



Research article

Unpacking principles of resilience mainstreamed in Ethiopia's local urban spatial planning documents: practices from Kombolcha, an urbanizing secondary city

Mulugeta Maru^{*}, Hailu Worku*Ethiopian Institute of Architecture, Building Construction and City Development/EiABC/, Addis Ababa University/AAU/, Po. Box. 518, Addis Ababa, Ethiopia*

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ABSTRACT

Adopting and enforcing redundancy, diversity, robustness, and integration principles are required to create spatially resilient cities. However, no studies have demonstrated their significance and application to local urban spatial planning legal frameworks (policy documents) and plans. Therefore, this study aims to fill this gap through an ex-ante review of six Ethiopian spatial planning policy documents: the Urban Development Policy (UDP), the Urban Planning Proclamation (UPP), the Structure Plan Manual (SPM), the Urban Plan Preparation and Implementation Strategy (UPPIS), and the first and second Growth and Transformation Plans (GTP I and II). Besides, the paper undertook post-ante evaluations of the 2001 Development Plan (DP), 2011 Structure Plan (SP), and the 2020 existing land use (ELU) of Kombolcha, a secondary city located in the South Wollo Zone of Amhara National Regional State, Ethiopia. Site observations supplemented the desk-based policy evaluation, Google Earth images, and data gathered from twenty-three purposefully selected key informants. NVivo 12 plus software aided the content analysis, where codes and categories were created based on the characteristics, and respective scores/coefficients were recorded. The findings revealed inconsistencies in the principles' mainstreaming with integration was well assimilated into the policy documents, receiving a score of 67.22, followed by redundancy, a value of 54.21. The tally for diversity and robustness were 44.84 and 31.83, respectively. Concerning policy-specific review, GTP I and II received the highest values of 54.28 and 57.74, respectively. However, UPPIS got the lowest with 18.50. Despite the plans' optimistic visions of addressing hazards and population growth-induced development pressures, their practical implementation had been hampered by the dominance of residential and manufacturing land-uses, haphazard block arrangements, and the municipality's limited ability to implement the proposals. The study, hence, necessitated capacity-building activities to improve local governments' spatial plan implementation capacities. The active participation of stakeholders and institutional collaboration also need further attention from all tiers of government.

1. Introduction

Local Agenda 21, UN-Habitat III New Urban Agenda, 100 Resilient Cities, the 2015–2030 Sendai Framework for Disaster Risk Reduction, and Sustainable Development Goals have ensured that -the concept of resilience has entered the urban policy action arena (Rogov and Rozenblat, 2018; Romero-Lankao et al., 2016; Yamagata and Sharifi, 2018).

In addition, the Organization for Economic Co-operation and Development (OECD), the European Commission/EC/, and the Rockefeller Foundation, in collaboration with ARUP, have introduced strategic

frameworks for creating resilient cities (Angelidou et al., 2018). According to Laframboise and Loko (2012), such frameworks have significantly changed urban policy design and implementation. Davis and Izadkhah (2008) stated that these national and transnational initiatives are appropriate for formulating, acting, and guiding the concept's development. As a concept, resilience emerged from ecology in the 1960s and 1970s (Tabibian and Rezapour, 2016). It started to appear in national and local development policy agendas soon after Holling's seminal work in 1973 (Evans, 2011; Martin-Breen and Anderies, 2011; Yamagata and Sharifi, 2018).

^{*} Corresponding author.

E-mail addresses: mulumaru@gmail.com, mulugeta.maru@eiabc.edu.et (M. Maru).

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However, comprehending the concept entails knowing how resilience theory has evolved (Al-Bqour, 2020). The author further claimed that the scholarly contribution of (Holling, 1973) on ecosystem resilience with significance to urban context is the foundation for the contemporary resilience theories.

Though the definition of resilience has remained elusive (McAslan, 2010), the necessity for a precise definition is important, as resilience is prone to becoming a catchword when hackneyed (Rose, 2007). As per Meerow et al. (2016), the earliest representation of the term is the ability of an ecosystem to function while changing, though it may not stay the same. Nevertheless, improvements were made by 1996 Holling's definition, which asserted that the buzzword encompassing constant (engineering) and dynamic (ecological) flexibility (Holling, 1996; Matyas and Pelling, 2015; Meerow and Newell, 2018).

The engineering approach to resilience is directly dependent on the capability of all the urban system's physical components: buildings and infrastructures to absorb the damages due to disturbances and quickly restore their state before the shock (Nyström et al., 2000; Plodinec, 2009; UN Habitat, 2017). On the other hand, Carpenter et al. (2001) circumscribed the ecological definition of resilience as the capacity of a system to measure the tendency of the system to stay functioning after disturbances or maintain its structure or function without being significantly affected and changing into a new equilibrium or steady-state.

Based on Gunderson (2000); Holling (1996), the emphasis of the engineering perspective is on a single stable state. In contrast, the ecological viewpoint is attributed to the existence of multiple states with the system's tolerance to disturbances, which enhances transitions among stable states. Nevertheless, Holling (1996) claimed the significance of the two theories in that they can become alternative paradigms whose adherents reflect discipline-specific practices. Cutter (2016) further construed that the two perspectives characterize resilience measurement approaches as a single measurable benchmark and as a process.

Folke (2006); Meerow and Newell (2018) attached Holling's (1973) initial definition to the dynamics of complex adaptive systems. Consequently, Walker & Salt (2006) contended the emergence of a socio-ecological systems/SES, within the spheres of the broader resilience thinking and ecological archetype, referring to the ability of a system to handle change and disturbance without transforming into an entirely new system state. This new scientific contribution emerged in the 1990s with an advanced look into the concept of incorporating intricate adaptive systems, including cities and their human settlements, into resilience discourses (Brunetta and Caldarese, 2020). Copeland et al. (2020) quoted that the urban system's resilience depends on the interaction between urban dwellers and the available resources, measured circuitously via the indicators or characteristics.

Morgado and Dias (2013); Pinho et al. (2013) discussed that creating a resilient city requires the designation, formulation, and enactment of urban policies encompassing the basic resilience characteristics. Accordingly, Godschalk (2003) named the characteristics as principles: redundancy, diversity, efficiency, autonomy, strength, interdependence, adaptability, and collaboration.

In support of this, Figueiredo et al. (2018) posited that a city that seeks to transition, transform and change to a better, robust state should focus on redundancy, flexibility, and resourcefulness inclusive and integrated resilience-building. Fleischhauer et al. (2008), on the other hand, coined that redundancy, diversity, strength/robustness, and collaboration/integration are essential in making cities more resilient through spatial planning and related policy instruments. In Assumma et al. (2020); Cai et al. (2020); Currie et al. (2018), these principles were applied to the analysis of the performance of local urban policies using System Dynamics Modeling (SDM). They also reported that policymakers are showing increasing interest in adopting the model.

Two studies are prominent regarding country-specific research that connects the relevance, applicability, and significance of the resilience principles to urban spatial planning legal frameworks. The first one is the research conducted by Oliveira et al. (2013), which reviewed four urban

policies in Portugal by applying recovery and social/capital building attributes of urban resilience. In other circumstances, Poku-Boansi and Cobbinah (2018) used adaptive capacity, inclusiveness, spatial planning, social capital, and learning to evaluate five urban policies in Ghana. These two studies weighted each attribute as explicitly or marginally considered within policy documents for further policy review and recommendation.

Furthermore, these studies performed ex-post policy reviews. They did not consider the role of local urban spatial planning policies in creating a resilient city based on the 2008 Fleischhauer's recommendations. Besides, the reviews relied solely on the term 'resilience' in policy documents, referring to various concepts such as uncertainty, risk, complexity, and insecurity (Taşan-Kok et al., 2013).

Concerning applying the principles to spatial resilience, Lu et al. (2021) argued that the spatial factors: urban blocks, land use functions, green spaces, structures, roads, transport networks and forests, landscapes, and real estate (Assumma et al., 2021) combined with the principles are the epicenters for evaluating local urban spatial planning policy documents, urban spatial plans of cities, and their practical implementation through existing land uses. Nevertheless, no previous studies have attempted to link these dimensions of spatial resilience in secondary cities of the global south. In addition, Maru et al. (2021) indicated the need for original research in this context.

Therefore, the purpose of this paper is to fill this gap by conducting ex-ante policy reviews and examining Ethiopia's local urban spatial planning policies and strategic documents. The redundancy, diversity, strength/robustness, and collaboration/integration principles of resilience were used in the study. The paper then conducted a post-ante evaluation to investigate the practical implementation of the principles using the 2001 development plan (DP), 2011 structure plan (SP), and 2020 existing land use (ELU) proposals of Kombolcha city, an urbanizing second-tier city in Ethiopia.

2. Literature analysis

2.1. The relevance of spatial planning in creating resilient cities

Spatial planning refers to the approaches widely applied by governments and institutions to affect the future distribution of land use functions in a physical space (Okeke, 2015). It affects the long-term use of space through proper land allocation for various urban functions. According to Sutanta et al. (2010), it is one of the most important tools to integrate urban risks, stresses, shocks, and uncertainties. It identifies past, present, and future hazard scenarios that can be mitigated or adapted through it (Nadin and Stead, 2008).

Thus, based on Fleischhauer et al. (2008) scientific contribution, spatial planning follows a multi-hazards approach since a single location in an urban area may be threatened by many types of natural and anthropogenic hazards. In this context, Trakas et al. (2019) coined that the hazards have an inherent tendency to spread across various spatial scales: regional, local, and neighborhood levels. Integrating the disturbances into spatial plans requires formulating coordinated policies, which spell out organizational and technical procedures at various scales: national, regional, and local Fleischhauer et al. (2008); MoUDH, 2016; Sutanta et al. (2010).

However, Sutanta et al. (2010) claimed that national and regional spatial planning provides strategic directions on urban land use at broader coverage, matching multi-regional spatial plans, and having few operational plans. Contrarily, the local levels of spatial planning are more attached to be functional and implemented at an urban/city level.

These scholars further claimed that spatial planning influences the creation of resilient cities through the four approaches at all levels of intervention. Namely: Avoid developments in some locations, provide differentiated land-use decisions, the spatial plan should be a legally binding document to regulate land use or zoning, and the spatial plans should provide options for adjustments to potential hazards.

According to [Fleischhauer et al. \(2008\)](#), embracing these frameworks in policies and graphical representations, easing practical implementation of spatial plans, can significantly make cities resilient and sustainable. In terms of policy and practice, [Elmqvist et al. \(2019\)](#) argued that both concepts, which comprise the core theme of the New Urban Agenda, are interconnected and should be examined carefully.

2.2. Resilience oriented urban policy review approaches

Any resilience-oriented policy evaluation depends on applying irrefutable evaluation criteria that define the characteristics of intricate resilient systems like cities ([Folke et al., 2002](#); [Godschalk, 2003](#); [Roberts, 2006](#)).

Accordingly, [Walker & Salt \(2006\)](#) have reported nine resilience qualities that need to be applied while evaluating resilience-based policy. The criteria developed by these authors included diversity, variability, modularity, acknowledging slow variables, tight feedbacks, social capital, innovation, overlap in governance, and ecosystem services. [Schouten, van der Heide, C. M., Heijman and Opdam \(2012\)](#) asserted these criteria at socio-ecological systems, including rural and urban settings.

In the urban context, [Arup \(2014\)](#); [Brunetta and Caldarece \(2019\)](#); [Figueiredo et al. \(2018\)](#); [MoUDH, 2015a](#). [MoUDH \(2015a\)](#) noted that resilience-oriented policy evaluation could deploy seven parameters: reflectiveness, resourcefulness, robustness, redundancy, flexibility, inclusivity, and integration. [Wardekker \(2018\)](#) often referred to these criteria as principles, while [Meerow and Stults \(2016\)](#); [Sharifi and Yamagata \(2014\)](#); connote them as characteristics of urban resilience. An online document entitled 'Cities resilience Framework (CRF)' published by the Rockefeller foundation in 2014 put the terms 'qualities' of a resilient urban system ([Arup, 2014](#)).

[Fleischhauer et al. \(2008\)](#); [Godschalk \(2003\)](#) indicated the significance of applying all or combining the principles in policy evaluation, formulation, urban spatial planning processes, and implementation. Formulating these urban resilience attributes has motivated scholars to apply the criteria in various national, regional, rural, and urban resilience-oriented policy evaluations.

For instance, [Schouten et al. \(2012\)](#) applied the nine attributes of resilience developed by [Walker and Salt \(2006\)](#) to evaluate seven rural development policies in Europe, with the Netherlands' case. The thematic focus of the evaluation was to measure the policy instruments' contribution towards creating resilient rural areas by focusing primarily on economic dimensions of resilience.

Three studies appeared prominent concerning urban application that has applied various but interrelated criteria to evaluate urban policies with differing thematic motivations. [Eraydin and Taş an-Kok, 2013](#) put 'Recovery' and 'Capital building' as the crucial criteria to evaluate urban policies within the developed world contexts. This study's prime themes were financial, social capital, and legal issues on creating resilient cities and seeing resilience features' induction in rehabilitating old buildings in Oporto, Portugal.

Another study conducted in Greece employed redundancy, modularity, buffering, connectivity, and the existence of legally binding land-use/zoning plans as a guiding feature of a resilient urban system ([Angelidou et al., 2018](#)). These authors applied the realization of resilience characteristics with the coastal city of Thessaloniki, while the thematic focus was on urban policies and the physical dimension of resilience.

Concerning the practice in developing countries, a study conducted in Ghana has endeavored adaptive capacity, inclusiveness/participation, social equity and learning, and spatial planning as the core criteria to evaluate five policy documents ([Poku-Boansi and Cobbinah, 2018](#)). This paper showed the extent to which the legal documents embraced the concepts of urban resilience and assessed the level of understanding of urban planners towards the practical application and implementation

within Ten Ghanaian Cities. [Table 1](#) summarizes the resilience approaches and the policy reviews undertaken in different countries.

2.3. Policy evaluation criteria used

Various scholars have widely elaborated and discussed the resilience attributes relevant to urban spatial planning frameworks. According to [Lu and Stead \(2013\)](#), promotion of compact cities models, resilient local urban spatial planning, duplication of critical urban support services, multiple accesses to urban land covers such as green areas, infrastructures are some concerns of the multiplicity of urban functions and systems, [Fleischhauer et al. \(2008\)](#) emphasized redundancy and diversity about diminishing high urban densities and promoting physical structure with multiple nodes. [Cruz, Costa, Sousa and Pinho \(2013\)](#); [Wardekker \(2018\)](#) discussed that redundancy is associated with systems designed with multiple nodes/areas to ensure that one element's failure does not cause the whole urban system to flop. Based on [Anderies \(2014\)](#), this principle allows spatial systems to withstand disruptions by ensuring continuity through substitutes' availability.

Redundancy is connected to various functions within a system and the mix of groups that prevail in that system ([Folke et al., 2002](#)). It constitutes multiple components or nodes against a central node in urban contexts to protect a site-specific against potential threat ([Fleischhauer et al., 2008](#)).

[Bevilacqua et al. \(2019\)](#), [Yamagata and Sharifi \(2018\)](#) asserted that redundancy includes diversity, which implies heterogeneity in public participation and inclusiveness ([Gharai et al., 2018](#)). It is further attributed to land use zoning instruments/urban functional zones, the spatial heterogeneity of main urban elements, resource diversification, and mobilization during hazard events ([Wardekker, 2018](#)).

Robustness is another principle relevant to local urban spatial planning. It determines the urban system's ability to survive external shocks ([Taşan-Kok et al., 2013](#)). It is a crucial component to spatial planning as it is linked to structural prevention measures as a part of building permissions and secures space availability for protective infrastructures ([Fleischhauer et al., 2008](#)). In line with this, [Bevilacqua et al. \(2019\)](#) discussed the robustness principle as well perceived, built, and implemented in physical assets of urban systems that can cope with disturbances without affecting any urban functions.

Robustness includes anticipating and assessing potential failures in urban systems. It is also concerned with the sustainability of physical structures, spacing, pattern and shape, and quality of urban blocks that define the form of cities ([Gharai et al., 2018](#)).

The integration principle is associated with a wide array of opportunities and incentives for enhanced participation of stakeholders ([Cruz et al., 2013](#); [Fleischhauer et al., 2008](#)). It is the tendency to which various nodes are directly connected. It further embraces the physical dimension and the relationships between communities and institutions ([Fleischhauer et al., 2008](#); [Taşan-Kok et al., 2013](#)).

The most valid aspect of this resilience attribute includes institutional reforms such as cooperation and integration among institutions, decentralized decision-making systems containing decision-making procedures, and transparency to the local community. It also encompasses sectoral and spatial inter-linkages ([Gharai et al., 2018](#); [Sharifi and Yamagata, 2014](#)).

In spatial planning frameworks, redundancy and robustness are about pre-existing situations, and they are more attached to prevention or preparedness. On the other hand, integration is attributed to the concerted efforts of various stakeholders towards building the resilience of urban systems in an integrated and coordinated manner through consultation. Diversity lies in both circumstances and shows the preparedness for hazards and their integration in the process of public dialogue ([Figueiredo et al., 2018](#)).

Table 1. The criteria and resilience discourses of the Resilience-based Policy reviews.

Article title, name of author/s/and year of publication	Objectives of the article	Policy documents reviewed	Criteria/approaches to resilience evaluation used	Thematic areas	Extracts
<i>Are we planning for resilient cities in Ghana?: An analysis of policy and planners' perspectives</i> (Poku-Boansi & Cobbinah, 2018).	<ul style="list-style-type: none"> • Are national planning legislation and policies that use urban resilience as an organizing concept driven by local understanding and situations, and are they likely to build resilient cities? • Do urban planners' perspectives influence urban resilience efforts? • Do national planning legislation and policies achieve balance by supporting all urban resilience principles, or do national planning legislation and policies narrowly advance some principles more than others? 	Five national planning policy documents framed by resilience concepts	<ul style="list-style-type: none"> • Adaptive capacity, • Inclusiveness/participation, Social equity and learning, Spatial Planning 	Participation, Adaptability,	<p>Focus: Cities in Ghana. Target policy areas:</p> <ul style="list-style-type: none"> • Focused on policies where resilience concepts are well embraced. • Evaluated the extent to which policy documents enhance or diminish some principles/criteria above others. • Did not consider criteria that take urban as SESs and holistically apply the principles.
<i>Spatial Planning For Urban Resilience: Assessing Current Prospects Through A Multilevel Approach And A Use Case In Northern Greece</i> (Angelidou, M. et al. (2018).	Aimed to assess whether and to what extent the western coastal front of Thessaloniki, Greece, currently a partially developed area, features elements of resilience and what opportunities can be harnessed to this end.	Sectoral planning documents: Urban, regional, transportation and environmental planning and management frameworks	<ul style="list-style-type: none"> • Redundancy • Modularity, • Buffering, • Connectivity, • Existence of legally binding land-use or zoning plans 	Integrated consideration of economic, social, and environmental dimensions of resilience	<p>Urban: Thessaloniki, Coastal city in Greece.</p> <p>Target policy areas: sectoral policies were expressively analyzed concerning urban resilience lenses mentioned and Strive to find out whether the attributes of urban resilience are practically realized at a spatial scale.</p>
<i>The Evaluation of Findings and Future of Resilience Thinking in Planning</i> (Eraydin and Taş an-Kok, 2013).	<ul style="list-style-type: none"> • Introduce the urban problems of the case study area. • Analyze how the main planning documents approach these problems • Undertake a critical appraisal of the applicability and usefulness of the resilience concept. 	A total of four policies with the following major objectives were reviewed: two with financial issues, one legal issue, one social issue promoting the attraction of new residents.	<ul style="list-style-type: none"> • Recovery • Capital building 	Policies, Physical dimension of resilience with particular focus on old buildings and The social dimension of resilience: the Population growth rate in urban areas, Levels of education, income disparity.	<p>Urban: Baixa District, Oporto, Portugal.</p> <p>Targeted policy areas:</p> <ul style="list-style-type: none"> • Urban rehabilitation policy discourses
<i>A resilience-based policy evaluation framework: Application to European rural development policies</i> (Schouten et al., 2012).	Evaluate to what extent rural development policies contribute to the resilience of rural areas.	Seven Rural Development policy documents	<ul style="list-style-type: none"> • Diversity, • Variability, • Modularity, • Acknowledging slow variables, • Tight feedbacks, • Social capital, innovation, • Overlap in governance and ecosystem services. 	<ul style="list-style-type: none"> • Environmental Policies, • Water quality • Environmental quality • Innovation • Energy 	<p>Rural: Netherlands</p> <p>Targeted policy areas</p> <ul style="list-style-type: none"> • Policy documents with resilience concepts are overarching. • Worked heavily on rural areas as SESs component and evaluated the document in an integrated and holistic manner.

Table 2. Description of spatial resilience principles used in this study.

NO	Resilience/principles	Conditions/targets the review is expected to achieve
1	Redundancy	Multiple centers: main center and sub-centers Duplication of main-urban support services: reserve areas and protected forests
2	Diversity	Diversity of land use zoning instruments/Diversity of urban functional zones Spatial diversity of main urban elements: land uses, road network, and hierarchies.
3	Robustness	Anticipation and assessment of potential failures in urban systems due to disruptions Sustainability of physical structures: roads and bridges Spacing, pattern, and shape of urban blocks: Promotion of quality urban blocks that define the form of cities
4	Integration	Public participation

Table 2 describes local urban spatial resilience principles and the conditions set to undertake this study based on the characteristics and definitions of the resilience attributes discussed above.

2.4. Policy environments for resilience in Ethiopia

The Ethiopian government has formulated and implemented policies and strategies to deal with urban disturbances called hazards and disasters (Powrie, 2012). Above all, the 1995 Ethiopian constitution offers people the right to live in a clean and healthy environment and guarantees them the right to sustainable development (Amsalu, 2018). The Constitution sets the ground for the formulation and enforcement of all Ethiopian policies (World Bank, 2017).

Accordingly, the National Policy and Strategy for Disaster Prevention and Management/NPSDPM/conceived in 1995 is the first step to show the government's political will to integrate risk reduction initiatives into development programs (Ponserre, 2004; Powrie, 2012). This policy document is the gateway for the formulation and endorsement of sectoral policies on resilience. The policy documents crafted include Agricultural Policy, Health Policy, Environmental Policy, and Water Resources Policy (Federal Democratic Republic of Ethiopia (FDRE), 2013).

Environmental policy formulated in 1997 is one of the best practices that linked environmental management or developments with risk reduction in Ethiopia. Based on Ponserre (2004), achieving disaster risk reduction and development measures planned to protect and rehabilitate the environment is the purpose of the policy papers.

The emphasis of the Climate Resilient Green Economy Strategy (CRGE), formulated in 2011, is climate change and disasters associated with it. The goal is to create a green economy based on four development pillars: agriculture, forestry, power, and transport (FDRE, 2011). The same source further reveals that urban areas are the centers of the strategy where carbon emissions and their abatement mechanism from industries, infrastructures, transport, and buildings have been remarkably elaborated.

With the aspiration to realize the green economy strategy and take responsibility, MoUHC has formulated a draft Urban Climate Resilience Strategy (UCRS) in 2017. This document aimed to implement urban-specific provisions of NPSDPM and realize the contents of CRGE in urban areas (MoUDH, 2017 unpublished).

The aim of UCRS is threefold: to identify the economic and social impacts of current climate variability and future climate change on urban development and housing in Ethiopia; to identify priority ways for the urban development and housing sectors to build climate resilience and reduce the impact of climate variability and climate change; and to map the necessary steps to finance and implement measures in the urban

development and housing sectors to build climate resilience in Ethiopia and deliver integrated CRGE in urban areas (MoUDH, 2017).

Ethiopia's government has shifted its policy formulation into a five-year comprehensive development plan called Growth and Transformation Plans (GTP). The purpose is to internalize and act on Millennium Development Goals (MDG), Habitat III urban agenda, Sustainable development goals (SDGs), and Hyogo action framework for Disaster Risk Reduction that remain in action from 2015 – 2030 (Powrie, 2012; Tesfaunegn, 2017). This document is subject to revision every five-year interval, takes account of new paradigms, and recognizes contemporary development pressures.

3. Methods and materials

3.1. Location, urban spatial planning contexts, and secondary cities in Ethiopia

Ethiopia, a landlocked country, is located in the Horn of Africa (Rebollo et al., 2015); (Tusa et al., 2020; Water and Land Resource Center(WLRC), Ethiopia, 2018). After Nigeria, it is the second-most populous country in Sub-Saharan Africa (Ministry of Urban Development and Housing/MoUDH/, 2015(MoUDH, 2015b). Administratively it is divided into ten regions (Figure 1).

The country has a long history of urban planning, consisting of three urban spatial planning hierarchies: national, regional, and local urban spatial plans (MoUDH, 2012(MoUDH, 2012)). In addition, the implementation of local urban spatial plans is facilitated through city-wide structure plans/(SPs)/, local development plans (LDPs), strategic, basic, and sketch plans (MoUDH, 2012).

Secondary cities in low-income countries are rapidly urbanizing due to rural-urban migration, causing massive urban expansion characterized by disorderly, inadequate infrastructure, and serious environmental concerns. The population of secondary cities in Sub-Saharan Africa has doubled over the past two decades and increased their geographic extent by a factor of two and a half. Four-fifths of the residential areas developed over the new millennium are informal and unplanned in SSA (Cities Alliance, 2021).

Figure 1 shows the eighteen secondary cities in the country. According to the Ethiopian Urban Good Governance Strategy document (2014), these cities have a population of about 100,000–500,000 (Ministry of Urban Development and Housing, 2014), coinciding with the definition provided by (UN-Habitat, 1996). Besides, Horst (2006) showed that the growth of these cities is alarming with fewer resources for planning and managing urban development and promoting employment and economic growth (Roberts and Hohmann, 2014).

Figure 1 further reveals the case study area, Kombolcha city, one of the secondary cities in Ethiopia, is found in the north-central part within the South Wolo Zone of Amhara National Regional State (ANRS). Astronomically, the city is located in an approximate geographical coordinate of between 11°06'N Latitude and 39°45'E Longitude.

Concerning local urban spatial planning practices, Kombolcha city had been provided with four sets of plans in 1981, 1985, 2001, and 2011. However, archived documents are available for the 2001 DP and the 2011 SP; the city's total area was 2242.34 and 12450 ha, respectively, to prepare and implement these plans. Accordingly, a land-use plan is obtained for all the plans, though road networks or hierarchy maps are unavailable for the DP.

The city of Kombolcha is fast-growing in Ethiopia, with a rapidly expanding population, a wide area of expansion, and a substantial infrastructure and service gap. Unlike other secondary cities, it is a regional and national industrial growth center (Woldeyes and Bishop, 2015). The city has seen significant changes in its population since 2007 (Table 3). According to the Ministry of Urban Development and Housing/MoUDH/(2015b), Kombolcha's population is projected to be more

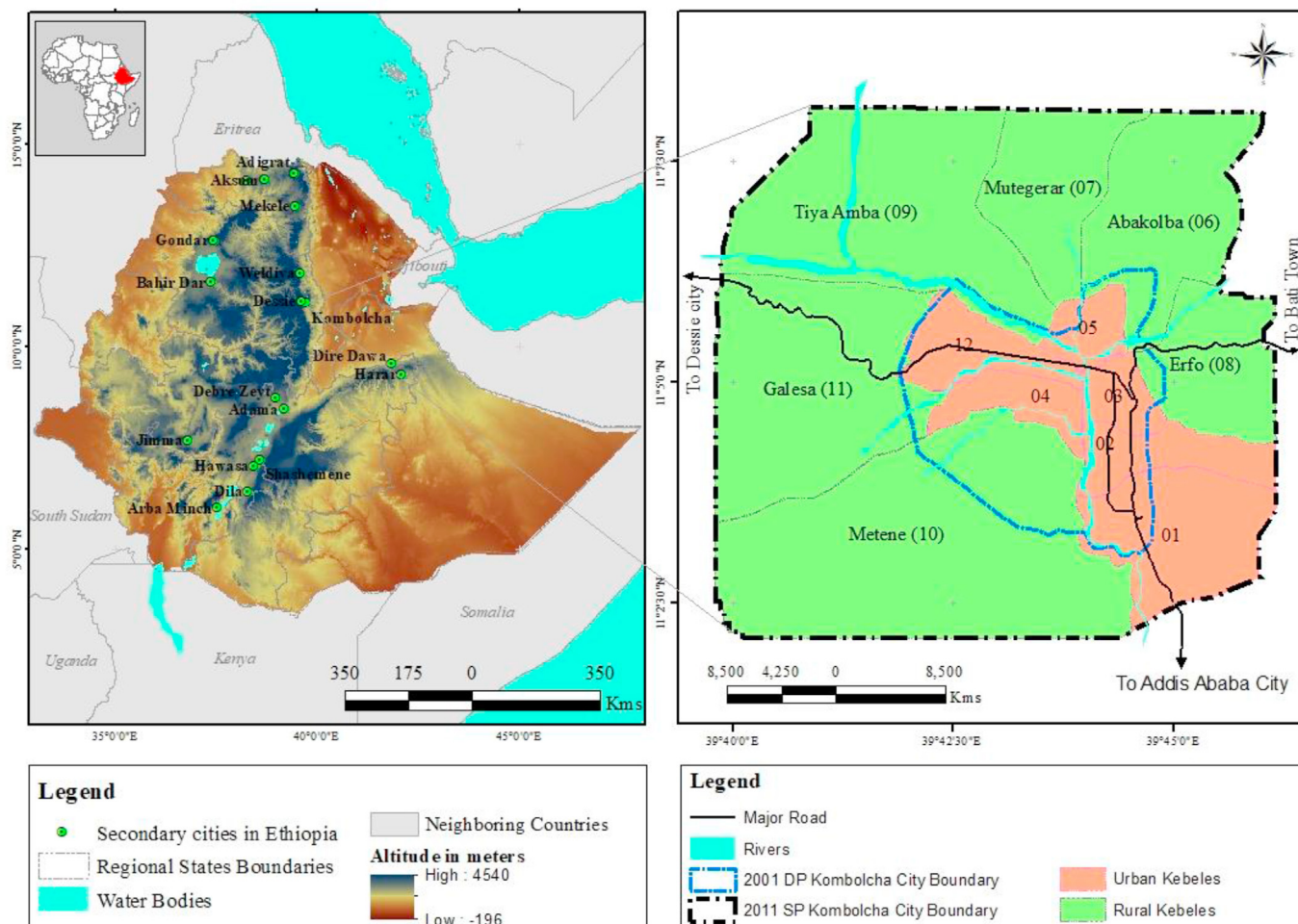


Figure 1. Location Map of Ethiopia and Kombolcha city.

than double in the next 20 years, reaching 334,274 in 2035. Its population density is thus roughly 1,115 inhabitants per square kilometer.

Table 3 reveals that the city's urbanization level exceeded 75 % in 2020, and the proportion of the urban population increased by nearly 10% between 2007 and 2020.

3.2. Data collection

3.2.1. Document study

This study applied a documentary research method that reviewed six Ethiopian spatial planning policy documents: Urban development Policy (UDP), Urban Planning Proclamation (UPP), Structure Plan Manual (SPM), Urban Plan Preparation and Implementation Strategy (UPPIS), and the first and second Growth and Transformation Plans (GTP I and II). For ex-ante analysis, the study consulted these spatial planning policies and strategies formulated and conceived after 2005, which marked a shift in the government's policy direction towards urban development by

producing the UDP. Furthermore, previous studies on urban planning and development in the country were also considered in this study. The 2001 DP and 2011 SP proposals and the 2020 ELU of Kombolcha city were the components of the post-ante review. The ELU was used to demonstrate implementing the proposals of the two local spatial plans associated with the resilience principles considered.

The paper further applied data control criteria such as authenticity, credibility, representativeness, and meaning developed by Scott S.J in 1990 (Ahmed, 2010; Bowen, 2009; Fitzgerald, 2012; Mogalakwe, 2006). Authenticity implies that the documents gathered, collected, and used are unaffected, independently prepared, and beforehand. Credibility shows that the policy documents considered are typically reliable references regarding the theme. On the other hand, representation indicates that the policy documents selected for the study represent the extent to which the issues considered are necessarily integrated or not. Meaning the last data control criteria refer to the degree to which the policy documents are clear and understandable (Fitzgerald, 2012).

3.2.2. Site observations

The task to explore the practical implementation of the provisions of the policy documents towards the spatial resilience principles needs to be ascertained by the facts/practices observed at different locations in the city. Thus, field photographs and google earth images were used to supplement the paper's findings. The preconditions set in Table three are the ultimate emphasis where the data through site observation was made. The sites visited included residential areas, industrial sites, locations in the city dominated by informal settlements, the inner city where

Table 3. Level of Urbanization of Kombolcha city.

No	Year	Urban Population	Rural Population	Total Population	Level of urbanization
1	2007	58,667.00	26,700.00	85367	68.72%
2	2017	104,792.00	32,701.00	137,493.00	76.22%
3	2020	122,637.00	33,503.00	156,140.00	78.54%

Source: (Maru et al., 2021).

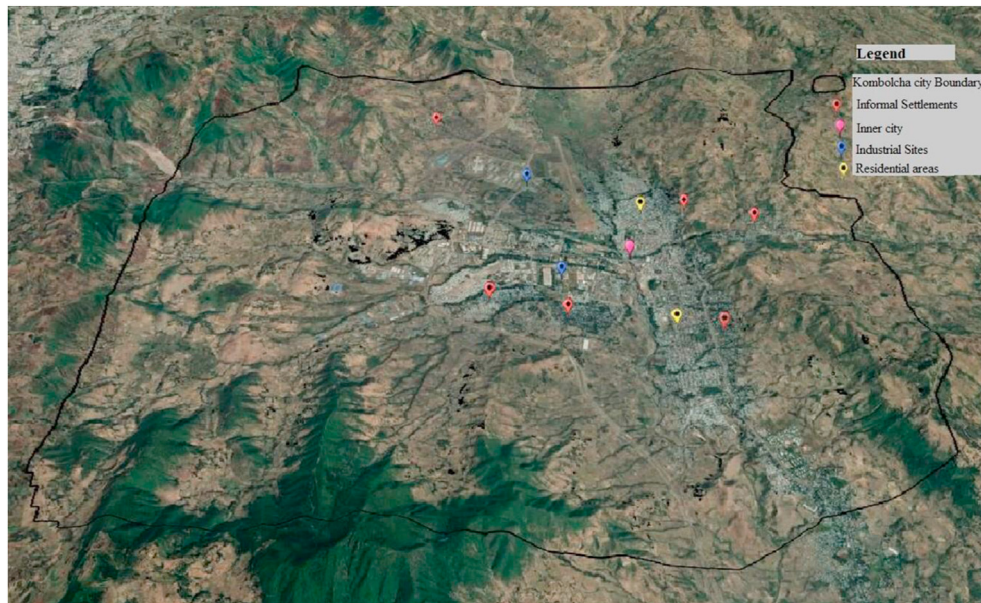


Figure 2. Sample points considered for site observation.

Table 4. Professional mixes of key informants interviewed.

No	Qualification	Sphere of planning	Number of participants
1	Economists	Social Planners	3
2	Sociologists		2
3	Geologists	Physical Planners	2
4	Environmentalists		7
5	Architects/Urban planners	Spatial planners	9
Total			23

bridges are damaged, and the nature and shape of the urban blocks are inconsistent (Figure 2). The site observation enabled the paper to cross-examine the proposals of the two plans against the existing land use and verify the data obtained through fieldwork. Furthermore, site

observation is part of the qualitative analysis conducted on the land use functions and the resilience attributes: robustness in particular.

3.2.3. Key informant interview

The study deployed key informant interviews on purposively selected twenty-three seasoned experts, who are effectively engaged in the interview conducted. These experts were selected from academics, urban planning and development consultants, development partners (UNDP and UN-habitat), and government officials: federal and urban plan implementation case team with Kombolcha city administration. The study has tried to reflect on the multidisciplinary nature of resilience discourses by adopting a spatial planning team mix of economists, urban planners/architects, geologists, environmentalists, and sociologists proposed in the SPM of Ethiopia (Table 4). The mix is proposed to be ideal for preparing SPs for cities (MoUDH, 2012). The differences in the

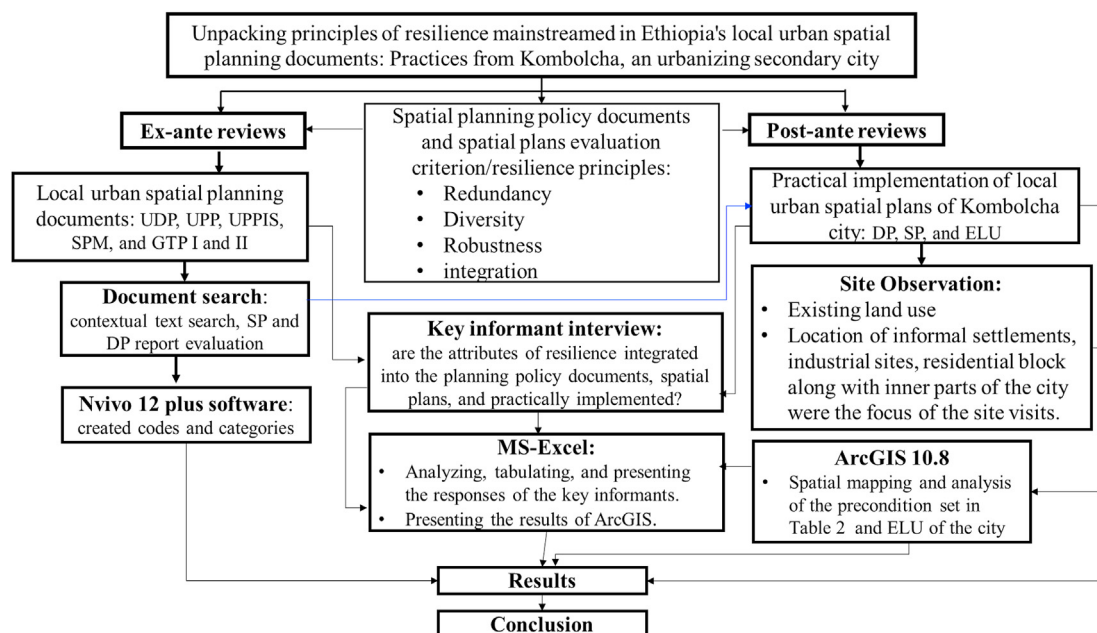


Figure 3. Methodological flow diagram of the study.

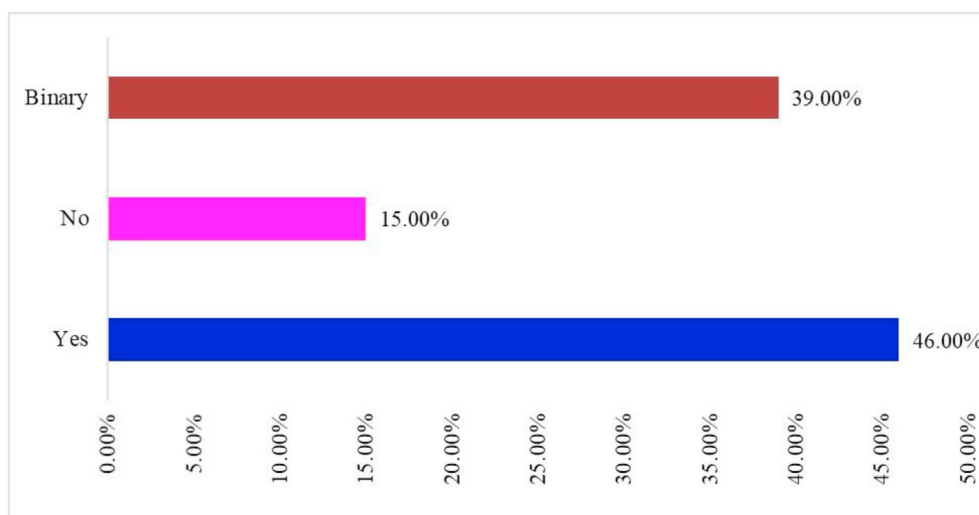


Figure 4. Views of the key informants on the integration of urban resilience principles into local urban spatial planning policy documents.

number of key informants also considered the level of engagement of the experts in the preparation and implementation of local urban spatial plans. These respondents were initially communicated in June 2019, and the data were verified in July 2021.

The researchers posed three major questions to the key informants (KIs). The first inquiry is devoted to getting the views of KIs on whether the resilience principles are integrated in Ethiopia's local urban spatial planning policy documents. The other request is concerned about their understanding of the policy provisions towards the principles practically reflected in Ethiopian cities' city-wide structure plan proposals. The last question raised to the key informants was related to the extent to which the various proposals of the spatial plans are implemented or not. They were also enquired to mention the principal challenges that obstruct the real realization of the proposals toward practically mainstreaming the resilience principles.

3.3. Data analysis

For this study, the units of analysis are the policy documents: UDP, UPP, SPM, UPPIS, and the GTP I and II deductively categorized by contents/themes/resilience principles: redundancy, robustness, diversity, and inclusiveness. The paper applied NVivo 12 Plus software for content analysis. The software aided in creating the codes and categories based on the resilience characteristics. It also allowed recording the respective scores/coefficients. ArcGIS 10.8 were also applied to perform spatial analysis on the preconditions set in Table 2 for each resilience principle. The key informant and ArcGIS results were tabulated and presented with the help of MS-excel. Figure 3 shows the methodological flow of the study.

4. Results

This section of the paper presents the views of the key informants toward incorporating the resilience principles into policy documents relevant to local urban spatial planning activities in Ethiopia: plan preparation and implementation. It also highlights reviewing the policy documents, the spatial plans prepared based on the policy documents, and the implementation of the plans towards the resilience principles exemplified by Kombolcha city.

4.1. The integration of the spatial resilience principles into local urban spatial planning policy documents of Ethiopia

4.1.1. Results from the key informant interview

The experts representing various professional backgrounds are presented with a question to measure their attitude towards incorporating

the spatial resilience principles into Ethiopian local urban spatial planning legal frameworks: UDP, UPP, SPM, UPPIS, GTP I, and II.

Accordingly, the participants in this study's key informants interview offered differing views on how the concepts of resilience, expressed in the four attributes, are mainstreamed into Ethiopia's local urban spatial planning/city-wide structure plan/policies. In addition, they provided their understanding as yes, no, and binary (both yes and no) responses (Figure 4).

Figure 4 reveals that 46% of the experts have recognized that Ethiopia's local urban spatial planning policy documents mainstreamed the resilience principles. According to these respondents, the principles are incorporated in the policy documents' through guiding principles and procedural sections. They testify that the practices can be traced mostly in the vision statements of the reports of cities' local urban plans. Furthermore, they also attest that the procedural manuals have illustrations and narrations on urban problems, uncertainties, risks, hazards, and disasters, which constitute the topics of spatial resilience.

According to Figure 4, 15% of the experts disagree with the concise and bold incorporation of the urban spatial resilience principles into the policy documents. The main reason forwarded by these respondents is that the policy documents are outdated and failed to capture the central themes of resilience in general and its spatial planning attributes, in particular. However, 39% of the respondents lie in limbo with the two answers. These respondents fall under the binary response, claim that the principles are not consistently mainstreamed throughout the policy document, and express concern about a lack of efforts to undertake period reviews sensible to the evolving contemporary urban issues.

4.1.2. Review results of the Ethiopian local urban spatial planning legal documents

The above results from the experts' are supplemented by evaluating Ethiopia's selected local spatial planning legal frameworks based on the redundancy, robustness, diversity, and collaboration attributes of spatial resilience as outlined in Table 2 of this paper. Thus, Nvivo 12 plus software review reveals significant variations in total scores for each policy document associated with the four spatial resilience principles, ranging from 18.5 to 57.74. Furthermore, the overall values for mainstreaming resilience attributes in Ethiopia's respective local urban spatial planning policy documents range from 31.83 to 67.22 (Table 5).

According to Table 5, the integration principle received the highest total coefficient of 67.2. It is followed by the redundancy principle, which has a value of 54.21. In Ethiopian urban spatial planning policy documents, the diversity attribute ranks third with a 44.84 total sum, while the robustness principle ranks last with a 31.83 tally.

Table 5. Scores of urban resilience principles against the local urban spatial planning policy documents.

No	Local urban spatial planning documents of Ethiopia		Urban spatial Resilience principles				Total
			Redundancy	Diversity	Robustness	Integration	
1	Urban Policy and proclamation	UDP (2005)	4.85	2.88	3.91	8.62	20.26
		UPP (2008)	9.58	7.72	2.16	5.23	24.69
2	Local Urban Spatial Plan making Manual and strategy	SPM (2006) revised in 2012	6.03	6.41	4.17	6.02	22.63
		UPPIS (2014)	4.02	4.91	3.95	5.62	18.5
3	National Development Plans	GTP I (2010–2014)	20.65	11.75	5.63	16.25	54.28
		GTP II (2015–2020)	9.08	11.17	12.01	25.48	57.74
Total			54.21	44.84	31.83	67.22	

Bold value indicates Highest score of resilience attributes for each policy documents reviewed.

Bold and italic values indicate Total sum of the attributes and policy documents.

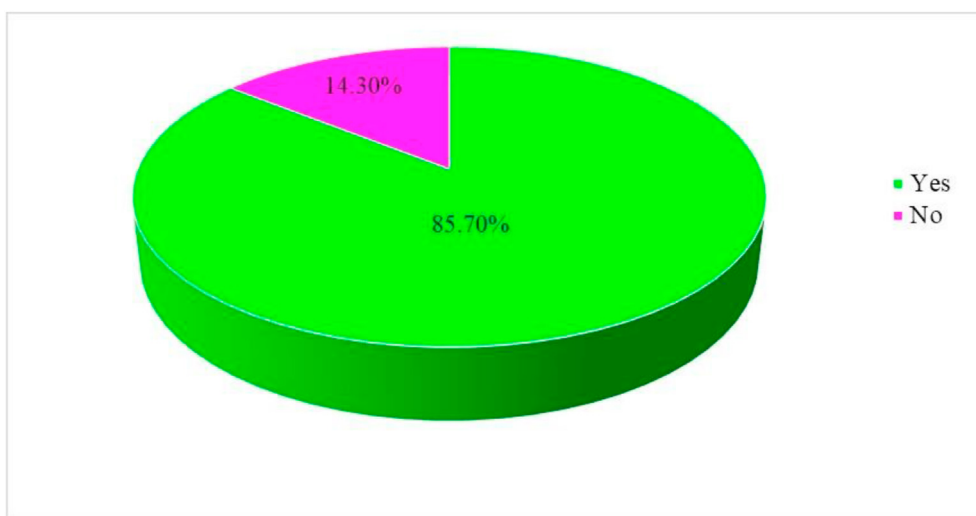


Figure 5. Views of the key informants on the integration of urban resilience principles into city-wide structure plans of cities.

However, in terms of policy documents, the GTP I and II of the National Development Plan have mainstreamed the principles with 54.28 and 57.74 values, respectively. The GTPs are followed by the UPP and the SPM, with respective values of 24.64 and 2.63. The 2005 UDP, on the other hand, receives a score of 20.26, whereas the 2014 UPPIS receives a point of 18.50.

The table's matrix also shows criterion-specific results for each policy document. As a result, the redundancy and diversity principles are rated the highest in the GTP I document, with 20.65 and 11.75 points, correspondingly. The robustness and integration principles, on the other hand, receive the highest records in GTP II, with a result of 12.01 and 24.48, consecutively.

4.2. Practices of integrating the principles into spatial plans of cities

4.2.1. The views from experts

The sector-based involvement of key informants has allowed capturing how the resilience principles were mainstreamed in the practical implementation of city-wide structure plans. Consequently, experts who provided a 'yes' or 'binary' answer (in section 4.1.2 above) were also requested to forward their views on the practical implementation of the policy provisions concerning the resilience principles (Figure 5).

As per Figure 5, close to 86% of the seasoned experts reveal that the spatial resilience principles are not reflected in the actual implementation of the city-wide structure plans. However, about 14% of the experts explicate that the proposals of the spatial plans are practically implemented and contribute towards making Ethiopian cities resilient in spatial terms. Nevertheless, all the respondents agree that the plans'

sector-specific and generalized spatial proposals are prepared in good alignment with the standards, assumptions, and expectations enshrined in the policy documents.

4.2.2. Urban spatial resilience principles and local urban spatial plans of Kombolcha city: DP and SP proposals and 2020 existing situations

4.2.2.1. Land uses. The 2001 DP and the 2011SP (Figure 6) have been evaluated against the sub-principles indicated in this paper's Table 2, Section 2.3.

The report of the DP has indicated two centers. The main center is in the city's central business district with diversified commercial activities. On the other hand, the sub-center is proposed in the 'expansion areas' of the city. However, these sites are not provided with separate local development plans showing the distribution and location of various urban functions (Table 6).

Based on Table 6, both of the local urban spatial plans of Kombolcha city incorporated the two basic redundancy attributes of resilience: reserved areas and protected forests in the land-use proposals. The DP has allocated about 261.18 ha (11.65%) and 329.89 ha (14.71%), respectively, out of 2242.34 ha of urban land. From the 12450 ha designated urban boundary in 2011, the SP has allocated 215.39ha (1.73%) and 5578.85ha (44.81%), respectively. The land allocations aimed to accommodate future development pressures resulting from hazards and population growth.

A cross-examination of the two spatial development plans of the city, against the redundancy principles, reveals a 10% decline in reserve areas and an increase in protected forests of just over 30%. However, in terms

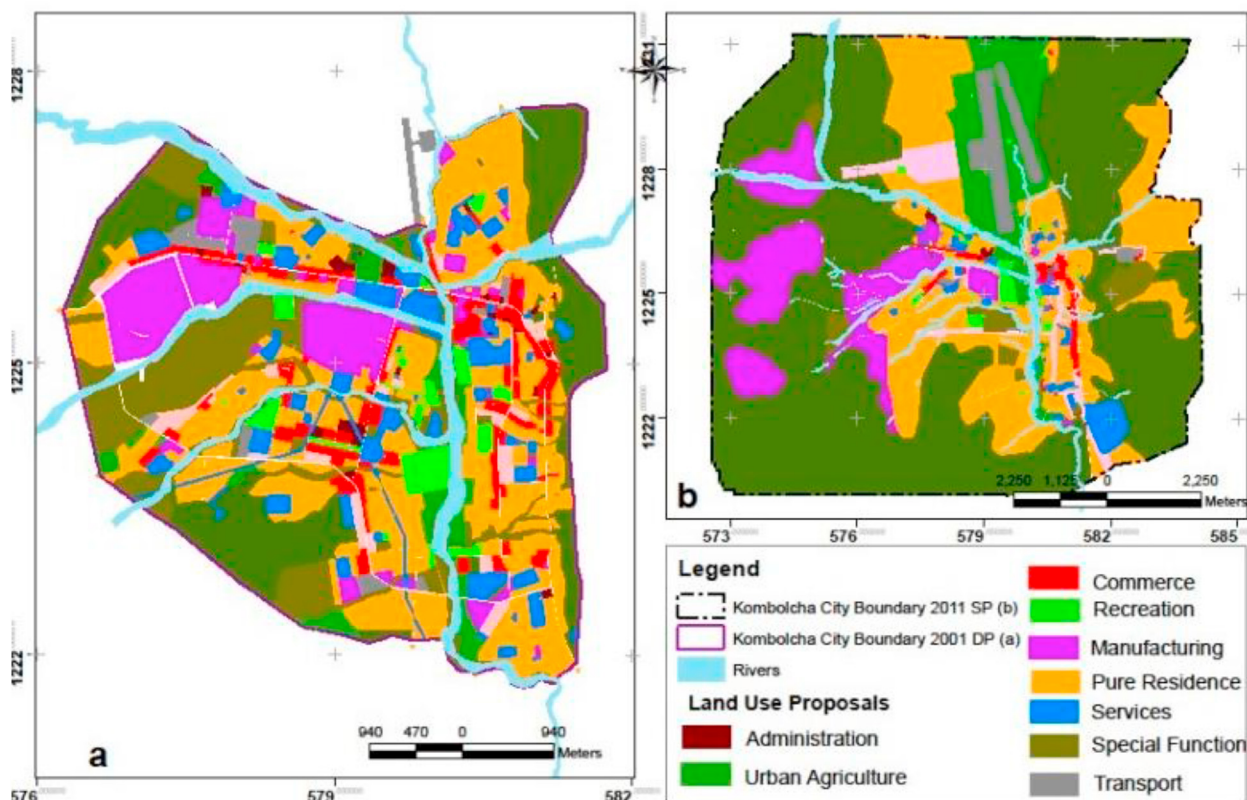


Figure 6. The 2001 DP (a) and the 2011 SP (b) proposals of Kombolcha city.

Table 6. Land allocation in the DP and SP.

Land use	Detail land use	DP		SP		General land allocations
		Area (ha)	Percentage	Area (ha)	Percentage	
Administration	Government and non-governmental organizations	18.93	0.84%	13.70	0.11%	Buildings
Commercial	Business activities	110.38	4.92%	69.72	0.56%	
Manufacturing	Factories and warehouses	194.87	8.69%	1080.66	8.68%	
Residence	Pure and mixed use	617.2	27.52%	2513.66	20.19%	
Services	Social services	173.79	7.75%	205.43	1.65%	
Sub-total		1115.17	49.73%	3883.16	31.19%	
Special function	Special function	161.39	7.20%	0.00	0.00%	Green
	Reserved areas	261.18	11.65%	215.39	1.73%	
Urban agricultutre	Poltry and husbandry	75.65	3.37%	689.73	5.54%	
Recreation	Play grounds	68.81	3.07%	80.93	0.65%	
Forest	Forest and green areas	0.00	0.00%	247.76	1.99%	
	Protected forest	329.89	14.71%	5578.85	44.81%	
	Nursery	7.24	0.32%	600.09	4.82%	
	Green along gulies, gourges,streams, river banks/buffer	0.00	0.00%	250.25	2.01%	
Sub-total		904.16	40.32%	7662.98	61.55%	
Transport	Terminal, airstrips, and dry ports	43.01	1.92%	354.83	2.85%	Infrastructure
Road	Road infrastructure	180	8.03%	549.05	4.41%	
Sub-total		223.01	9.95%	903.87	7.26%	
Area (ha)		2,242.34		12450.00		

Bold value indicates Values of the resilience attribute sub-conditions set in Table 2 (areas and percentages) and total area of area of the city. Bold and italic value indicates Sub total sum values of land uses (areas and percentages).

of total land allocation, the SP apportion a higher proportion of land than the DP for the two sub-themes of redundancy. The land allocated to road and transport during the two planning periods, constituting the robustness principle, shows a diminishing trend in the SP with about 2.69%. However, this cannot suggest that the SP provides infrastructure at lower

coverage than the DP. According to the interviewee, the actual implementation of the SP, road networks, and associated amenities had been spatially constrained by the rippling topography of the city.

Concerning the multiplicity of functions in the city, the SP has proposed three centers (Figure 7). The main center (Figure 7a) proposed

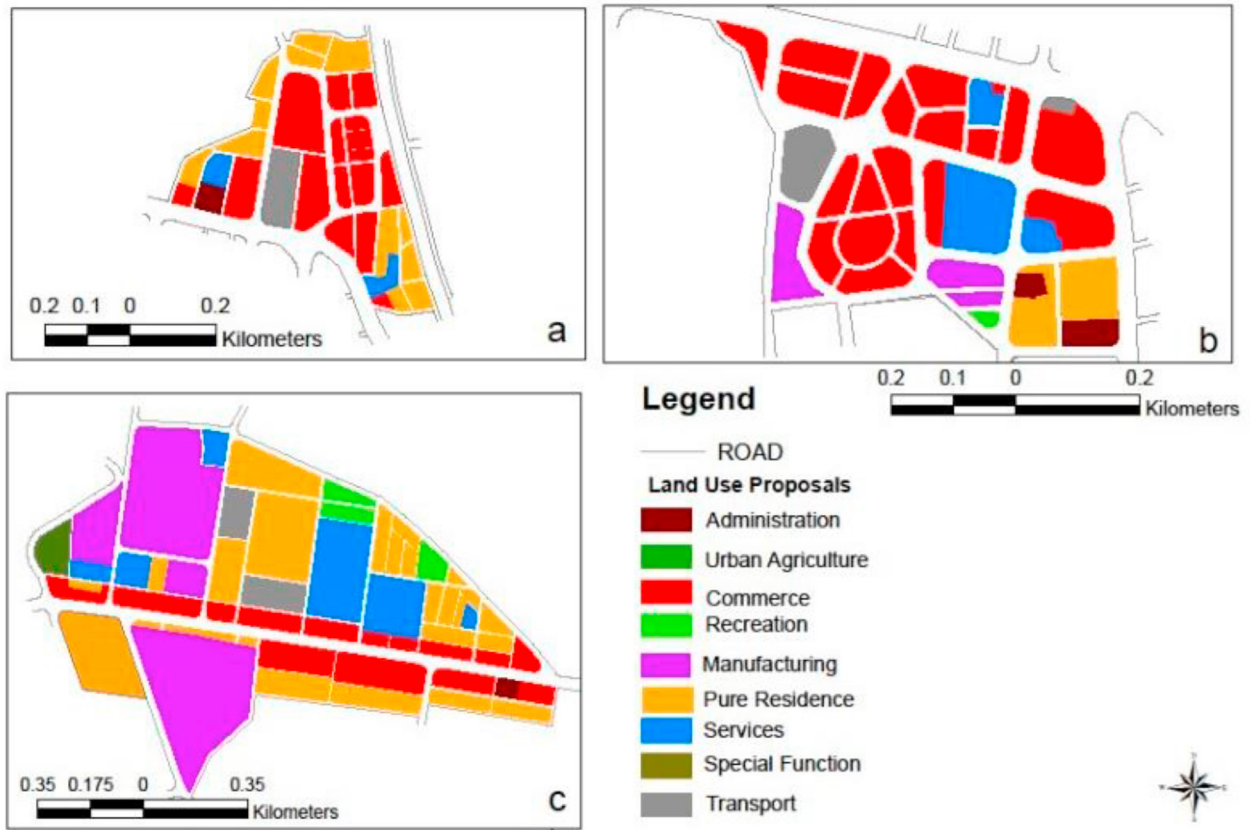


Figure 7. The main and sub-centers of Kombocha city proposed in the 2011 SP.

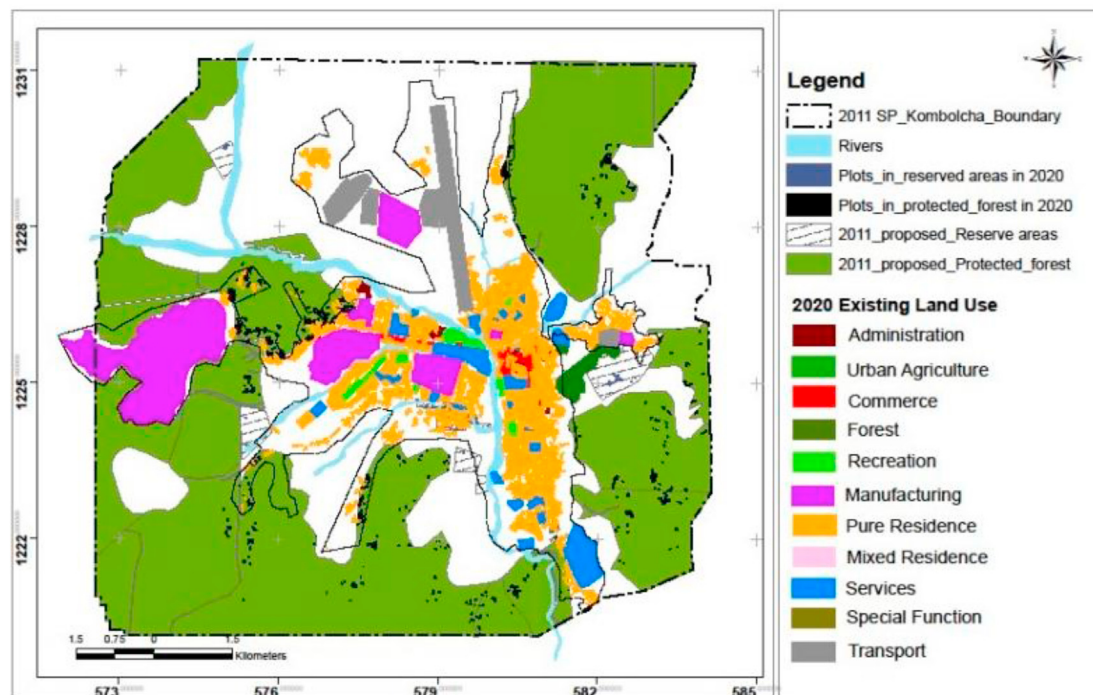


Figure 8. The 2011 SP reserved areas and protected forest proposals and their situation in the 2020 existing land use of Kombocha.

Table 7. Proportion of reserved areas and protected forest proposed in the 2011 SP and occupied by other urban functions in 2020.

No	2020 land use	Reserved areas		Protected forest	
		Area (ha)	Percentage of land occupied	Area (ha)	Percentage of land occupied
1	Residential	26.92	13.18%	60.12	1.14%
2	Manufacturing	6.6	3.23%	0	0.00%
3	Forest	44.06	21.54%	0	0.00%
	Sub Total	77.58	37.95%	60.12	1.14%
4	Non-occupied land	126.73	62.05%	5230.55	98.86%
	Total	204.31	100.00%	5290.67	100.00%

Bold value indicates Sub-total and total land areas of redundant land uses in Kombolcha city.

during the DP, which covers 21.46 ha, is maintained. The additional main center is located at the central market (Figure 7b), with 113.99 ha of land. The one sub-center (Figure 7c) with 23.60ha was proposed in the Western part of the city.

The paper has also inevitably examined the practical implementation and mainstreaming of the resilience sub-principles proposed in the SP into the 2020 existing land use of the city (Figure 8).

Based on Figure 8, the 2011 SP proposals are violated by the occupation of the sub principles of redundancy (reserve areas and protected forest) by various other land uses in 2020, dominantly by residential uses. According to Table 7, residential establishments have converted about 13.18% from reserve areas and 1.14 % of the land allocated to protected forests.

The key informant at the city administration attests to land conversion to formal (through land allocation by the local government) or informal (individuals grabbing the land). Nevertheless, the informal land occupation outweighs the formal. Thus, environmentally sensitive areas like forest areas are invaded, usually creating scattered and corridor-like developments mostly along the existing road (Figure 9 and Figure 10).

As per Figure 9, informal settlements grow haphazardly in agricultural fields and near remnants of forest covers. The pavement of the access roads is of poor quality, and the pattern is organic.

Figure 10 depicts the quality of informal residential buildings as rectangular-shaped substandard houses that exploit the forest trees found near the site. These areas are deprived of basic infrastructures such as access roads and sanitation services.

The respondent from the city administration further replies that such action also affects the proportion of land use heterogeneity. The respondent asserts that the dominance of residential among the entire

urban element increases the susceptibility of reserve areas and protected forest areas to human encroachment, which the existing land use testifies (Figure 11).

Figure 11 shows that residential and manufacturing land uses cover 16.71% and 15.51% of the built-up areas, respectively. The plan further confirms the efforts towards introducing two centers: the main center (Figure 11b-Borchele and market area) and the Sunny-side sub-center (Figure 11c) against the 2011 SP proposals. These sites are significantly allocated for commercial activities.

4.2.2.2. Road networks, hierarchies, and urban blocks. Land conversion has implications and effects on the redundancy, diversity, and robustness principle of resilience. These are also characterized by urban roads, determining the urban forms/blocks, accessibility, connectivity (bridges), and road hierarchy. Accordingly, the 2011 SP has proposals on road hierarchy and network to facilitate mobility and connectivity.

The road hierarchies include Principal Arterial Street (PAS), Sub Arterial Street (SAS), Collector Street (CS), and Local Streets (LS). The SP showed that all these roads are networked appropriately to facilitate mobility and access to various parts of the city (Figure 12a). The plan had proposed the construction of five, including the existing one, bridges along PAS and SAS roads that avert the connectivity problems created due to the Borkena River. On the contrary, the existing road network shows a rare consideration of the road hierarchies (Figure 12b), dominated by local streets, with no additional bridge on the River to connect the eastern and western parts of the city.

The road hierarchy proportion indicated in Table 8 shows that the SP allocated close to 4.181% of land to urban roads with varying widths, excluding the local streets. Nevertheless, the road networks and the

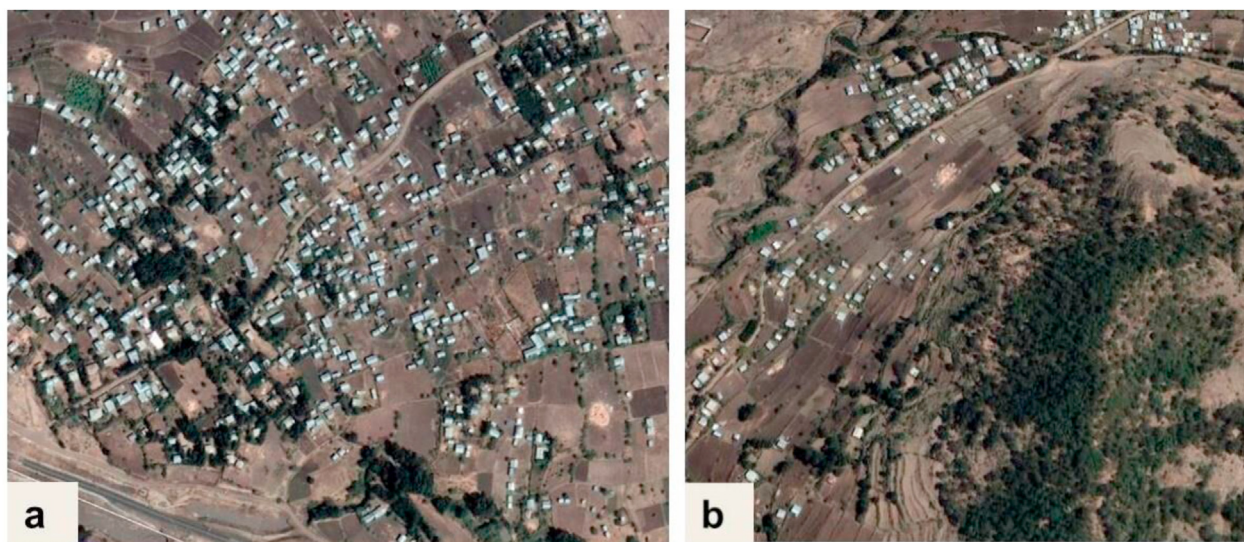


Figure 9. Google earth pro image showing informal residential buildings built in reserve areas (a) and protected land (b).

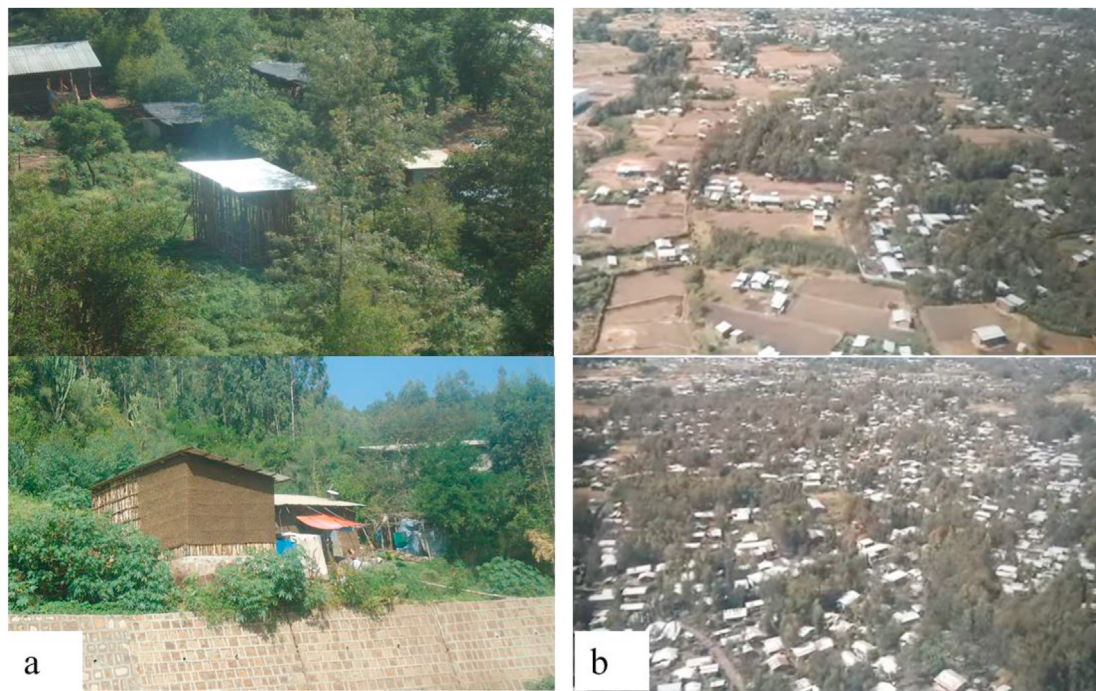


Figure 10. Typical informal residential buildings built on protected forests (a) and reserved sites (b).

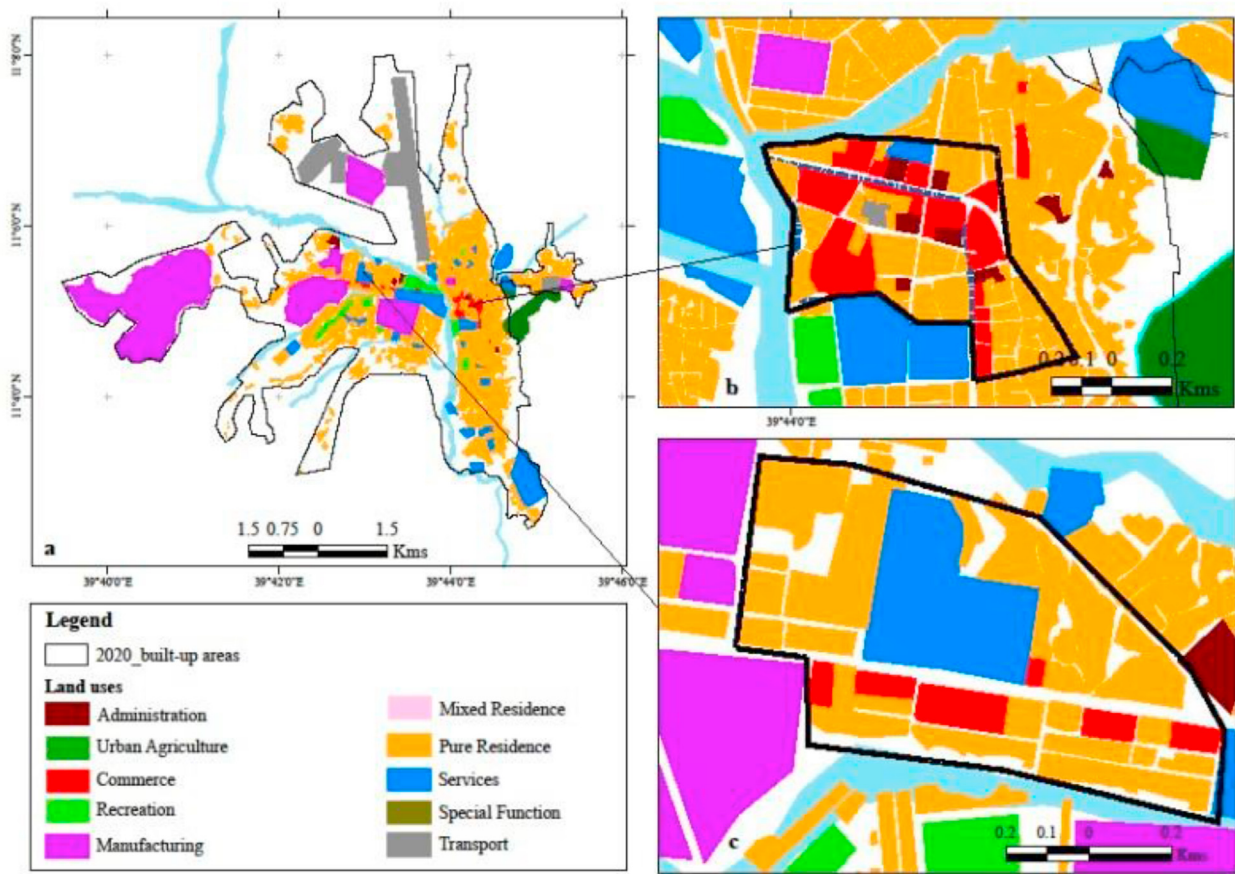


Figure 11. ELU of Kombolcha city in 2020 (a), main city center (b), and sub-center (c).

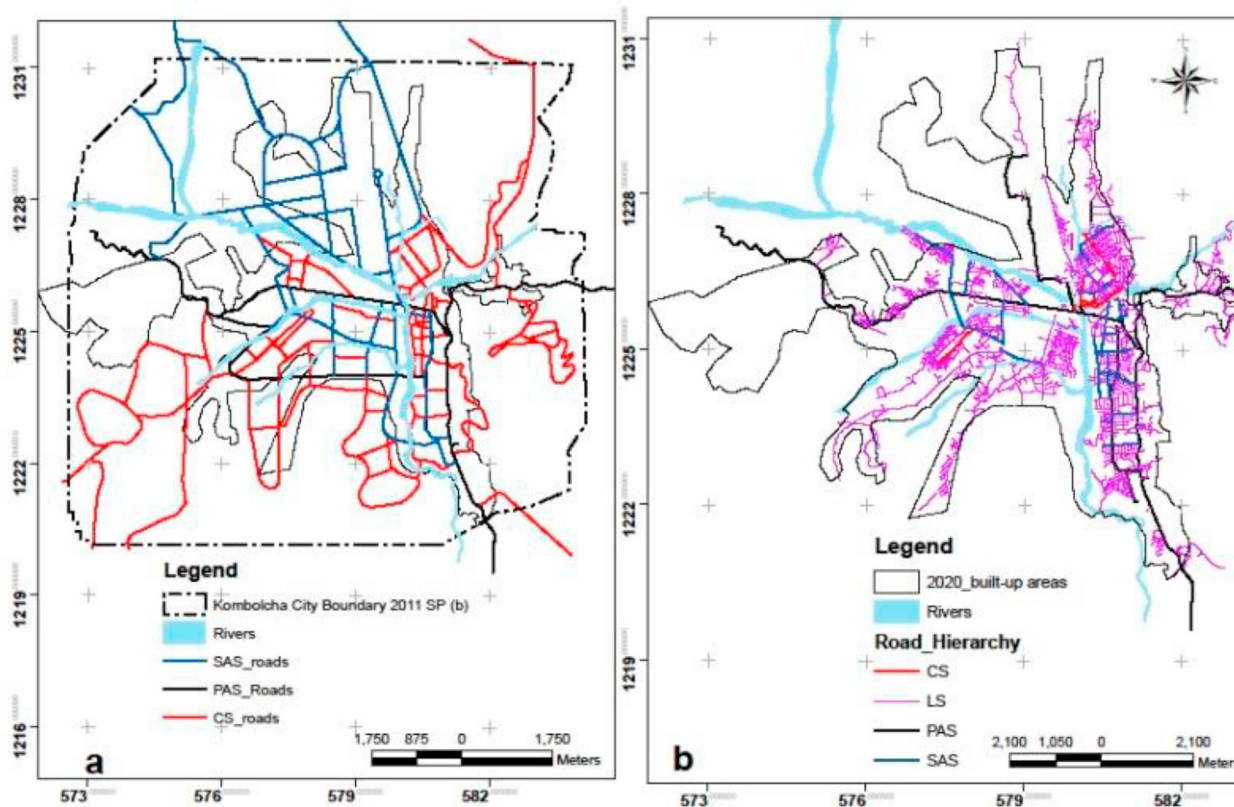


Figure 12. The 2011 SP proposal (a) and the 2020 existing (b) road hierarchies and networks map of Kombolcha city.

Table 8. Land allocated to various road Hierarchies proposal of the 2011 SP of Kombolcha city.

Hierarchy	Width (m)	Length (m)	Area (m ²)	area (ha)	the percentage from the total area of the city (12450) (ha)
PAS	40	29,280.16	1,171,206.59	117.12	0.941%
SAS	30	32,554.22	976,626.59	97.66	0.784%
	25	38,764.26	969,106.59	96.91	0.77882%
CS	20	92,514.33	1,850,286.59	185.03	1.486%
	15	15,964.44	239,466.59	23.95	0.192%
Total			5,206,692.96	520.67	4.181%

structure plan's proposed hierarchies have not been implemented in the past ten years. Figure 13(b) and Table 9 reveal these findings.

As indicated in Table 9, the total road coverage of the city in 2020 is about 4.00% of the built-up areas. The LS, which is not considered part of the SP's road hierarchy proposals, takes the large portion with 3.48%, followed by SAS, which constitutes about 0.44%. Finally, PAS and CS have 0.13% and 0.12% scores, respectively.

The PAS road is significantly attributed to the trunk road that connects the Eastern and Western parts of the city with one single bridge on River Borkena, which bisects the city into east and west (Figure 13 a).

A lack of adequate bridges also hampered the city's traffic mobility. According to Figure 13(b), during the summer season, vehicles in the city cross the River Berberie, which is inoperable during the rainy season. Furthermore, the pedestrian bridge along the Berberie River is in poor condition due to flooding (Figure 13c). According to the 2020 Kombolcha City Asset Management Plan/KCAMP/report, nearly 30% of urban roads are unpaved or poor. The city's urban form is organic and haphazard, with inconsistent block spacing and shape (Figure 14).

The oldest settlements in the city have well-marked and defined urban roads, although there are relatively regularized blocks along the eastern escarpments (Figure 14 a and b). Conversely, there are locations

in the city dominated by inorganic urban forms characterized by very narrow roads and blurry blocks and spacing (Figure 14c).

4.2.3. Challenges hampering the practical implementation of the proposals of the spatial plans

The study has raised the third question to the professionals attached to identifying the root causes that hampered the practical implementation of city-wide structure plans of cities, particularly Kombolcha city. Accordingly, the paper presented four factors, which the experts assert as the critical challenge affecting the implementation of spatial plans towards attaining resilience (Figure 15).

Based on Figure 15, close to 35% of the experts reveal that poor political commitment at the federal, regional, and local levels have exacerbated the poor implementation of spatial plans in Ethiopian cities. The experts emphasize land-use zoning change imposed by either the federal or regional government is the manifestation of the political intervention affecting the real realization of spatial plans proposals. The response further shows that Local Development Plans/LDPS does not support mere intervention.

With about 30% response rate, poor institutional collaboration is the second most significant challenge followed by poor stakeholder

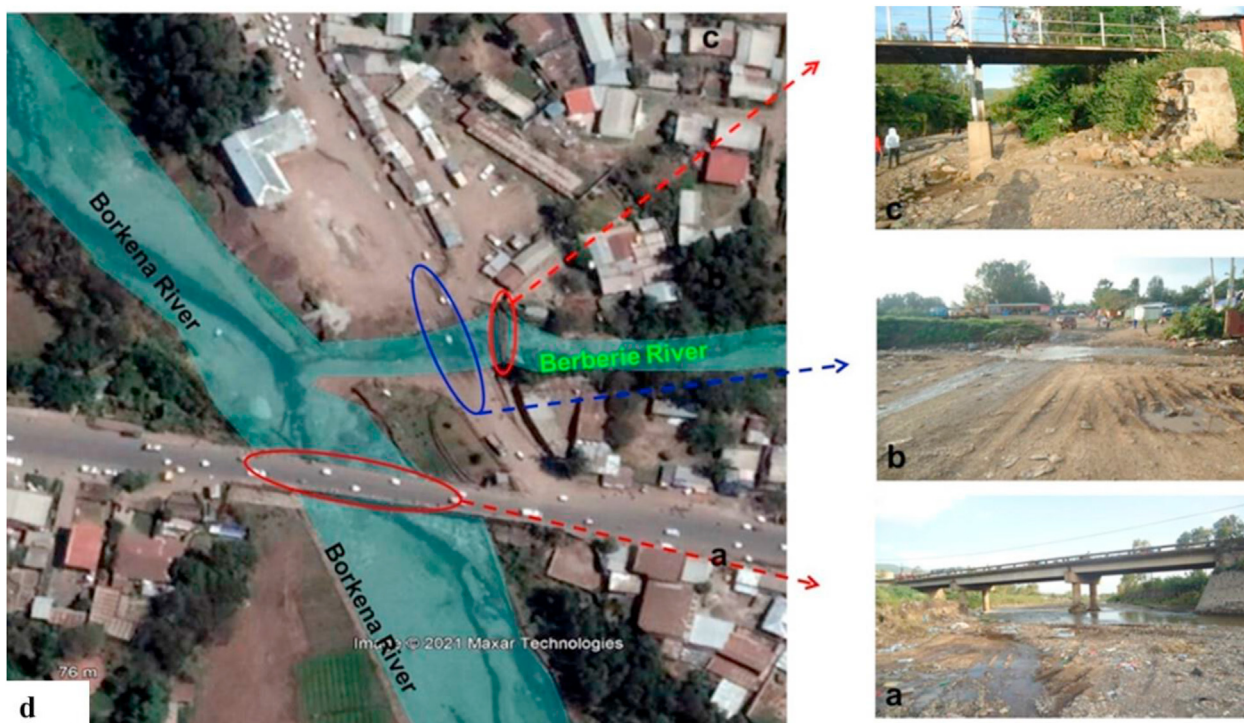


Figure 13. Connectivity issues in Kombolcha city.

Table 9. Existing road hierarchies of Kombolcha city.

No	Existing Road hierarchy	Road size	Area (ha)	Percentage form the built-up spaces
1	PAS	Greater than or equal to 40 m	4.881765	0.13%
2	SAS	25–30 m	16.10175	0.44%
3	CS	15–20 m	153.4129	0.12%
4	LS	Below 15 m	127.9153	3.48%
	Total		153.41	4.18%

engagement, accounting for more than 25% of the response from the experts.

The fourth issue contributing to the poor implementation of the spatial plans is the poor technical capacity of municipalities, accounting for about 21% of responses. In this context, the architects and planners air that the plan implementing offices are not well staffed with the required professional qualification and staff.

5. Discussions

Urban resilience provides a robust vision for building a resilient city through an innovative approach to spatial planning (Poku-Boansi and Cobbinah, 2018). In his 2013 study, Yossef (2013) said such planning has a greater impact on shaping the urban forms, including physical structures, security, environmental and socio-spatial policies, and the city's resilience. According to Gunder and Hillier (2009), urban spatial planning 'is the provision. of future' certainty' in a complex, unsteady, dynamic and fundamentally uncertain world.'

Fleischhauer et al. (2008) explained that urban spatial planning takes three forms: national, regional, and local. The local urban spatial planning promotes resilience thinking in various parts, including the vision statements depicting the creation of livable and resilient cities (Yamagata and Sharifi 2018). Fleischhauer et al. (2008) contribution also noted that the creation of resilient cities lies in integrating redundancy, diversity, robustness, integration/collaboration principles, and sub-dimensions in

the local urban spatial plans and implementation. Pinho et al. (2013) asserted that planning evaluation may consider the content of the policy document or investigates the results of the document throughout the planning process, or it could consider both at a time, measured against resilience attributes.

Poku-Boansi and Cobbinah (2018) depicted that the principles can be used to measure experts' understanding to measure the extent to which the local spatial planning documents: legal frameworks and spatial plans embrace the concept of resilience. The same sources indicated the practices in Ghanaian cities, applied adaptive capacity, inclusiveness, spatial planning, and social equity resilience principles confirmed that urban planners could not translate the concept consistently due to a limited understanding of resilience thinking.

However, the situation in Ethiopia is quite different. The experts representing differing professional qualifications are very much aware of the resilience concept and its integration into spatial planning legal documents, measured against the four principles of spatial resilience. The interviewee also noticed the huge gap wreaked due to the life span of policy documents, which were endorsed more than a decade ago since 2005. The planning documents have poor implications for contextualizing urban spatial resilience discourses, even though an attempt to measure urban resilience in the scientific world in the 2010s (ICLEI, 2019).

Policy-specific review of this study showed the complementarity of the findings with that of Poku-Boansi and Cobbinah (2018), which attested that the resilience principles were not consistently mainstreamed across the policy documents evaluated. Nevertheless, the experts involved in this study revealed that the guiding principles, procedure manuals, and vision statements were the entry points for resilience thinking in Ethiopia's local urban spatial planning exercises. According to (Holden et al., 2016; Ilmola, 2016), these components of the local spatial planning documents guide all the planning activities towards resilience.

The allocation and distribution of urban services and systems reveal that the disruption of one specific locality does not cause damage to others (Meijers and Romein, 2003). The SPM and UPPIS have also shown the percentage of respective land uses in this context. However, the

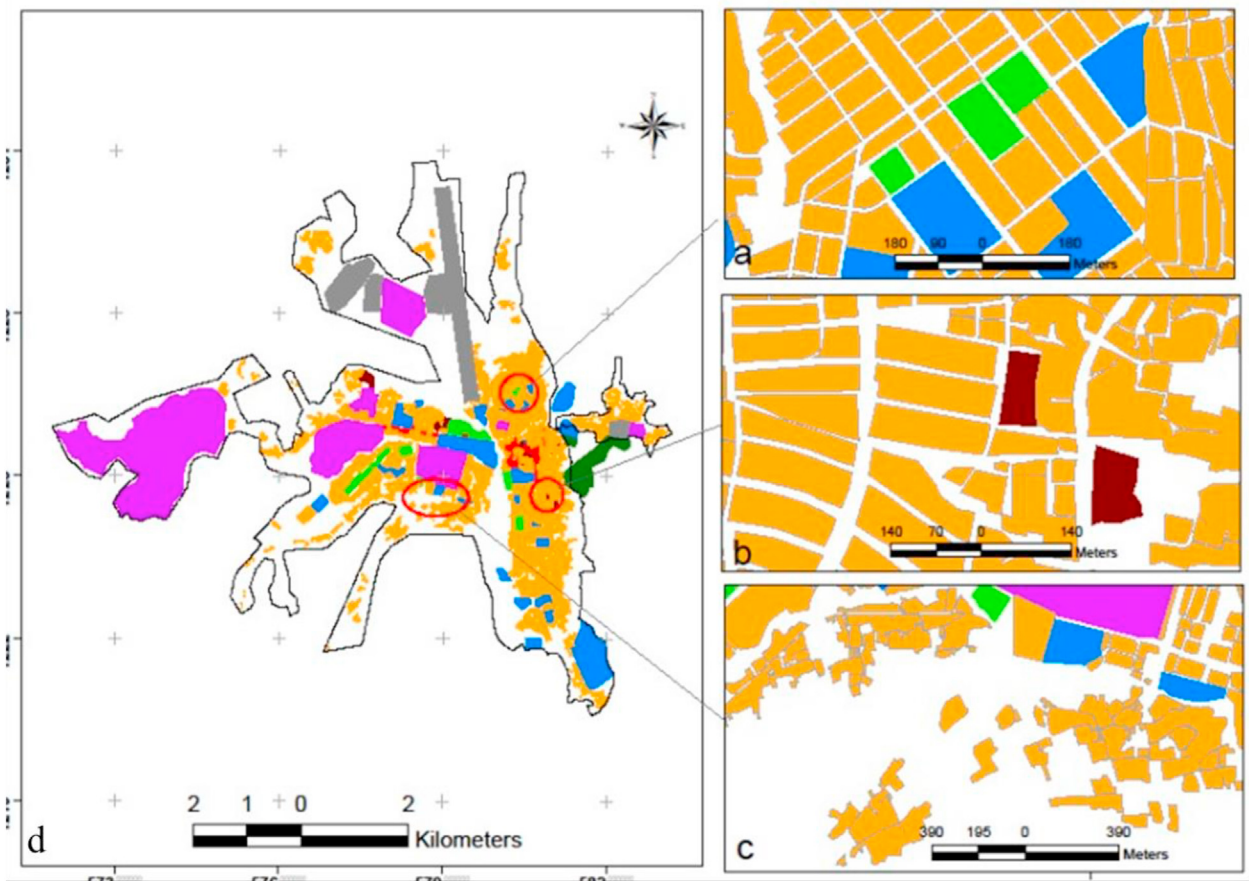


Figure 14. Inconsistent urban block arrangements in Kombolcha city in 2020 (d) a grid pattern (a), mixed pattern (b), and inorganic pattern (c).

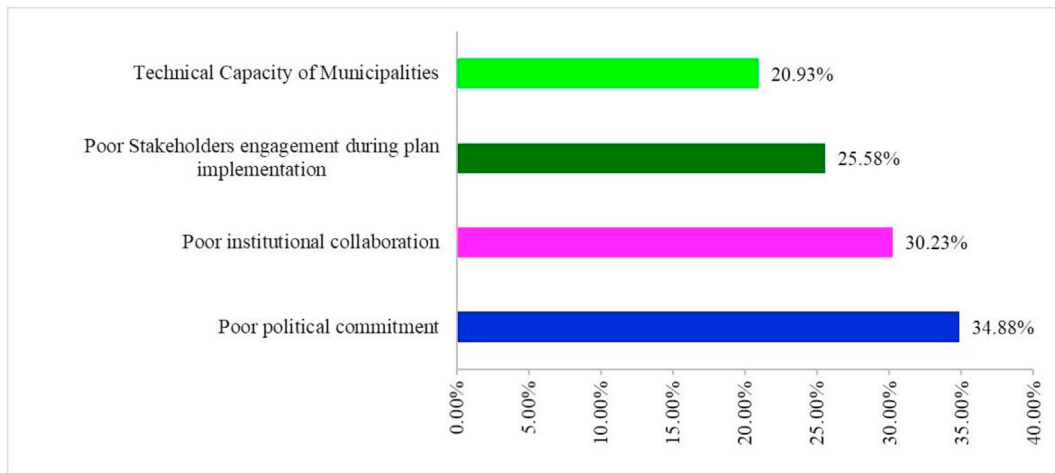


Figure 15. Major factors affecting the implementation of local urban spatial plans towards resilience.

UPPIS, as later promoted in the GTP II document, provided the 30:30:40% land allocation for green and shared public spaces, roads and infrastructures, and buildings. Thus, such land allocation has made these local urban planning documents cognizant of the redundancy, diversity, and robustness principles. The documents presented the approaches to anticipate and assess potential failures in urban systems due to disruptions.

Within this framework, the 2001 DP and 2011 SP of Kombolcha city allotted land to reserve areas and protected forests, essential components of the redundancy principle. The SPM showed that these areas are

mandatory provisions that enable any urban center to withstand future development pressures and potential uncertainties/hazards.

Furthermore, the redundancy principle leads to diversity (Kharrazi et al., 2016). Diversity is defined in land-use types that entail the provisions of main urban elements (Brunetta et al., 2018). In this vein, diversified road types, sizes, hierarchies, land use functions, and location are the concerns of this principle (Figueiredo et al., 2018; Taşan-Kok et al., 2013; Wardekker, 2018). Consequently, the two local urban spatial plans of Kombolcha city, based on the SPM, designated various land use functions and road hierarchies. As a result, the DP and SP endeavored to

anticipate potential system collapse and make provisions to ensure that the failure is safe, predictable, and can withstand hazards.

Concerning the practical implementation of spatial plans and their vision related to resilience principles, research by (Oliveira et al., 2013), which evaluated four urban policies against resilience's recovery and social capital characteristics, showed mild success. With such a showcase to success and failure, the practical implementation of the provisions of the legal frameworks in Ethiopia was not effective, as exemplified by the different spatial plans of Kombolcha city.

According to the cross-examination of the DP and SP of Kombolcha city with actual physical developments (ELU), the lands designated as reserve areas and protected forests were transformed into other land-use functions, especially where informal settlements and industries have been established. As a result, the existing urban functions of the city are dominated by the redundancy of residential and manufacturing land uses at the expense of realizing the resilience principle.

The SP proposed green spaces and protected forests along river banks, degraded lands, and mountainous city areas. As per Yamagata and Sharifi (2018), encroachment of these environmentally sensitive areas by informal settlements disrupts the natural and built environments' capacity to withstand disasters.

Besides the urban land use functions, the presence and installation of highly networked and hierarchically developed road infrastructures are inevitably necessary to mobilize goods and services to and from an urban center (Woldeyes and Bishop, 2015). Within the spatial resilience perspective, Gharai et al. (2018); Ilmola (2016); Lu et al. (2021) contended that urban structures, particularly road and their network make cities robust/strong towards potential disruptions.

The comparisons made concerning the proposals of the two plans against the structural components: roads and their hierarchy show diverging achievements that do not support robustness or connectivity attributes of resilience. The majority of existing roads further do not satisfy the minimum national standards set on UPPIS and SPM (KCA, 2011).

The urban system component with high significance to spatial resilience and influenced by road networks is the urban block (Gharai et al., 2018). The same source indicated that the fine-grained/subtle urban blocks enhance resilience, while the coarse-grained/crude hamper the capacity of cities to withstand hazards. In this context, the urban block arrangement of Kombolcha city is characterized as crude with haphazard spacing, pattern, and shape accompanied by the poor quality of the physical structures.

Barthel et al. (2013); Suárez et al. (2016) further alluded that the spatial resilience of cities could be affected by institutional skill, structure, and collaboration. Accordingly, the poor political commitment, institutional collaboration, stakeholder engagement, and technical capability of municipalities were among the factors that affected the actual implementation of the proposals of the DP and SP towards avoiding urban disturbances and enhancing urban spatial resilience of Kombolcha city.

5.1. Implications of the study

The study has implications for other secondary cities in developing countries and the formulation, review of urban spatial policies, and implementation of the plans. The first is the inevitability of undertaking periodic and regular revisions and amendments to spatial planning legal documents and plans to incorporate the evolving and contemporary urban development agenda, particularly resilience discourses. Second, emphasis should be placed on the actual and practical implementation of site-specific spatial development strategies, backed up by local development and integrated sectoral plans that account for local hazards and their means of adaptation or mitigation. The third implication is to deploy intensive and comprehensive urban governance capacity-building

interventions for cities, institutions, and communities. Strengthening the vertical and horizontal collaboration among stakeholders should center the spatial resilience and planning endeavors.

6. Conclusions

Evaluating city-wide structure plans is a task completed before, during, and after implementing the plans. Thus, the structure plan's socio-economic, physical, and spatial dimensions serve as the focal points for evaluation. Methodologically, the process should be supported by document review and fieldwork, with data on plan preparation, implementation, and municipal capacity.

The evaluation considers the achievements of the plan implementation against the proposals set in the SP: measuring the development with the impact it induced in the urban center. The land use, road network, and LDPs prepared for implementing the SPs are also the point of convergence of the review process from a spatial planning perspective. The study also pointed out the absence of scholarly contributions on applying resilience principles in evaluating local urban spatial planning legal documents and city-wide structure plans of secondary cities in developing countries.

In this context, this study attempted to review six of Ethiopia's local urban spatial planning legal frameworks and two spatial plans prepared to implement the provisions of the policy documents toward spatial resilience of Kombolcha, one of the second-tier cities in Ethiopia.

Nevertheless, in evaluating UDP, UPP, UPPIS, SPM, GTP I, and II policy documents in Ethiopia, the evaluation focused on demonstrating the relevance and application of four resilience principles: redundancy, diversity, robustness, and integration. The principles were also used to assess Kombolcha's DP, SP, and ELU. The key informants reiterated that the principles were well mainstreamed, albeit inconsistently, in the legal frameworks and the DP and SPs, which were prepared based on their provisions.

The vision statements for the plans were very interesting and eye-catching, intending to create a resilient Kombolcha city. However, the practices of implementing the proposals of Kombolcha city's DP and SP, as illustrated by the ELU, reflect a diverging achievement with very little effort to practically mainstream the principles on the ground.

Poor LDP implementation and municipalities' lack of technical and financial capacity, poor institutional collaboration, and stakeholder engagement contributed significantly to the city becoming spatially non-resilient. Furthermore, the lack of political commitment from the national, regional, and local governments was a major reason for the counter-action towards resilience building in Ethiopian cities.

In a nutshell, creating a bold, astounding, and ambitious vision statement does not guarantee the achievement of goals unless it is accompanied by appropriate capacity-building activities, such as training for implementing institutions and professionals. The training could cover the entire planning process, from plan preparation to plan implementation and evaluation, to create a resilient city. The study also suggests further research into institutional collaboration during spatial planning processes and the financial implications of implementing plans in the global south. The study was limited by the lack of data on the 1981 and 1985 masters plans of Kombolcha city and the 2001 road network map. Thus, trend analysis of four different planning periods was not conducted.

Declarations

Author contribution statement

Mulugeta Maru: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Hailu Worku: Analyzed and interpreted the data; Wrote the paper.

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Data included in article/supplementary material/referenced in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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