Addis Ababa City Government Plan & Development Commission

THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

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Technical Report 4.4 | Urban Governance and Planning

Addis Ababa Spatial Compendium

Mapping and Urban Analytics for Ethiopia's Capital

A Technical Report commissioned by the Addis Ababa Urban Age Task Force

URBAN AGE

Addis Ababa Urban Age Task Force

The purpose of the Addis Ababa Urban Age Task Force (AAUATF) is to support the City of Addis Ababa in advancing its strategic development agenda. The Task Force's work builds upon the Addis Ababa City Structure Plan (2017–2027), exploring opportunities for compact and well-connected urban growth that can be delivered through integrated city governance.

In addition to advisory activities and capacity building, it identifies strategic pilot projects to address complex urban challenges around housing, urban accessibility, green and blue infrastructure, and urban governance.

The AAUATF is a partnership between the Addis Ababa City Plan and Development Commission (AACPDC), LSE Cities at the London School of Economics and Political Science, the Alfred Herrhausen Gesellschaft, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

urbanagetaskforce.net/addisababa

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Aims

The Addis Ababa Spatial Compendium is a resource commissioned by the Addis Ababa Urban Age Task Force to document and represent visually some of the base layers of urban development through the most dominant urban typologies in Addis Ababa using Geographic Information System (GIS) software. In the first section of this report, a brief overview of selected city level maps will introduce key spatial planning strategies supporting the current urban development. In the second section, through the application of data approximations to the urban typologies, key geo-spatial insights are provided and depicted in maps, 3D models and the Spacemate diagram, a summary diagram documenting the key spatial characteristics of different areas.

Introduction

Addis Ababa is Ethiopia's largest city with an estimated population of between three to four million people (CSA 2013) within an area of 527 km^2. The city is divided into 11 sub-cities, four of which are inner sub-cities and the other seven potential expansion areas. The latest Addis Ababa City Structure Plan (2017 – 2027) (AACPPO 2017) plans to densify and develop the city in different zones. However, there is a lack of spatial and socio-economic information to support decisions about future developments. The Addis Ababa Spatial Compendium offers a mapping and illustration-based resource that introduces Addis Ababa's spatial configuration and physical make-up. The first section covers city-wide overviews with a series of maps and additional information. All of the different maps are overlaid onto a map of the 2011 urban footprint and show the political/administrative boundary of Addis Ababa. The second section introduces the city-wide building typology map, highlighting most distinctive building typologies (residential- or function-related) and some of their key characteristics. The third section details more localised urban forms at a scale of 500 by 500 metres. Four sample areas have been chosen that contain some of the most prominent residential building typologies from across the city.

This research is based on spatial analysis and visualisation techniques, building on data collected during site visits and Google Maps-based visual building type detection. It involved the identification of the most distinctive building typologies in Addis Ababa and classification of the city buildings with these typologies. More than a million buildings were classified to create a city morphological map of Addis Ababa, allowing practitioners and policy makers who often work with sample areas to have access to information for the whole city.

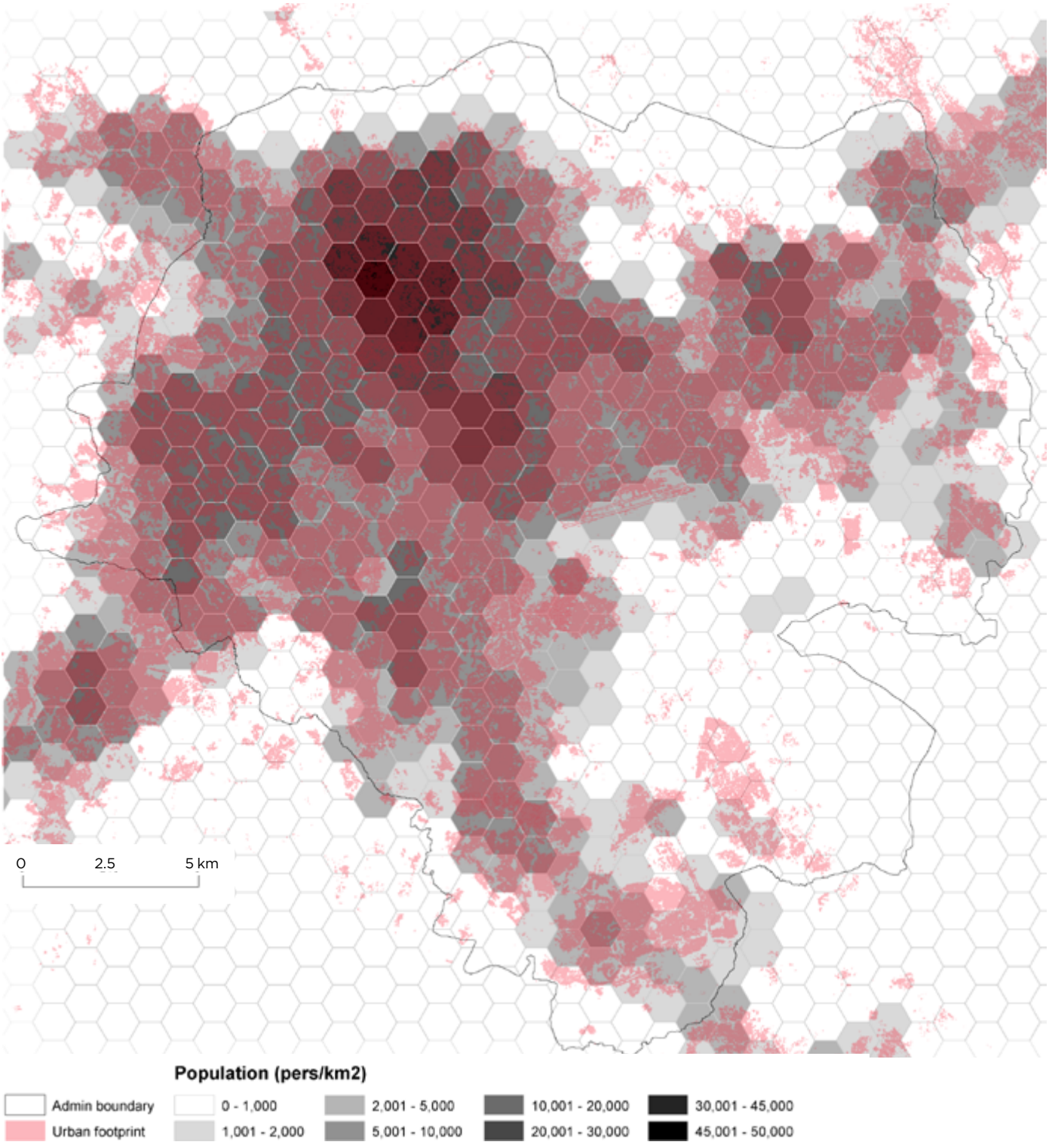
The compendium shows the building typologies with their locations and demonstrates how planning affects the real world — the working situation for planners and policy makers. By showing the urban patterns and building characteristics of the city, this report also will help the revision phase of the Structure Plan.

1. Addis Ababa city-wide mapping

1.1 Residential density

Population densities are among the most fundamental descriptors of cities. This map illustrates Addis Ababa's residential density in grey, overlaid in red with the urban footprint (built-up area of the city). It shows the number of people living in each square kilometre (hexagon). The darker tones represent the areas with higher residential densities. These same densities are represented on the next page in 3D.

Addis Ababa's geographical expansion has often outpaced its population growth, visible through the lower densities of its expansion areas. The high-density areas are mostly located in the centre, reflecting the older and more populated inner-city neighbourhoods. In many instances, these are "kebele houses", state-owned informal housing previously owned by landowners, mostly with poor levels of liveability, which represent 70-80% of the entire housing stock. Other larger, higher-density areas are visible outside the city centre towards the south, south-west and east.



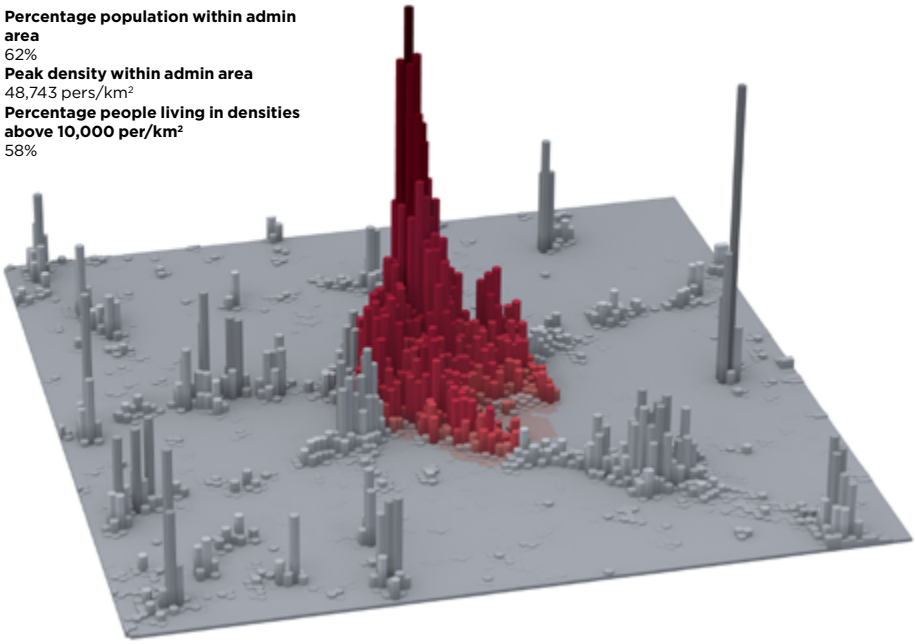
Source: Urban Age/LSE Cities analysis based on data from the EU Joint Research Centre; the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu Office

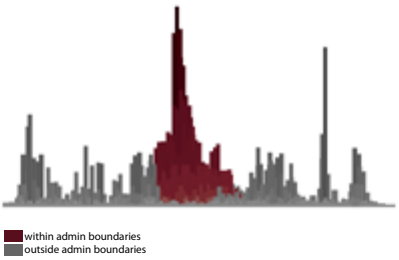
The 3D density visualisations below compare Addis Ababa residential densities with four other African cities. Density is a measure that helps describe how people live. Higher densities are often related to improved service deliveries, more sustainable development, and higher urban vitality. At the same time, higher densities also can be associated with unhealthy overcrowding. The densities below show the number of people living in a square kilometre of a 100 x 100 kilometres urban area. The areas in red represent the administrative city.

Accra, like many other cities, shows considerable levels of low-density sprawl while Luanda, with more development in its outskirts, presents some of its higher densities outside the administrative area. On the opposite side, Lagos, as Addis Ababa, has its peaks and higher densities within the administrative city. Dar es Salaam's urban development is constrained by the city's topography, demonstrated by its central and coastal densities (LSE Cities 2018).

Addis Ababa

Percentage population within admin area
62%
Peak density within admin area
48,743 pers/km²
Percentage people living in densities above 10,000 per/km²
58%

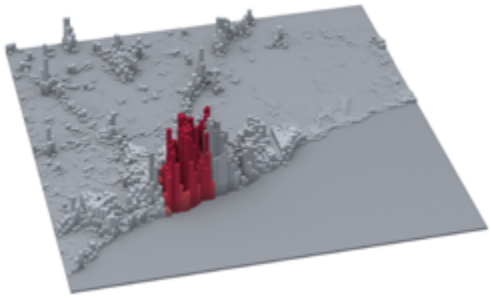




Outside administrative area
High density
Low density
Within administrative area
High density
Low density

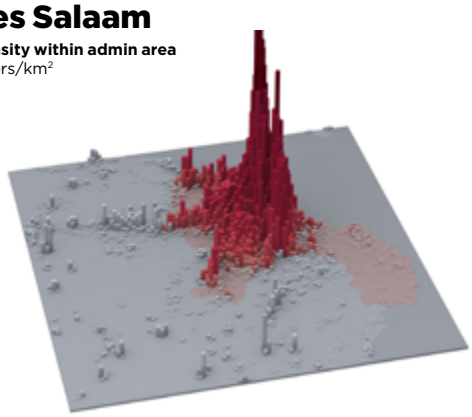
Accra

Peak density within admin area
14,507 pers/km²



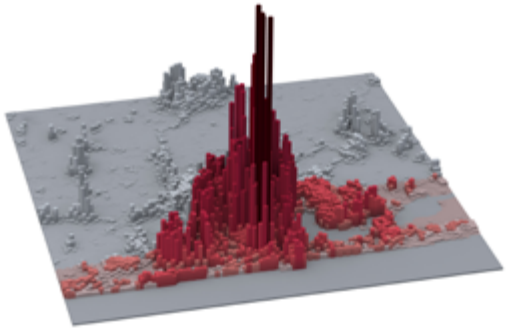
Dar es Salaam

Peak density within admin area
42,241 pers/km²



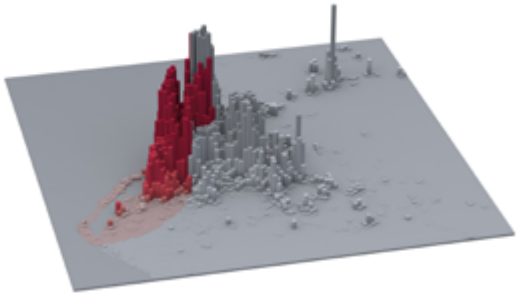
Lagos

Peak density within admin area
52,579 pers/km²



Luanda

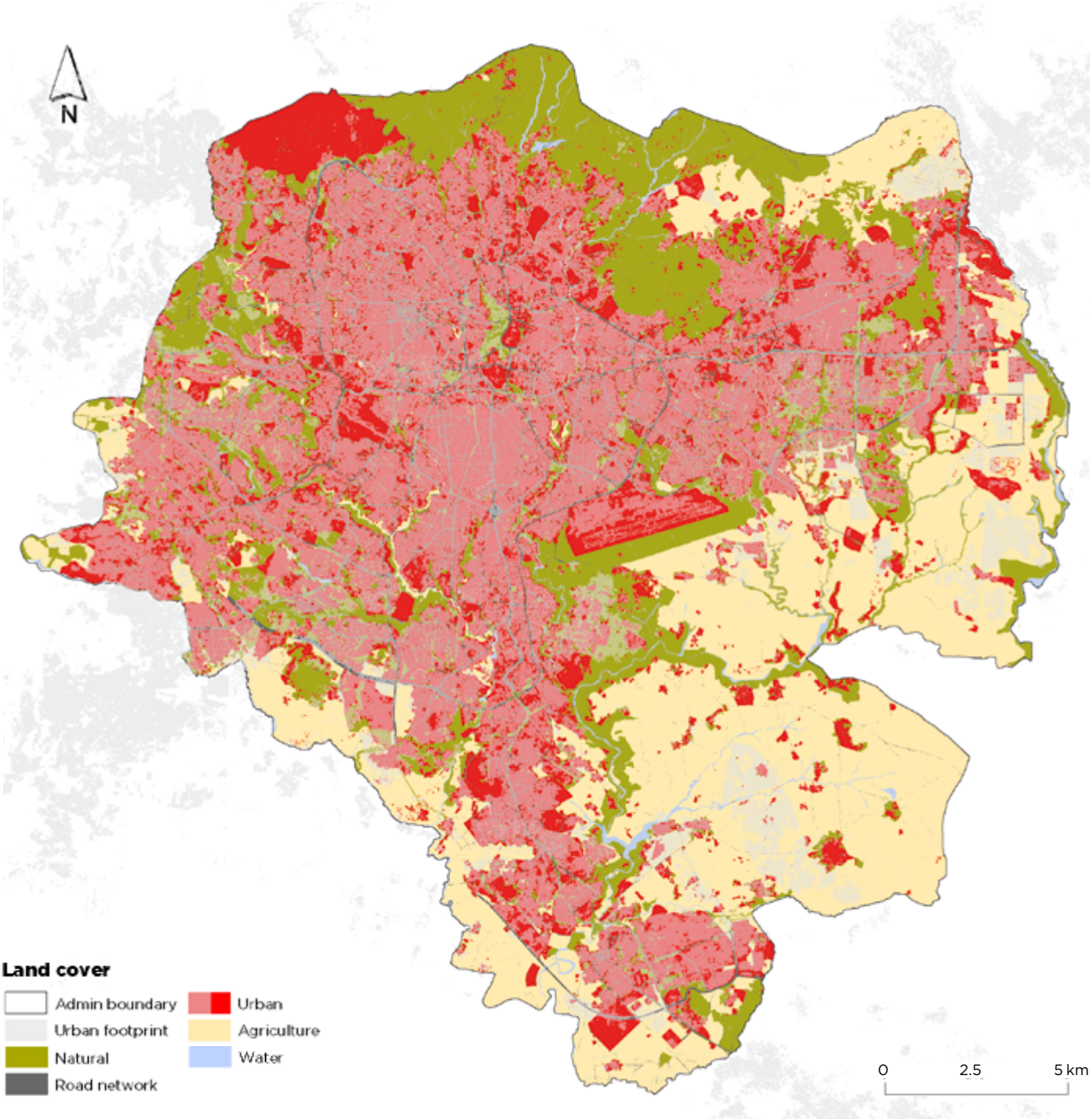
Peak density within admin area
27,512 pers/km²



1.2 Land cover

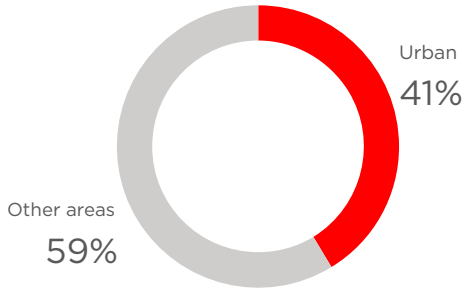
A particularly helpful spatial analysis of cities concerns their land cover patterns. This map illustrates the five main categories of land cover in Addis Ababa, distinguishing built-up areas from natural areas. The following page shows a breakdown of land cover by percentage, total area and per capita area.

Addis Ababa's non-urban areas are still dominant (59%) in the administrative area. However, the city is expanding rapidly as seen in the proposed urban areas in red: the areas matching the existing footprint of Addis Ababa are in light red, while the dark red shows the new expansion areas. Currently, the city looks under construction with many new developments in consideration to push the farmers' land mostly to the periphery.

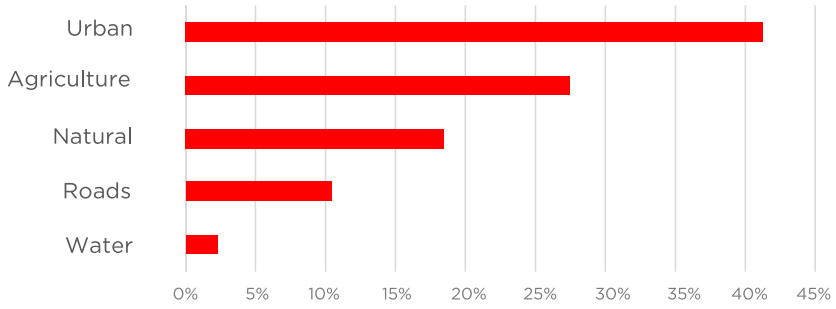


Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu

Urban land cover as percentage of admin area



Percentage of total area by category



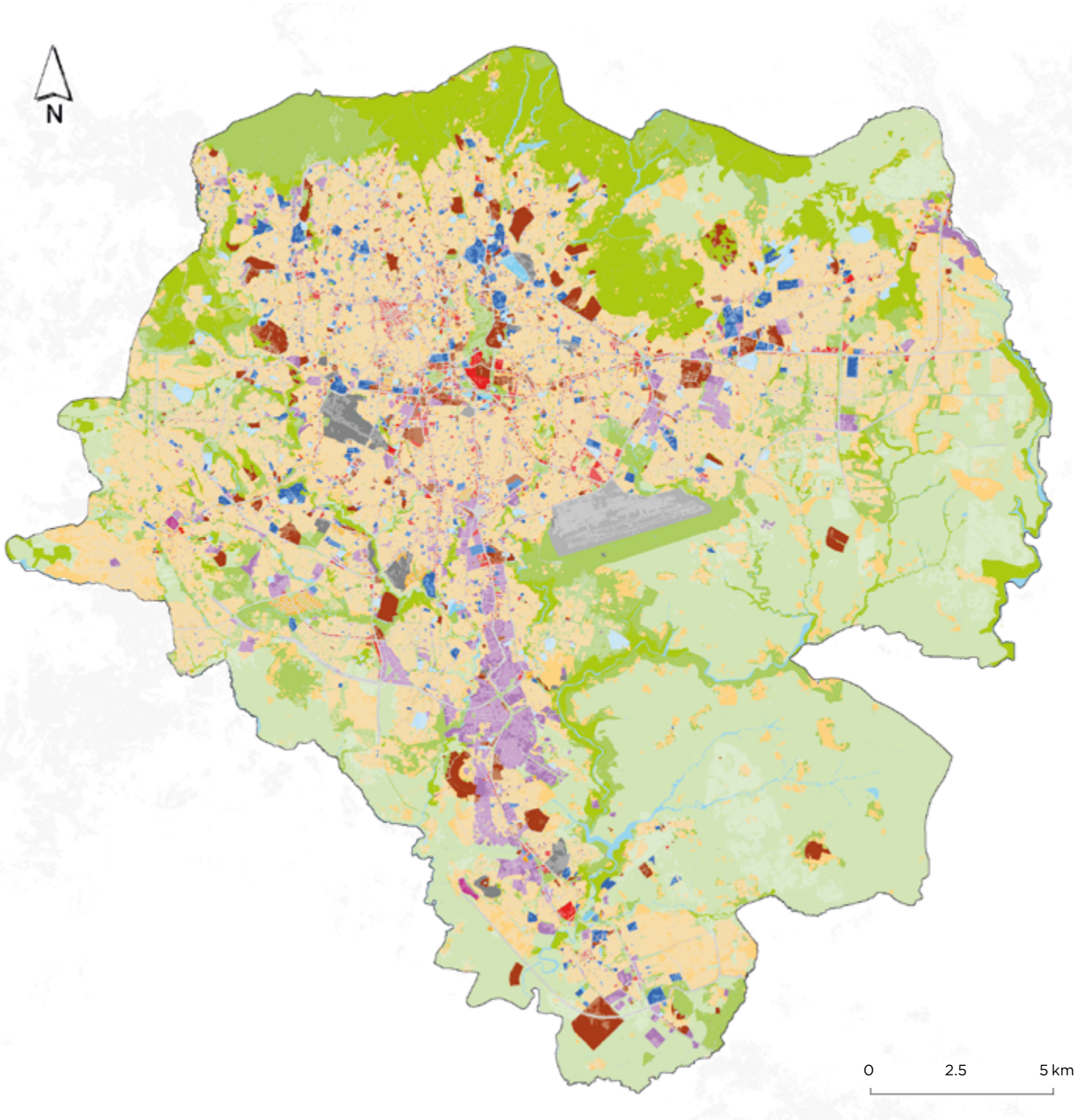
Total and per capita area by category

	m^2	m^2/pers
Urban	214,553,732	61
Agriculture	142,992,257	41
Natural	96,115,598	27
Roads	54,135,166	15
Water	11,924,237	3

1.3 Current land use

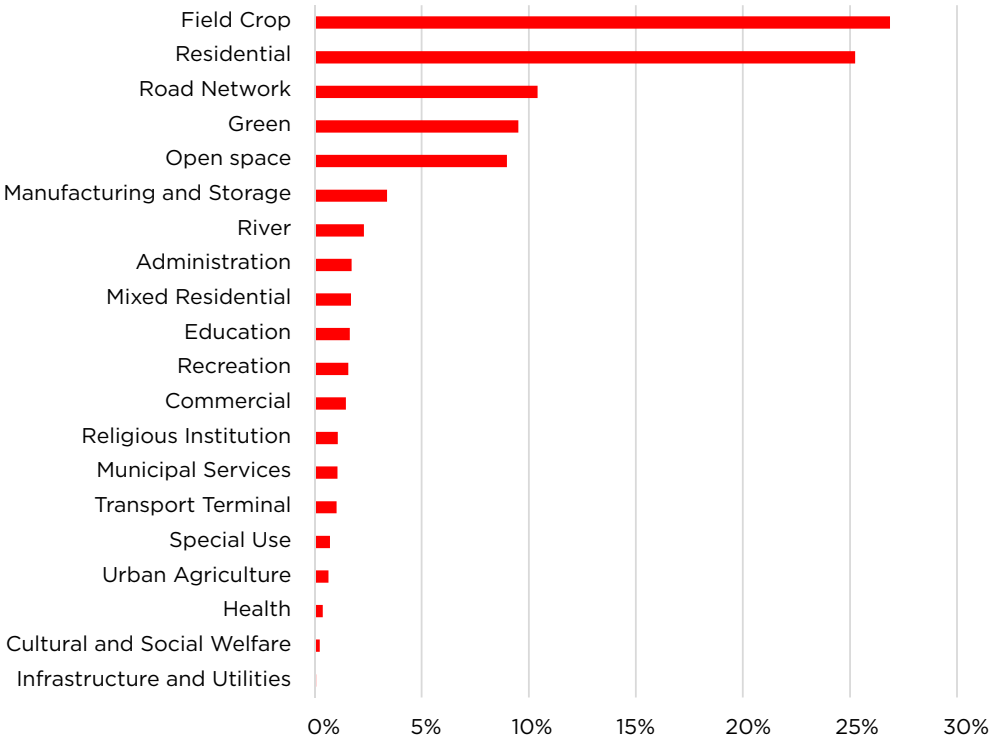
A more detailed analysis of land cover considers specific uses of land, infrastructures and buildings. This map provides spatial information on current land use, while the breakdown of land use by category is shown on the following page.

The land use plan tries to identify and categorise the different functions covering the city. The map clearly shows a dominant occupation with field crop, followed closely by residential areas. Other elements to highlight are the (red) commercial centre around Kirkos and Merkato, the mixed-use typologies along the city's key corridors and the decentralised distribution of administrative and municipal buildings. South of the airport (in purple) the large industrial area of Akaki Kality can be clearly identified. This map also shows the agricultural, green and open spaces providing the space to future urban expansion (see section 1.4 map). At the same time, the mountains surrounding the city are a major barrier to the city's growth.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu

Percentage of total area by category



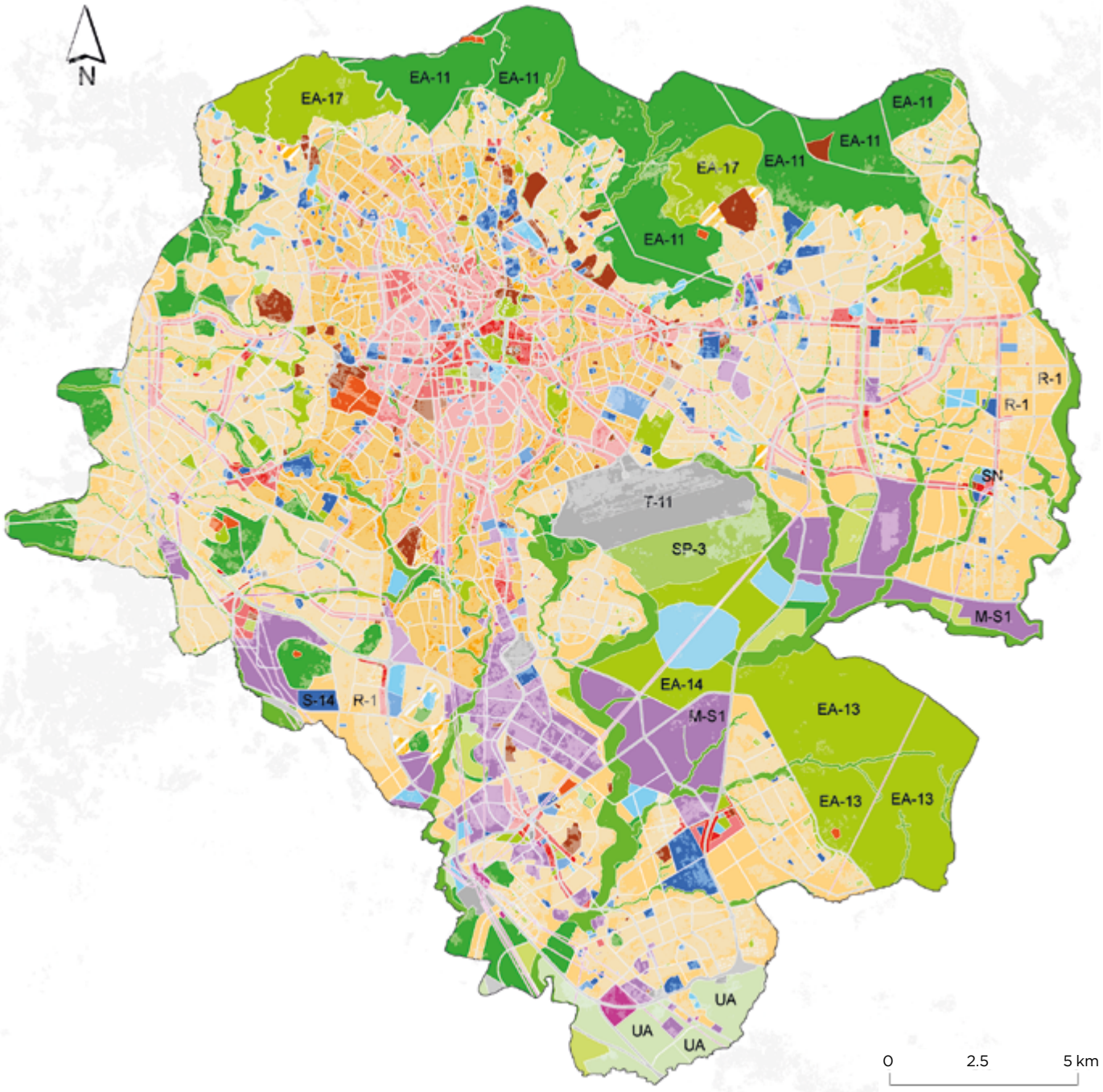
Total and per capita area by category

	m^2	m^2/pers
Field Crop	139,638,904	40
Residential	131,210,153	37
Road Network	54,135,166	15
Green	49,472,920	14
Open Space	46,642,678	13
Manufacturing and Storage	17,585,710	5
River	11,924,237	3
Administration	8,948,512	3
Mixed Residential	8,802,562	3
Education	8,566,127	2
Recreation	8,147,425	2
Commercial	7,613,777	2
Religious Institution	5,587,067	2
Municipal Services	5,512,687	2
Transport Terminal	5,301,075	2
Special Use	3,697,655	1
Urban Agriculture	3,353,353	1
Health	1,981,888	1
Cultural and Social Welfare	1,201,479	0
Infrastructure and Utilities	397,613	0

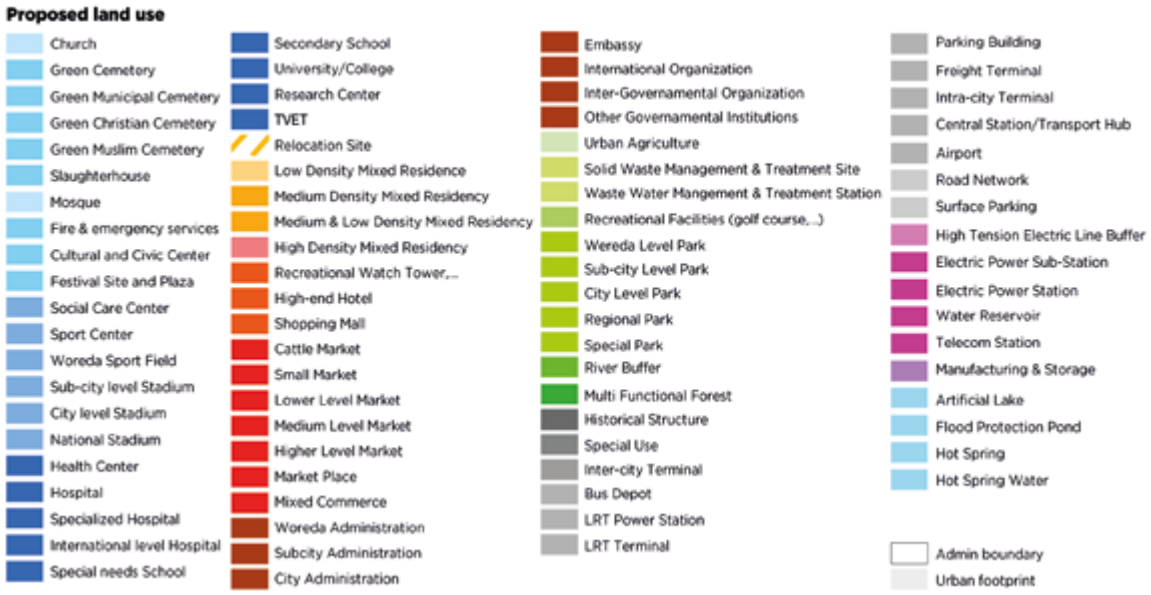
1.4 Structure Plan Land Use (proposed)

While the previous page showed the existing situation, this map shows the proposed land use put forward by the Addis Ababa City Structure Plan (2017-2027). The Structure Plan sets out strategic and spatial planning policies and is the basis for detailed policies in local plans. A breakdown of proposed land use by category is shown on the following page.

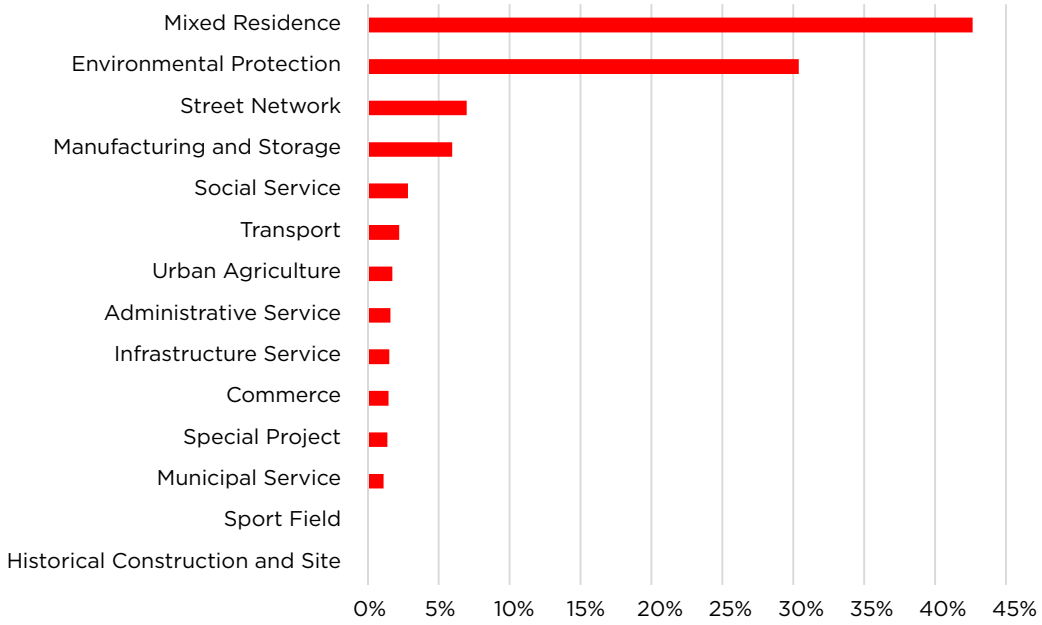
The Structure Plan proposes the following spatial development principles: the promotion of intensive uses of land and space; urban-rural harmony; decentralisation of urban activities; promotion of mixed/compatible land use; and integration of different components along activity spine/mass transport lines with increased foresight and plan practicality. The plan implies some urban expansion to agricultural areas while primarily focusing on intensifying urban land uses within already developed areas. The plan also suggests investing in areas of environmental protection in the north and south-eastern areas of the city, from Gulele botanical garden, Entoto to Yeka Hills. Higher- and medium-density areas were defined in the central areas of the city, with the exception of some of the eastern areas.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu



Percentage of total area by category



Total and per capita area by category

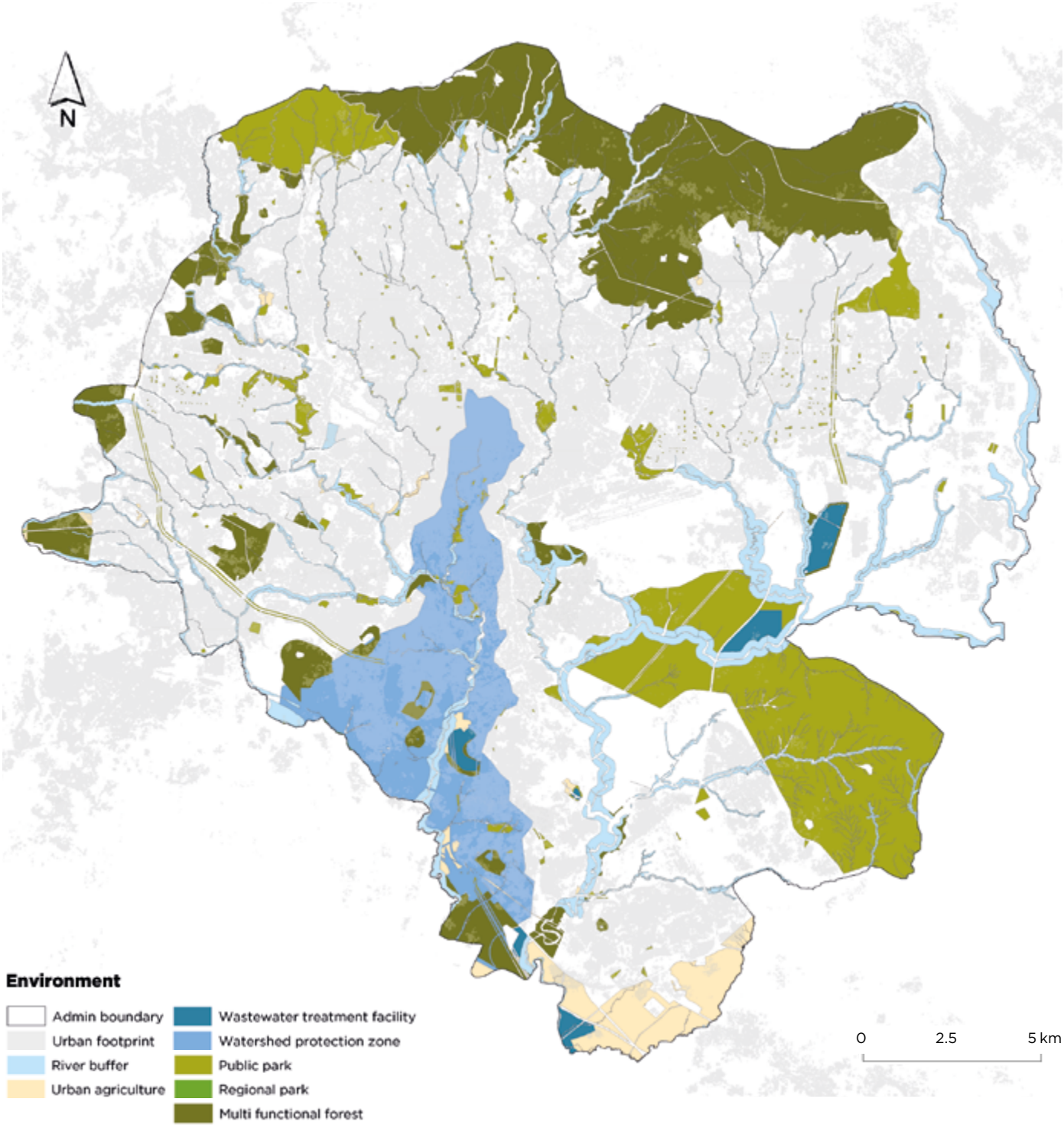
	m^2	m^2/pers
Mixed Residence	221,944,729	63
Environmental Protection	158,200,304	45
Street Network	36,366,832	10
Manufacturing and Storage	30,994,580	9
Social Service	14,836,177	4
Transport	11,526,026	3
Urban Agriculture	9,094,455	3
Administrative Services	8,347,297	2
Infrastructure Service	8,008,517	2
Commerce	7,601,020	2
Special Project	7,197,002	2
Municipal Service	5,896,969	2
Sport Field	191,757	0
Historical Construction and Site	176,060	0

1.5 Environmental protection areas (proposed)

Environmental protection plays an increasingly important role in strategic urban development. This map illustrates proposed protected sites and areas that have special status due to their environmental importance. In total, these areas account for 37% of land in Addis Ababa.

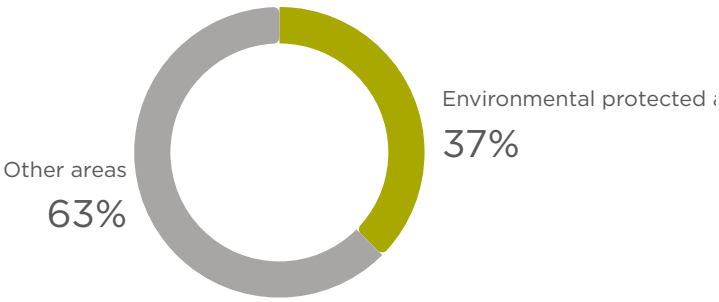
The following page shows a breakdown of the total environmental protected area by category.

As one of the priorities to ensure quality of life, safeguarding green areas aims to ensure clean, green and safe environment for residents. Of those reserved areas, the Entoto reserved forest park, the Sheger river basin rehabilitation project and the Gulele botanical garden are new projects designed to protect the environment.

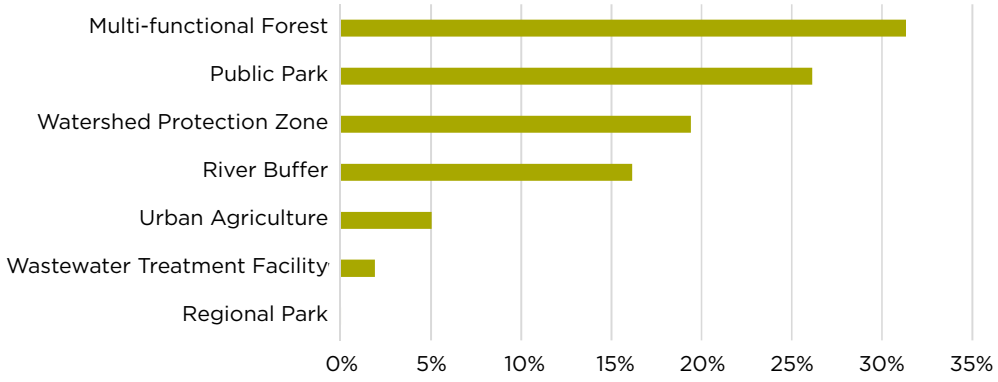


Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu

Environmental protected areas as percentage of admin area



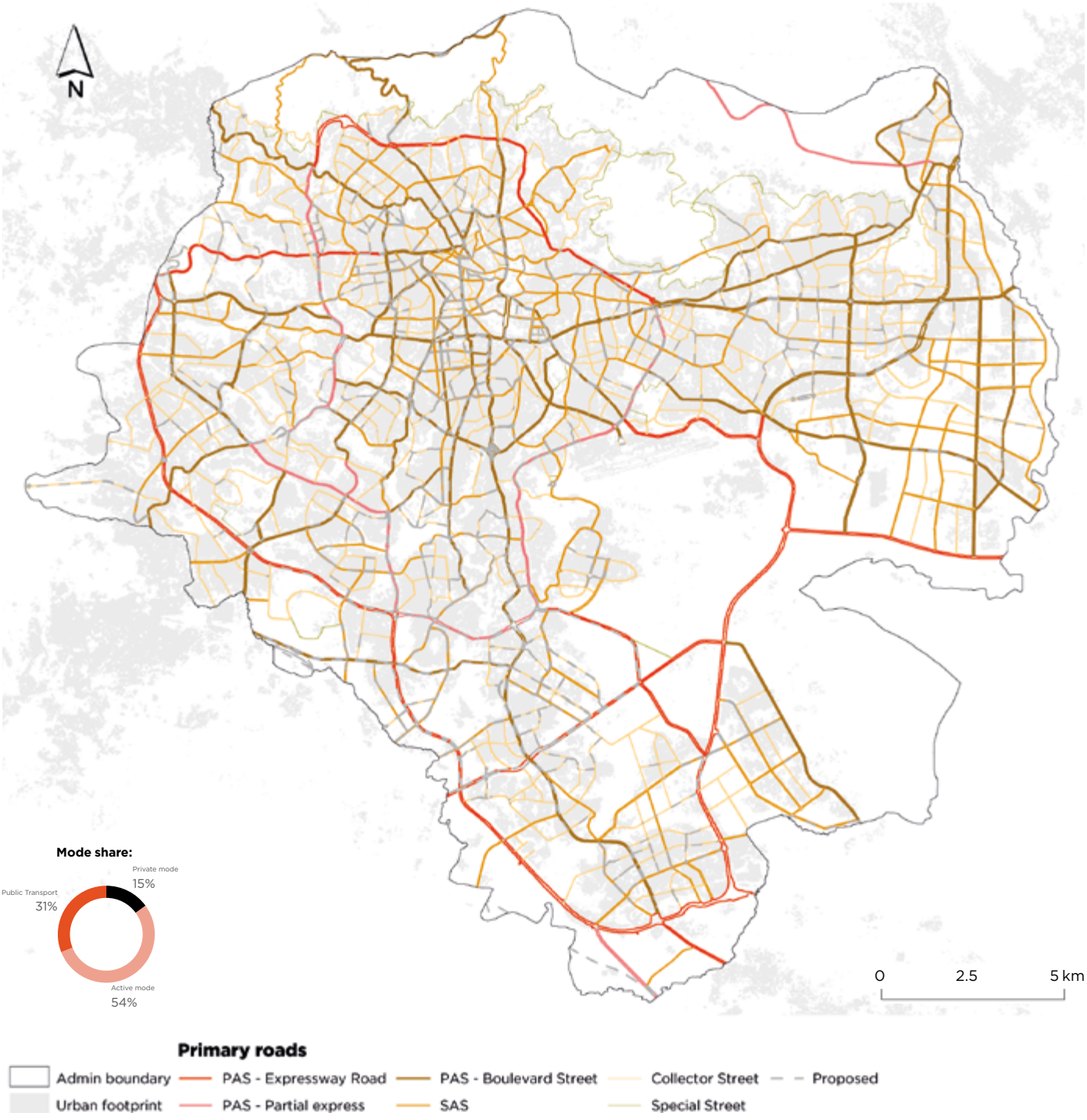
Percentage of environment protected area by category



1.6 Primary road network

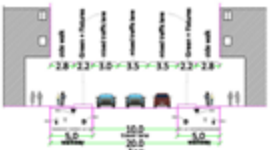
Besides land cover and land use, transport infrastructures are a further fundamental component for strategic spatial development and related analysis. This map illustrates the existing and proposed primary route network of roads by category. On the following page the different categories are represented as cross-sections.

Addis Ababa relies on radial and orbital road patterns, where main roads radiate from the centre to the other regions in Ethiopia through five outlets. The ring road encircles the core and intermediate parts of the city, serving to link the peripheral areas of the city.

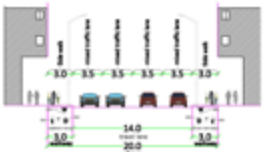


Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; Corine land cover/Copernicus.eu and the World Bank Report PAD1293

Road cross sections

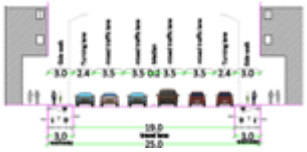


CS20M (B)



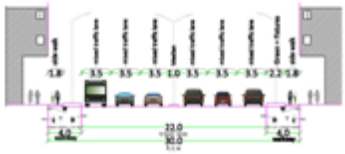
CS 20M (C)

SAS 25M (B)

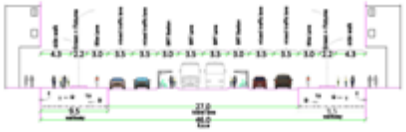


SAS 25M (CS-25) (C)

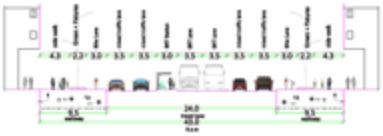
SAS 30M (B)



SAS 30M (C)



PAS 40M (A)



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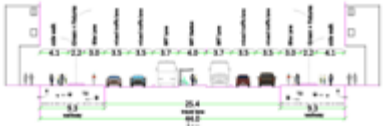
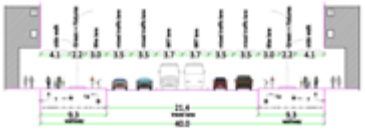


PAS 40M (A)



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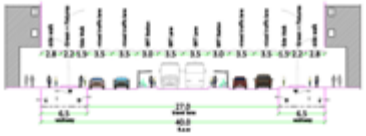
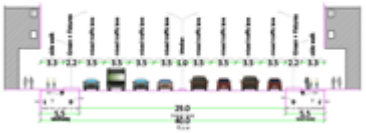


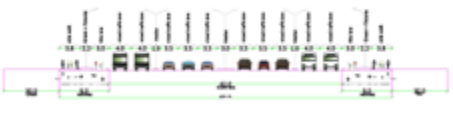
PAS 40M (B)



PAS 40M (C)

PAS 50M (C)

PAS 60M (C)

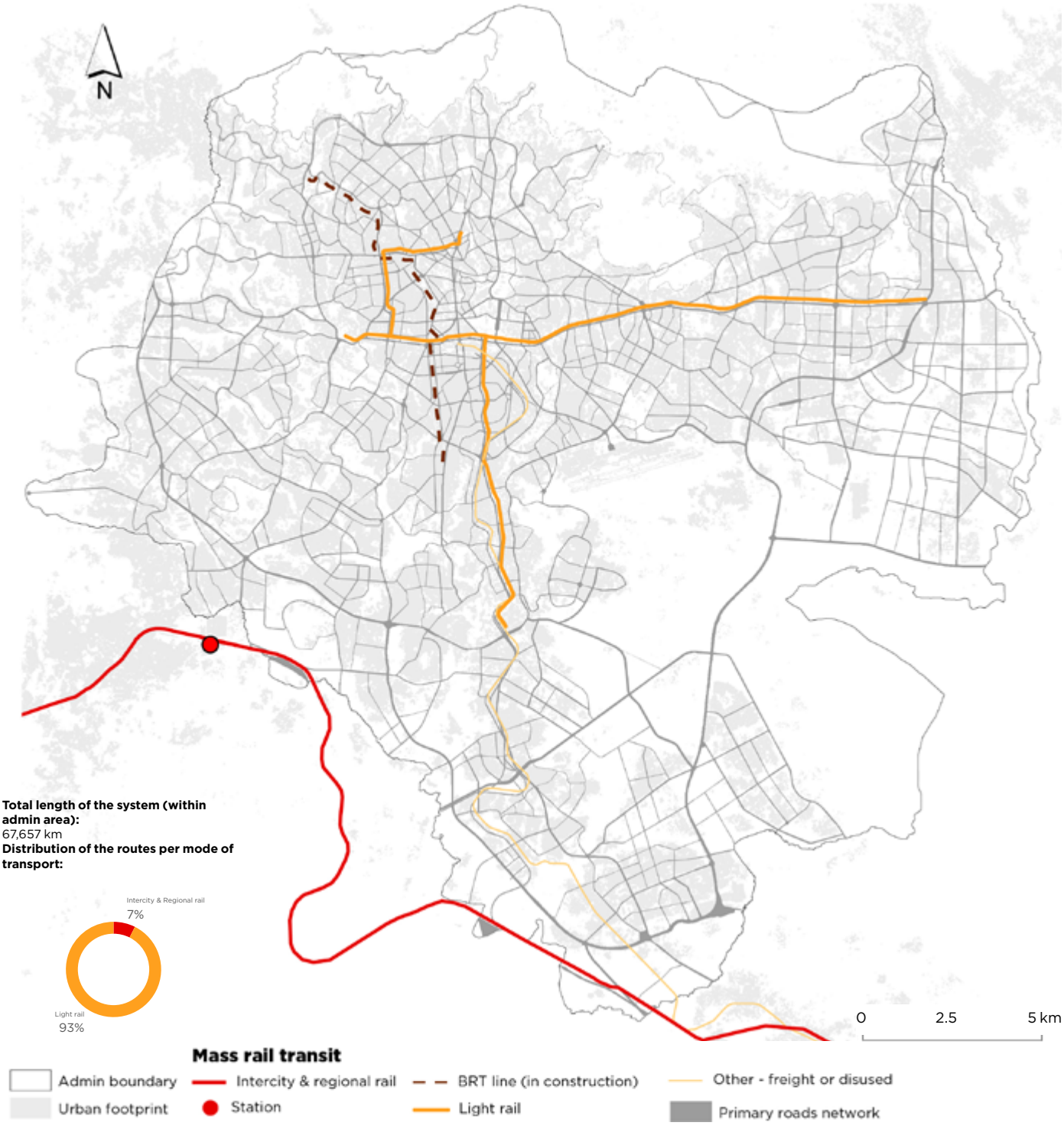


PAS 60M (C)

(A) Road x-section inside the Ring Road and TOD corridors | Road x-section for BRT station options
(B) Road x-section inside the Ring Road and TOD corridors
(C) Road section outside the Ring Road

1.7 Rail and bus rapid transit network

The map below shows the rail network and the BRT line (in construction) overlaid on the primary road network. Freight and disused rail lines are shown alongside the existing passenger network, as these offer an opportunity to implement new public transport lines using existing infrastructure. The light rail network stretches north-south and east-west, crossing through the heart of the city and linking important residential and business areas. The Ethio-Djibouti railway line (of approximately 752 km) cuts through the southern periphery, starting at Furi-Lebu Station around Jemo area and running along Adama, DireDawa (cities of Ethiopia) to end in Djibouti port. This line contributes to the city's connectivity with Djibouti, trying to stimulate a better economic relationship between the two cities. The BRT line under construction is the first of a proposed network of around 12 km; it will go through mostly poor and densely populated areas.

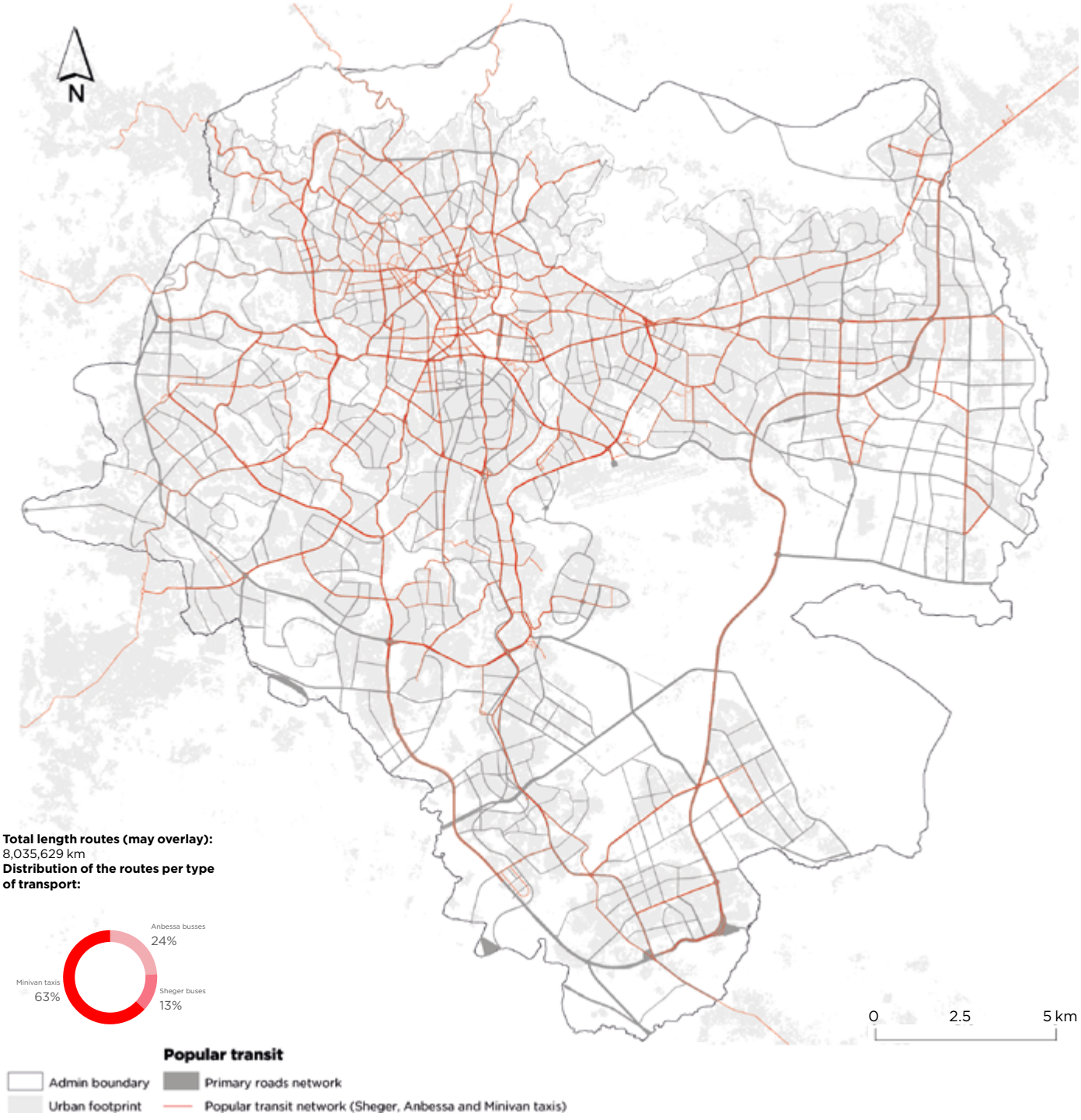


Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; OpenStreetMap@ and Corine land cover/Copernicus.eu

1.8 Popular transit network

The map below shows the popular transit routes of Addis Ababa, overlaid on the primary road network. These routes represent a mix of informal, semi-formal and regulated popular transit systems that increase accessibility to jobs, services and amenities where mass transit systems do not reach. This popular transport network includes a mix of modes from formalised buses to shared minibuses taxis and includes Anbessa, Sheger and minivan Taxis. The minibuses are the most common public transport modality.

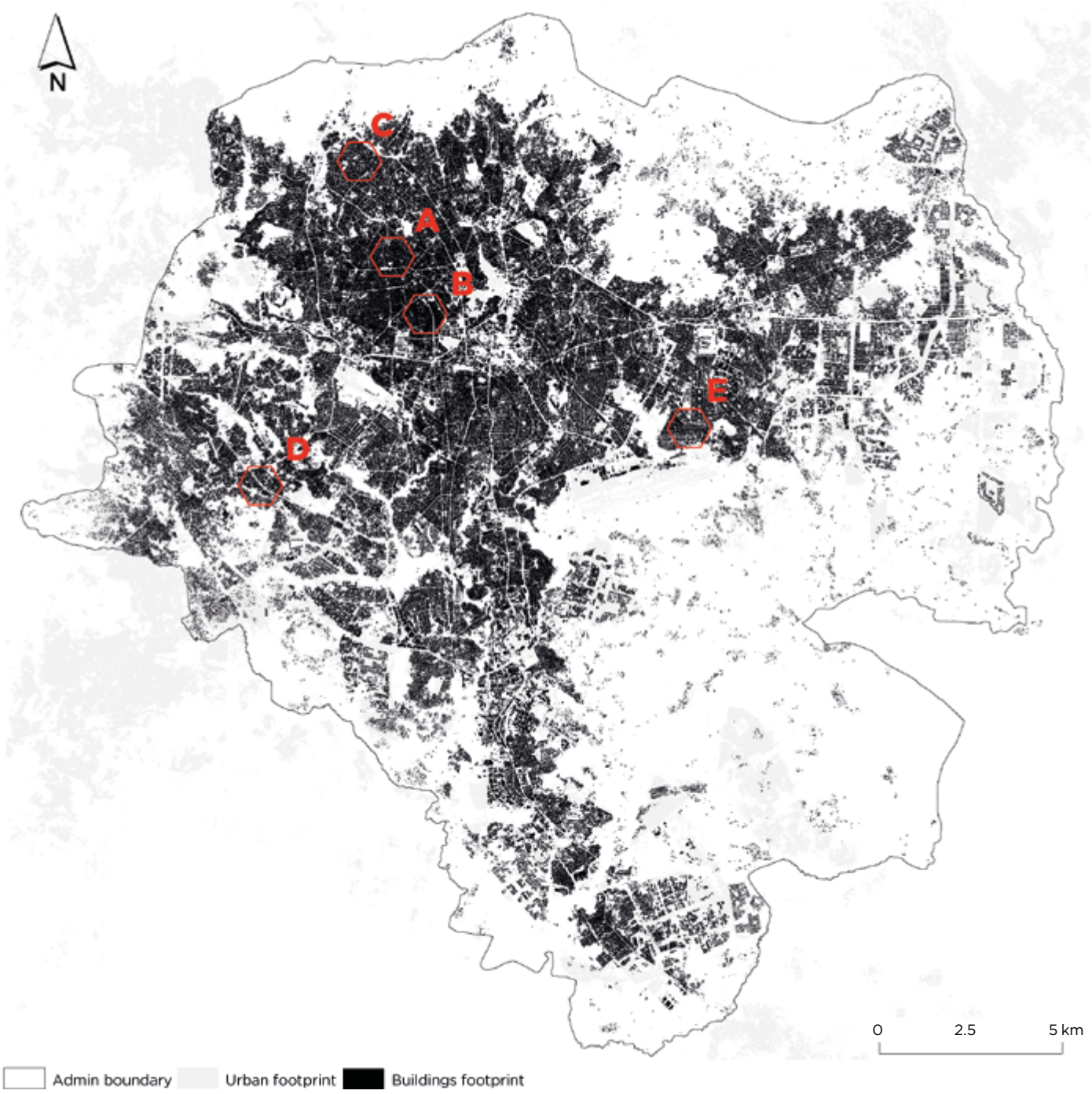
Although not shown in the map above, new dedicated bus lanes have been implemented in key locations from Mexico to Jemo area that seem to lead people to turn to public transport as their commuting times are now reduced. The existing old taxis depend on a bargain system that is often not affordable. The new meter taxis allow fairer prices, even if not cheap, and a more organized and formalised system. Even if these do not carry as many people as a minibus, a lot of people depend on these new taxis.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; and the Working Map of Addis Ababa's Public Transport Network led by the Addis Ababa Road and Transport Bureau specifically Addis Ababa Transport Authority in partnership with WRI, Addis Ababa University, Transport for Cairo and Digital Matatus.

1.9 Buildings footprint

This map shows a 2011 building footprint of Addis Ababa. The building footprint is defined by the perimeter of individual buildings. Parking lots and other nonbuilding facilities are not included in the building footprint. Highlighted in red are five areas illustrated in the figure ground analysis of the following page. The areas represent a sample of five different residential densities across the city.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and Corine land cover/Copernicus.eu

Urban grids

The maps below demonstrate the complexity of the urban grid and the variety of the patterns created by the building footprints (per km²). These figure grounds illustrate the surface coverage and open space ratio of areas with different residential densities, from a peak density of approximately 49,000 pers/km² to one of 8,000 pers/km².

A

Population density (approx.) 49,000 pers/km²
Surface coverage 51%

B

Population density (approx.) 36,000 pers/km²
Surface coverage 51%

C

Population density (approx.) 24,000 pers/km²
Surface coverage 35%

D

Population density (approx.) 15,000 pers/km²
Surface coverage 25%

E

Population density (approx.) 8,000 pers/km²
Surface coverage 32%

A. Around 'Awtobis Tera' (by the Merkato) – mostly very low-rise, compact and informal area.

B. Around 'Geja' neighbourhood – a mix of compounded and informal houses.

C. Around 'Winget' (located near the Botanical Gardens) – an old neighbourhood with mixed typologies. Mostly informal, but previously a high-level neighbourhood.

D. Around 'Ayer Tena' (by the end of the city in the border with the Garage region) – mostly compound gated condominiums and mixed-use buildings.

E. Around 'Bole' homes to 'Gerji' (between the airport and the new stadium) – Bole homes are mostly compound villa-type housing. Gerji is a new settlement that has been developing quite rapidly.

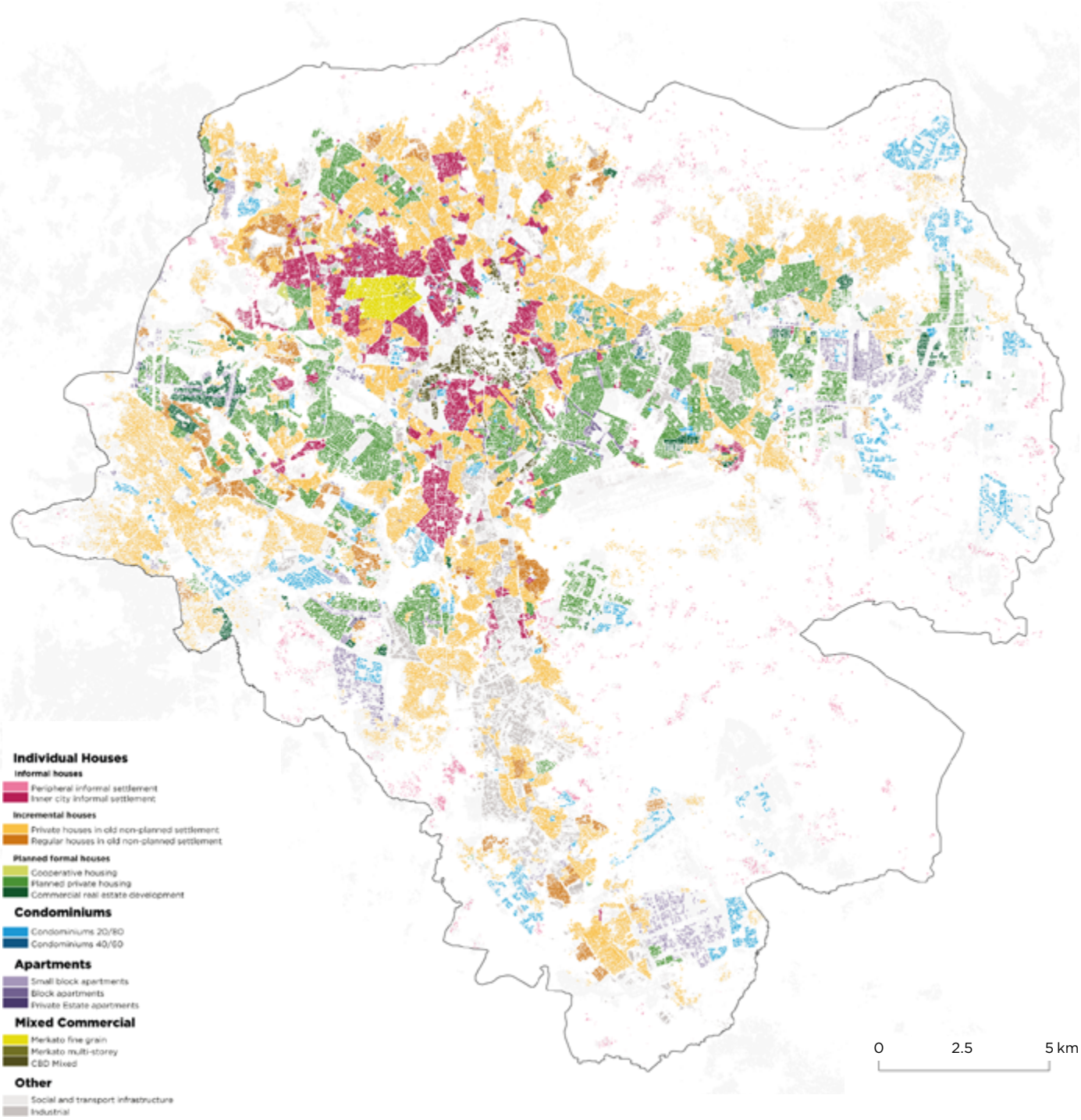
Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office and the EU Joint Research Centre

2. Addis Ababa building typologies

2.1 Building typology Addis Ababa Administrative Boundary

A comprehensive analysis of Addis Ababa's building typologies revealed a total of 12 dominant residential building types. These are listed in the legend below and are used to map typologies across the different territories of Addis Ababa. Further details on these typologies are provided in the subsequent section.

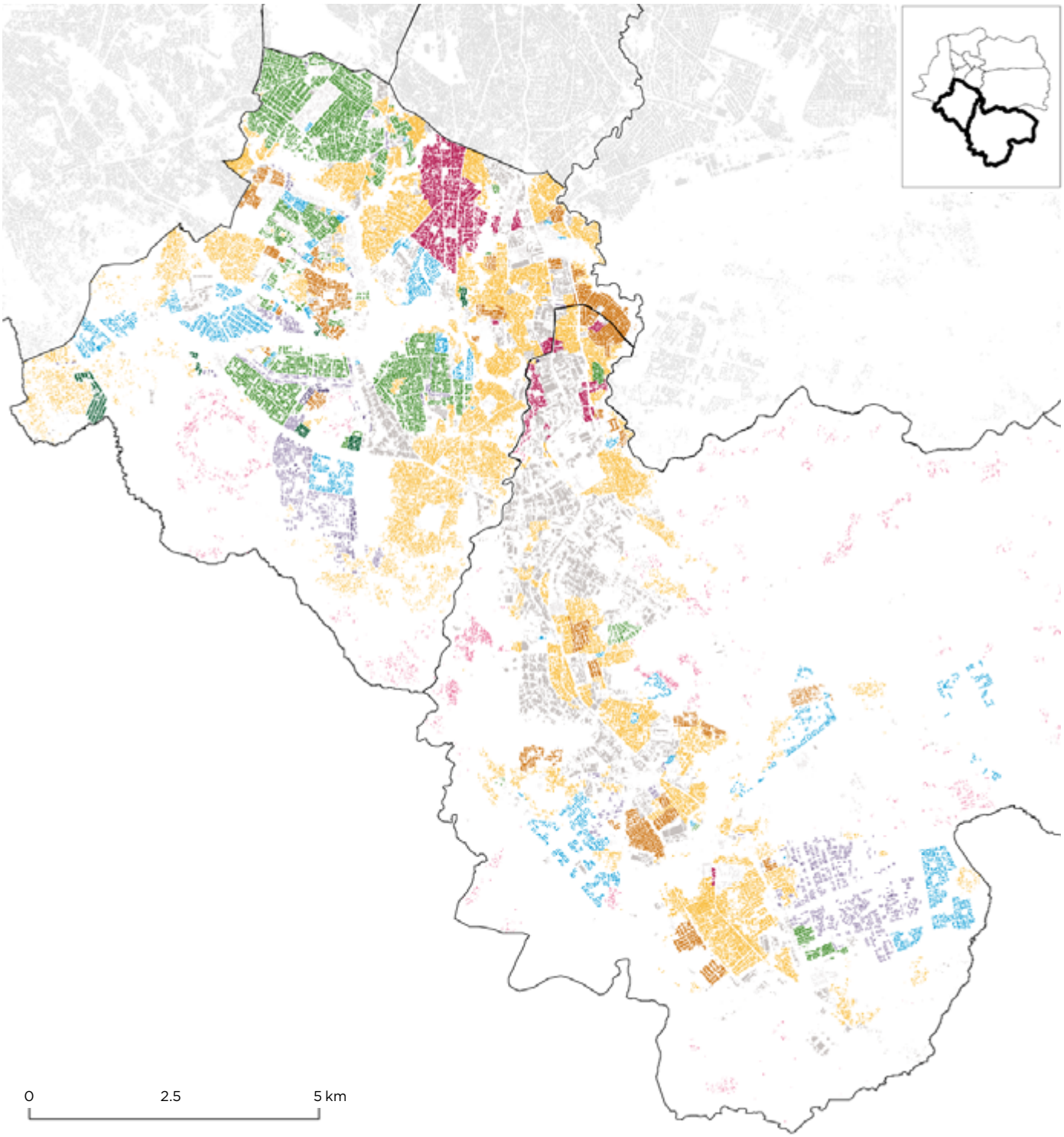
The map below shows the spatial distribution of the 12 most dominant residential building typologies and five further functional typologies. Over the next few pages, different maps offer a more detailed perspective of the variety of typologies and their spatial distribution. The maps will show the patterns within the 11 sub-cities and their 116 woredas. Of the 11 sub-cities, four are inner-city development (centre of Addis Ababa) and the other seven are potential expansion areas.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.2 Building typology South Addis

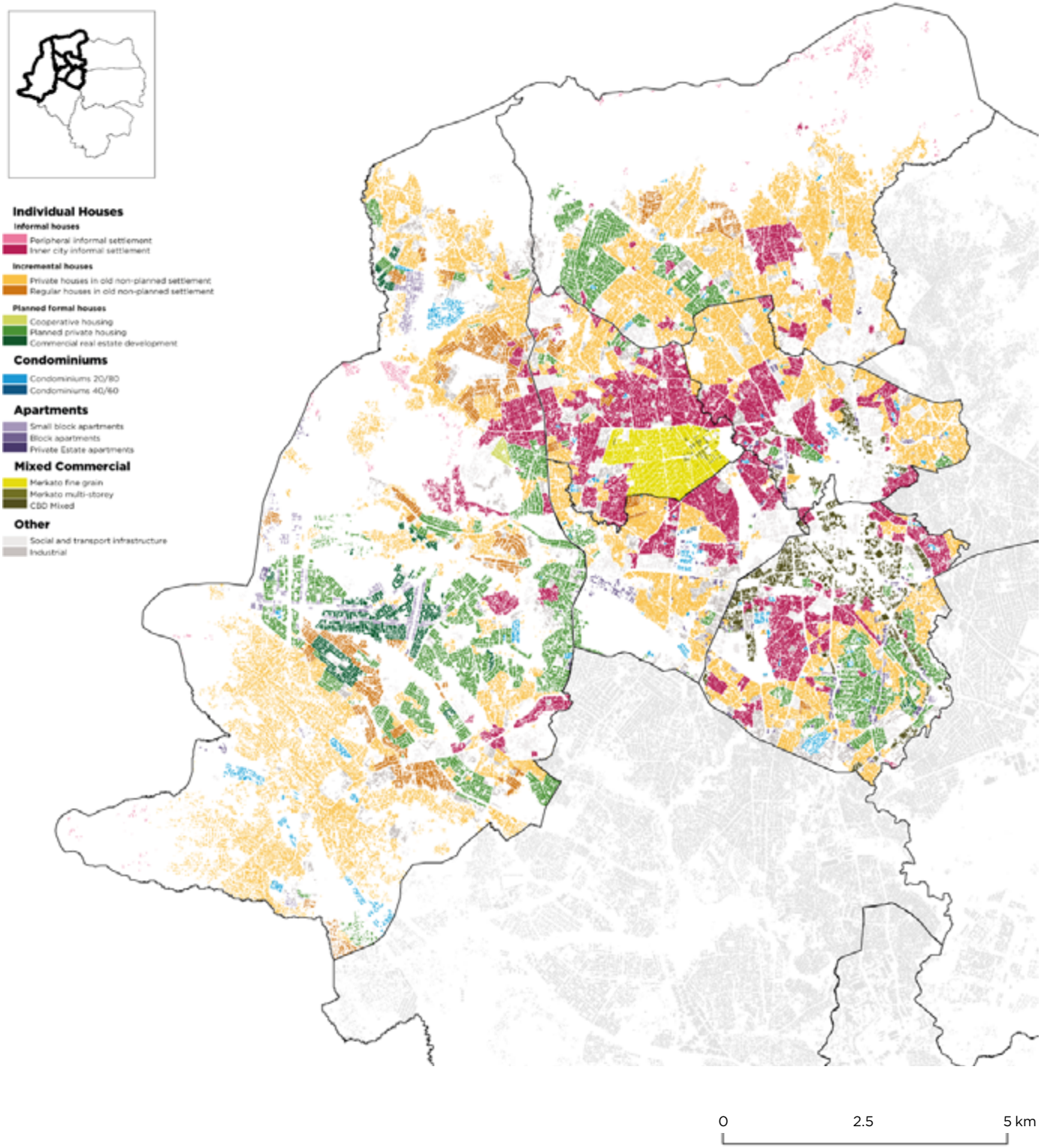
This map focuses on the two sub-cities of Nefas Silk-Lafto and Akaki-Kality. These sub-cities emerge as very mixed in terms of the existing variety of typologies (from residential to industrial) but not very compact when exploring their urban development. Old neighbourhoods such as Saris and Mekanisa coexist with new development areas such as Lafto and Akaki, where cooperative houses and industries (respectively) can be found.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.3 Building typology North-West Addis

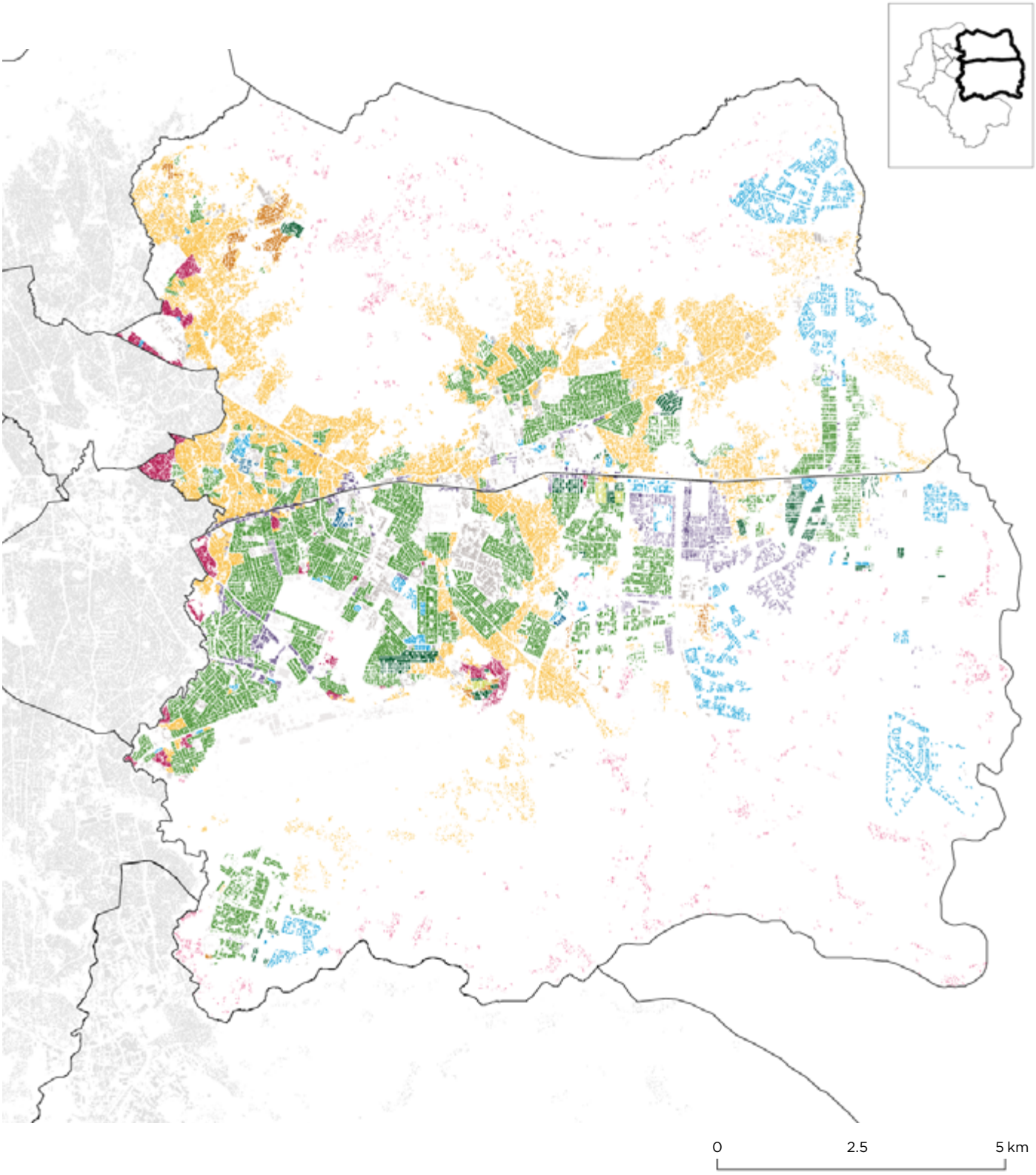
This map shows the sub-cities of Kolfe-Keranio, Gullele, Addis Ketema, Lideta, Arada and Kirkos. These include inner-city areas made up of old neighborhoods such as Kazanchis, Merkato and Piassa, whereas Kolfe-Keranio and Gullele are expansion areas. In Kolfe-Keranio sub-city, old neighbourhoods such as Winget and Torhailoch coexist with new areas such as Ayer Tena and Alembank. There seems to be a significant contrast between the central areas and the peripherical areas when exploring housing typologies. Informal, incremental and mixed commercial are some of the dominant categories in the centre. Planned formal houses along with other less representative categories emerge strongly in the periphery.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.4 Building typology North-East Addis

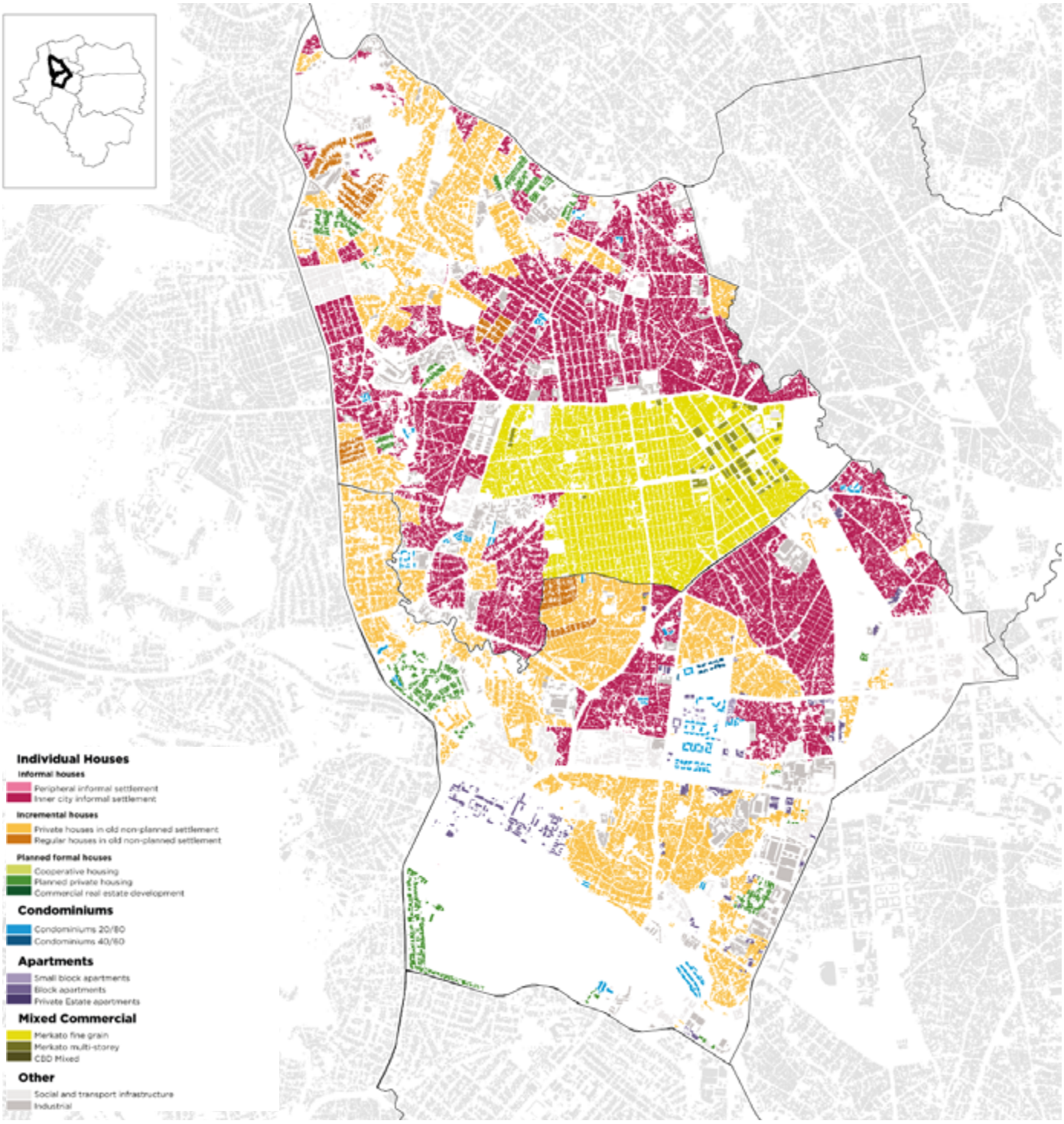
This map focuses on the sub-cities of Yeka and Bole and the new sub-city called Lemi Kura, which is taken half from Yeka and another half from Bole sub-city in the north-east of Addis Ababa. This side is considered as a potential expansion area, where the airport is located in Bole sub-city. It is predominantly occupied by incremental houses and planned formal houses, but condominiums emerge at higher density in its edges. Along the main axis, some commercial real estate development is also visible. Dispersed peripheral informal settlements are also visible in the north and south areas in the map.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.5 Building typology Centre-West Addis

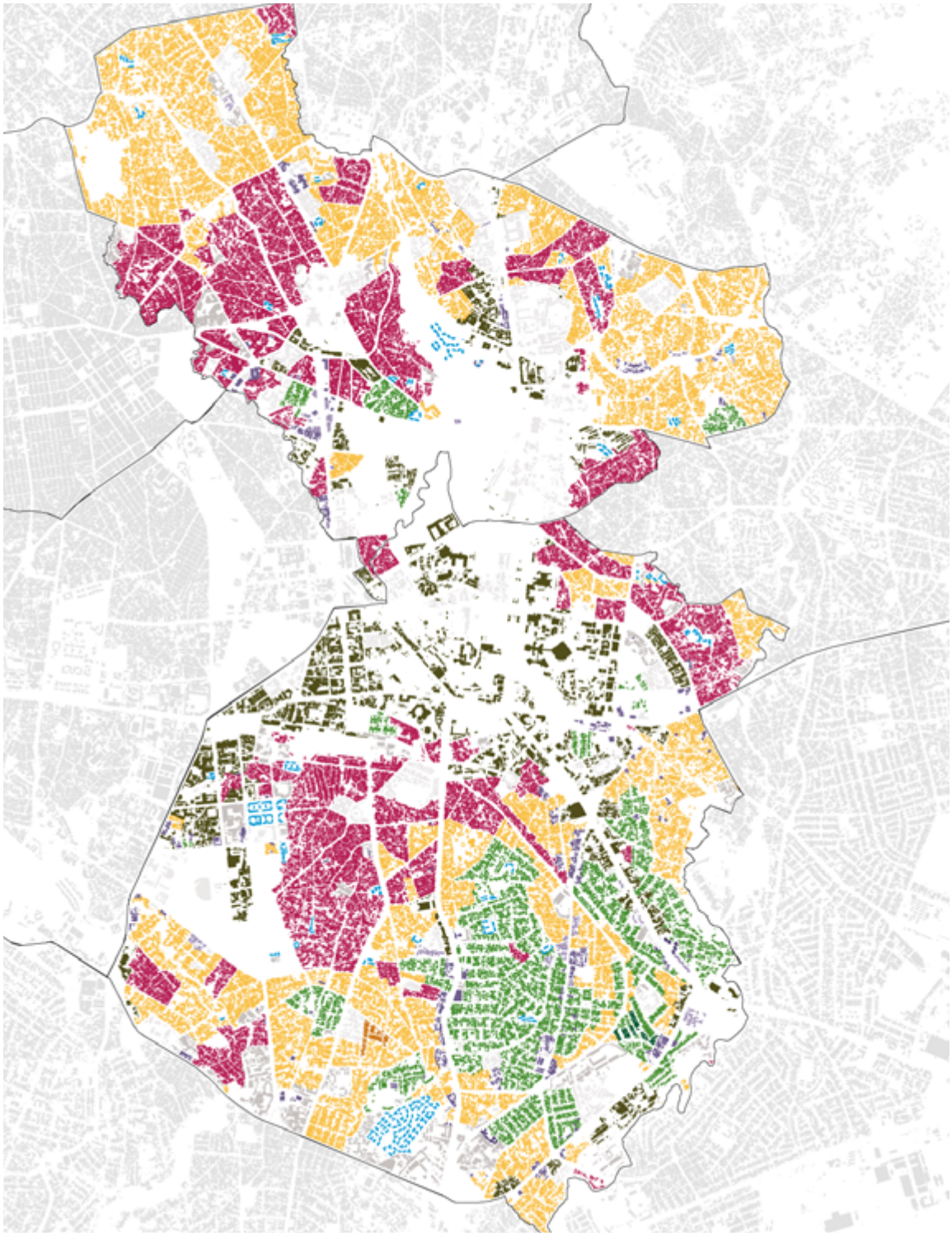
This map provides a more detailed overview of the Addis central area, specifically the Addis Ketema and Lideta sub-cities. It highlights the dominant presence of informal housing, in tones of pink, an area whose urban fabric is rapidly changing. Addis Ketma is known mainly because of Merkato, the biggest market in the city (represented in bright green in the map) where individual ground-level shops are being replaced by multi-storey shopping buildings. Lideta incorporates half of the financial district where high-rise bank headquarters are emerging. The compactness of the central areas is very clear in this map.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.6 Building typology Centre-East Addis

The Centre-East of Addis Ababa, specifically Arada and Kirkos sub-city, corresponds to the Central Business District (CBD), an area shared with Lideta sub-city. The CBD supports most of the city's institutional and business activities (in dark green), including most of the high-star-ranking hotels and Meskel Square, the biggest plaza of the city, where most city level events are held. Both central areas are mostly mixed-use with continuous clusters of typologies clearly defined when compared with the development of other less central areas.



0 1 km

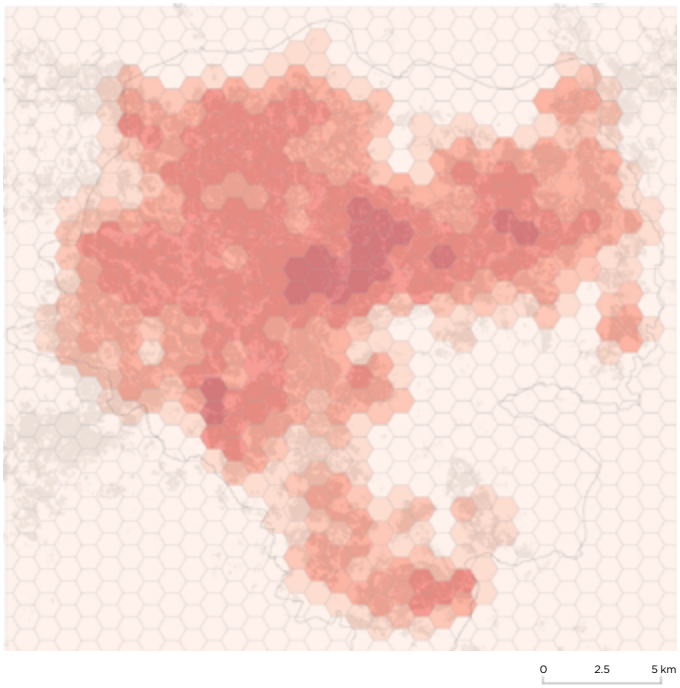
Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.7 Building density

Unlike population densities, building densities describe the amount of internal building space (or floor space) available per given area of land. The following maps illustrate the density of floor area per km² of Addis Ababa. They provide a contrast between the residential, workplace floor area and total floor area with the city densities.

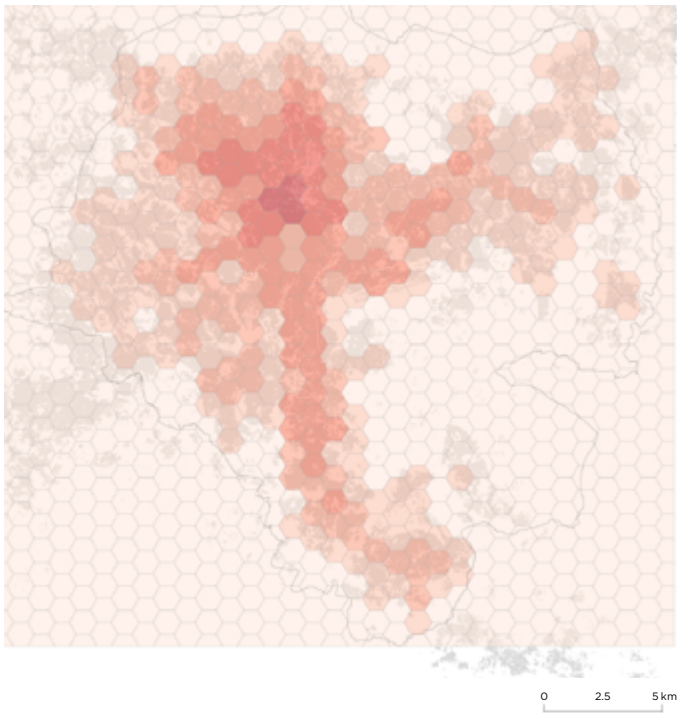
2.7.1 Residential floor area density

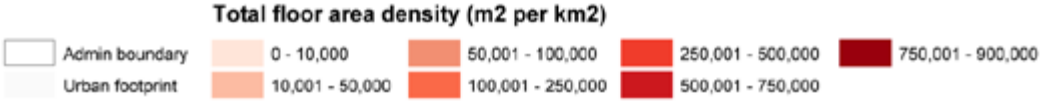
This map illustrates a divide of the residential density into three zones. High-density mixed residence along the mass transport corridor line, medium- and low-density mixed residence density varies from centre to periphery, depending on the location in relation to transport system and width of street and industry and a mix where small-scale industries could mix with residences in the inner core. This diagram is shown as a 3D model on p. 30.



2.7.2 Workplace floor area density

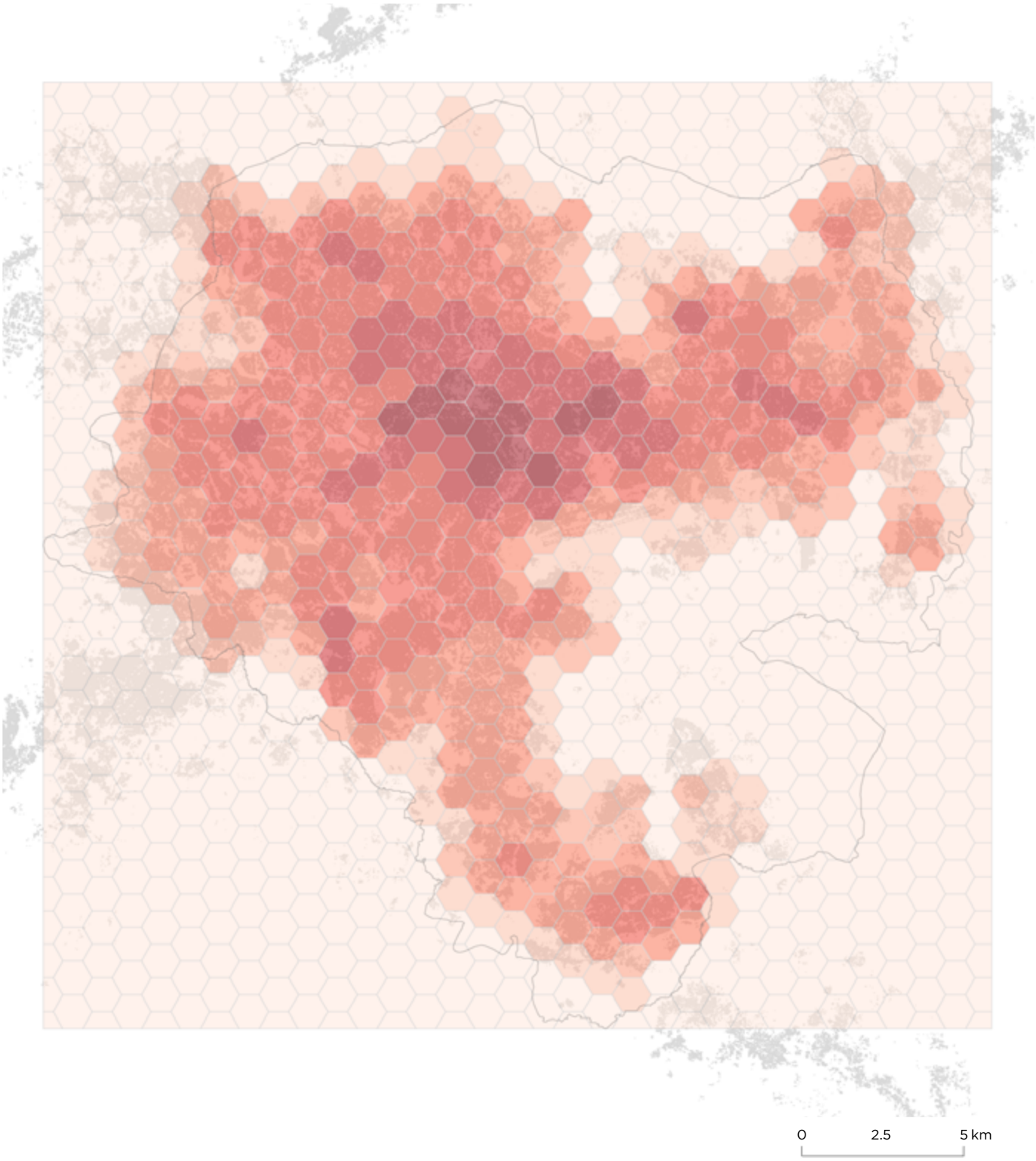
Workplaces are denser in the inner city and along major roads of the city. In most of the buildings around the major roads, the ground to fourth floor commonly has a commercial function while the rest might be offices or apartments. This diagram is shown as a 3D model on p. 31.





2.7.3 Total floor area density

This map shows that the floor area density drops from the city centre going outwards.

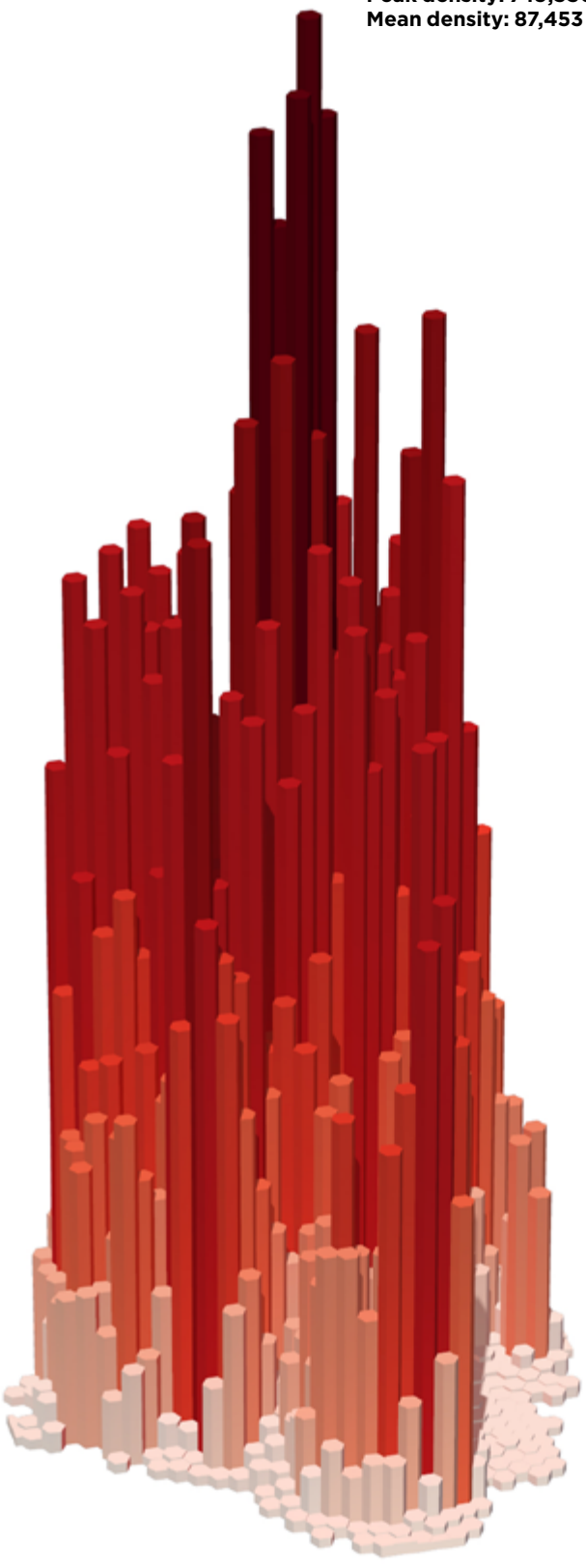


Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

Residential floor area density (3D perspective)

These 3D maps compare residential floor area density and workplace floor area density in Addis Ababa. These maps were modelled using an average floor height for each of the represented typology. The taller spikes in the 3D models represent higher densities of floor area concentrated in particular locations. Flatter zones suggest areas of a low-density nature.

Peak density: 749,550 m²/km²
Mean density: 87,453 m²/km²



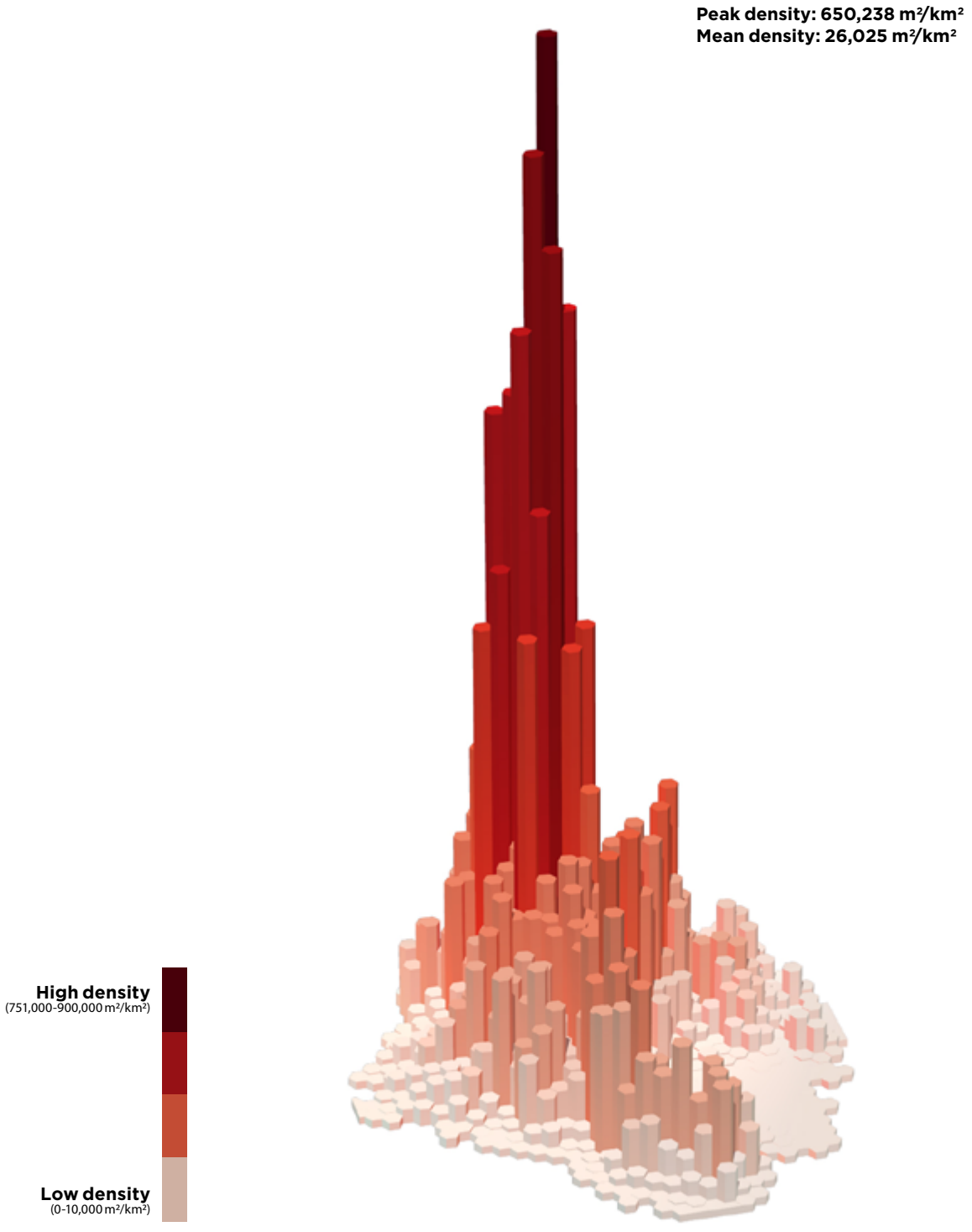
High density
(751,000-900,000 m²/km²)

Low density
(0-10,000 m²/km²)

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

Workplace floor area density (3D perspective)

The workplace floor area densities have their peaks in the central areas, contrasting with the residential floor areas, which have a more consistent dispersion of densities, with the exception of the edges of the city. These represent the density of the building areas defined as workplaces (where people work) in contrast to the map on the left page representing the density of the building areas where people live.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.8 Urban morphology samples

This section provides an overview of the urban morphology samples that were identified in the study and introduces some of their key characteristics through short descriptions and the use of visual representations. The samples presented here (maps and photos) are illustrative only of the type of areas defined with these typologies. These are just small samples. Other similar areas, with similar characteristics and in different locations might have been classified with the same category.

2.8.1 Individual housing typologies

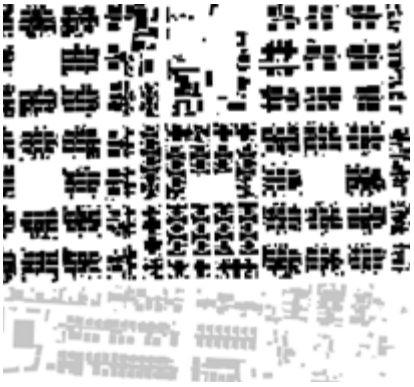
Individual housing typologies, the first broad category of building typology explored, are individual housing through the sub-categories of planned formal houses, informal houses and incremental houses. These photos and maps are illustrative only of the type of areas defined with these typologies. These are just small samples and other similar areas in different locations might have the same category. Below is a black and white (nolli) map of each area, showing the building footprint and the corresponding aerial photo. A short description of each typology represented in these maps was added in the left column.

Planned formal houses

Cooperative housing

Building height range: 2-3
Average number of floors: 2.5
Floor area ratio: 0.4

Housing cooperatives are voluntarily formed by individuals, usually from a middle-income background. This housing type is majority back-to-back row housing with an average building height of 2-3 storeys.



Planned private housing

Building height range: 2-3
Average number of floors: 2.5
Floor area ratio: 0.7-1.2

This typology refers to the housing that is planned in regular rows and is of similar height and mixed type. There is greater diversity of building form with this housing than with commercial real estate development.

Commercial real estate development

Building height range: 2-3
Average number of floors: 2.5
Floor area ratio: 0.9-1.1

These villas display regularity in terms of their organised layout and appearance. Patterns are explicit at the level of building form.

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

Informal houses

Peripheral informal settlement

Building height range: 1
Average number of floors: 1
Floor area ratio: 0.1

This type of occupation is formed with a group of people settling at the periphery mostly without pre-existing legal consent. Some might be farmers' houses. These small, single-floor buildings are described as informal settlements as they are non-planned. This characteristic is reflected in their irregular, scattered arrangements on the peripheries of Addis Ababa.

Inner city informal settlement

Building height range: 1
Average number of floors: 1
Floor area ratio: 0.5-0.6

Located in the inner city, these non-planned informal settlements or "kebele housing" majority areas are distinguished by the randomness of the street layout and the compactness and similarity of the buildings within them. Most of these kinds of settlements are old houses that the city administration rents out to low-income residents.

Incremental houses

Private houses in old non-planned settlement

Building height range: 1
Average number of floors: 1
Floor area ratio: 0.3-0.6

Old neighbourhoods of mainly residential housing often incorporated with cottage industry, mainly people who make 'shema' traditional cloth made of cotton, clay pottery, etc. This category of housing demonstrates a distinctive irregularity in terms of housing and street design.

Regular houses in old non-planned settlement

Building height range: 1
Average number of floors: 1
Floor area ratio: 0.3

This typology is exemplified by its regularity, consisting of orderly urban arrangements. These seem to be planned old settlements of small old places where there has been an attempt to organise the layout and create a grid of roads for access.

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.8.2 Apartment typologies

The urban morphology samples displayed below relate to the category of apartments where condominiums are the dominant typology. Condominiums are subsidised housing built by the government for people who are registered. Registration took place twice, in 2005 and 2013. In the first registration, people could choose only the number of bedrooms, while in the second one there was an additional indicator related to their income status, with 10/90 for low-income groups with studios and one bedroom, 20/80 and 40/60 for middle-income with one, two and three bedrooms.

Apartments

Small block apartments

Building height range: 4
Average number of floors: 4
Floor area ratio: 1.7

These apartments are packed tightly together with a high number of apartments per square km. These tend to be buildings where 30-40 people gather together to buy a plot of land (at affordable prices) and self-build it. They use a lottery system to then define who owns which apartment.

Block apartments

Building height range: 6
Average number of floors: 6
Floor area ratio: 2.9

This type of apartment has a bigger building footprint and consists of more storeys than the small block apartments. Block apartments might include real estate developments which leased the plot to build on and sell, often located in the outer city areas; or apartments owned by the federal housing corporation rented to institutional workers (teachers, parliamentary workers, etc.). These are mostly located in the inner-city area.

Private estate apartments

Building height range: 11
Average number of floors: 11
Floor area ratio: n.a.

This typology describes a similar group of buildings constructed in keeping with an organised layout that includes designated public space. Although rather like condominiums in this respect, they lack the distinctive style and shape of condominium housing.
These represent higher income and luxury apartments.

(building footprint not available - see appendix on page 51 for explanation)

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

Condominiums

Condominiums 20/80

Building height range: 5
Average number of floors: 5
Floor area ratio: 1.0-2.3

Broadly speaking, condominiums are multi-storey apartment blocks that were promoted by the government after the 2002 masterplan. These inner-city pockets of condominium housing are much smaller than those on the outskirts of the city. They are approximately ground plus four floors in height.

Condominiums 40/60

Building height range: 12
Average number of floors: 12
Floor area ratio: 3.9

These condominiums are similar in shape and layout to the above condominium typology. However, they tend to be constructed on the outskirts of the city and have a building height that is higher than ground plus four floors. Their price per m^2 is generally higher than the 20/80 which is assumed to be related to better quality, design and area.

Condominiums: Commercial areas in the ground floor of the condominium's apartment buildings

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.8.3 Mixed commercial and other typologies

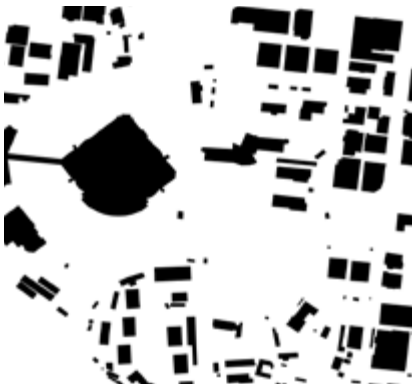
This section and its resulting samples focus more on the functions of buildings beyond the residential. This includes commercial (evident in the Central Business District and Merkato), social and transport infrastructure, and industrial.

Mixed commercial

Central Business District

Building height range: various
Average number of floors: 7

Mostly mixed-use buildings, institutional and company offices located in the centre of Addis Ababa. These also include hotels, cafes and restaurants, as well as some residential, including apartments owned by the government, private built to rent and cooperatives. They encompass a diversity of building types but are dominated by modern high-rises.



Merkato fine-grain

Building height range: 1
Average number of floors: 1
Floor area ratio: 0.7

Merkato is one of the biggest markets in Ethiopia. This typology is defined first by the commercial functions of the buildings and second, as a point of departure from other buildings in the Merkato by the strikingly compact, fine-grain appearance of the small buildings comprising these areas (although densely occupied).

Merkato multi-storey

Building height range: 7
Average number of floors: 7
Floor area ratio: 4.2

Also within Merkato stand the tall, large buildings that make up this subcategory. These mostly correspond to new development done to make use of the high land value of the area. Many people who once had smaller shops move to these buildings with wider shopping areas and an agglomeration of different shops inside.

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

Other

Social and transport infrastructure

Building height range: various
Average number of floors: 3

This encompasses single-use building areas designed for a specific purpose including religion, culture, education, government or health. The bigger areas that are characteristic of this type are distinctly separated from the organised rows of villa-type housing and may contain a variety of building types and heights.

Industrial

Building height range: various
Average number of floors: 1

This typology refers to the function of the buildings that fall within it. These areas consist of buildings connected to industry, including factories, construction and agricultural warehouses. The buildings themselves are of a similar neutral, regular appearance. There are smaller industrial areas in the inner-city while the larger areas tend to be located in the outer-city areas.

Merkato - Large open-air market, comprised of commercial buildings of different dimensions

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

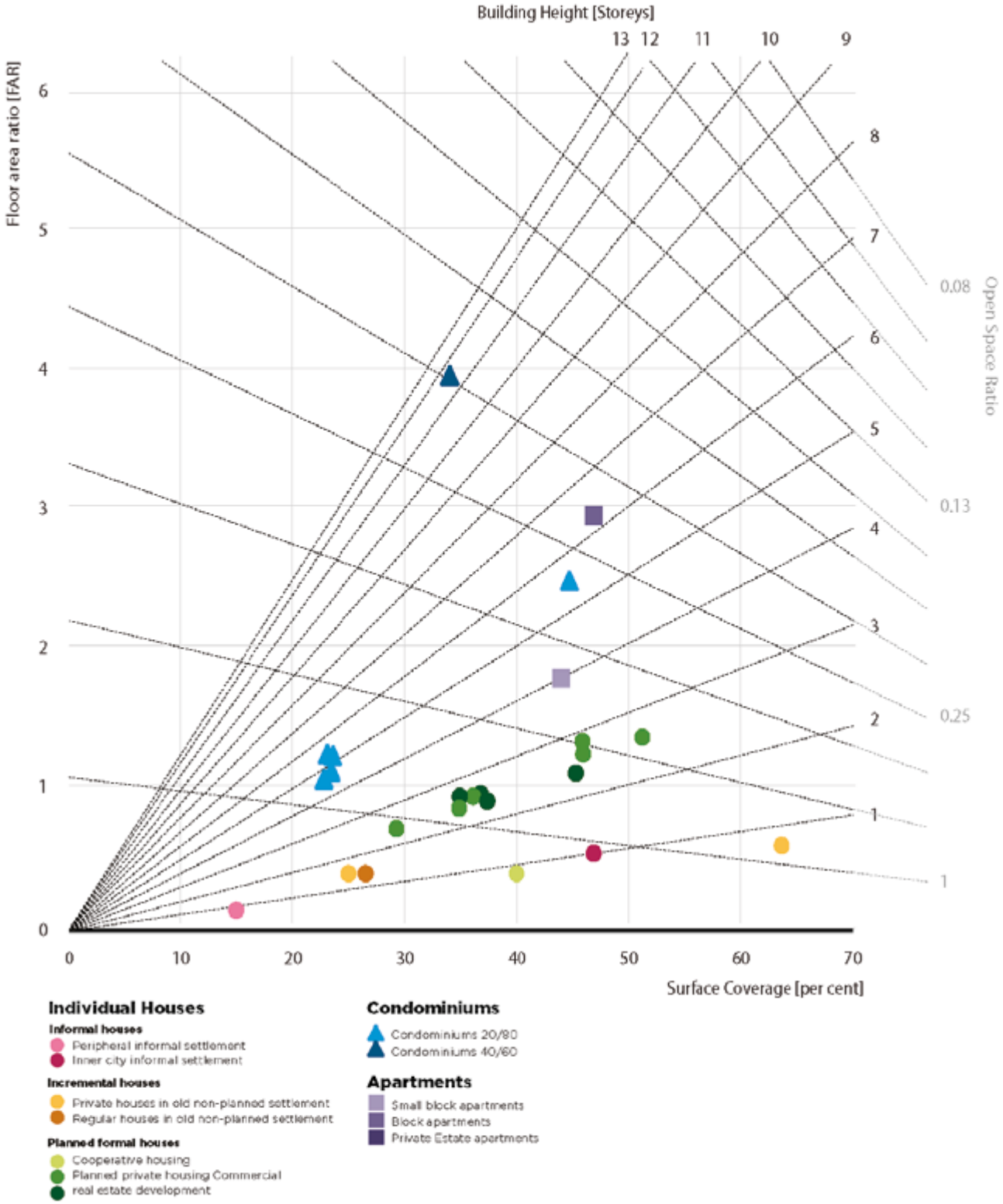
2.9 Figure ground samples

The morphology samples are presented as figure ground diagrams, two-dimensional maps where the building footprints are represented in black and open spaces (including roads, parks, empty plots, etc.) are in white. Each red box represents the overarching category that the diagram falls into, and each diagram conveys a particular building typology.

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

2.10 Spacemate diagram

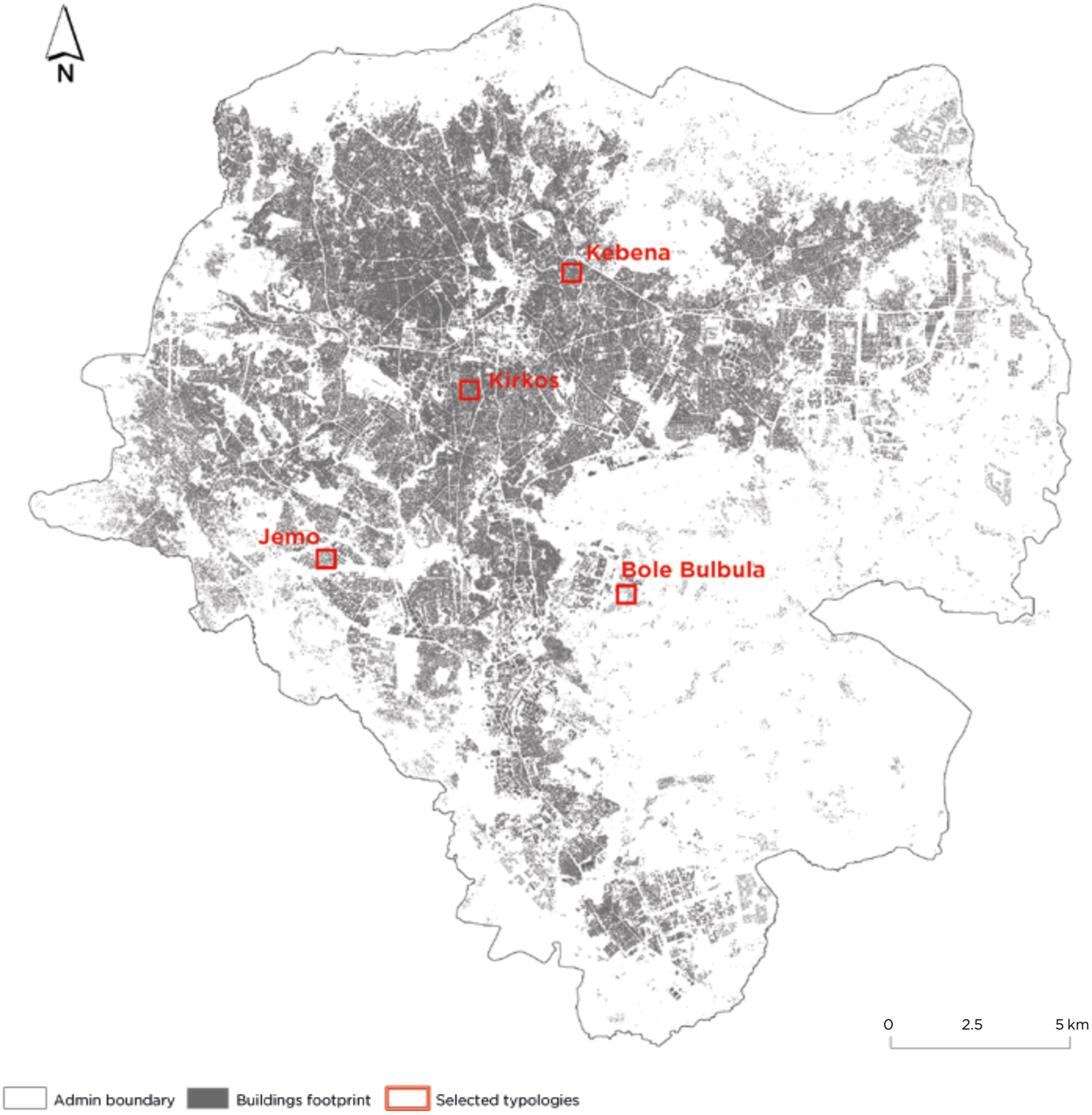
The Spacemate illustrates the spatial diversity of the urban morphology samples. Floor area ratio (FAR), an indication of building density, is calculated using the total floor area for the whole building on every storey divided by the whole surface within the 500-by-500 metre frame. FAR is higher for the multi-storey apartments and condominiums than individual houses that are around 1-3 floors. At the extremes, the lower-density peripheral informal settlements have the lowest FAR value of 0.1 whilst the hyper-dense condominiums 40/60 typology have the highest FAR value at 3.9.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office, Google Maps and projected values based on fieldwork sampling

3. Local area samples

On the 2011 building footprint map below, the four urban morphology samples are highlighted in red. The selected typologies were investigated at a scale of 500 by 500 metres, and include areas from the neighbourhoods of Jemo, Bole Bulbula, Kirkos and Kebena. Comparing the urban morphology across these different neighbourhoods gives an indication of how the design of housing impacts the quality of the public realm. The relationship of these four sites, as well as their historic formation and housing typology, varies from informal housing to high-end real estate developments, but this study focuses on the dominant type of housing found in the specific locations.



Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; Google maps and local survey

The figures below show the four selected area samples, which exhibit some of the most prominent residential building typologies of Addis Ababa, from mid-density apartment blocks to low-density housing. This introduction to the areas includes an aerial view, a figure ground diagram, and a photograph for each sample. The next spread present a more in-depth analysis of each area with a comparative set of maps and indicators. In terms of methodology, many indicators (those marked with *) enabled an additional "purification" of the morphological characteristics, allowing the most prominent urban form in a given area to be expanded across the entire 500-by-500 metre sample.

Bole Bulbula



Jemo



Kirkos



Kebena



3.1 Bole Bulbula

Bole Bulbula is one of the new neighbourhoods with different housing typologies, from informal settlements along the river to high-end apartments and individual houses. This specific area represents a condominium housing neighbourhood. Condominium housing was promoted by the government after the 2002 master plan. More than 160,000 housing units were completed and transferred to low-income recipients. These are multi-storey apartment blocks constructed in areas across the city. The inner-city pockets of condominium housing are much smaller than those on the outskirts of the city. Bole Bulbula is one of the peripheral project sites.

Bibliographical sources:
https://bit.ly/2YqAv1h
https://bit.ly/2YdlNLu

Total built up area*: 45%

Land coverage*
Buildings: 18%
Streets: 22%
Parking: 6%
Open space : 55%

Site photo

Aerial view map

Built up vs open space map

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; OpenStreetMap@; Google maps and local survey

Building height map

Average building height: 4.5 floors
FAR*: 1.2
Percentage surface coverage*: 45%
Open space ratio*: 55%

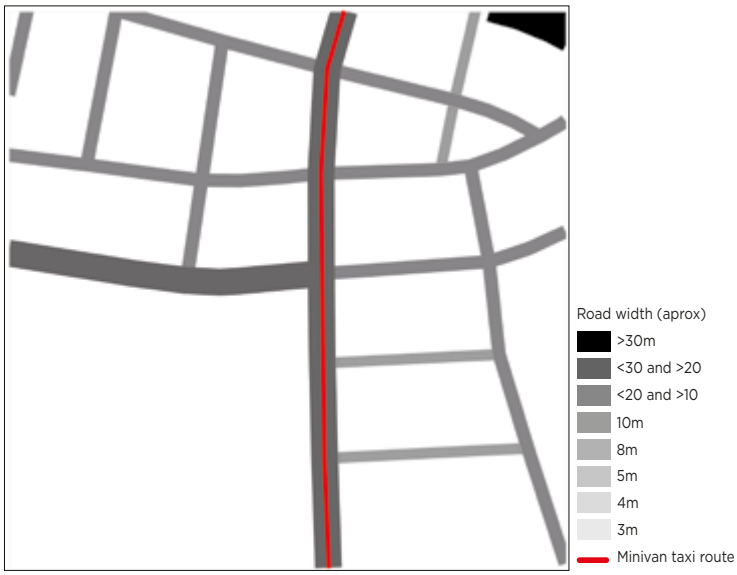
Land use map

Percentage Floor area
Residential: 85%
Commercial: 10%
Mixed use: 0%
Service: 4%
Other: 1%

Population (approx.): 600 pers

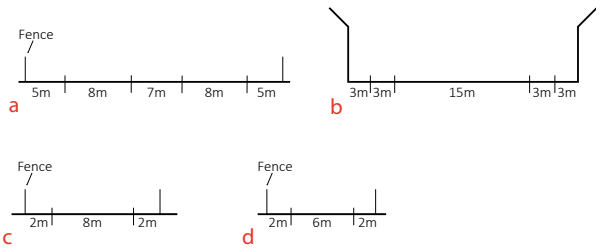
Note: In the mixed-use buildings, only the ground floor is commercial; all other floors are residential. The service building is used as traditional kitchen, storage, slaughter room and laundry room. Most of the residential blocks have five or six typologies per floor room.

Road space map



Road network length*: 4,150 m
Total length of public transport route: 508 m

Percentage of network by road category*
Main street (a):2%
Collector street (b): 24%
Secondary street (c): 59%
Tertiary street (d): 15%



3.2 Jemo

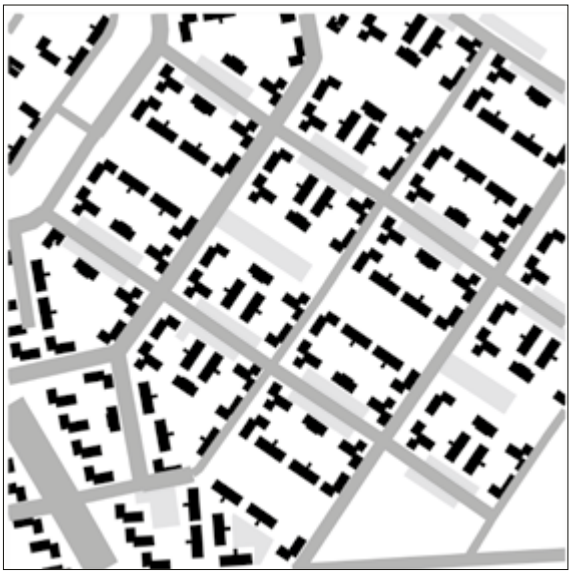
Jemo is one of the new neighbourhoods most probably formed due to the large number of condominiums. This specific area represents another condominium housing neighbourhood. It is one of the largest condominium housing projects and is split into three zones: Jemo I, II and III. Compared to Bole Bulbula, it feels denser, with the main roads quite crowded and vibrant.

Bibliographical sources:
https://bit.ly/2YqAv1h
https://bit.ly/2YdlNLu

Site photo

Aerial view

Built up vs open space map



Total built up area*: 43%

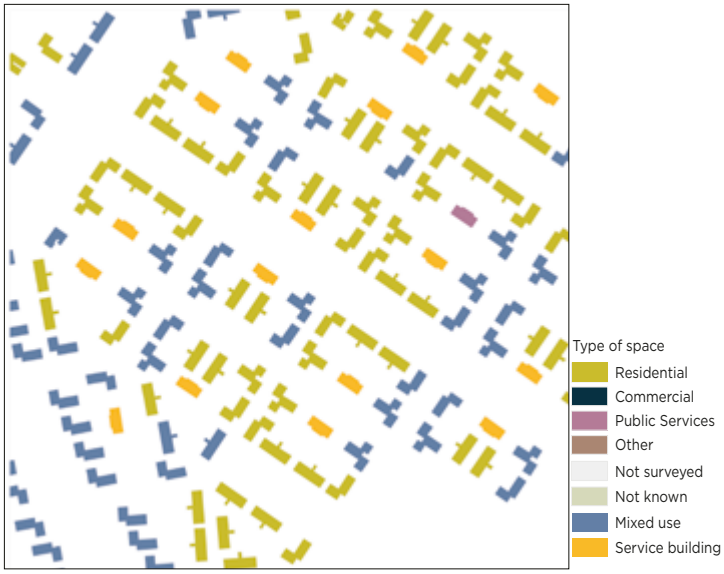
Land coverage*
Buildings: 18%
Streets: 18%
Parking: 7%
Open space :57%

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; OpenStreetMap@; Google maps and local survey

Building height map

Average building height: 4.7 floors
FAR*: 0.8
Percentage surface coverage*: 43%
Open space ratio*: 57%

Land use map

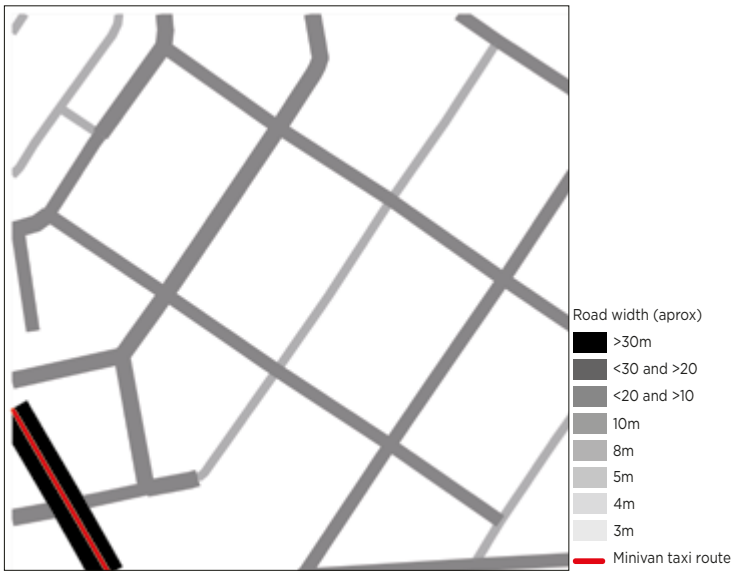


Percentage of floor area:
Residential: 88%
Commercial: 8%
Mixed use:
Service: 4%
Other: 0%

Population (approx.): 1,500 pers

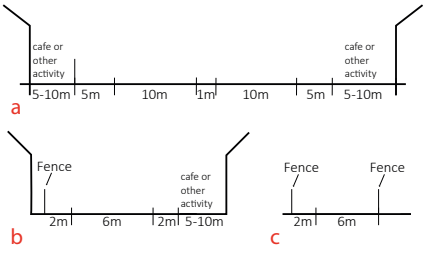
Note: On the mixed used buildings only the ground floor is commercial, all other floors are residential. The service building is used as a shop, meeting room and laundry room. Most of the residential blocks have five, six and eight typologies per floor.

Road space map



Road network length*: 3,856 m
Total length of public transport route: 174 m

Pecentage of network by road category*
Main street (a): 4%
Secondary street (b): 73%
Tertiary street (c) 23%



3.3 Kirkos

Kirkos is an old neighbourhood named after a church, with a big marketplace and the old Ethio-Djibouti rail line passing through it. It is a village but also one of the sub-cities within the city. This specific area represents the dominant building type in the area, the Kebele housing — government-owned rental housing generally occupied by low-income residents. These are described as informal settlements not because they exist outside a legal framework, but because they are non-planned.

Bibliographical sources:
https://bit.ly/2YdlNLu

Site photo

Aerial view

Built up vs open space map

Total built up area*: 59%

Land coverage*
Buildings: 49%
Streets: 10%
Parking: 0%
Open space 41%:

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; OpenStreetMap@; Google maps and local survey

Building height map

Average building height: 1 floor
FAR*: 0.5
Percentage surface coverage*: 59%:
Open space ratio*: 41%

Land use map

Percentage of floor area
Residential: 86%
Commercial: 0%
Mixed use: 2%
Service: 0%
Other:12%

Population (approx.): 5,000 pers

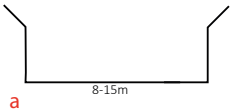
Note: Along the collector street most of the housing units are commercial, workshops or small coffee shops. In one compound four to nine households live together, and in one household approximately five to seven people. In total approximately 20 - 63 people live in one compound (information from in-situ street interview). Examples of a compound can be seen on the map (areas delimited by a grey square)

Road space map

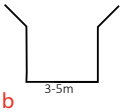
Road network length*: 5,749 m
Total length of public transport route: 0 m

Percentage of network by road category*
Collector street (a): 7%
Secondary streets (b): 93%

Note: Includes roads with pavement works



a



b

3.4 Kebena

Kebena is an old neighbourhood formed along a river of the same name that stretches to the mountain. This particular area is a lower- and middle-class housing area that includes some cooperative housing.

Site photo

Aerial view

Built up vs open space map

Total built up area*: 45%

Land coverage*
Buildings: 35%
Streets: 10%
Parking: 1%
Open space :55%

Source: Urban Age/LSE Cities analysis based on data from the Addis Ababa Master Plan Project Office; OpenStreetMap@; Google maps and local survey

Building height map

Average building height: 1 floor
FAR*: 0.4
Percentage surface coverage*: 45%
Open space ratio*: 55%

Land use map

Percentage of floor area
Residential: 71%
Commercial: 2%
Mixed use: 0%
Service: 0%
Other: 27%

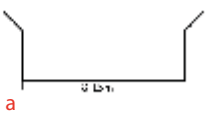
Population (approx.): 4,700 pers

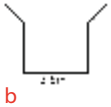
Note: The surveyed area is quite unique when compared with the rest of the site. While most of the neighbourhood is residential, there is a mix of land use, in particular around the church. Approximately five to seven people live in one house (information from in-situ street interview).

Road space map

Road network length*: 4,520 m
Total length of public transport route: 0 m

Percentage of network by road category
Collector street (a): 21%
Secondary streets (b): 79%


a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Appendix: Methodology and challenges

Methodology

In a context of data scarcity, the creation of a dataset with building typologies can be of great use in understanding and planning the city's growth with importance for urban research and practice. Buildings determine physical and social structures, which can relate to how and where people live, work and relax, while also allowing a reflection on the changes occurring in the city (Hecht, Meinel, and Buchroithner 2015; Jochem et al. 2020; Alexiou, Singleton, and Longley 2016).

Despite the relevance of this data, this did not seem to be available for Addis Ababa, from an investigation of institutional, spatial and statistical available data and personal contacts with some of the key planning and mapping agencies in Addis Ababa. The only existing building information, at the city level and for the whole city, was the geometric information of the buildings in 2011 (buildings footprint), while information such as building type, use and height was yet to be created.

This research is based on a mixed methods approach with a focus on spatial visualisation techniques and quantitative analysis. Building on data collected during site visits to areas displaying a higher diversity of building typologies, the first step involved the identification of the most distinctive building typologies in Addis Ababa through aerial photography and satellite imagery visual pattern recognition, tools which are increasingly available, high-resolution and open source.

Basic rule sets differentiating building types were based on the exploration of characteristics such as: villa type and apartment, detached, semi-detached, terraced housing types, levels of compactness, building footprint design pattern, rooftop pattern recognition and road layout.

From this stage, four main urban typologies and five function-centred typologies were identified. For this initial classification, the data collected was used to identify areas on Google Earth and define them in accordance with these broad categories, assigning input data (categories) into one or more building features.

This data was then exported to GIS and overlaid on the building footprint of Addis Ababa, where a typology map was created and refined. Through collaboration with local researchers, the initially broad categories of building type were disaggregated into sub-categories to provide a further level of spatial understanding. The process of disaggregation focused on neighbourhood design, street and building configurations.

In this way, the urban typology of "apartments" was differentiated into three sub-categories, according to factors such as average building height and the type of development.

For each of the architectural types, data approximations relating to the number of floors, apartments, people and jobs were applied. This enabled calculation of residential and workplace floor space within the results displayed in 3D models.

This report highlights the main findings of the spatial analysis work, despite the challenges of this methodology. More than one million buildings were classified to create a city morphological map of Addis Ababa. This approach produces a structure of potential clustering solutions that hopefully can be used in collaboration with local knowledge of the spatial context when creating more refined building typologies. A set of six maps shows the results of this work (pages 43 to 49).

Challenges

The proposed urban typologies and their associated characteristics in this spatial compendium are based on estimations from local experts and have been subjected to the individual interpretation of researchers. These approximations relate to the number of people, shops and jobs available in buildings and also to their function.

An absence of data in this context has led to assumptions informing the process of categorisation and the creation of the typology map. Shapefile data illustrating building footprints in Addis Ababa was produced in 2011 whereas Google Earth satellite images and Shapefile data specifically relating to condominiums is more updated. Lack of suitable and updated data is a challenge that has to be recognised.

Assumptions have been made with some building types when the data available does not clearly distinguish one typology over another. As this project is the first of its kind to take place in this context, only dominant typologies have informed the compendium. Subdivisions of the buildings that are not visible could have been missed due to methodological limitations.

Additionally, the building footprints data includes small scattered buildings which are at risk of not having been classified. This is because the level of detail required to ensure the inclusion of all buildings in this analysis, would require more time and more researchers involved in the data analysis.

Considering these factors, the values produced from the spatial compendium, such as average building height, would benefit from review by local experts.

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Technical Report 2.2 | *Digital Van Service for Addis Ababa: understanding the transport landscape and the potential for digital bus aggregation in Ethiopia's capital* by Chris Kost and Gashaw Aberra (Institute for Transportation and Development Policy (ITDP))

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The Task Force is a partnership between the Addis Ababa City Administration Plan & Development Commission (AAPDCo), LSE Cities at the London School of Economics and Political Science, the Alfred Herrhausen Gesellschaft, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

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