



## Research article

# Managing the challenges of competing interests of different regions in setting the boundaries of neighboring urban areas: the case of Addis Ababa city administration and oromia regional state, Ethiopia



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## ABSTRACT

In Ethiopia, urban boundary roles are ineffective, leading to conflicting urban development, particularly on areas share borders and are administered by different regional governments. Therefore, this study examined the nature of shared urban boundaries and related social-ecological challenges. It employed a case study approach, and the findings are conceptualized to the broader urbanization and urban planning trends, with particular relevance to any urban areas sharing borders. Temporal satellite images from 2005 and 2018 were used to examine land use/land cover changes around shared urban regions, and their proposed and existing land-uses were compared with the aid of Geographical Information System and ERDAS IMAGINE. The findings show lack of clear criteria to delineate urban boundaries in Ethiopian urban planning; absence of regional planning leading to indistinct and overlapping boundary setting, which triggered challenges related to: rapid conversion of ecosystem service providing sites to settlements, conflicts over land administration, and land ownership insecurity. Furthermore, non-integrated urban planning trends between urban areas sharing borders amplify the proposal of conflicting and incompatible land uses. As a result, policymakers and planners should employ integrated and participatory urban and regional planning concepts for the effectiveness of urban areas sharing boundaries and administered by different regions.

## 1. Introduction

Urbanization is the process of becoming urban, and the increase in the number of urban areas, population and related activities (Uttara et al., 2012). As such, the global north is extensively urbanized, whereas the global south's urbanization is accelerating rapidly (Manzoor H. and Iram I., 2018). Aside its many benefits, the downsides of urbanization include: to convert farming land to built-up spaces and increase land speculation (David B., 1978; Melo, 2018; Woldegerima et al., 2017), as well as ecological impacts, such as the loss of biodiversity (McKinney, 2008), and disturbance of hydrological processes (Abiye et al., 2009; Foster et al., 1994; Lian et al., 2010; Mohamed and Worku, 2021).

The effects of urbanization can be managed in various ways, one of which is urban boundary demarcation (Gennaio et al., 2009). It usually includes policy measures that play a role in determining the extent of

urban expansion, and managing urban space growth in an orderly fashion (Liu et al., 2017). Also, urban boundary is an indicator of access to urbanization, and of great importance for spatial-temporal monitoring and analysis of urban sprawl (Ning et al., 2018); and moreover, well-managed boundary controls can encourage social and climate-smart growth by encouraging mixed-use developments and reducing car dependence (Teri Shore, 2020).

So far, very few studies have been conducted on the topic of urban boundaries as a separate entity, and it has been understood in the broad context of urban expansion (Abed and Kaysi, 2003; Liu et al., 2017; Ning et al., 2018; Tayyebi et al., 2011). Similarly, in Ethiopia, the effects of unmanaged urban boundaries and related social-ecological challenges are poorly understood (Benti et al., 2021), if at all, for urban areas with overlapping borders and administered by different regions.

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The country is governed by an ethnic-based federalism system (Alem, 2021; Federal Negarit Gazeta, 1995), which consists of eleven (11) regions and two (2) charter cities, each with its own regional boundaries defined by different circumstances. This system is currently being challenged by intensifying ethno-political conflicts. The experience of ethnic federalism over the last 30 years appears to be more of a problem than a solution for deep-rooted socio-political conflicts that necessitate trans-boundary governance for issues such as urban boundary delineation (Alem, 2021).

According to Alem (2021), spatial planning on a national and regional scale is one of the Federal Democratic Republic of Ethiopia's (FDRE) intervention areas aimed at bridging the gap in managing cross-boundary issues but not implemented. As a result of Ethiopia's urbanization, many urban area boundaries are indistinguishable and overlapping (Benti et al., 2021).

Furthermore, the lack of thorough research and a limited focus on boundaries resulted in ambiguous urban boundary demarcations, which

became a source of conflict among regions and impacted various ecosystem services, particularly in urban areas sharing borders and administered by different regions (Benti et al., 2021; Koroso et al., 2020). These are the common issues between Oromia (Ethiopia's largest region) and Addis Ababa (a charter city and the capital of both the country and the Oromia regional state).

Addis Ababa the capital city with its fast urbanization and persisting pressure on surrounding towns is the paramount example of urbanization in Ethiopia (Meskerem Z. et al., 2017). For instance, its built-up areas increased by 120.93 km<sup>2</sup> between 1986 and 2010, this expansion is horizontal and mainly impacts the peri-urban environment and its inhabitants' livelihoods (Kasa et al., 2011). As a result, the city grew at expenses of farmlands and vegetated areas, influencing directly the communities living in the peri-urban areas and the food production (Abo-El-Wafa et al., 2017).

Such situations are visible in the towns of the Oromia Special Zone Surrounding Addis Ababa (OSZSA) (Mohamed and Worku, 2019) as the

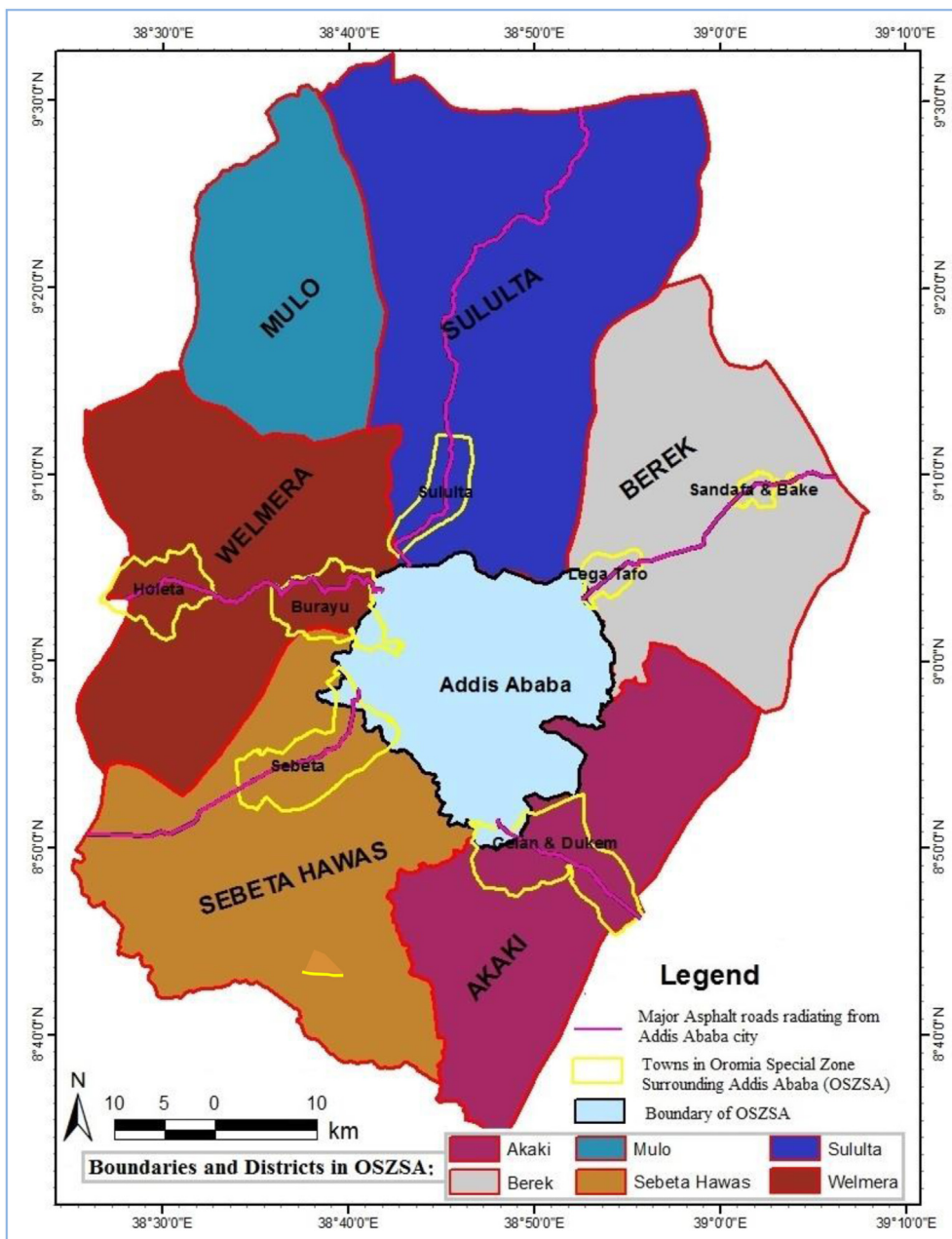


Figure 1. Boundaries, names of the districts and towns of the OSZSA with respect to Addis Ababa.

peri-urban areas of the capital city of Ethiopia encompasses the OSZSA. The OSZSA is administered by the Oromia regional state and made up of six major districts (Akaki, Berek, Sebeta Hawas, Mulo, Sululta and Welmera) and seven major towns (Burayu, Gelan & Dukem, Holeta, Lega Tafo, Sandafa & Bake, Sebeta, and Sululta), and coincide with the five major highways that depart from Addis Ababa and pass through these towns (Mohamed and Worku, 2019) (Figure 1).

The boundaries of the towns in the OSZSA determine the boundaries of the Oromia regional government, as Addis Ababa is located in the center of the region and its unmanaged boundary expansion directly affects the Oromia region's boundary and vice versa. Most of the towns in the OSZSA contain large extent of boundary overlap with the Addis Ababa city, which is governed as a charter city having different administrative entity. Among towns in this region, boundaries of three towns: Sebeta, Burayu, Gelan & Dukem overlap with capital of Ethiopia by 1457.77 ha, 1000.58 ha, and 923.12 ha, respectively.

In this regard, the Sebeta town contains the largest boundary overlap with the capital. Moreover, the Addis Ababa city boundary also extends further into the rural regions of Sebeta, making it different from the others. The availability of the city and its largest overlapping boundary have also put Sebeta town under pressure in terms of land use/land cover change.

As a result, this study is a pioneer in examining the nature of shared urban boundaries and related social-ecological challenges that can arise as a result of conflicting interests of overlapping urban boundaries, particularly between urban areas under different administrative regions

in Ethiopia, and possible urban boundary management options have been proposed.

## 2. Materials and methodology

The case study approach was used in this study, but the findings are conceptualized to broader urbanization and urban planning trends, with special relevance to any urban areas that share borders. As case studies, Addis Ababa, Ethiopia's premier, largest, and capital city; and Sebeta, an emerging, fast-growing town with the largest boundary overlaps with the capital, are used. This was chosen to trace the most significant social-ecological challenges of urban areas sharing borders in the hope that they will serve as learning examples for other urban areas sharing boundary lines and comparatively at a lower stage of development, as well as for urban areas that are expected to emerge with similar characteristics.

Secondary spatial data, such as satellite images, land use plans, and the boundaries of the urban areas used as case studies, were mostly applied in this study. Besides that, the contents of Ethiopian urban planning documents were systematically reviewed in order to identify the issues specified in relation to the country's urban boundary demarcation. Furthermore, issues of urban boundaries beyond spatial data analysis were gathered from primary data sources, which included issues in the process of boundary demarcation of the case study urban areas obtained from urban planners, as well as some social-ecological related aspects in the overlapping regions obtained through interviews with residents living in areas of major land use/land cover change hotspots.

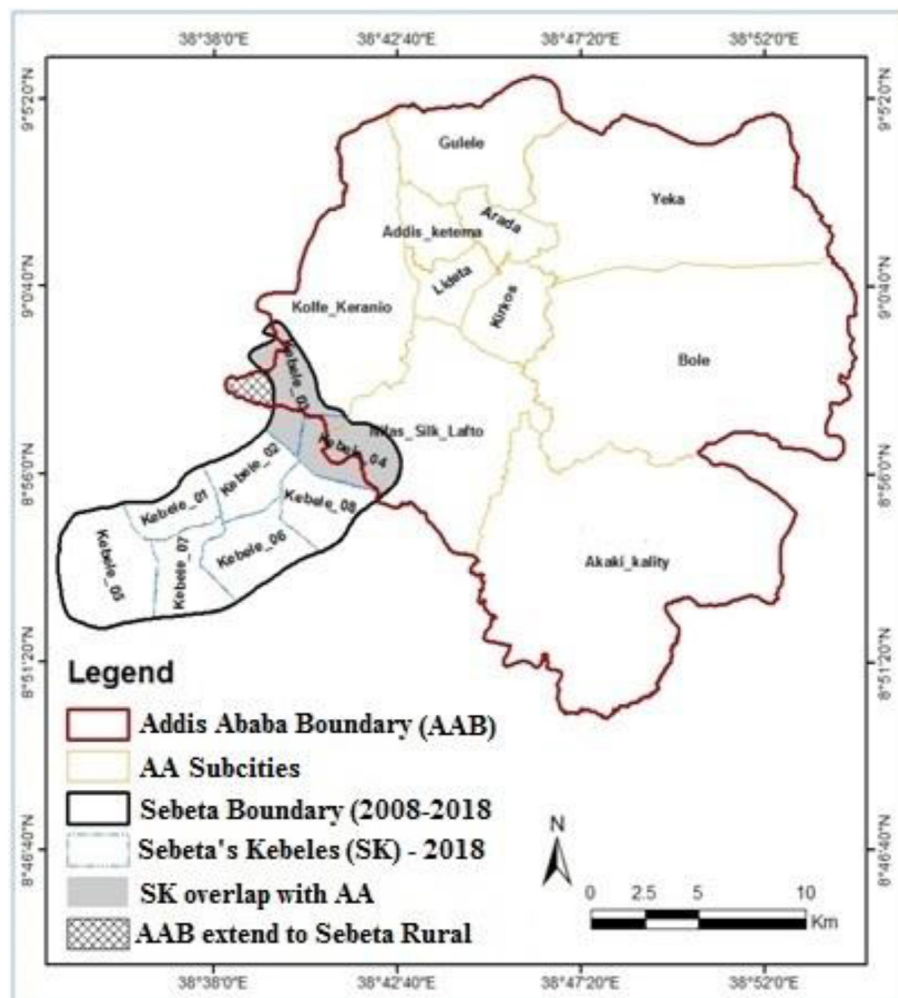


Figure 2. A Map showing the Sebeta town and the Addis Ababa boundaries, and their overlapping regions.

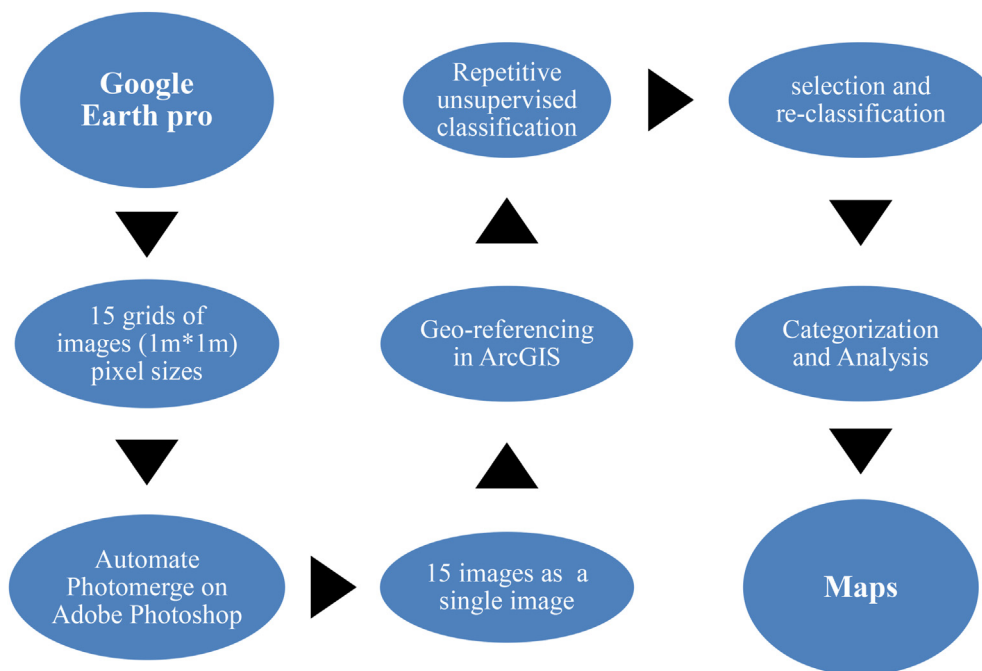


Figure 3. A flow chart illustrating the main steps involved in processing the images downloaded from Google Earth pro.

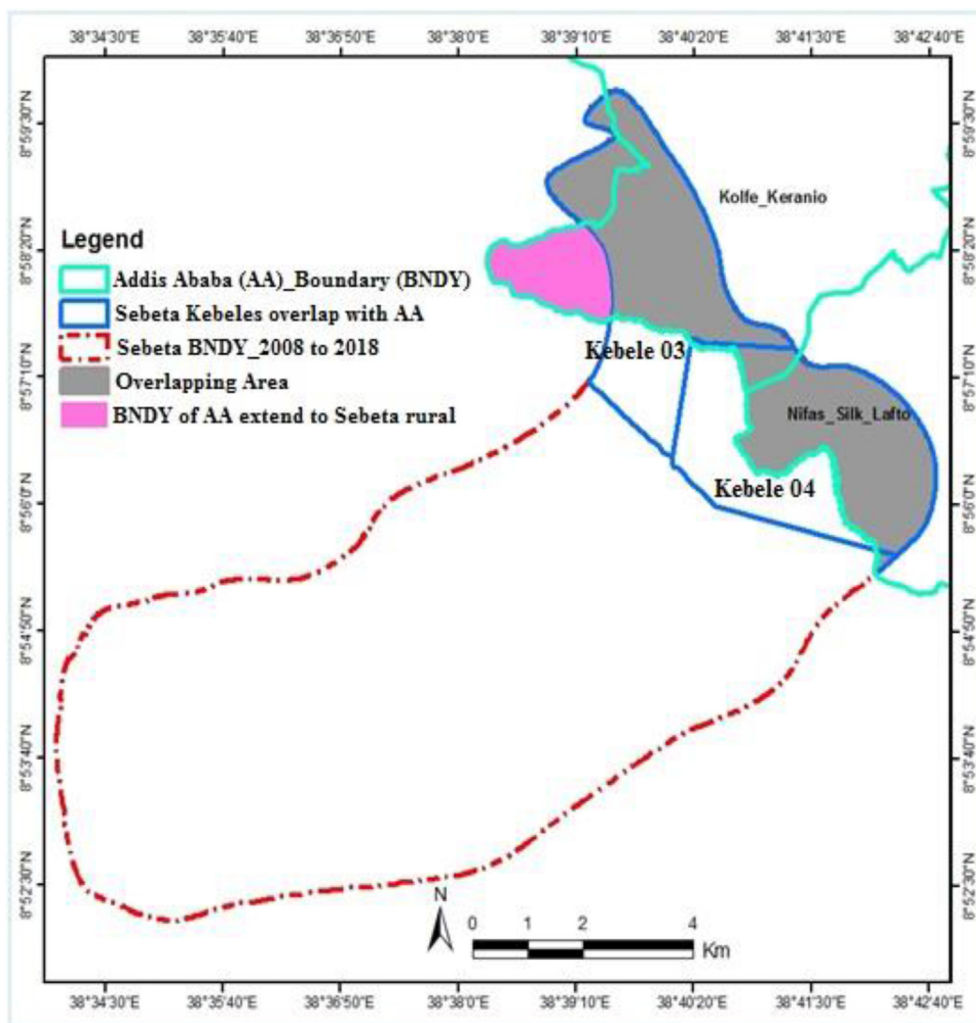


Figure 4. A Map depicting the overlapping region between Sebeta town and Addis Ababa city.



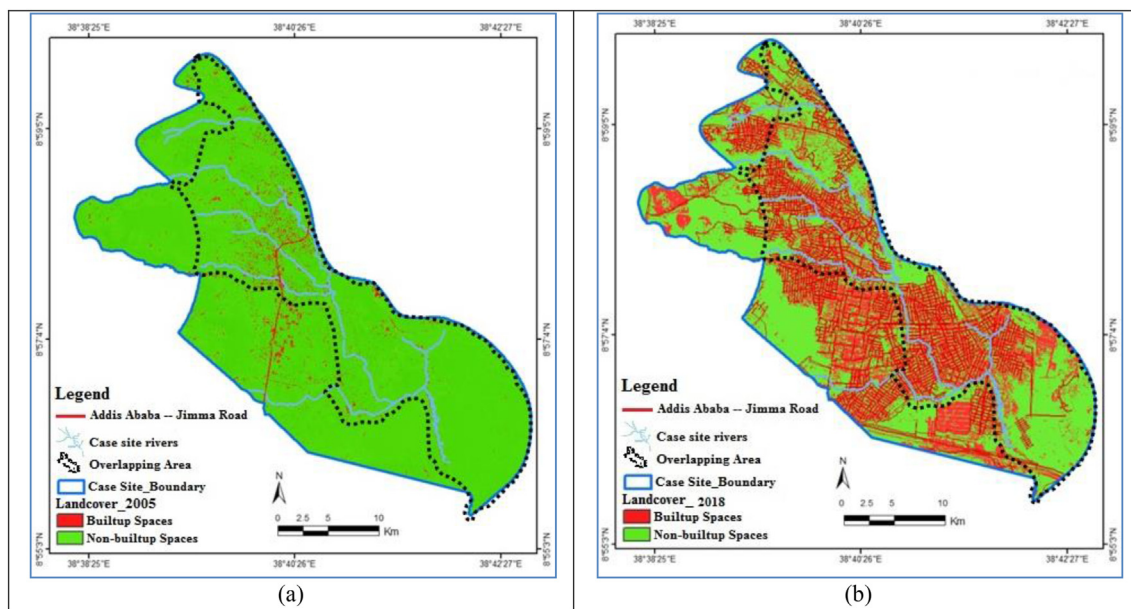


Figure 5. Land cover around the overlapping region in 2005 (a) and in 2018 (b).

The overlapping areas between the Sebeta town and Addis Ababa city were assessed as follows: The first step was to define the overlapping region under three considerations (i) to be framed within the 2008–2018 boundary of Sebeta and Addis Ababa 2016–2026 boundary. (ii) The two Kebeles of Sebeta town (03 and 04) were included in the analysis because a large portion of the Kebeles exists in the overlapping region. (iii) Part of the Addis Ababa boundary extends over the rural Kebeles of Sebeta (Figure 2).

The second step was selecting the spatial data for the analysis of the overlapping area. In this research, cloud-free historical satellite imageries from Google Earth Pro of 2005 and 2018 were used to analyze land use/land cover change. The reasons for using Google Earth Pro are the lack of high-resolution historical images and the high cloud-cover in other freely available satellite image sources in the specified years. The 2005 marked the beginning of OSZSA reforms for the towns surrounding Addis Ababa. It was also a year of political unrest due to the 2005 elections, which also caused major land-use changes. The 2018 was chosen because it was the end of the first structure plan period of the town, and therefore revised for the 2018–2028 period.

High resolution (pixel size of 1m\*1m) historical imageries from Google earth pro were downloaded under the following adjustment options: (i) In order to avoid the tilt while zooming in the Google earth, the Navigation option was adjusted to “Do not automatically tilt while zooming”. (ii) Under the 3D view option: the Unit of Measurement was adjusted to meters/kilometers, Elevation exaggeration was set to the minimum scale which is 0.01 and the Lat/Long display option was adjusted to the Decimal Degrees. Based on the resolution scale indicated above, the study area and its immediate surroundings were covered with about 15 grids of images (Figure 3).

Table 1. Land cover categories and their dynamics between 2005-2018.

Land cover categories	Total Area			
	2005		2018	
	Hectare (ha)	Percent (%)	Hectare (ha)	Percent (%)
1 Non-built-up Spaces	2,508.32	97.30	1,823.52	70.73
2 Built-up Spaces	69.67	2.70	754.47	29.27
Total area of the Case Site Boundary	2,577.99 ha			

The images were merged to a single file in Adobe Photoshop CS6 using the Automate Photomerge tool, and it was based on similarities or common geometries, and its geo-referencing was carried out in ArcGIS using Coordinate points of easily detectable places collected from Google Earth Pro using the Placemark tool. Finally, the overlapping region was extracted from the geo-referenced image using the spatial analysis tool's Extract by Mask feature.

The Geographical Information System (GIS) 10.1 and ERDAS IMAGE 2013 software were used for image preprocessing (collecting control points for rectification, defining projection and rectification), supervised classification, and finally analyzing land use/land cover change. The comparison of the land use/land cover change was made based on two main classifications: (i) Built-up areas, comprising settlements, infrastructure, and other human-made constructions; and (ii) Unbuilt areas comprising all areas absent of constructions, such as natural landscapes (water bodies, different forms of vegetation, and the like), and working landscapes include agricultural land, historical sites, pastureland, and the like.

Third, the competing land was analyzed by comparing the Addis Ababa City's proposed land use for 2016–2026 and the Sebeta town proposed land use for 2018–2028, against the 2018 recent and detailed land use of Sebeta town. Although the recent land-use proposal of the Addis Ababa city, which used for the comparison, was prepared two years before the 2018 existing land use, it is the only detailed available data, and most of the land uses around the overlap have shown insignificant land use changes during these two years.

Moreover, urban planners involved in preparing the structure plans of the Sebeta town and the Addis Ababa city were interviewed to know the criteria and process used in defining the urban areas' boundaries. Furthermore, the challenges beyond the spatial analysis and mapping were traced through systematic informal interviews with residents living in the overlapping region.

### 3. Results and discussions

#### 3.1. Planning documents pertaining to urban boundaries in Ethiopia and the nature of the study region's boundaries

The result of the systematic review of the Ethiopian urban planning documents shows that the state's roles in urban land development in the country include the preparation of urban planning-related manuals,

standards, policies, and proclamations. On the other hand, the urban land management bureaus are responsible of auditing land and allocating it for various land uses and services. In particular, each region and chartered city has its own land management agency, which only acts and is responsible within its own region. In most cases, the country implements a decentralized urban planning approach, and most regions in the country have their own planning offices, but mostly rely on planning documents similar to those used by the federal government, which is primarily applied to the capital city, Addis Ababa.

In addition, the planning documents show that urban land management in Ethiopia is dependent on the extent and types of urban planning,

but the distinctions between urban and rural land management are always unclear, and their implementation is also poor.

In terms of urban boundary, the systematic review proofed that the Ethiopian urban planning documents lack clear and detail criteria for setting boundaries of urban centers in the country. The concept of the physical boundaries for urban centers that comprising a general content about the boundary issues is specified in the Article 6 of the Ethiopian Urban Planning Proclamation (EUPP) No 574/2008, and consists of three key points: (i) Urban centers should have clear boundaries. (ii) The boundaries between urban centers shall be defined by the relevant regional governments, and the boundaries of the Charter cities (Addis

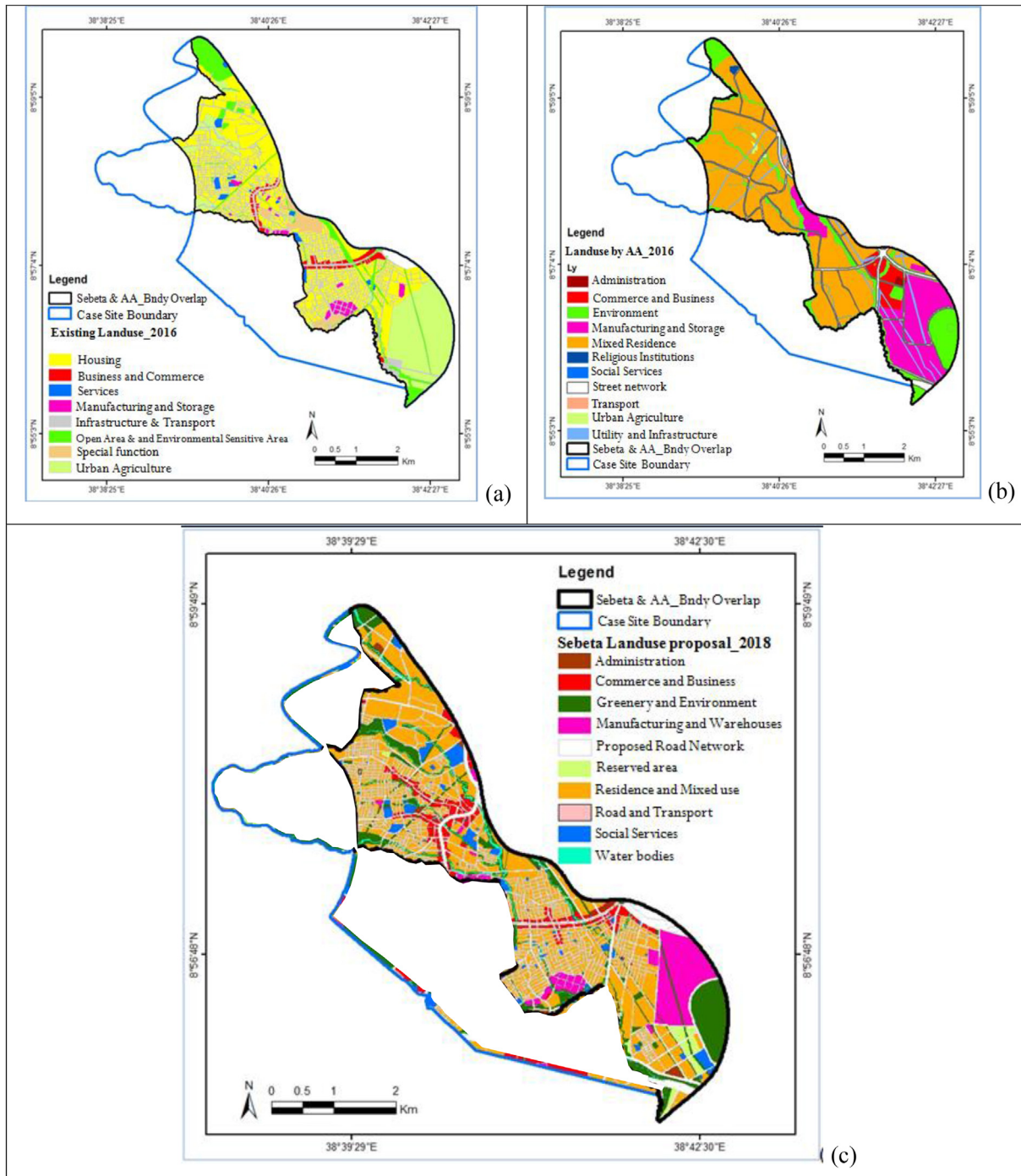


Figure 6. The 2016 existing land-use (a), the proposal by Addis Ababa city for 2016–2026 (b), and the proposal by the Sebeta town for 2018–2028 (c).

Ababa and Dire Dawa) shall be indicated in their respective charters. (iii) The urban center may be favored by the authority concerned and granted the status of a growth center to merge its immediate surroundings for a development purpose, irrespective of its physical boundary (Erena et al., 2018). Apart from this proclamation, there are no other guidelines and clearly defined criteria for delimiting urban boundaries in the country.

Similarly, the absence of a comprehensive boundary delineation criterion in the national urban planning manuals of the country opens decentralized and unstructured urban boundary setting methods at regional planning offices even at urban level. For instance, the Oromia Urban planning Institute (OUPI) prepare plans for the towns administered under its regional jurisdictions like the Sebeta town, and the Addis Ababa city Administration have prepared the structure plans of the city at different time period. In addition to the lack of criteria in boundary setting, non-integrated structure plan preparation has resulted in boundary overlap in the study area.

For instance, between the 2008–2018 defined boundary of the Sebeta town and the 2016–2026 established boundary of Addis Ababa city, there is about 1,414 ha of shared land. Furthermore, the Addis Ababa city’s boundary intrudes about 248 ha into the rural areas of Sebeta, which indicate its urbanization footprint extends beyond the urban area

of the Sebeta town (Figure 4). As a result, the shared boundary between the Addis Ababa city and the Sebeta town is characterized by being ambiguous and overlapping.

Furthermore, neither of the two urban areas has fully recognized the precise defining elements of their respective urban areas, and they are only competing for the region indicated as the overlapping area. As a result, parts of two Kebeles (03 and 04) of the Sebeta town of the Oromia regional state, as well as two sub cities of the Addis Ababa city administration (i.e. Kolfe Keranio and Nifas Silk Lafto) are indistinguishably located to determine which of the two urban areas they belong to.

In general, the nature of the two urban areas’ boundaries is very complex, and they are not framed by fixed landscape features. Furthermore, there are no written documents stating the defining features of their boundaries, with the exception of the administrative bodies of the two urban areas stating orally that their urban areas are already defined by natural features such as rivers and mountains. According to Alem (2021), the current urban planning practice and related legal provisions in Ethiopia override citizens’ right, and vague land policy constrains interregional cooperation in planning and land governance, and she call calls for people focused planning, the revision of policy and legal frameworks to facilitate cross-boundary land governance.

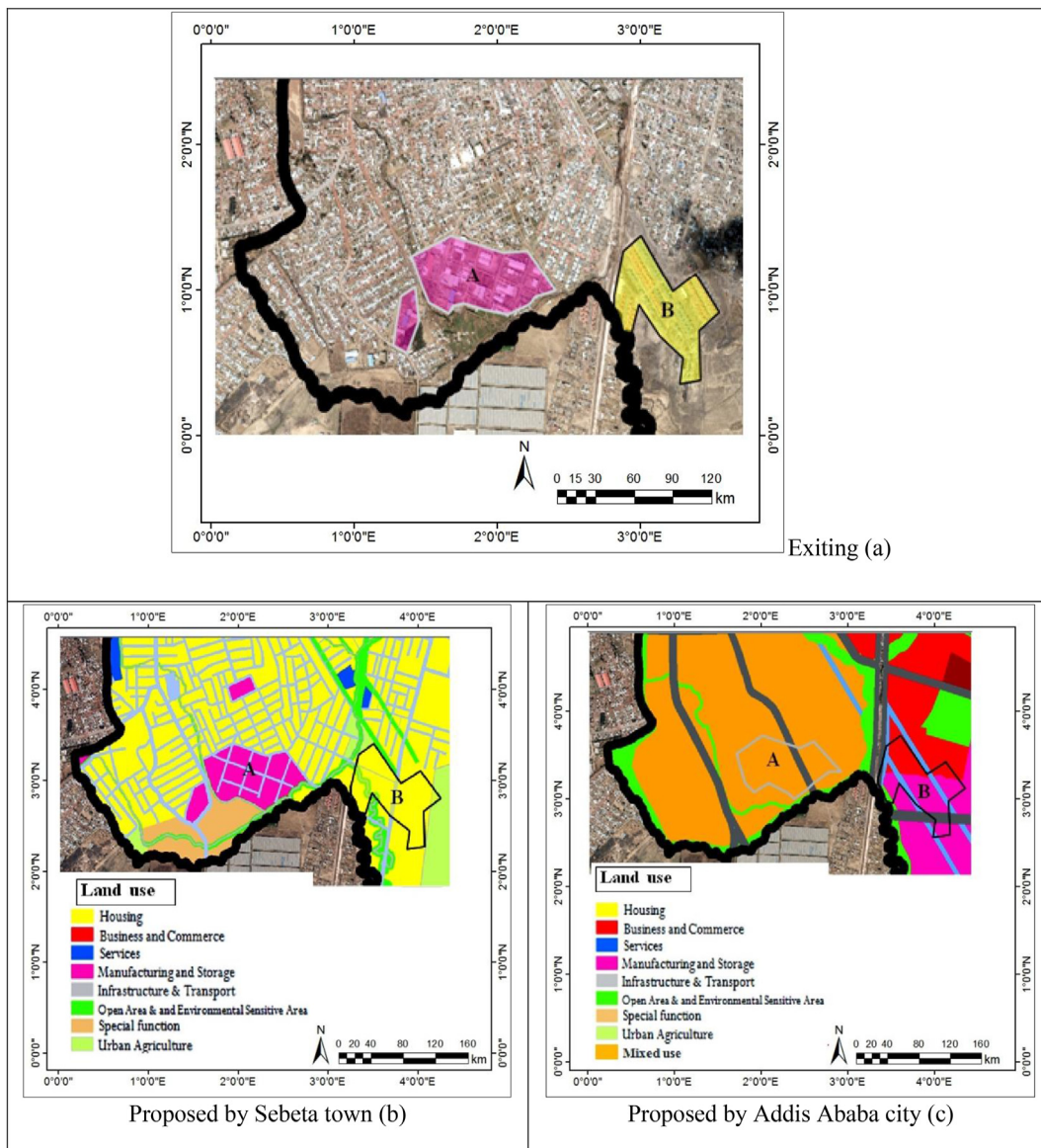


Figure 7. Hotspots showing Level of contradiction (a).



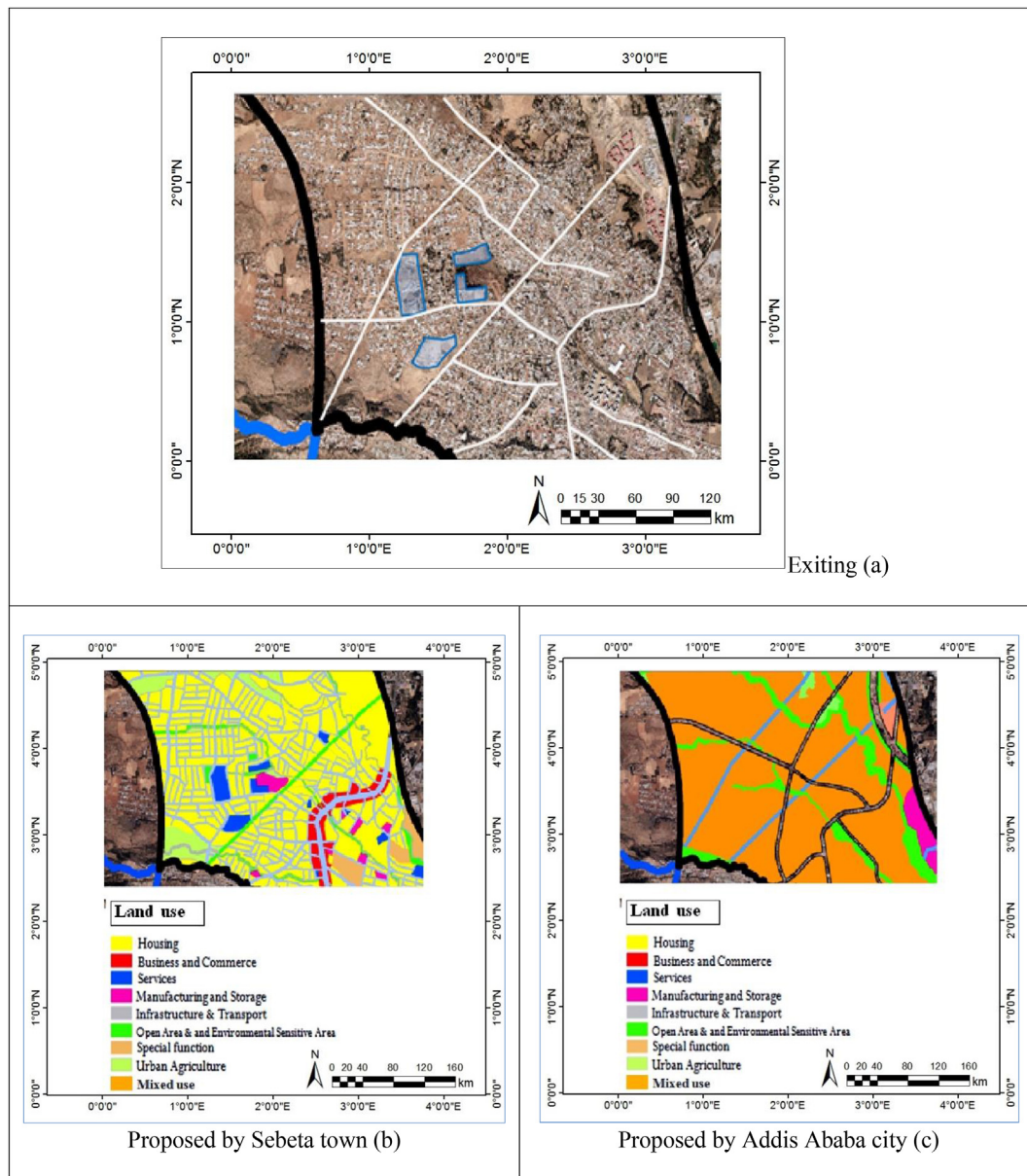


Figure 8. Hotspots showing Level of contradiction (b).

### 3.2. Overlapping boundary setting and related socio-ecological challenges

In the process of urbanization of the Addis Ababa city and the Sebeta town, the unmanaged horizontal urban expansion of the two urban areas contributed to the overlapping boundary setting. Because of the overlapping region's unclear ownership of the land, its existence has largely resulted in a conflict of interests between the Sebeta town administration, which represents the interests of the Oromia Regional State, and the Addis Ababa city administration. Basically, Addis Ababa is interested in horizontal expansion and occupying large vacant land in its peri-urban areas for various investments that require large plots, whereas the Sebeta town is interested in retaining the city's further expansion to the Oromia Regional State boundary.

As a result, the main reason for the overlapping area's major socio-ecological challenges is a conflict of interest on land between the two regions, and the identified challenges are elaborated under the following themes: the conversion of large portions of non-built-up spaces to built-up spaces, mismatching and incompatible land uses, and unclear property ownership rights. These challenges have been contributed to the

unsustainable social-ecological related land use changes in the urban areas and their detail explanation are given as below.

Some studies back up the findings of this study. They demonstrated that overlapping administrative boundaries among urban areas complicates urban land management, and allows for the expansion of edge built-up zones that potentially harm natural and agricultural lands (Benti et al., 2021). Furthermore, the ambiguous and overlapping boundaries attract informal settlers (Achamyeleh, 2014; Benti et al., 2021). The increase in informal settlements is due to the fact that illegally subdivided plots located outside of a municipal boundary, which are typically supplied by local peri-urban landholders, are relatively cheap and affordable to the urban poor for the construction of a residential house (Achamyeleh, 2014).

#### 3.2.1. Fast rate conversion of the natural and working landscapes

The high rate of conversion of the natural and working landscapes is one of the first social-ecological challenges of the overlapping boundary. Land-use/land cover changes caused by the overlapping boundaries poses challenges that extend beyond the overlapping region. As a result,



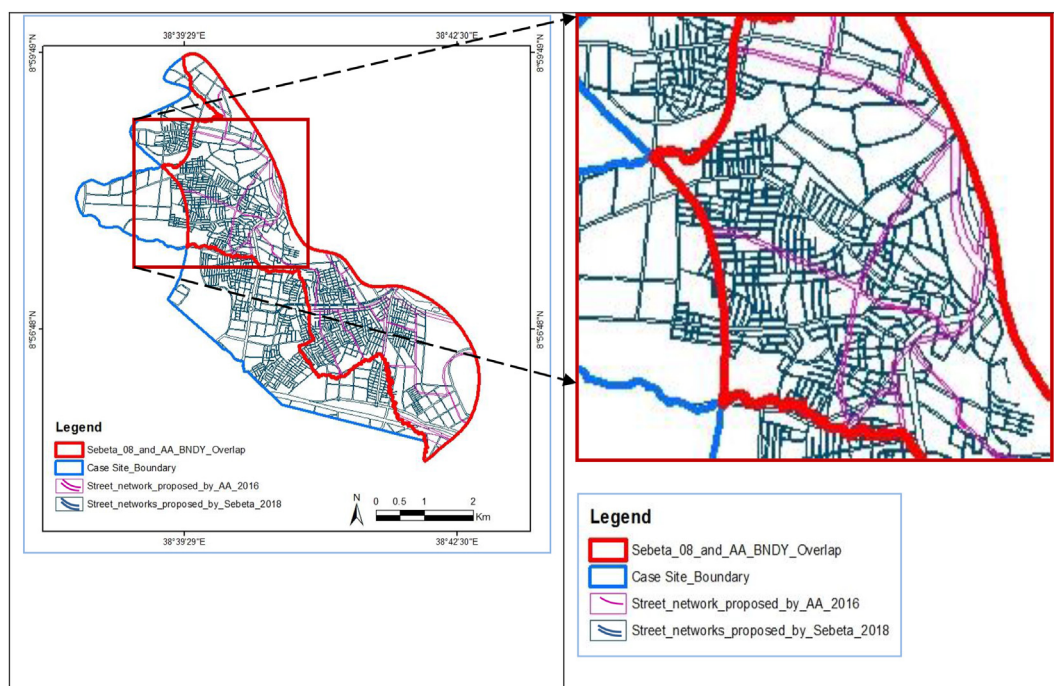


Figure 9. Level of integration of street network proposed by Addis Ababa city in relation the existing overlap.

the entire areas of the two Kebeles (03 and 04) of Sebeta town, as well as some portions of two sub-cities (*Kolfe Keranio and Nifas Silk Lafto*) of Addis Ababa city containing the overlapping region, which covers about 2,578 ha, were mainly affected (Figure 5).

Out of the 2,578 ha of the total areas, the total built-up spaces in the case site area comprising the overlapping region was about 70 ha in 2005, and increased to 754 ha in 2018 (Table 1) which indicates about 1083% increment whereas the non-built-up spaces that majorly included the natural and working landscapes reduced by 73% within the last thirteen (13) years.

The main reason for the converted large portions of non-built-up spaces to built-up spaces indicated in Figure 5 was a conflict of interest between the Oromia regional state, as reflected in the Sebeta town administration, and the Addis Ababa city administration on the overlapping area. In addition to the competition for land occupation in the peripheral areas caused by the two urban areas, which exacerbated the conversion of natural and working landscapes to other land uses, the absence of clear land administration on the overlapping region provided opportunities for unmanaged land invasion, both formally and informally.

Many previous researchers have shown the impacts of the increment of unmanaged built-up spaces. They pointed out that it degrades both natural and working landscapes (Benti et al., 2021), potentially reduces ecosystem services (Kindu et al., 2018), reduces urban green areas and natural vegetation (Degife et al., 2019; Girma et al., 2019), increases the formation of heat islands (Arviso et al., 2018), enforces surface runoff (Erena et al., 2018) and increase pollution (Mohamed and Worku, 2021). Furthermore, the fast rate of socio-ecologically related landscape changes should be managed as early as possible (Benti et al., 2021). It requires various urban planning models, integrated planning methods, and a better understanding of different land-use planning and policies (Gibson and Quinn, 2017; Kindu et al., 2018).

### 3.2.2. Conflicting land-uses

Another challenge on the overlapping area is the availing of two structure plan proposals containing contradictory land-uses. The first one is the Addis Ababa city structure plan proposal (2016–2026) which was prepared by the Addis Ababa Master Plan Project Office (AAMPPO). The

second is the Sebeta town structure plan (2018–2028) which was prepared by the Oromia Urban planning Institute (OUPI) in collaboration with the town administration. This demonstrates that the structure plan proposals were prepared under different authorities, years of plan preparation, and service periods. The failure of the two regions to conduct integrated works during the structure plan preparation process resulted in contradictory land use proposals in the overlapping region.

Moreover, the Addis Ababa land-use plan is un-detailed considering the overlapping region as the outskirts of the city and allocated the region for investment related land use that require large areas. On the other hand, the Sebeta town land use plan is detailed around the overlapping region because the town administration considers the region as the most important place because of its locational advantage to the capital city, and the town administration have also been requested more urban development demands around the region (Figure 6).

The level of contradiction of the proposed plans of the two urban areas against the 2016 existing land uses on the overlapping region varies. The Addis Ababa city's proposed plan considers poorly the existing reality of the area and contradicts largely the existing land-use plans. In contrast, the Sebeta town's proposed structure plan is better integrated into the existing land-uses.

Some of the hotspots indicated in Figures 7 and 8 show that Sebeta town better consider the existing land use while the proposal by the Addis Ababa city is very general and mismatch with the varies activities on land.

Existing physical infrastructures like roads and other social services were not indicted properly in the Addis Ababa city proposal whereas they are shown clearly in the Sebeta town proposal.

In addition, the proposed street network by the two administrations also contradict each other. In this regard, the road networks proposed by the Sebeta town is very detailed and better fit to the existing situations; whereas the Addis Ababa proposal does not show all major roads, were poorly integrated into the existing road networks, and there are cases where major roads proposed by the Addis Ababa city discontinue and passes on blocks containing settlements (Figure 9).

The contradicting land uses is the result of non-integrated urban planning trends, as the two administrations prepare their plans at different planning periods. In addition, the contradiction is resulted due

to rare assessment of land use plans of each other while preparing their urban plans at different time frames; and moreover, lack of regional plans which bottlenecked to cross-check and monitor the level of contradiction between the two urban areas and with the existing landuses.

One of the challenges of the overlapping boundary is contradicting landuses: The consequences of contradicting land uses are significant threats to conservation (Rajvanshi, 2005), causing ownership insecurity (Magsi et al., 2017), increasing ecological degradation such as riverine ecosystems (Valle et al., 2015) primarily on landscapes classified as natural and working. According to Jong et al. (2021), overlapping land right is one of the root causes of conflict related to land use and related changes, which supplement the case study area.

The result show that the conflicting landuses were mostly resulted due to a non integrated landuses planning. The works of some scholars indicate that integrated land use planning is a tool for guiding decision-makers by presenting development plans that prevent land use conflicts (Mann and Jeanneaux, 2009; Wehrmann and Schmitz, 2011). In addition to, governance and institutional arrangements for collaborative regional and local landscape planning (Mann and Jeanneaux, 2009) are also crucial in reducing conflicting land use allocations.

3.2.3. Unsecured ownership of property

The undetailed and ambiguous criteria for boundary setting in the Ethiopian urban planning documents are a major cause for the demarcation of the overlapping boundary in the study area. There are also very

limited formal land registration data that clearly defined the belongingness of each parcel of land in the overlapping region to which urban administration.

These and other related causes contributed to unclear ownership of land in the boundary overlapping area between the Addis Ababa city and the Sebeta town administrations, and created conflicting interests. Consequently, the residents in the overlapping region feel unsecured property ownership right, because the urban land management offices of either the Addis Ababa city or the Sebeta town permits land related development. Some of the residents living in the overlapping area stated that experts from the two urban planning offices approached them and prepared their plans at different times, and therefore they do not trust in register their properties to any of them. Such insecurity prevents them to invest in their lands. Besides creating the unsecured individuals' property ownership, the boundary overlap has also led to mismanagement of communal land. Residents in the area were pointed that there are many cases where such spaces are abandoned for many years. In addition, there are also cases where communal spaces have been used for mass housing like condominiums and the houses have been transferred to different urban administrations that lack the right ownership of the land. For example, the condominiums constructed by the government located within the overlapping area. The overlap of buildings and boundary lines also shows that there are instances where a block of buildings falls within different administrative boundaries, which is unavoidable (Figure 10).

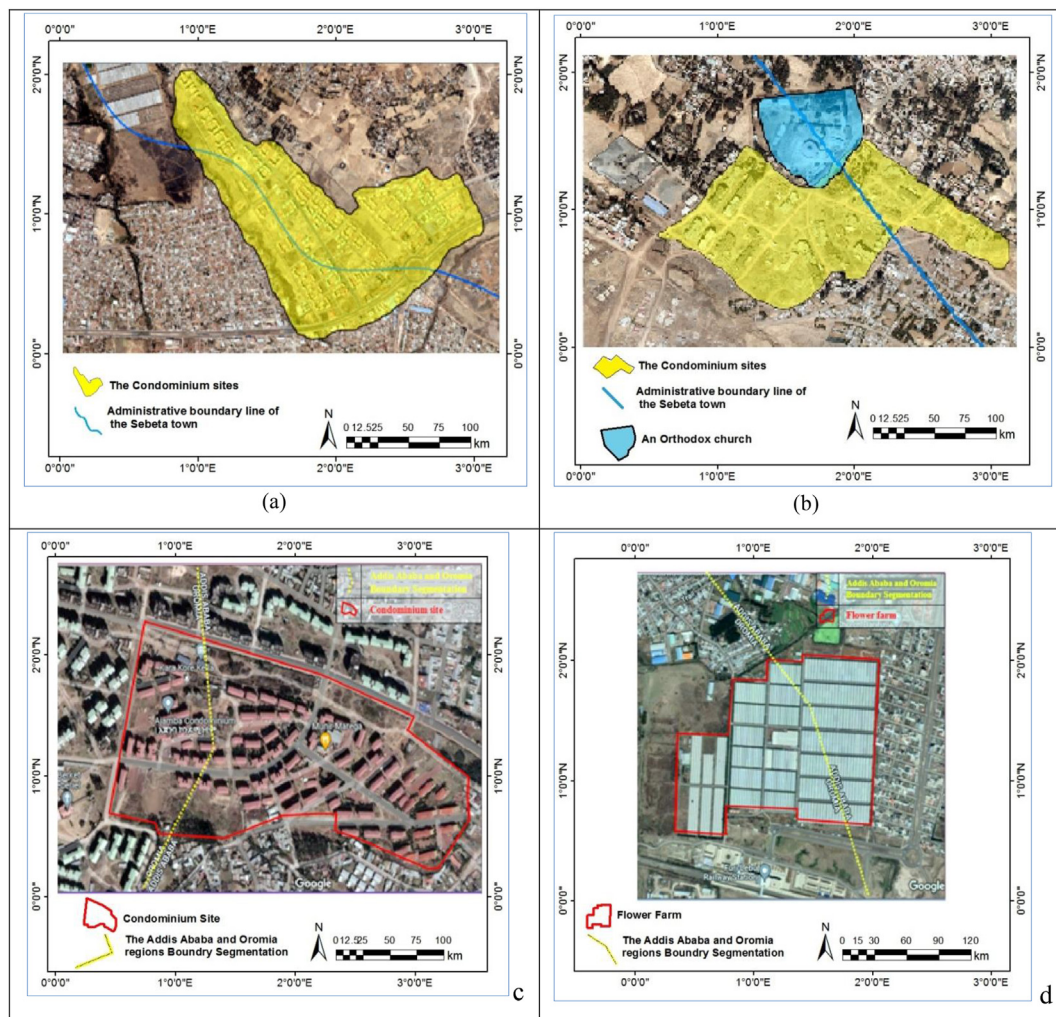


Figure 10. The Condominium sites [Jemo (a), Fanuel (b), and Ajamba(c)] and Flower farm (d) are some examples of large projects located in ambiguous and overlapping regions.

Different scholars have stated that land tenure is a condition for establishing land for housing and access to other services (McLees, 2011). In contrast, insecure land tenure is the main characteristic of informal settlements (Zárate, 2016), which mainly relates to the lack of title and formal registration (Ávila and Ferreira, 2016). Although there are numerous cases where informal land ownership has contributed to insecure property ownership in the overlapping region, the main cause is a lack of formal registration security caused by an unclear definition of each parcel of land to which urban administration it belongs.

Brown (2010) indicated that insecure tenure or contested resource, makes local people vulnerable to dispossession from their land, and it may also increase for investors reputational risk. In addition, insecure tenure also results in the loss of land, especially when alternative livelihood and housing options are limited (Reale and Handmer, 2011).

Researchers also included some significant methods of securing land ownership. For example, adequate tenure security and sustainable land use are critical components of effective urban land governance (Alemie et al., 2015). As a result, a more sustainable land management strategy could ensure the sustainability of ecosystem services (Sahle et al., 2019). Similarly, the Economic incentives (EIs) simulations have aided in controlling land ownership transfer (Suroso and Kombaitan, 2018).

Furthermore, without sufficient understanding of non-formal land rights, land procurement proposals for the public infrastructure upgrades can be frustrated by the individual or group claims on the land, making the service provision impossible especially in the peri-urban areas where the informal settlements are common.

#### 4. Conclusion and recommendation

The challenges of unclearly demarcated town and city boundaries under the territorial definition of different regions were highlighted in this study, which have a direct impact on the natural and working landscapes that provide important ecosystem services to urban areas. This paper also contributes milestone scientific contribution to a better understanding of how different urban areas with shared borders and administered by different regions with competing interests complicate the conversion of natural and working landscapes to built-up spaces, particularly in countries led by ethnic-based federalism, similar to Ethiopia.

In the absence of standards for delineating clear urban boundaries, their determination is usually based on the level of experts' interpretation. This contributes to the indistinct and overlapping urban boundary settings. This research also identified lack of effective land auditing and absence of thorough investigation of existing resources of an urban area, which is evidenced in the study town and complicated the overlapping region.

The other issue concluded from this research finding is that the overlapping and ambiguous urban boundaries complicate the urban land management. The overlapping boundary-setting facilitates the increment of built-up areas, cause conflicts, attracts informal settlers potentially, and creates contradicting development.

Another conclusion from this study is that non-integrated urban planning for urban areas sharing boundaries contributes significantly to the proposal of conflicting landuses and maximizes overlapping urban boundaries.

Moreover, in the increasing urbanization trends particularly in the global south where experiencing high rate of urbanization, this research contribute a milestone to science in showing how unmanaged urban boundary setting of urban areas administered by different administrative regions can led to the social, ecological and economic challenges. The case specific issues of urban boundaries within a country, in this case Ethiopia, can be enlarged to any urban areas existing in the bordering of different countries although the rate and level of the challenge varies. The validation of this research also extends beyond the urban territorial administrations as it can also contribute to any urban-urban or rural-urban or rural-rural areas having shared boundaries and located at any global territories.

Therefore, this study recommends that clear urban boundaries should be delineated using well-defined and permanent natural and human-made features like mountains, networked green infrastructures, rivers, and monuments. This research also suggests that, in addition to technical solutions, policymakers should promote and pave the way for integrated urban planning trends especially for urban areas sharing borders. This facilitates a proper integration of necessary socio-economic services while reducing environmental footprint of urban areas sharing boundaries. The gap for future researchers will be comprehensive socio-economic characterization of the overlapping urban boundaries in the study region as the major scope of this research is the social-ecological aspects of the overlapping.

#### Declarations

##### Author contribution statement

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

Heyaw Terefe; Daniel Callo-Concha: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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##### Data availability statement

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

##### Declaration of interest's statement

The authors declare no conflict of interest.

##### Additional information

No additional information is available for this paper.

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