and assessing the caliber of urban environments, the study also fills in gaps in the body of existing literature. This study intends to enhance the quality of life for locals, encourage sustainable urban growth, and create inclusive, secure, and stimulating public spaces by identifying and repurposing sensitive vacant spaces. The study ends with suggestions for how community organizations, legislators, and urban planners can work together to turn underutilized areas into vibrant, multipurpose hubs that improve the overall urban experience.

Keywords: Urban Acupuncture (UA), Slum neighborhoods, Green infrastructure, Small-scale interventions, Sustainable practices, Urban regeneration.

1. Introduction

The growing urban population necessitates new strategies for revitalization. With an emphasis on cost-effectiveness and flexible design, urban acupuncture provides effective and successful solutions. With limited funds and resources, it improves the quality of life by addressing urban deterioration brought on by unchecked and fast urbanization (Solà-Morales, 2004).Urban Acupuncture treats urban stress points by targeting specific areas for focused interventions, similar to acupuncture's approach to relieving bodily stress (Chon & Lee, 2013).

The goal of urban acupuncture (UA) is to influence the urban structures of cities' outdated and abandoned locations (M Faizi, 2020). It ultimately aims to repurpose and restore these urban spaces into their setting (Casagrande, 2020). Urban Acupuncture (UA) embodies the "triple bottom line" by prioritizing social and environmental viability in urban regeneration with minimal financial investment. (Bergman, 2013).

Urban Acupuncture (UA) implementation in large cities follows a filtering framework, considering spatial aspects like walkability, safety, accessibility, and aesthetics, as well as socio-spatial aspects like inclusivity and livability (Vidal, D.G., Barros, N., 2020). The framework utilizes principles and strategies to pinpoint intervention points, considering citizen interaction and public space aspects. It serves as a starting point for effective (UA) design and encourages discussions on implementation (Hyun-Jae Nam, 2021).

Urban Acupuncture (UA) considers spatial aspects like walkability, safety, accessibility, and aesthetics, as well as socio-spatial aspects like inclusivity and livability when choosing strategies and locations (Vidal, D.G., Barros, N., 2020). The Urban Acupuncture (UA) framework identifies intervention points based on citizen interaction and public space aspects, serving as a starting point for effective design and implementation discussions.(Hyun-Jae Nam, 2021).

The city assigns low priority to addressing issues related to urban open space (Mensah, 2014). Additionally, the city requires green parks and appropriate urban open spaces (Jensen, F.S. and Koch, N.E, 2004). Slum areas' neglected areas turn into landfills, creating problems for the

community and environment (Anguluri, R. and Narayanan, P, 2017). The potential of public open spaces as community centers is hampered by incomplete evaluation, which restricts the variety of activities and fair access (Zewdie, M., Worku, H, 2021).

Unsuitable surfaces and poor footpath conditions make it difficult to walk, which reduces the number of safe and enjoyable walking opportunities and active transportation choices (TUFA, 2019) . The accessibility and inclusivity of public areas are restricted by inadequate road access, inadequate parking, and a lack of thorough walkways (TESFAYE, 2014). Connectivity to green spaces is hampered by design errors, which also impede lively community settings (Cirolia, 2021).

Convenience, community involvement, and recreational options are hampered by the lack of multifunctionality of current common areas (Eshetu, S.B., Yeshitela, 2021). Insufficient multifunctionality in public areas impairs community involvement, accessibility, and quality of life (Birru, 2014). The lack of thorough assessments in communal areas jeopardizes environmental conditions, amenities, housing unit suitability, and quality of life (Nuriye, 2020). Community cohesion is impacted by unequal access and participation due to a lack of inclusion assessments (Seifu, 2021). Inadequate instruction and training make it more difficult to maintain public areas and jeopardize cleanliness and safety (TUFA, 2019).

Environmental, spatial, and social variables need to be taken into account when evaluating open spaces for intervention. Location, connectivity, condition, and surface coverage are examples of environmental criteria. A focal point, alignment with the intervention's identity, activities, safety, and user-attraction potential are all societal factors. Two filters are used in slum regions: an urban catalyst filter that takes into account mixed-use districts, street patterns, and easily accessible public transportation for simple access and appeal, and population density to target areas with significant need.

Interventions for regeneration in regions at risk take into account both physiological and geographical factors. In addition to socio-spatial elements like livability, inclusion, social activities, cooperation, education, and safety, they emphasize heritage, multipurpose public

areas, green spaces, accessibility, and walkability. These factors produce welcoming, safe, and inclusive public areas. By using socio-spatial analysis and autoethnography as useful methods for comprehending cultural settings and assessing the caliber of urban environments, the paper fills a vacuum in the body of existing knowledge.

2. Methods and Materials

2.1 Description of the Study Area

This research is conducted in the Ethiopian capital city, in the Lideta sub-city, particularly in a slum neighborhood 'Golla Sefer', which covers about 34-hectare. As it is indicated on the map, the study area is located in the inner city, and a major river passes through the study area. The area is near landmarks such as Churchill Avenue and Tewodros Square. The area is characterized by high-density slum settlements with so many unused spaces. Golla Park, which is a public park, is part of the study site.

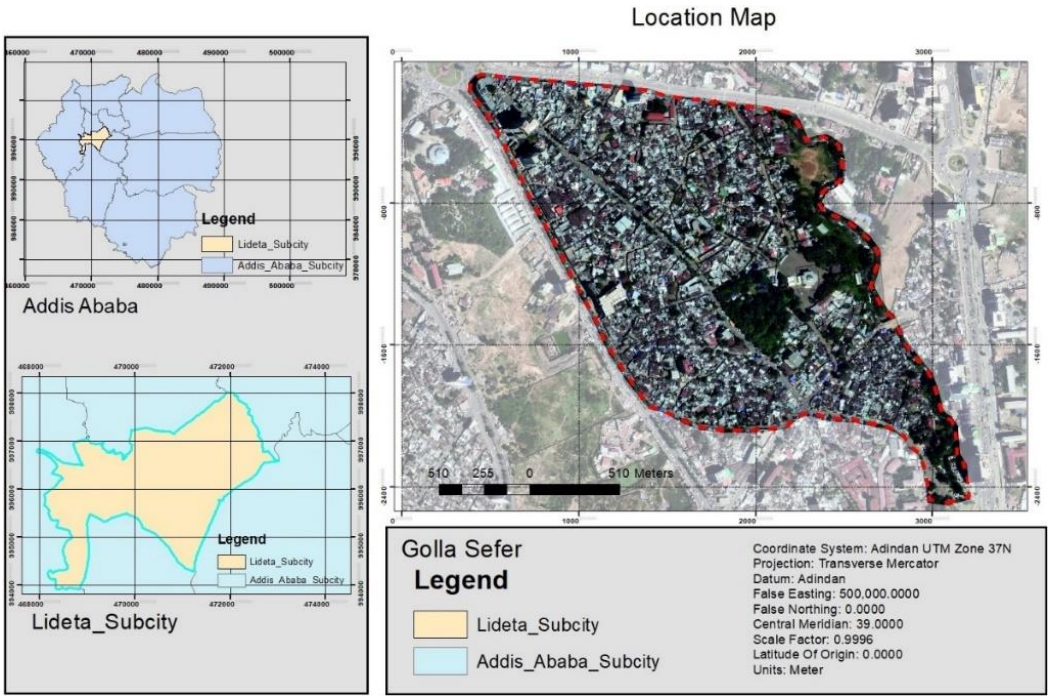


Fig 2.1 Location Map 1

Natural Features of the Research Area There are various natural features in the study area. Water Bodies A sizable river flows through the region, and retaining walls have been erected along its banks to lessen the risk of flooding and landslides. Green Spaces There are three primary green areas in the area. There are many kinds of vegetation along river embankments, individual plots, and other open areas, as well as Golla Park, the neighborhood green park of the Golla Michael church. Landforms The region features moderate slopes elsewhere and steep slopes along the riverbanks.

2.2. Methods of sampling technique, data collection, and data analysis

Using GIS maps and site observations, the study employed a non-experimental design to examine green infrastructure, open spaces, and socio-spatial dynamics. To investigate perceptions, it blended qualitative techniques like focus groups and interviews with quantitative techniques like spatial metrics and GIS tools. While the explanatory approach used AHP and design principles to link social needs and spatial factors to intervention suitability, the exploratory approach found gaps and intervention sites, such as fragmented green spaces and vacant lots.

The study evaluated green infrastructure, waste disposal, and "sensitive spots" using primary data from interviews, site observations, field notes, photographs, and focus groups. The analysis was enhanced by secondary data sources like Nortek maps, satellite imagery (Google Earth), scholarly publications, and population figures from the Lideta sub-city government.

Primary data for the study came from observations, field surveys, questionnaires, and interviews with local administrators, stakeholders, and residents of Golla Sefer. Lideta sub-city population statistics, satellite imagery (Google Earth), GIS data (Nortek maps), and previous research on Addis Ababa's urban areas were examples of secondary data. Woreda 7 was the subject of both primary and secondary data, which included road networks, contours, and the state of green spaces.

To cover the study area and evenly distribute data, the data collection was planned to cover every block. Residents are also handed the questionnaires, with a minimum of three to five questionnaires in each community space surrounded by multiple households, to gather the qualitative and quantitative data needed for the study. Yemane formal was used to identify the primary formal for the sample size. The total number of persons living within a 5-meter radius of the communal spaces is entered into the Yemane formula, and the result is then divided by the number of people who will be questioned. The population is 6290; this figure is factored into the Yemane calculation, which yielded a sample size of 376.

In order to analyze waste disposal and green infrastructure, the study gathered data through site observations utilizing GIS tools, cameras, and checklists. Voice recorders and questionnaires were used to interview residents, administrators, and vendors. In order to suggest community-driven solutions, focus group workshops used participatory mapping and photographs, while a literature review made use of scholarly databases and reports.

2.4. Data analysis

To address the primary study issues, many forms of data are analyzed, including information from various documents, surveys, observations of the physical environment, questionnaires given to residents, and interviews with residents. Thus, by establishing a correlation between the research questions and the data gathered, the data is analyzed to derive fundamental conclusions.

To portray the results in a more comprehensible manner, quantitative analysis techniques such as tabulating the raw data, creating graphs and charts, and summarizing the information from the respondents are used. By mapping respondents' actions on common open spaces in their various locations and comparing the proposed and current conditions of open spaces, a qualitative analytical approach is also used to investigate spatial phenomena. Furthermore, qualitative analysis is carried out to examine the data and look at how each activity affects the public open spaces and other activities that take place over a variety of periods.

Identifying Sensitive Points of Open Areas for Urban Acupuncture Interventions : This study employs a multi-dimensional approach to collect and analyze data, focusing on heritage preservation, multi-functionality, green spaces, open spaces, and walkability. The following methodologies will be utilized: Nortek mapping, site visits, satellite imagery, and resident questionnaires were used in the study to collect data on Heritage Usage. Site visits, Nortek mapping, and interviews were used to analyze multi-functional aspects and evaluate space utilization.

GIS tools, satellite mapping, surveys, focus groups, and activity observation studies were used to assess access to green space. Site inspections and resident engagement were used to evaluate the availability of open spaces, with an emphasis on usability and accessibility for a range of demographics. Footpath surveys and inspections were used to assess walkability in order to pinpoint problems and maintenance requirements.

This study applies a comprehensive approach to evaluate the livability, inclusivity, social activities, collaboration with administration, public education opportunities, and safety of urban spaces. The following methods will be employed:

Through resident surveys, structural checks, and inspections, the study evaluated livability. Visual surveys, GIS mapping, and focus groups on accessible and senior-friendly features were used to assess inclusivity. Time-lapse photography, behavioral mapping, and community engagement were used to analyze social activity. Data on community gardening and resident input from surveys and interviews were part of the collaboration with the administration. Attendance and surveys were used to track public education participation, and community feedback was used to assess safety through maintenance, drainage, and lighting inspections.

Several criteria and sub-criteria are used to assess the suitability of factors in a given area. These include flooding risk, visibility, proximity of vacant spaces, presence of streams, slope, walkability, road type, land use, and vegetation cover. Each criterion is assigned a score, ranging from 1 to 5, indicating the level of suitability. The factor suitability rating provides categories such as highly suitable, suitable, moderately suitable, poorly suitable, and unsuitable.

Additionally, each criterion is assigned a percentile value representing its importance in the overall assessment. By evaluating these factors and their suitability, informed decisions can be made regarding the development and utilization of the area.

Selecting the Sensitive Spots: The selection of vulnerable areas is based on spatial and physiological aspects. Data collected from on-site questionnaires evaluates residents' responses to understand the environmental situation. Criteria such as flooding risk, visibility, proximity to vacant spaces, presence of streams, slope, walkability, road type, land use, and vegetation cover are assessed, with each criterion assigned a suitability score.

Weighting and Overlay (Multi-Criteria Analysis) :Finding appropriate locations for urban green spaces requires a thorough evaluation process that incorporates a number of elements essential to sustainability and urban planning. Multifunctionality, integrating heritage elements, open space size, walkability, livability, cooperation with local government, educational opportunities, accessibility, inclusivity, and open space safety are important factors to take into account.

The methodology used in this evaluation includes a Weighting and Overlay technique, in which weights assigned to each factor according to its perceived importance are superimposed on top of reclassified layers. Together, these weights add up to 100%, guaranteeing a fair evaluation of the requirements.The data is transformed in a number of ways to standardize the evaluation process. To ensure uniformity in the assessment, criterion maps are standardized using linear scale transformation, reclassified into five classes (1 to 5), and converted into raster format for consistent analysis.

The Analytical Hierarchy Process (AHP), a methodical approach to decision-making, is used to estimate weight. In order to assign precise weights to the criteria maps using a three-step AHP process, pairwise comparisons are conducted to ascertain the relative importance of each factor. A weighted overlay technique is used to analyze standardized criteria maps as part of the site selection process. Based on the weighted results, this analysis method assists in identifying and prioritizing appropriate locations for urban green spaces, guaranteeing that the selection process is impartial, data-driven, and in line with the intended urban planning objectives.

Analysis of Multiple Criteria Critical factors like flooding risk, visibility, the proximity of vacant spaces, the presence of streams, slope characteristics, walkability, road types, land use patterns, and vegetation cover are all taken into account when evaluating possible locations for urban green spaces. Each component is given a weight according to how important it is thought to be in determining flood susceptibility; the weights add up to 100%. These procedures include using linear scale transformation, classifying raster maps into five classes, and converting maps into raster format.The Analytical Hierarchy Process (AHP) is used to estimate weights by allocating weights to criteria according to their relative importance. The precise computation and distribution of weights to the criteria maps are made easier by pairwise comparisons. A Weighted Overlay Analysis using standardized criterion maps is incorporated into the site selection process to guarantee that the choice is systematic, data-driven, and in line with sustainability and urban planning objectives.

3. Result and Discussion

3.1. The sensitive vacant spaces for Urban Acupuncture Interventions

3.1.1.Accessibility within the communal space

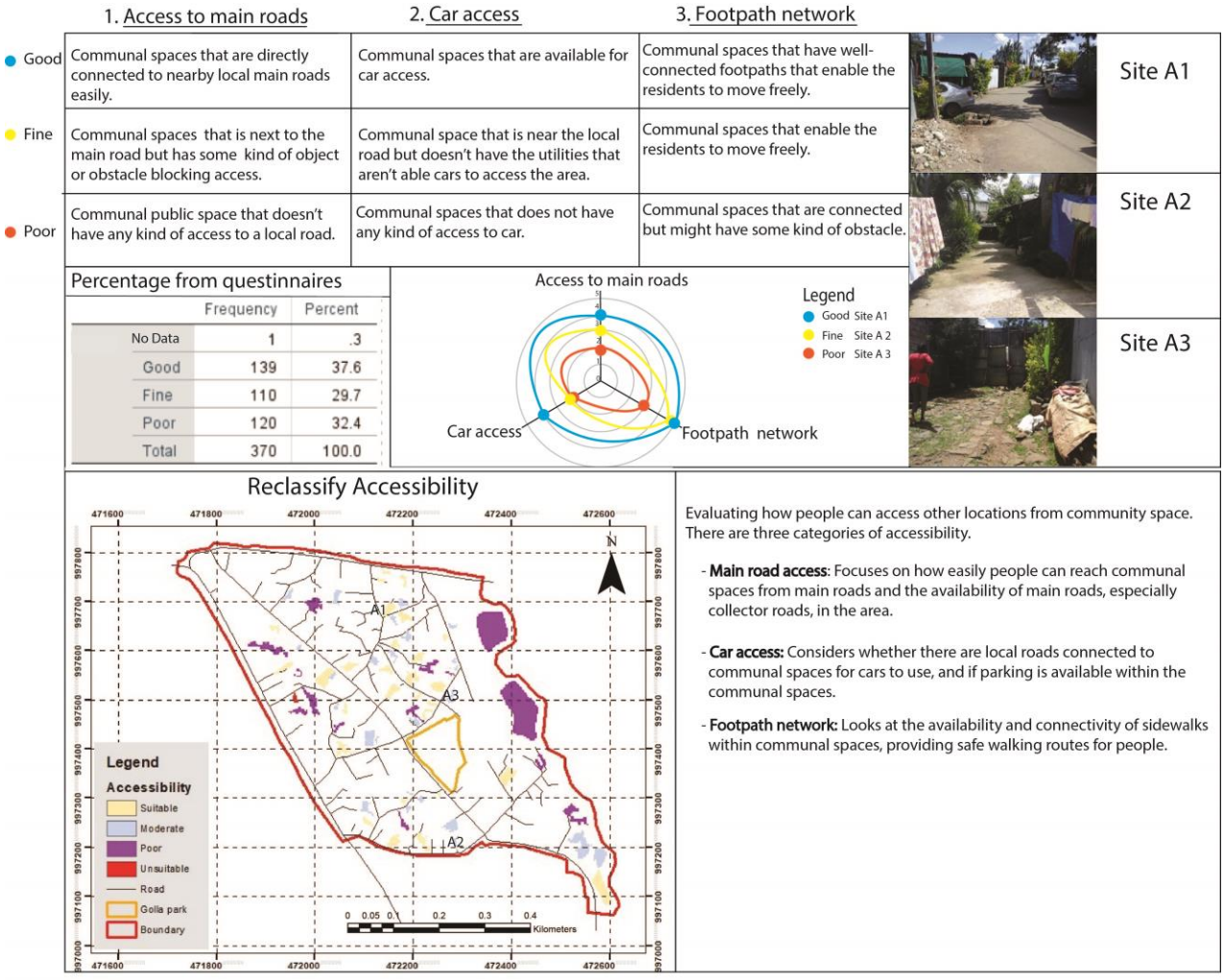


Fig 3.1. Accessibility communal space 1

Accessibility evaluates the ease of reaching communal places from major roads, including key roads, car access, and sidewalk connectivity for safe walking. In Golla Sefer, blocked or poor-quality roads hinder access. Accessible Design emphasizes wheelchair-friendly and barrier-free facilities (Wagle, 2020). Fair access, signage, and walkways are guaranteed for everyone by

universal design principles (Bordas Eddy, 2017). Enhancing major and collector roads close to public spaces promotes the use of communal spaces and makes movement easier. In order to strengthen neighborhood identity, Creating a Sense of Place emphasizes public art, landmarks, and thoughtfully designed spaces. Putting money into walkway networks guarantees secure routes, but accessibility needs to be continuously improved (De Lange, M. and De Waal, M, 2019.).

3.1.2.Walkability within the communal space

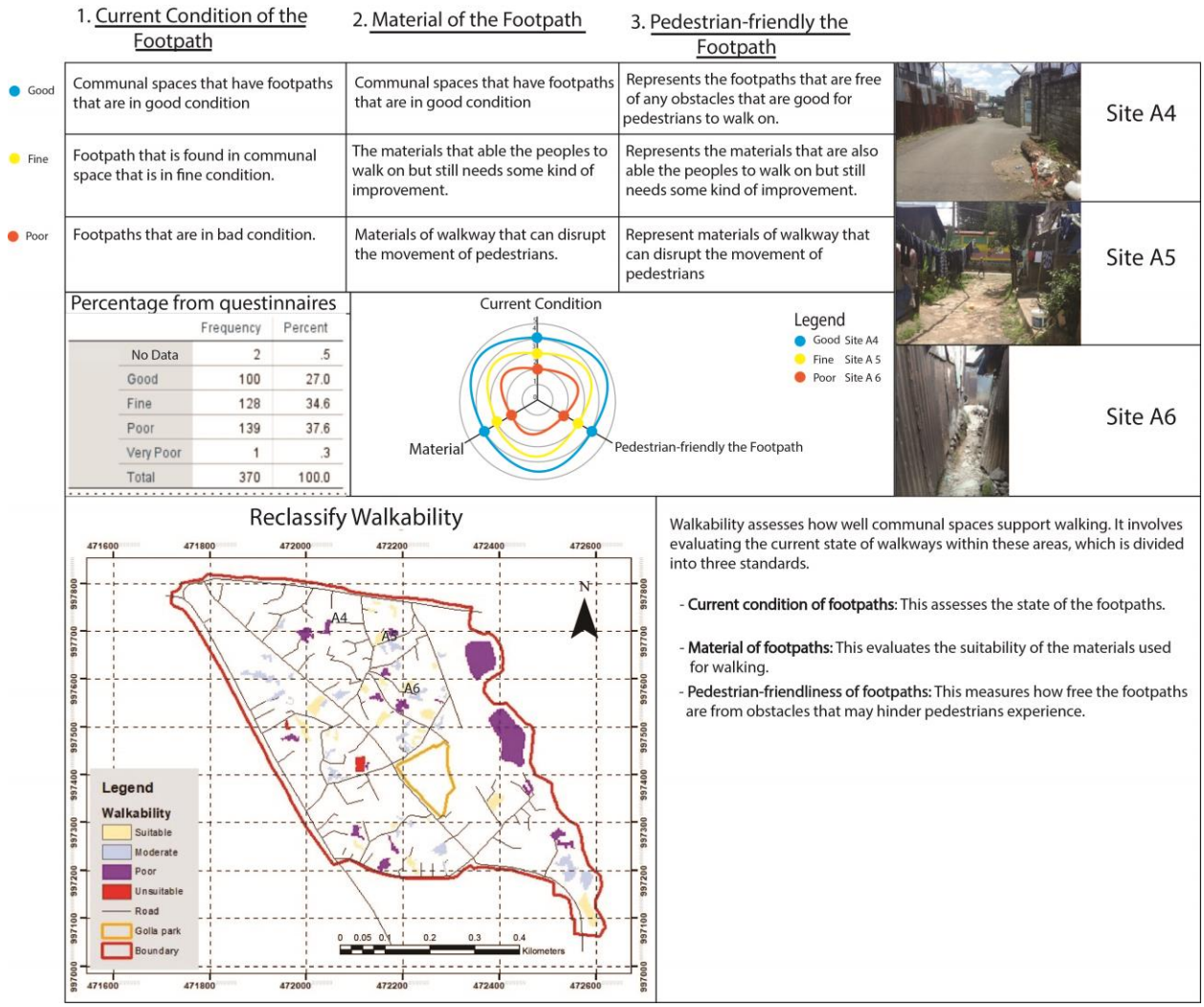


Fig 3.2. Walkability communal space 1

A walkable environment is defined by a number of elements that make it accessible and appealing to pedestrians. Clear signage, enough pedestrian crossings, well-maintained sidewalks, sufficient lighting, and cozy features like benches and rest areas are some examples of these elements. Enhancing the walking experience also requires smooth, well-paved walkways that are clear of hazards and impediments

Clear signage, well-kept walkways, lighting, and amenities are necessary to create a pedestrian-friendly environment (Figliozzi, 2014). Better walking surfaces, designated walkways, signage, maps, seating, and public art are among the things that Golla Sefer needs to improve (Gibson, 2009). Stakeholder cooperation is required for infrastructure improvements like better sidewalks, lighting, and pedestrian crossings (World Health Organization, 2023).Direct pathways and accessible crossings are key components of walkable urban areas, which prioritize safety and connectivity (Cervero, R., Guerra, E, 2017).

3.1.3.Incorporate heritage within the communal space

- Traditional ceremonial spots

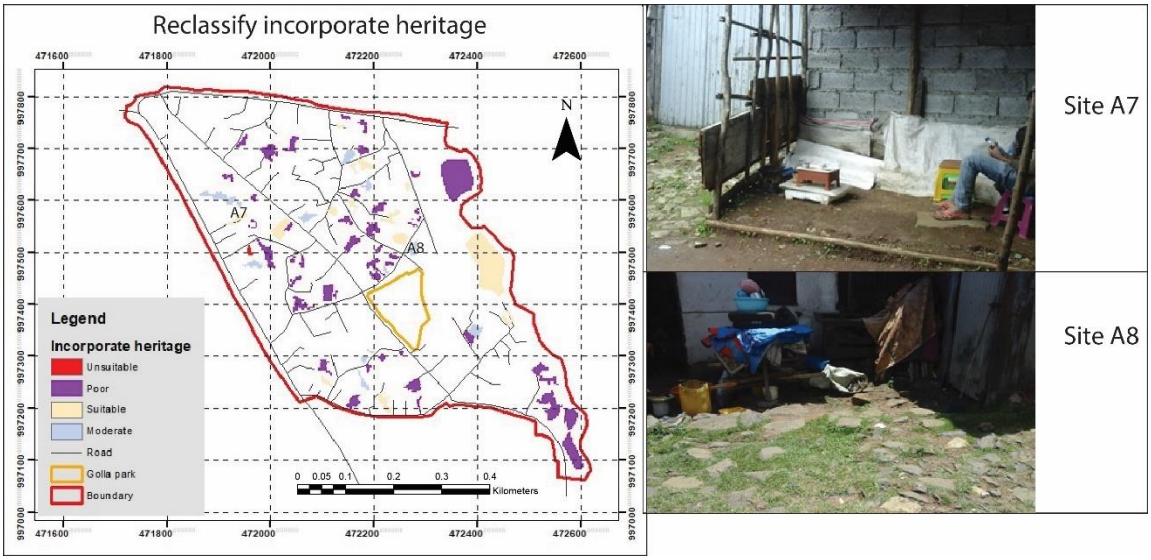


Fig 3.3. Heritage in communal space 1

3.1.4.Multi-functional within the communal space

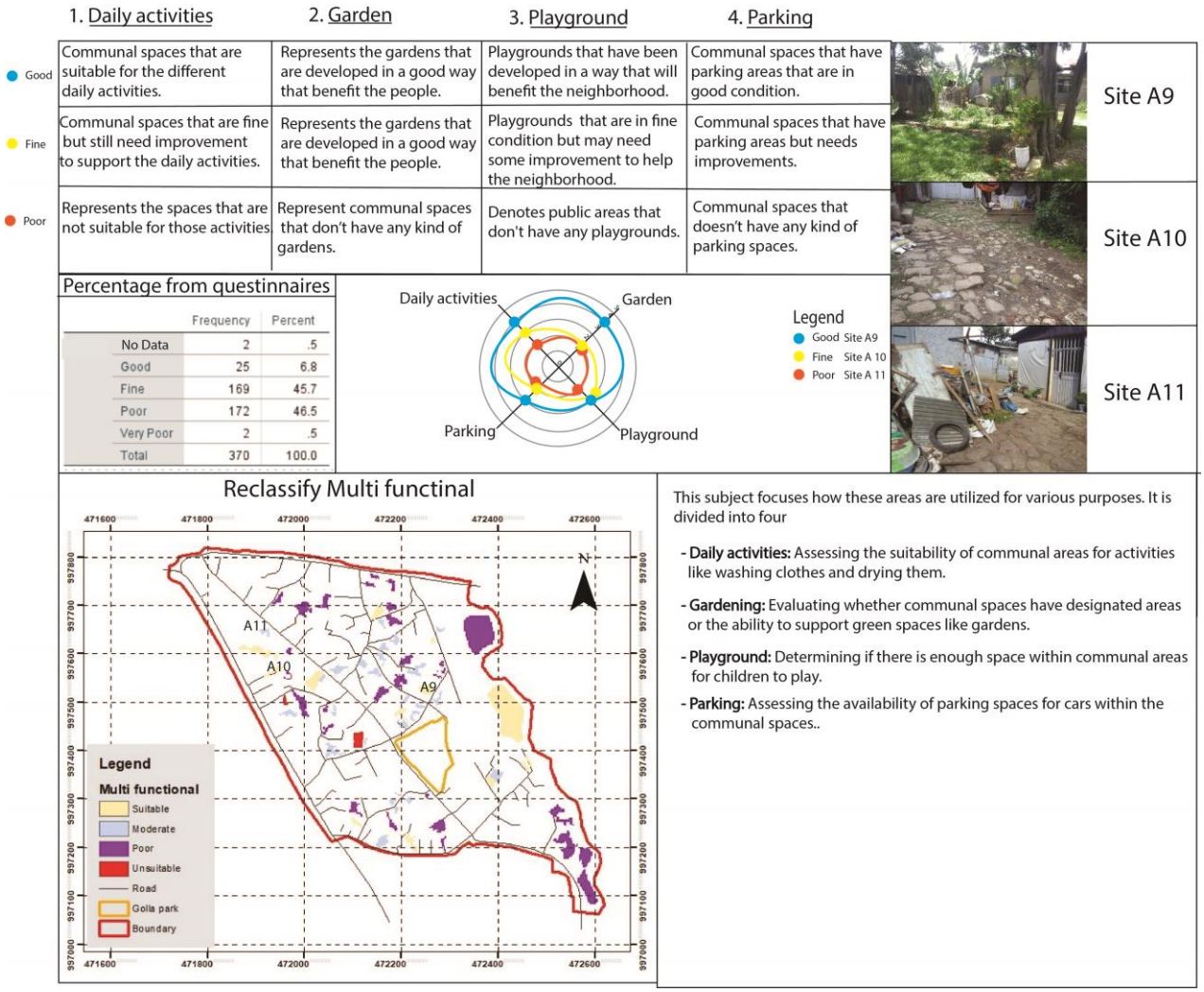


Fig 3,4.Multi Function in communal space 1

Multi-functional communal spaces provide convenience, community interaction, and leisure opportunities for a variety of uses, including everyday activities, gardening, playgrounds, and parking. These areas improve people's quality of life and create a feeling of community by providing features like green spaces, sports facilities, and seating areas. In Golla Sefer, multipurpose public areas that support a variety of activities, such as playgrounds, parking, and gardening, improve well-being. Issue resolution and designated areas prioritize adaptability and social engagement (Papazoglou, M.P. and Van Den Heuvel, W.J., 2006) .While community

involvement promotes ownership and addresses local needs, effective planning and design maximize urban space (Keijzer, 2021). Durability and environmental benefits are increased through community-led projects, sustainable practices, and proper management (Ling, T.Y. and Chiang, Y.C., 2018).

3.1.5.Inclusivity within the communal space

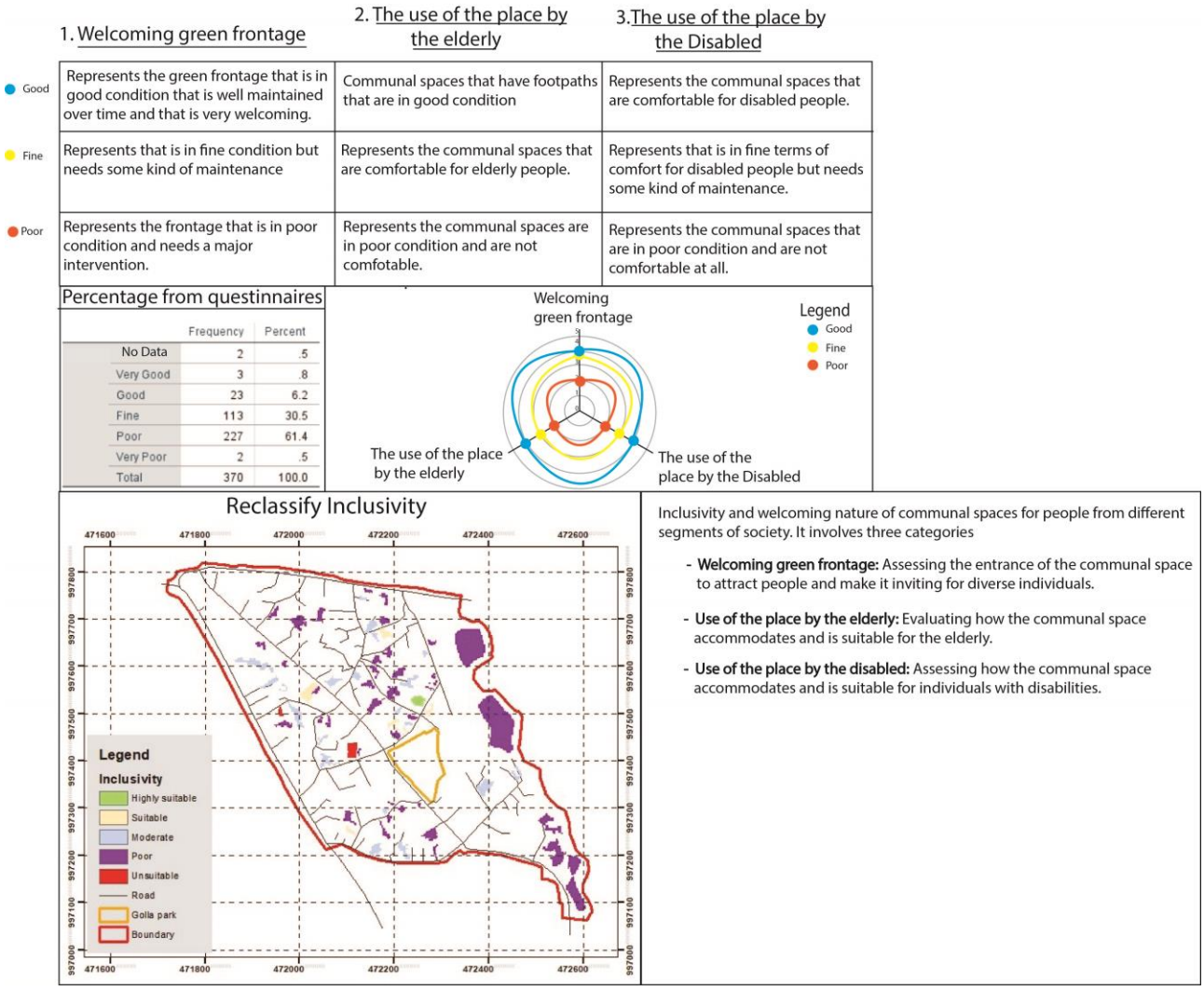


Fig 3.5. Inclusivity in communal space 1

When designing inclusive public areas, pay particular attention to three important factors: a welcoming green frontage, senior citizen suitability, and disability accommodations. These components enhance the enjoyment and inclusivity of spaces. To ensure usability for everyone, Golla Sefer's designs should put the elderly and disabled first by utilizing universal design principles, tactile elements, clear signage, and adjustable features (Null, 2013).

3.1.6.Opportunity to educate the public of Golla Sefer

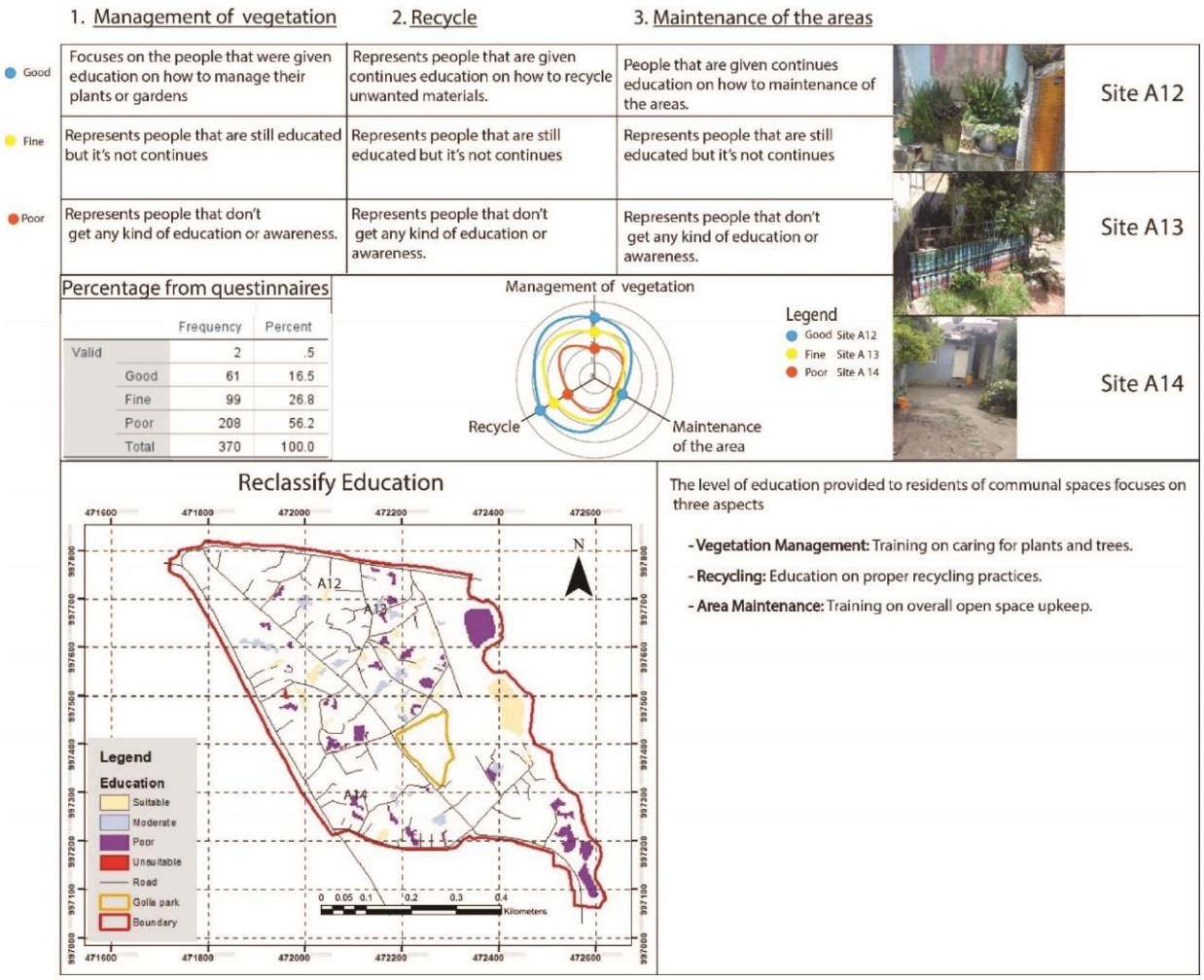


Fig 3.6. Opportuntiy to educate 1

Residents are empowered to maintain common areas through education on recycling, vegetation management, and area upkeep. In Golla Sefer, more training is required. Workshops,

conferences, and educational initiatives can impart social skills and sustainable practices (Wates, 2014). Curiosity and a bond with nature are fostered by educational settings and hobby classes (Edensor, T., Leslie, D., Millington, S, 2009). Knowledge-sharing is facilitated by public programming, such as educational events and guest speakers (Casanova, H. and Hernandez, J. eds., 2015). Involving local experts provides unique insights (Hoogduyn, 2014). Recycling education encourages waste minimization and adherence to regulations (Abu Bakar, A.I., Abas, M.A., Muhamad, 2022).

3.1.7.Collaboration between local administration and the public

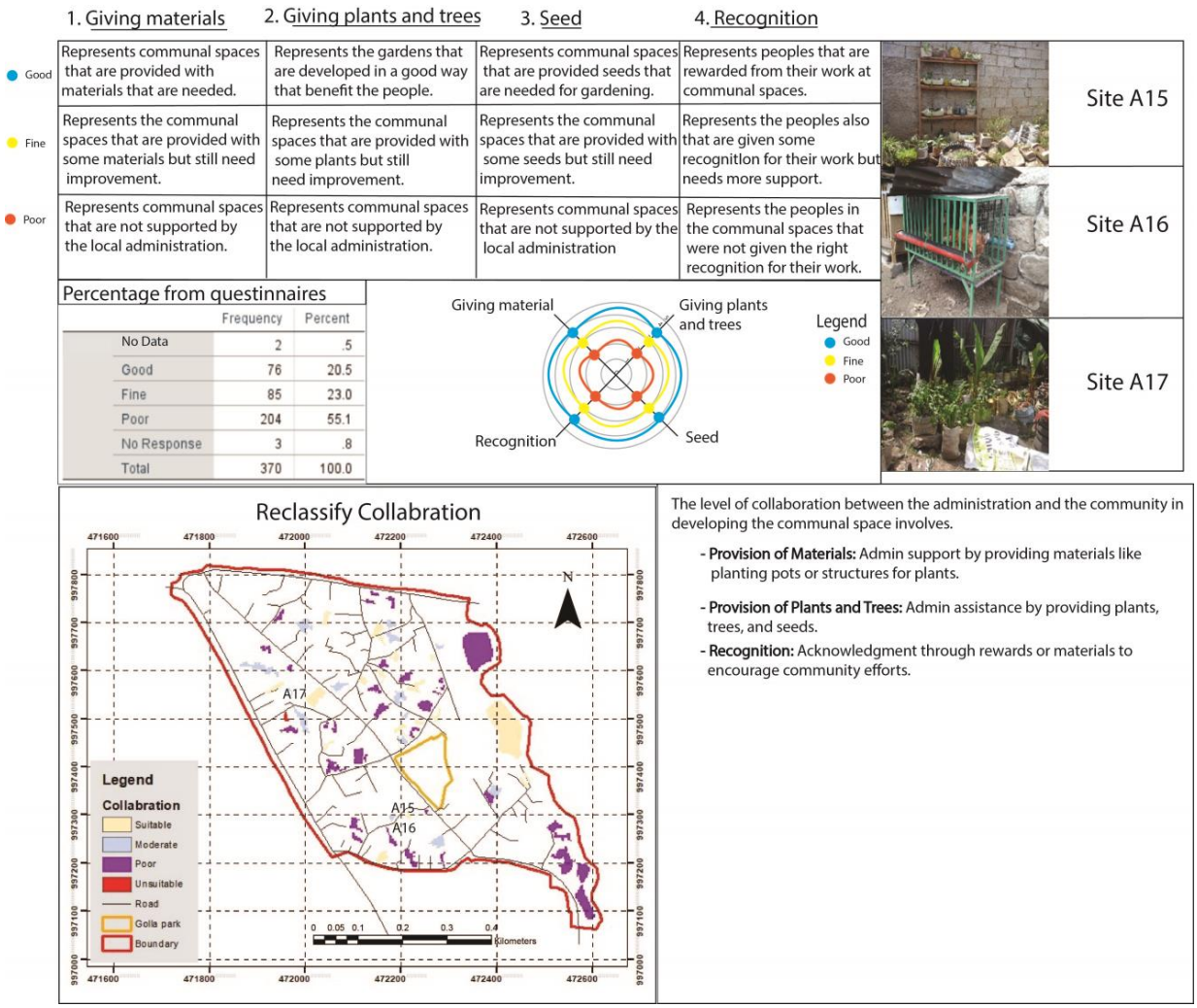


Fig 3.7. Collaboration administration 1

The cooperative creation of public areas entails administrative assistance in the form of supplies, vegetation, and acknowledgment. Providing trees, planting pots, and tools encourages biodiversity and creates a visually appealing space. Certificates and awards recognize community service, encouraging pride and continued participation, strengthening community bonds, and improving common areas.

Collaborative projects and maintenance instruction empower residents, while information distribution and academic collaborations enhance education in communal spaces. In Golla Sefer, the local government provides residents with planting pots, seeds, and materials to transform communal areas into green spaces. Outstanding achievements in maintenance are acknowledged with certificates, rewards, or supplies. Open communication channels between the local government and public gathering places foster engagement and feedback (Chen, J., Chen, T.H.Y., Vertinsky, I, 2013).

Collaborative planning involves meetings and workshops with the local government and community, promoting shared responsibility and participation (Margerum, 2011). Clear roles between the public and local government enhance accountability and teamwork (Chan, 2017).

Community involvement is nurtured through recognition and rewards, fostering pride and continuous participation (Lauber, T.B., Decker, D.J. and Knuth, 2008). Monitoring, acknowledgment, and capacity building empower community engagement and the development of communal spaces (Iaconesi, S., Persico, O., Iaconesi, S., 2017).

3.1.8.Livable quality within the communal space

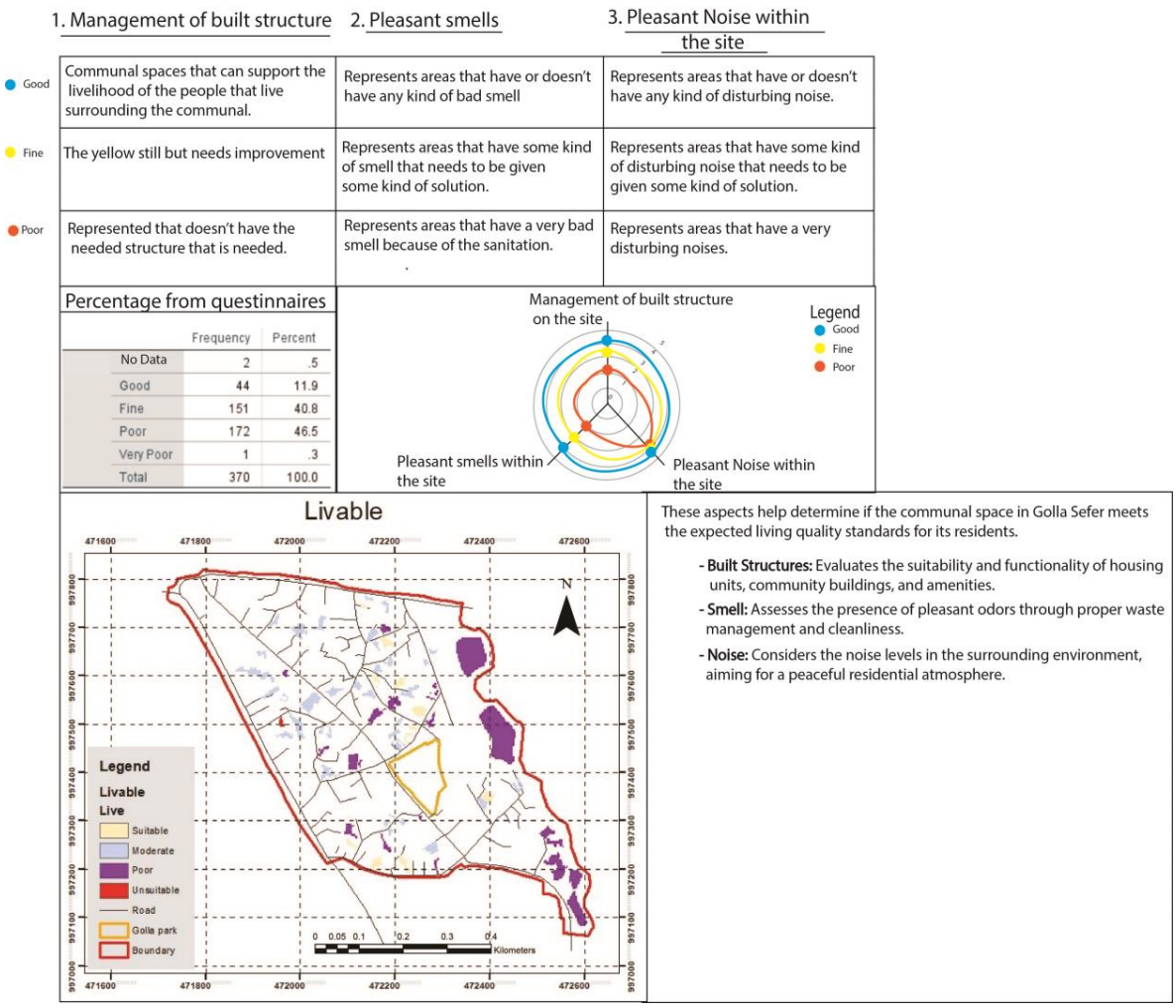


Fig 3.8. Livable quality 1

Golla Sefer's built structures, noise levels, and odors are assessed to make sure that common areas satisfy requirements for living quality. In order to provide safe, cozy, and pleasurable living conditions, it evaluates housing units, manages waste to eliminate odors, and takes noise levels into account for a calm environment.

High living standards in common areas are ensured by assessing Golla Sefer's built environment, noise level, and odors. Well-being is enhanced by suitable housing, useful amenities, and green spaces (Fredericks, J., Caldwell, G.A., Foth, M, 2019). Regular cleaning keeps the environment

clean, and effective waste management reduces odors. Reducing noise levels fosters a peaceful atmosphere (Abid, 2016).

3.1.9.Safety within the communal space

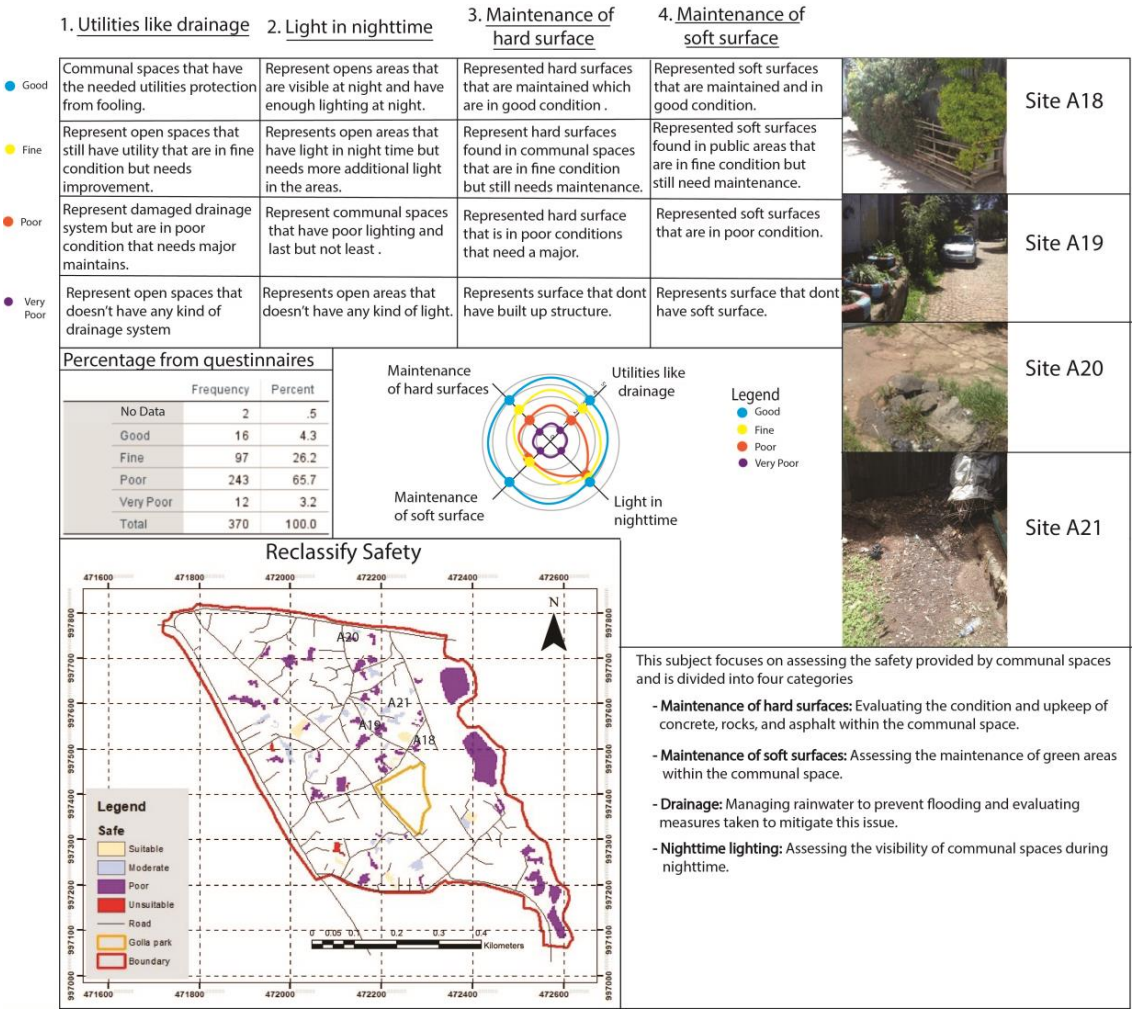


Fig 3.9. Safety in communal space 1

In order to maintain safe conditions, safety primarily focuses on maintaining hard surfaces like asphalt and concrete. For a fun and risk-free experience, soft surfaces like lawns and green spaces must be maintained. Adequate nighttime lighting improves visibility and fosters a sense of security, while appropriate drainage systems are assessed to prevent flooding.

Evaluating and maintaining hard surfaces, drainage systems, nighttime lighting, and soft surfaces are all part of determining how safe Golla Sefer's public areas are. Safety requires routine repairs and inspections. Private areas are usually well-kept, though maintenance varies. Visibility varies at night, and certain places require better lighting.

Well-maintained infrastructure, including play equipment and walkways, is crucial(Bain, L., Gray, B. and Rodgers, D, 2012). Ensure safe soft surfaces and well-lit restrooms (Potter, 2003).Promote safety through education, training, proper drainage, and accessible safety equipment (Kendrick, D., Young, B., Mason-Jones, A.J., 2013). Adequate nighttime lighting is essential for visibility and security(Crouch, S., Shaftoe, H., 2014).

3.2.Criteria and sub-criteria for multi-criteria suitability analysis

Suitability maps for acupuncture interventions were generated using multi-criteria analysis, considering factors like flooding risk, visibility, proximity to vacant spaces, stream network analysis, slope, walkability, road types, and land use/vegetation cover.

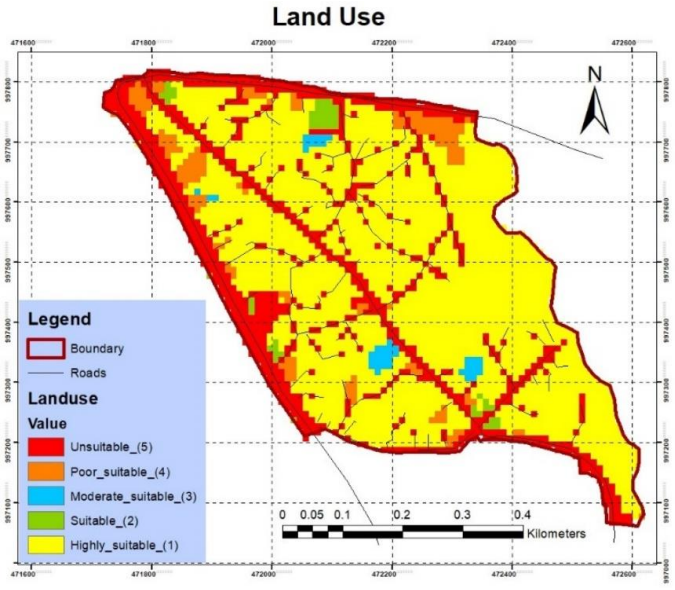


Fig 3.10. Reclassified Land use 1

3.2.1.Reclassified Land Use

Communal spaces are typically necessary for residential space because people need it for a variety of activities. As a result, the highest rating is given to them based on references from various types of literature, making them highly suitable. In contrast, mixed-use and services are seen as suitable, while manufacturing or activities that are

related to that are seen as unsuitable.

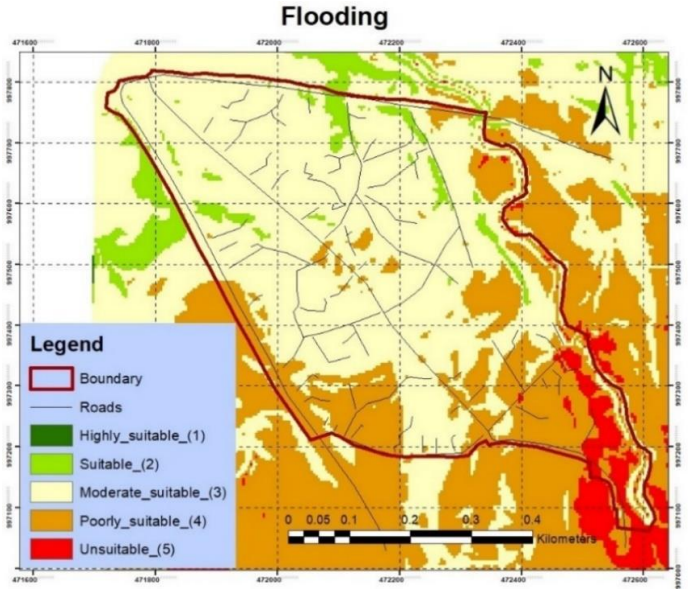


Fig 3.11. Flooding Map 1

3.2.2.Reclassified Flooding

The first factor is flood-prone area analysis. According to the analysis, communal spaces in danger of flooding are deemed unsuitable for acupuncture intervention, but the spaces with a medium or low risk of flooding are deemed moderate and suitable for acupuncture intervention.

Fig 3.12. Vegetation Cover 1

3.2.3.Reclassified Vegetation

The third aspect to identify the areas for urban acupuncture intervention is vegetation mapping and the availability of roads. Areas with high vegetation cover are highly suitable for intervention, while medium and low vegetation cover are thought to be moderate and unsuitable, respectively.

In addition, more roads with good quality are suitable for acupuncture intervention and to be connected with communal spaces.

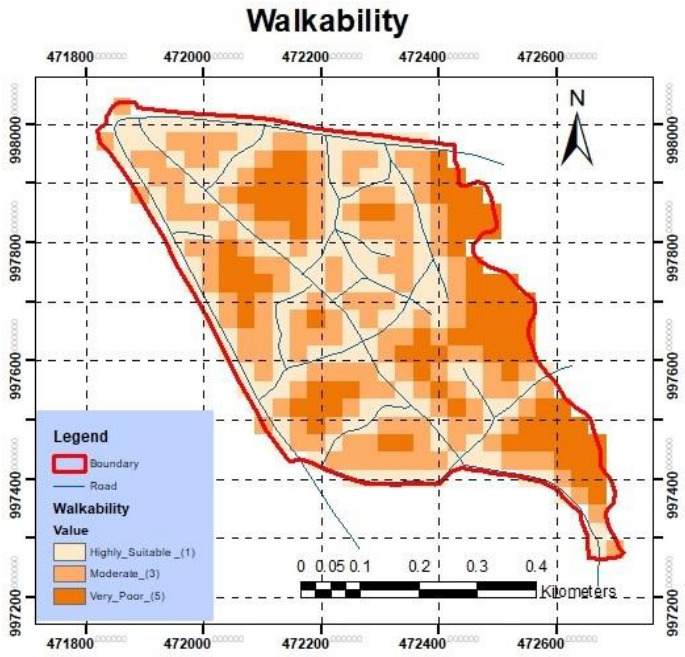
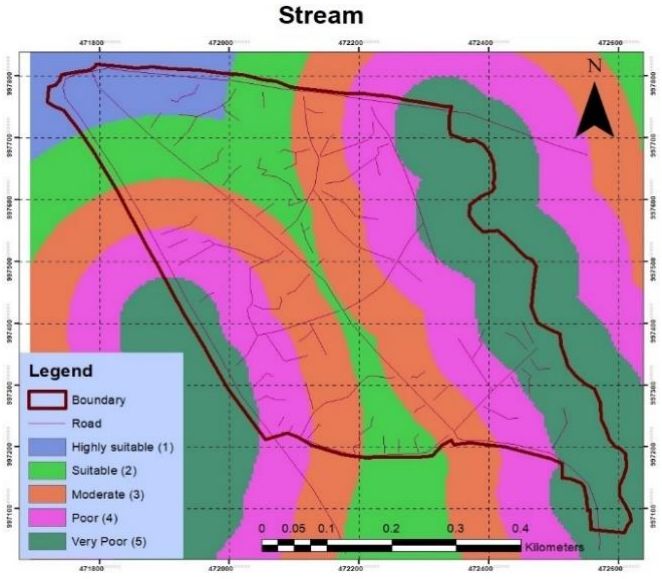


Fig 3.13. Walkability Map 1

3.2.4.Reclassified Walkability

Walkability is also an important aspect of creating useable communal spaces. Local roadways that allow people to enter and exit common spaces and give the space a greater purpose are necessary for the intervention to be successful. According to the analysis, a place within 5 meters is highly suitable as

it is usually called a walkable distance, while 10 and 15 meters are moderately suitable, andanything over that is regarded as poor and unsuitable.



3.2.5.Reclassified Stream

The "Stream" map shows land suitability for development near a stream, where suitability increases with distance: unsuitable within 15m, poorly suitable from 15-25m, moderately suitable from 25-30m, and suitable from 35-40m, becoming highly suitable beyond. The map uses color-coding and covers 34 hectares.

Fig 3.14 Stream Map 1

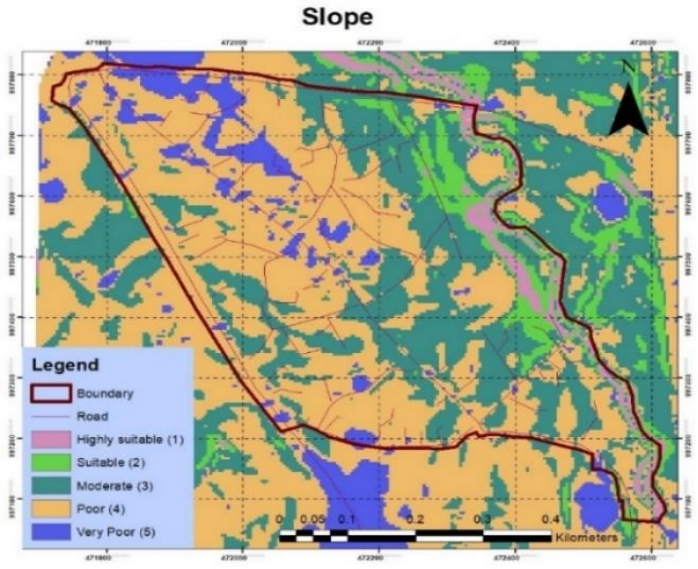


Fig 3.15 Slope Map 1

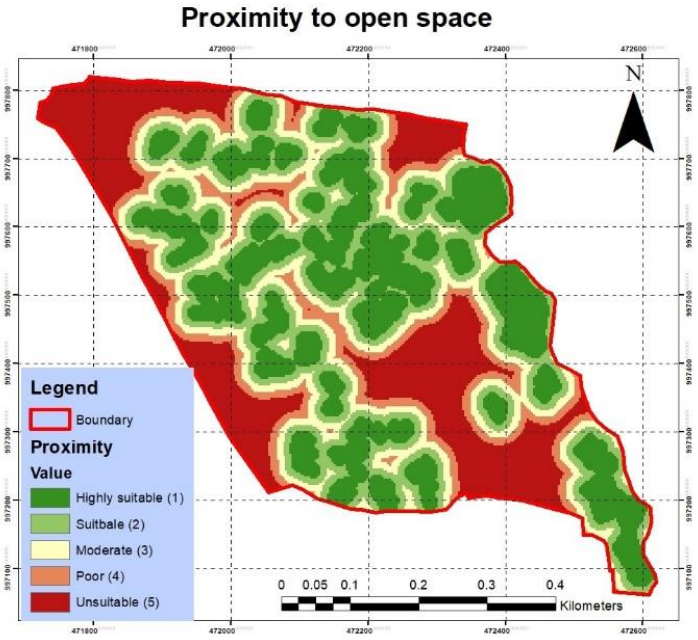


Fig 3.16 Proximity to Open space 1

3.2.6.Reclassified Slope

When it comes to reclassified slope, the areas that have an elevation between 0 to 5 are highly suitable, while 5 to 10 percent of elevation is considered to be suitable, and 15 to 20 percent of elevation is considered moderately suitable. while greater than 20% is considered to be poorly suitable and unsuitable.

3.2.7.Reclassified Open Space

This map shows the proximity of vacant areas reclassified in this study to connect different communal spaces to develop a well-coordinated green infrastructure within the neighborhood. Communal spaces that are within a close proximity of 5 meters of each other are considered to be highly suitable, while within 10 meters.

3.3.Map of sensitive points of open areas for urban acupuncture intervention

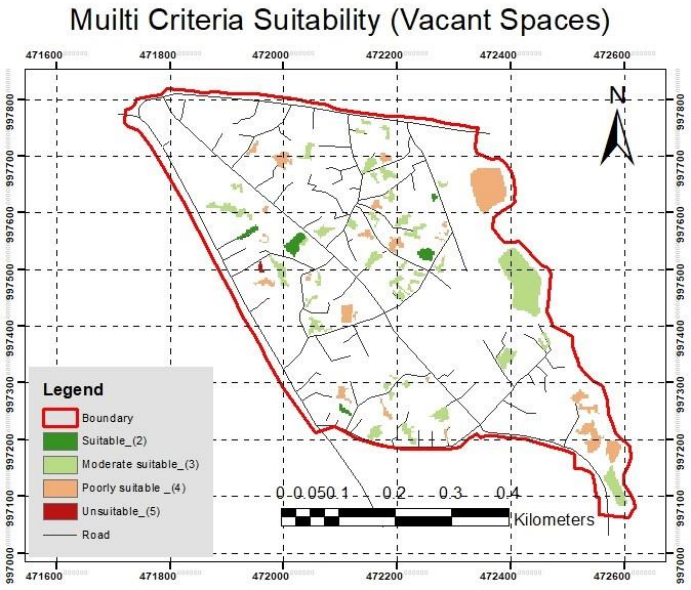


Fig 3.17 Multi criteria vacant space 1

Multi-criteria suitability analysis was used to generate the maps. Factors such as accessibility, walkability, availability of communal spaces, inclusivity, education, collaborative development, quality of built structures, and safety were considered. These evaluations ensure easy access, inclusive design, community engagement, and a safe and enjoyable environment in communal spaces.

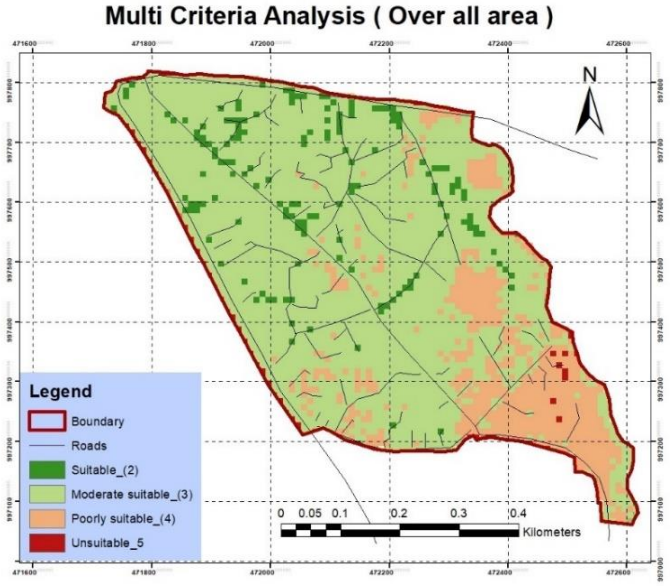


Fig 3.18 Multi criteria over all space 1

A multi-criteria suitability analysis was used to identify suitable areas for acupuncture intervention. Factors such as flooding risk, visibility, proximity to vacant spaces, vegetation cover, road quality, and slope were considered. Communal spaces were highly suitable, while flood-prone areas and poor visibility were unsuitable.

4.CONCLUSION

In Addis Ababa, targeted interventions such as urban acupuncture in public areas are part of urban planning for diverse populations. Sustainable and inclusive development is promoted by effective resource allocation and context-specific tactics. Improving access to common areas in Golla Sefer requires giving connectivity and street conditions top priority. The accessibility and usability of these areas can be greatly increased by repairing local road deficiencies, improving collector roads, and improving footpath infrastructure.

In order to improve connectivity and accessibility, Golla Sefer's urban planning is informed by an assessment of public transportation accessibility in public areas. Allocating resources is aided by zone classification based on accessibility. Improving access by foot, car, and main road is essential for inclusive and accessible spaces. By giving these factors top priority, we can encourage equitable access, encourage active mobility, and improve Golla Sefer's general livability.

"Evaluating pedestrian-friendly elements and the proximity of green spaces highlights the necessity of strategic urban planning and stakeholder cooperation to improve quality of life, accessibility, and active transportation. Sustainable living is promoted by incorporating green spaces into public areas. Success requires cooperation between planners, architects, and stakeholders. "Maintenance of common areas is essential to the creation of lively, inclusive, and sustainable environments that prioritize the well-being of residents."Assessing common areas and attending to physiological requirements emphasizes the creation of lively, inclusive spaces for improved community well-being.

Common areas foster convenience, social interaction, and a feeling of community by offering facilities and areas that support a range of activities. "For implementation to be successful, cooperation is essential. Planning events in public areas encourages community involvement.Prioritizing the various needs of the community results in inclusive, frequently used common areas that improve wellbeing and a sense of community.

"Different needs are taken into account when designing inclusive communal spaces, which promote community involvement and a sense of belonging through accessible features, green frontages, and inclusive amenities. A strong sense of inclusivity and belonging can be fostered for all community members by putting an emphasis on inclusivity and involving people from a variety of backgrounds. This allows communal spaces to be carefully customized to meet individual needs.

"Safeguarding public areas is crucial for creating pleasant surroundings. Examining lighting, drainage, and surfaces improves visibility and reduces the risk of accidents. Creating safe spaces requires evaluating the safety of common areas. Assessing lighting, drainage, and surfaces improves visibility and reduces accidents. "Maintenance ensures safety in communal spaces, fostering a secure community environment for all activities through collaboration among organizations, authorities, and residents," the statement reads.

RECOMMENDATION

Prioritizing small-scale interventions that include amenities, seating, lighting, and enhanced accessibility is advised in order to improve Golla Sefer's common areas. Encouraging locals to recycle and conserve water will guarantee these areas' long-term viability. To create distinctive public areas that encourage environmental stewardship, cooperation between the government and the populace is essential. The community's overall sustainability will be enhanced by highlighting sustainable practices like recycling and the use of renewable resources.

Creating lively and livable public spaces requires maximizing available open spaces, engaging in urban acupuncture, and encouraging resource efficiency. The community's overall accessibility will be increased by putting safety measures in place and improving walkability through pedestrian-friendly infrastructure. Additionally, by working with stakeholders and removing physical barriers, efforts should be made to improve access to green spaces.

Involving the community in the design process and creating multipurpose spaces will optimize their usability and satisfy the various needs of locals. Encouraging inclusivity through universal design principles and collaborating with disability organizations will guarantee that public areas are hospitable and accessible to people of all abilities.

Education and awareness programs, along with partnerships with academic institutions, will help spread knowledge and engage the public in the improvement of communal spaces in Golla Sefer.To promote inclusivity in communal spaces in Golla Sefer, incorporate universal design principles, engage the community, raise awareness, and collaborate with disability organizations.

To educate the public and promote a culture of learning, plan workshops, educational events, and hands-on learning opportunities. Create open lines of communication and promote joint planning and decision-making between residents and the administration. Enhance the standard of public areas by adding green elements, managing waste effectively, maintaining regular cleaning schedules, and attending to safety issues. In Golla Sefer, these actions empower locals, encourage information exchange, and establish welcoming and safe public areas.

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hancing+the+green+frontage+at+entrances,+ensuring+the+needs+of+the+elderly+are+met,+and+providing+accessible+features+for+individuals+with+disabilities

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Appendix B : Questioner

The questionaries below are prepared with the accordance of the research objectives 2, 3 and 4. These questions will be asked on each 5 blocks (ketenas) of the site to understand the point of view of the public on green infrastructure.

1. Respondent's age..... 2. Respondent's sex_____

- What is the study area's current spatial condition in relation to its green infrastructure?

Green Areas (House Hold)

1. where do you get services in green areas?

1.□ Inside Golla Sefer 2. □ Outside of Golla Sefer

2. Outside of Golla Sefer where is the Specific area?

1.□ Friendship Park 2.□ Ethio Cuba Park 3. □ Unity Park 4. □ Other

3. Why do you not get a green area service inside Golla Sefer?

1.□ Lack of green area in the site 2. □ Not interested 3. □ To have a better service 4. □ Other

4. Are there things you like in Golla Sefer'sr green development?

1.□ The use of pocket spaces in the site 2. □ The use of recycled materials as a planting pot on the street side 3.□ Planting of street-side trees 4. □ Other

5. How important do you consider it to have Greenspaces in your local area?

1. □ Very important 2.□ Quite important 3.□ Not important

6. Does the presence of different plants and trees attract you to engage in outdoor activities?

1. □ Yes 2. □ No

- What vacant spaces on the site are suitable for urban acupuncture interventions?

Vacant Spaces (House Hold)

7. Have you noticed pollution in the open spaces?

1. □ Yes 2. □ No If yes, what is the primary cause of the pollution?.....

8.Is there a problem with flooding?

1.□ Yes 2.□ No If yes, what is the primary cause for flooding?.....

9.Is there environmental degradation in the open space you noticed?

1.□ Yes 2.□ No If yes, what is the primary cause for the degradation?.....

10. Were there any efforts made by you and by the people who use space to mitigate the pollution and the degradation?

1. □ Yes 2. □ No If yes what was the mitigation made ……...

10.1. If it's no, why?

1.□ Wasn't important 2.□ I wasn't required to do so

12.Do you think if there are more green public spaces like this the spaces can be focal area for activities?

1. □ Yes 2. □ No

How do you rate the following

		Very Good	**Good**	**Ok**	**Poor**	**Very Poor**
13	Environmentally friendly features like manmade landscape					
14	Adequate lighting during night time					
15	Provide opportunities for activities (sports, recreational and agricultural activities)					
16	Access to the main road from the open area					
17	Safety (Availability of retainer walls and flood mitigation amenities)					
18	Circulation space is easy for children and disable people					
19	Comfortable for circulation					
20	Availability of personal security					
21	Accessible at any time for every activity without time bounded					
22	Open space size for different activities					
23	Flexible in time of change					
24	Local aesthetic					
25	Responsibility of local administration to manage the space					
26	promote interaction among different social groups					

- What type of interventions are necessary to ensure sustainable neighborhood development?

Sustainability (Environmental Aspect for green space)

27. what is your vision for green areas in the neighborhood?

1. □ To be as aesthetically pleasing 2.□ To attract different street-side activities
3. □ To improve the spatial condition of the site 4.□ other

28. What do think the impact green areas will have on the Environmental aspect of the site?

1. □ Preventing soil 2.□ Decrease the flooding 3.□ Cleaner air 4.□ other

29. In what way are you going to contribute for the development of the green area?

1. □ Planting trees 2.□ Cleaning the site 3.□ By giving a plot of land 4.□ other

Residential use (Household)

Household number ……Code Number…… House type……Sex……Age…

1. Do you grow your own Plants or vegetables on your compound?

1. □ Yes 2. □ No

2. if no, what is stopping you from growing your own Plants and vegetables?

1. □ lack of spaces 2. □ Lack of gardening skills 3. □ Lack of plants and tools needed

3. Were there any upgrading activities in the block you lived at?

1. □ Yes 2. □ No 3. □ There are no such upgrading activities in this block

3.1. If yes, were you involved in the upgrading process?

1. □ Yes 2. □ No

3.2. if its yes what was the focus of the upgrading program?

1. □ Planting Street side trees 2.□ Reusing unwanted materials to beautify vacant spaces 3. □ Others

3.3. If it's no, why were you unable to involve in the upgrading process?

1.□ Wasn't important 2.□ I wasn't required do so 3.□ Personal reasons

4.Is there any kind of pollution Challenges near the open area of the residential site.

1.□ Is it solid waste related 2.□ sanitation related

5. Is there any efforts made on the common open spaces to grow plants?

1. □ Yes 2. □ No

5. 1.If yes, where do you grow your own Plants or vegetables?

1. □ My garden 2. □ Out of the compound or street side 3. □ At the side of my entrance door to my house 4. □ other

5.2. If its yes, Was the efforts made individually by you on your specific spaces?

1. □ Yes 2. □ No, it's was made by all of us

5.3. If it's yes, what is stopping you from growing Plants by group?

1. □ Lack of coordinated action between one another to use the open space

2. □ Boundary issues between one another 3. □ Lack of plants and tools needed 4. □ Lack of spaces

What vacant spaces in the site are suitable for urban acupuncture interventions?

Open spaces

6. For what proposes do you use the open area currently for?

1. □ For public gathering 2. □ Daily Activities 3. □ Playground 4. □ Used for raising chickens

7. The is pollution in this area ?

1. □ yes 2. □ No

7.1. If yes, what is the primary cause for the pollution ?

1. □ Causes related to solid waste 2. □ Causes related to sanitation 3. □ Worm infestation

8.Is there environmental degradation in the open space you noticed ?

1.□ Yes 2.□ No

8.1. If yes, what type of environmental degradation exists in the open space ?

1.□ Soil degradation 2.□ Water degradation 3. □ Worm infestation

How do you rate the following

		Very Good	**Good**	**Ok**	**Poor**	**Very poor**
10	Sociable, active, and passive user engagement on the open					
11	Accessibility to the main road and easy to access throughout the day					
12	Safety of the open space (Availability of different utilities like drainage system, light in night time, and maintenance)					
12	Walkability within the open space					
13	Collaboration between local administration and community to improve the open space					
14	Opportunity to educate the public on the utilization of open space					
15	Use of local resources or reusing within the open space					
16	Multi-functionality of the open space					
17	Incorporates heritage (coffee drinking spots)					
18	Inclusivity encourages activities that are welcoming					
19	Comfortability that offers a variety of activities, standing and sitting					
20	Livable, well-used, and activated spaces day and night					

What type of interventions are necessary to ensure sustainable neighborhood development?

Sustainability (Social Aspect residential areas)

21. what is your vision for open areas in the residential area?

1. □ To have pleasing space or space to relax 2.□ To hold different activities and be a center of gathering place 3. □ A space that has different utility to be multifunctional 4.□ other

22. What do think the impact green areas will have on the social aspect?

1.□ Create different gathering places with in the site

2.□ Improve the health of the communities 3.□ Create a sense of identity with in the public 4.□ other

23. In what way are you going to contribute for the development of the green area?

1. □ Planting trees 2.□ Cleaning the site 3.□ By giving a plot of land 4.□ other

Commercial use (Street side shops)

1. Do you grow plants in your shop frontage?

1. □ Yes 2. □ No

2. if no, what is stopping you from growing Plants on your shop frontage?

1. □ Lack of spaces 2. □ Lack of skills 3. □ Lack of plants and tools needed

3. Were there any upgrading activities in the block?

1. □ Yes 2. □ No 3. □ There are no such upgrading activities in this block

3.1. If yes, were you involved in the upgrading process?

1. □ Yes 2. □ No

3.2. if its yes what was the focus of the upgrading program

1. □ Planting Street side trees 2. □ Reusing unwanted materials to beautify vacant spaces 3. □ Others

3.3. If its no, why were you unable to be involved in the upgrading process?

1.□ Wasn't important 2.□ I wasn't required do so 3.□ Personal reasons

- What vacant spaces in the site are suitable for urban acupuncture interventions?

Vacant Spaces (Shop)

4. For what proposes do you use the open area currently for?

1.□ For parking 2.□ To showcase merchandise 3.□ Serve customer 4.□ other

5. Do you think the open area is well buffered from moving cars to accommodate your customers?

1.□ Yes 2.□ No

6. Is this open space free from any kind of barriers that could block the street

1. □ Yes 2. □ No

7. Does the open space have appealing attributes to attract a diverse customer to your shop?

1.□ Yes 2.□ No

7.1. If no, you think if the open spaces in integrated with a green component it could attract people?

1.□ Yes 2.□ No

8. Does this open space serve multiple preposes

1. □ Yes 2. □ No If yes, please state those preposes ……

9.Is the open space Comfortable for social interaction compared to others

1. □ Yes 2. □ No

10. Does this space offer different activities that will activate at other times

1.□ Yes 2.□ No If yes Specify the activities. …….

11.Is there pollution in your in this area?

1. □ Yes 2. □ No If yes, what is the primary cause for the pollution?.....

How do you rate the following

		Very Good	**Good**	**Ok**	**Poor**	**Very poor**
12	Inviting with multiple points of entry					
13	Availability of different Utility peoples can use					
14	Visual Quality (barer)					

15	Accessibility from the main road					
17	Safety of the open space for the customers					
18	Walkability					
19	Accessible at any time for every activity without time-bounded					
20	Availability of personal security					
21	The ability to attract customers from a different place					
22	Incorporates heritage					
23	Open space size for different activities					
24	Responsibility of local administration to manage the space					
25	Flexible in time of change					

- What type of interventions are necessary to ensure sustainable neighborhood development?

Sustainability (Economical Aspect for shops)

26. what is your vision for open space near a commercial area?

1. □ To integrate green components so customers stay long 2.□ To attract different street-side activities to boost income 3. □ To integrate utility to make the space multifunctional at different times 4.□ other

27. What do think the impact green areas will have on the economic aspect of the site?

1. □ Create different job opportunities that are related to green areas for the public.

2.□ Increase the land value of the site.

3.□ Boost the local business by attracting different people to the site.

4.□ other

28. In what way are you going to contribute for the development of the green area?

1. □ Planting trees 2.□ Cleaning the site 3.□ By giving a plot of land

4.□ other

Appendix C : Observation Check List

Street pattern	**Good**	**Fair**	**Poor**	**Remark**
Sub arterial				
Collector street				
Local street				
The surface of the space				

Observation

	Residential spaces			Commercial spaces			Green spaces		
Transport	**Good**	**Fair**	**Poor**	**Good**	**Fair**	**Poor**	**Good**	**Fair**	**Poor**
Bus loading and unloading									
Bus circulation									
Taxi Parking									
Taxi circulation									

Automobile circulation									
Automobile parking									
Transport users									

Observation

	Adequately Exists on site	**Potential improvement**	**Not feasible**	**Remark**
Space				
Size				
Space adaptability				
The surface of the space				
Focal point				
Environmental				
Natural shade				
Environmentally friendly features				
Open space influence on pedestrian flow				
Linkage of the open space				
Linked to facilities				
Society				
Convenient and safe pedestrian access				

Inviting with multiple points of entry				
Play spaces designed				
Individual sitting replacing bench				
Range of activities that will activate public space				
Safety & maintenance				
Maintenance of open space				
Free from barriers to the street				
Equitable access				
Well-buffered from moving cars				

Appendix D : Workshop Questioner

ከታች ያሉት መጠይቆች ለምርምር ዓላማዎች ተዘጋጅተዋል

1.የአረንጓዴ አካባቢዎች አገልግሎት ከየት ያገኛሉ?

1.□ ጎላ ሰፈር ውስጥ 2. □ ከጎላ ሰፈር ውጭ

1.1 ከጎላ ሰፈር ውጭ ልዩ ቦታው የት አለ?

1.□ ጓደኝነት ፓርክ 2. □ ኢትዮ ኩባ ፓርክ 3. □ አንድነት ፓርክ 4. □ ሌላ

1.2 በጎላ ሰፈር ውስጥ የአረንጓዴ አካባቢ አገልግሎት ለምን አያገኙም?

1.□ በአካባቢው አረንጓዴ አካባቢ አለመኖር 2.□ ፍላጎት የለም 3.□ ለእኛ የተሻለ አገልግሎት እንዲኖረን 4. □ ሌላ

2.በጎላ ሰፈር አረንጓዴ ልማት ውስጥ የሚወዷቸው ነገሮች አሉ?

1.□ በአካባቢው ውስጥ ትናንሽ ቦታዎችን መጠቀ 2.□ እንደገና ጥቅም ላይ የዋሉ ቁሳቁሶችን በመንገድ ላይ እንደ መትከል ማሰሮ መጠቀም 3. □ የጎዳና ላይ ዛፎች መትከል 4. □ ሌላ

3.በአካባቢያችሁ ግሪንስፔስ መኖሩ ምን ያህል አስፈላጊ ነው ብለው ያስባሉ?

1. □ በጣም አስፈላጊ 2.□ አስፈላጊ 3. □ አይጠቅምም

4.የተለያዩ ተክሎች እና ዛፎች መኖራቸው ከቤት ውጭ እንቅስቃሴዎችን እንዲያደርጉ ይስብዎታል?

1. □ አዎ 2.□ አይ

5.በአሁኑ ጊዜ ክፍት ቦታን ለየትኞቹ ተግባራት ይጠቀማሉ?

1. □ ለሕዝብ መሰብሰብ 2. □ እለታዊ ተግባራት 3. □ የመጫወቻ ቦታ 4. □ ዶሮዎችን ለማርባት ያገለግላል

6.በዚህ አካባቢ ብክለት አለ ? 1. □ አዎ 2.□ አይ

6.1.አዎ ከሆነ፣ ዋናው የብክለት መንስኤ ምንድን ነው።

1. □ ከደረቅ ቆሻሻ ጋር የተያያዙ ምክንያቶች 2.□ ከመጸዳጃ ቤት ጽዳት ጋር የተያያዙ ምክንያቶች

7.በክፍት ቦታ ላይ የአካባቢ መራቆት አለ?

1. □ የአፈር መበላሸት 2.□ የውሃ መበላሸት 3.□ ትል መበከል

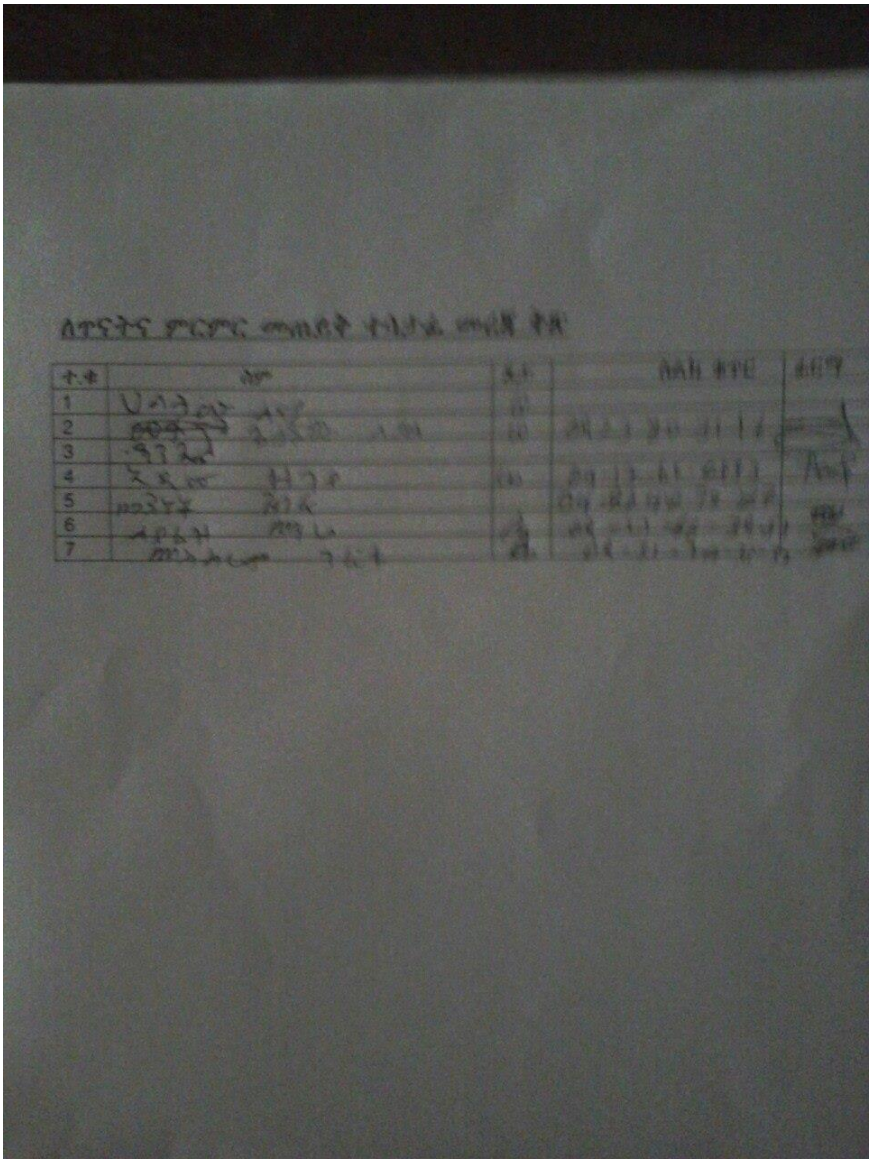
8.በግቢዎ ላይ የራስዎን ተክሎች ወይም አትክልቶች ያመርታሉ?

1. □ አዎ 2.□ አይ

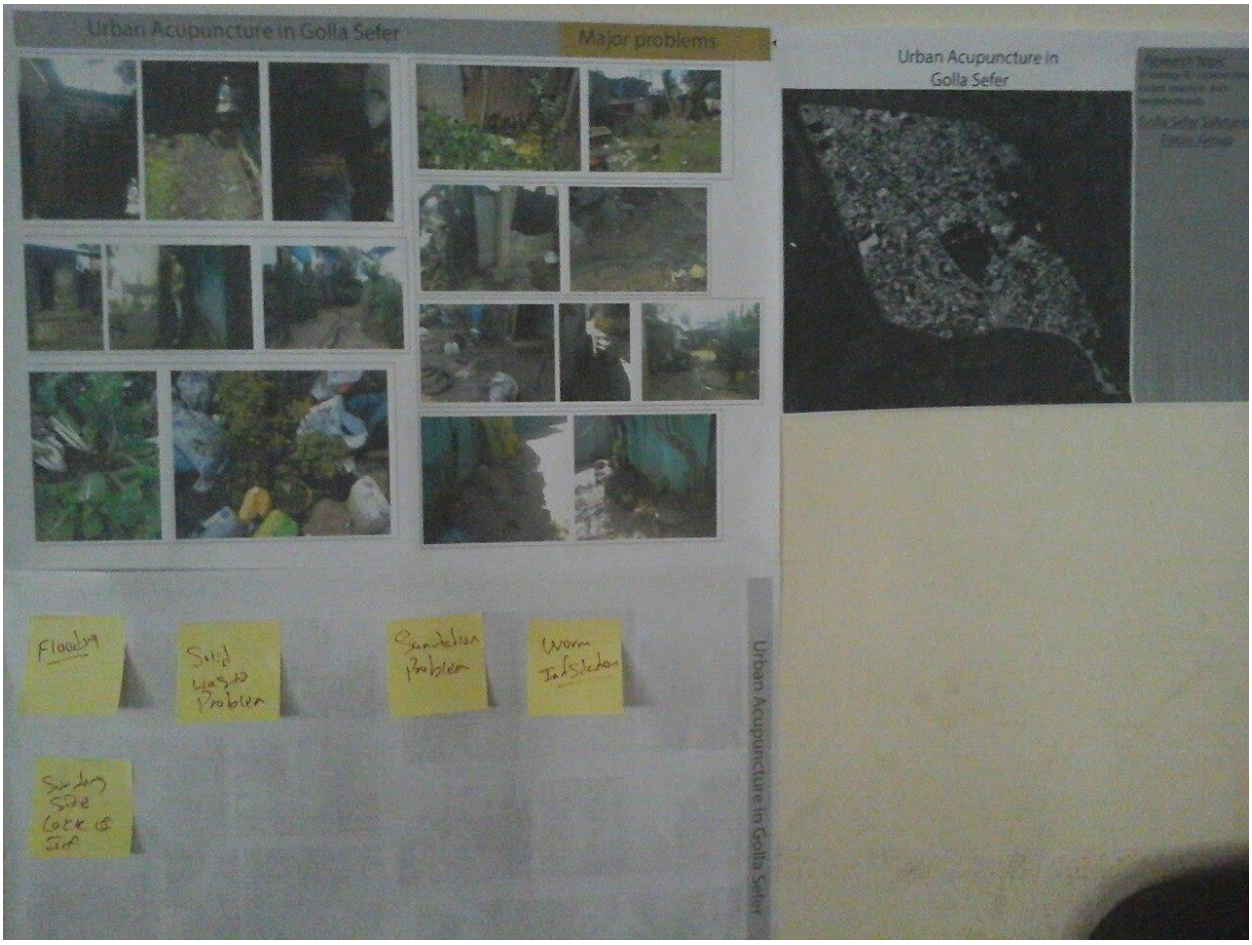
9.አይደለም ከሆነ የእራስዎን ተክሎች እና አትክልቶች እንዳያመርቱ የሚከለክለው ምንድን ነው?

1. □ የቦታ እጥረት 2.□ የአትክልተኝነት ችሎታዎች እጥረት 3.□ አስፈላጊ የሆኑ ተክሎች እና መሳሪያዎች እጥረት

Appendix E : Images taken from the workshop and ethical consent from the participant



Ethical consent from the participant


Urban Acupuncture in Golla Sefer
Major problems
Urban Acupuncture in Golla Sefer
Urban Acupuncture in Golla Sefer