POLITECNICO MILANO 1863

School of Architecture, Urban Planning and Construction Engineering

Master's Degree in Sustainable Architecture and Landscape Design 2025-2026

Reclaiming the Street: from a car-centric to a people -oriented Vision

Experiments in Sheikh Zayed city, Cairo Metropolitan Region

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Acknowledgments

While writing my acknowledgments, I can not believe that the time is here, it has been a long and beautiful journey that changed a lot about me personally and professionally.

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To my parents and 2 sisters, Farah and Lobna, thank you for always being my light and for showing me that love and support know no distance. Thank you for believing in me.

English abstract

In recent years, urban and transport policies have increasingly focused on the impact of car-oriented urban structures on accessibility, urban quality, and their lack of environmental sustainability, particularly in rapidly expanding urban contexts.

In response, to the negative externalities associated with intensive car use, planning approaches have focused on alternative forms of mobility, such as active mobility and accessibility by proximity as the key tools to improve walkability, reduce car dependency to enhance the everyday urban environments.

These approaches focus mainly on organizing daily services, public spaces, mobility systems at neighborhood scale, adopting bottom up logic to support a people-centered urban living.

This research explores accessibility by proximity and active mobility as the framework for re-organizing car oriented urban fabrics. This study is conducted in Sheikh Zayed city, Egypt , a newly planned city developed to accommodate the massive urban growth that the Great Cairo region experienced. It is located on the west side of the region and strongly relies on private vehicles for everyday life.

Through a multi-scale spatial analysis, this research examines land use distribution, street typologies, mobility networks and ecological systems to identify challenges and focus on the opportunities within the existing urban structure.

Based on these analysis, a set of strategies are proposed including land-use restructuring, superblock implementation, active mobility networks, public transport enhancement, mobility hubs and ecological corridors.

Tested at two different scales, city-wide and neighborhood scale, the strategies demonstrate how the existing car- oriented urban fabric can be retrofitted to enhance walkability, accessibility and social interactions. The research contributes to the discussion on sustainable urban mobility in rapidly growing cities and offers a framework to make the cities more livable, inclusive and resilient urban environments.

Italian abstract

Negli ultimi anni, l'attenzione delle politiche urbane e dei trasporti si è concentrata sull'impatto del traffico veicolare sulla qualità urbana e sulla sostenibilità ambientale, in particolare nei contesti urbani in rapida espansione.

In risposta alle esternalità negative legate all'intenso uso dell'auto, gli approcci di pianificazione hanno iniziato a focalizzarsi su forme di mobilità alternativa come lla mobilità attiva e sull'accessibilità per prossimità come strumenti chiave per migliorare la camminabilità, ridurre la dipendenza dall'automobile e valorizzare gli ambienti urbani della vita quotidiana. Questi approcci si concentrano principalmente sull'organizzazione dei servizi quotidiani, degli spazi pubblici e dei sistemi di mobilità alla scala di quartiere, adottando una logica bottom-up a supporto di un vivere urbano centrato sulla persona.

Questa ricerca esplora l'accessibilità per prossimità e la mobilità attiva come quadro di riferimento per la riorganizzazione dei tessuti urbani orientati all'automobile. Lo studio è condotto nella città di Sheikh Zayed, in Egitto, una città di nuova pianificazione sviluppata per accogliere la massiccia crescita urbana che ha interessato la regione della Grande Cairo. Situata nella parte occidentale della regione, la città presenta una forte dipendenza dall'uso del veicolo privato nella vita quotidiana.

Attraverso un'analisi spaziale multi-scalare, la ricerca esamina la distribuzione degli usi del suolo, le tipologie stradali, le reti di trasporto pubblico e per la mobilità attiva e i sistemi ecologici, al fine di individuare criticità e opportunità all'interno della struttura urbana esistente. Sulla base di tali analisi, viene proposta una serie di strategie integrate, tra cui la riorganizzazione degli usi del suolo, l'implementazione delal strategia deii superblocchi, lo sviluppo di reti di mobilità attiva, il potenziamento del trasporto pubblico, l'introduzione di hub di mobilità e la creazione di corridoi ecologici.

Testate a due scale differenti, quella urbana e quella di quartiere, le strategie dimostrano come l'attuale tessuto urbano orientato all'automobile possa essere riqualificato per migliorare la camminabilità, l'accessibilità e le interazioni sociali. La ricerca contribuisce al dibattito sulla mobilità urbana sostenibile nelle città in rapida crescita e propone un quadro operativo per rendere gli ambienti urbani più vivibili, inclusivi e resilienti.

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1.1 Introduction

According to the latest UN DESA findings, 55% of the current world population lives in cities, and it is projected to reach 68% to be living in cities by 2050, this might be a real problem with the way our cities are expanding nowadays, adding to this, the economical restrain and the problems that third world countries face, we might end up with unlivable cities.

In this context, urban developement must shift from quantitave expansion towards creating places that support the everyday life, **"Creating Places not Spaces"**, this requires an approach that address all aspects of the community, not only the physiccal growth but also social, environmental and functional aspects. Sustainable urban planing plays a major role in this process because it minimize urban sprawl, reduce resource consumption and creates resilient livable cities.

A major component of sustainable urban planing is urban mobility because it strongly influence accessibility, quality of life and overall the way residents experience the city. Cities that depend on car oriented planning prioritise cars which leads to reduced walkability, congestion, limited access to daily services.
Urban mobility is the main engine that makes this entire plan work.

One of the biggest mistakes caused by the current planing system is to equate accessibility with the ability to travel long distances quickly, this leads to urban environment where daily activity require extensive travel, undermining convenience and inclusivity. The question then arise of mobility models based solely on speed and distance which marks the importance of proximity and every day accessibilty in shaping a livable urban environment.

These challenges mark the need to rethink how cities are planned and experienced, especially at the scale of every day life, where mobility, accessibilty and urban form directly intersect.

1.2 Research background and motivation

Figure1. Great Cairo Region during the Industrial Revolution in the 1960-1970s Periode

Mid-20th century, between 1950 and 1980, is when the Egyptian population started to grow massively. Following the 1952 Revolution, Egypt entered a demographic transition, the population doubled from 20 million in 1952 to 40 million by 1978.

In the 1960s, the country focused on heavy industrialization. Factories were centralized in the Great Cairo Region and Alexandria, pulling millions of people from rural Upper Egypt and the Delta into cities that were not designed to hold them.

Several factors drove this phenomenon. Between 1960 and 1970, the government introduced "socialist rent control laws," which benefited existing residents but made new apartment construction unfeasible for the private sector. At the same time, the government was unable to supply new housing quickly enough to meet the 2–3% annual population growth. Unable to find affordable formal options, many migrants purchased small plots of agricultural land on the outskirts of the city.

The informal "logic" started from here because construction was technically illegal, there were no master plans, and people built only what they needed and could afford. By the 1980s, these informal areas housed over 50% of Cairo's population.

These trends led to fragmented urban fabric, lack of open and green spaces, poor connectivity, as well as a lack of access to public services. The residents depended on creating the transport mode that would contribute to the car-based urban structure characteristic of the later planned new towns.

Mid 1980s, in response to overcrowding and the informal urban growth.
the government initiated the development of new desert Cities, expanding to the east and west of Cairo to relieve pressure on the city center.
one of those cities is Sheikh Zayed which was designed with modern infrastructure and spacious layouts, trying to avoid the mistakes of informal settlements, new problems emerged.

These new cities emphasized private vehicle use over pedestrian movement, creating car dependency and inheriting some of the accessibility and mobility challenges that exist today, despite their proper urban planning.

01.3 Research topic and aim

The Research topic
This research investigates how Urban growth and mobility systems influence Walkability ,Accessibility and active mobility in a car oriented new towns. it focuses on Sheikh zayed as a case study for transitioning toward a more walkable, pedestrian-friendly, and sustainable urban environment.

The research aim
Using adaptive sustainable Urban Planing Strategies to create Livable Cities, healthier and inclusive neighborhood by adapting the Accessibility By proximity concept which makes the Active Mobility by default the main transport mode for accessing daily basic services and urban opportunities

The Research question
How can car-oriented new cities be spatially restructured to enhance walkability, accessibility by proximity , and active mobility at the neighborhood and city scale?

01.4 Relevance to the case study

Sheikh Zayed city is particularly relevant within the framework of **accessibility by proximity.**
The urban structure reflects the limitations of the car-oriented planning and how it is the main method to access everyday essential services and not on foot or by active modes
The city, developed in low density and functional separation with oversized road infrastructure, demands long travel distances for daily activities, thereby undermining proximity-based accessibility.

Those characteristics make Sheikh Zayed city a suitable case study to examine how proximity principles can or have been implemented to transform urban structure, street hierarchy, or transportation network for a transition through a more liveable and inclusive district

In the same time, it is a newly planned city that has the potential to be adjusted which is a great opportunity to be able to make it a sustainable livable city on the long Term and Adjust to its Future Extension

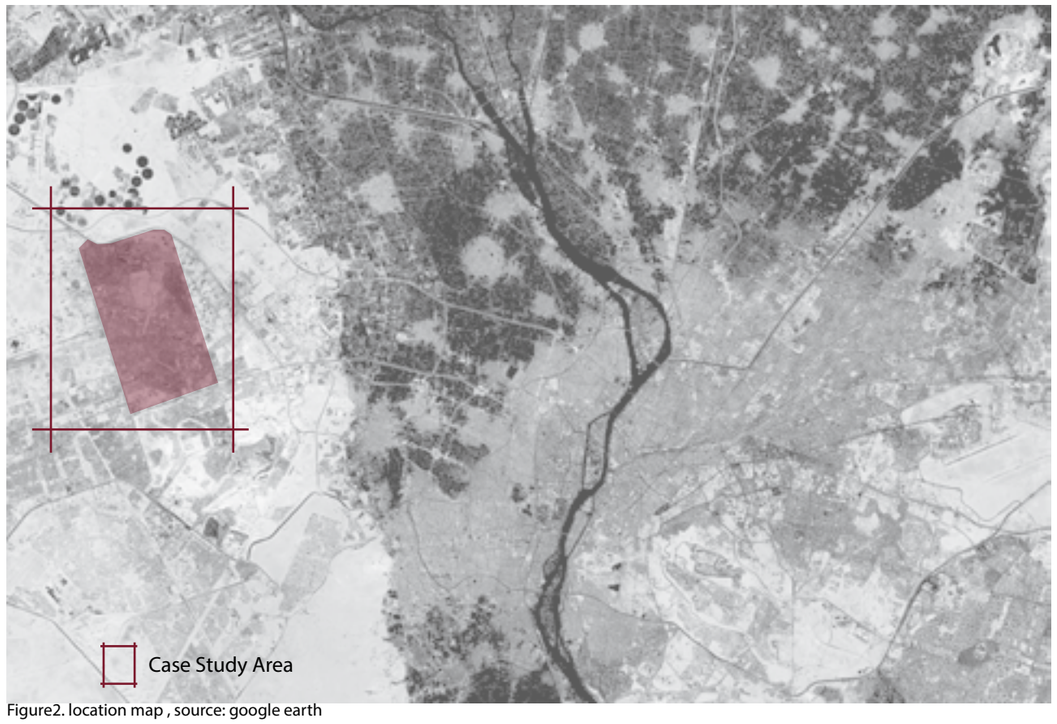


Figure2. location map , source: google earth

1.5 A Cross scale approach:Large,Medium,Small Scales

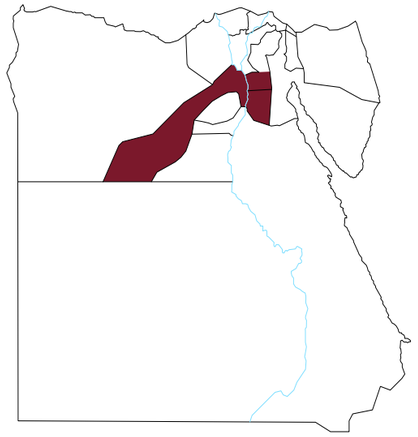
Egypt is the land with the biggest population in the Middle East region, with over 118 million people as of 2025.
Covering more than 1 million km^2, it is a land where 95% of the territory is desert; most of the population is concentrated around the Nile.
Egypt's geography is unique and has been moulded by its distinct topography, which consists of a huge desert area that has a water course and its surroundings.

Based upon this, the Greater Cairo region (GCR) has emerged as Egypt's political, cultural, and economic core. It has over 20 million people living within; it is expanding rapidly, often encroaching on agricultural land, which led to blurring the boundaries between Cairo and Giza.
This growth brings opportunities; it also raises pressing challenges for mobility, infrastructure, and sustainable urban planning.

The governance of the Great Cairo Region is multi layered. This city is administratively formed of several governorates (Cairo, Giza, and Qalyubia).
Each one of those 3 has a governor appointed by the central government; there is no directly elected mayor for the Greater Cairo Region.

Decisions regarding urban planning, land use, and transport policies are mainly determined by national authorities, specifically the ministries responsible for these areas: the Ministry of Housing, the Ministry of Utilities, and the Ministry of Urban Communities).
Large scale infrastructure projects such as new towns and transport network are approved and funded by the national level, which shows that the governance system follows a top down approach with limited local autonomy.

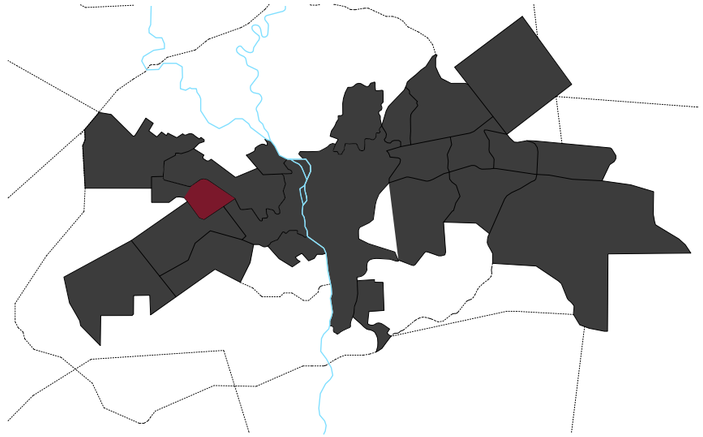
This top down approach cause the local needs to be neglecte, making it difficult to address problems.
Projects take a long time to be approved while the urban spaces are always changing; some of the policies of the national level are not always applied on the groud, and most importantly, the lack of contribuation of local authorities. All of this leads to a one size fits all approach that ignore the variability of the Great Cairo Region.



Country Scale

Great Cairo Region

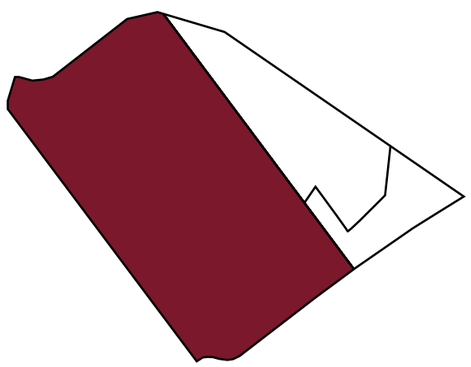
Egypt Borders



Regional Scale of The Great Cairo Region
(L Scale)

Sheikh Zayed City

Urban Fabric



City Scale of Sheikh Zayed
(S Scale)

Sheikh Zayed Built Area

Regional Services / Open Land

Figure 3. cross scale approach :country scale, regional scale and city scale

Large Scale Analysis
Great Cairo Region

2.1.1 Introduction

Figure 4. Urban fabric in great cairo region source : : Nate Tischler, World Cityscapes & Skyscrapers, 2025.

The Urban planning and infrastructure developments in The Great Cairo Region and in Egypt are governed through a **highly centralized institutional** framework led by the state and its national authorities.
The planning frameworks of this Strategic policy is defined by **the Ministry of Housing, Utilities and Urban Communities (MoHUUC)**, which oversees urban development at the national level, and other administers agencies are responsible for city planning process.
The General Organization for Physical Planning (GOPP), operating under this ministry, work on the national, regional, and local spatial plans, which include master plans for cities, and the coordination planning agendas across government entities.
Under the New Urban Communities Authority (NUCA), established 1979 mainly responsibl for implementation and management of new urban communities, this entity is responsible for preparing structure and detailed plans, issues permits, and directs development in newly planned cities such as Sheikh Zayed.

Plans and proposals must afterwards undergo review and approval processes involving both GOPP and the ministry, to ensure the alignment with national development strategies and security considerations.
For large-scale urban projects such as the designation of new city locations and major infrastructure initiatives, final authorization is typically through presidential decrees and along with the approval of the Cabinet, reflecting high-level strategic priorities.

The funding for urban development in new cities is from a mix of sources.
Historically, new city projects were financed directly from the state budget. Over time, it expanded to include also land sales and real estate revenues managed by NUCA, which generate resources for infrastructure.

There is also efforts to attract domestic and foreign investment through mechanisms such as the Foreign Investment Gateway for new cities, which strengthen the role of private capital in financing infrastructure.

International cooperation, including funding and technical support from development partners, contributes to specific planning and capacity building initiatives to make financial inputs for urban development more diverse.

2.1.2 Urban sprawl

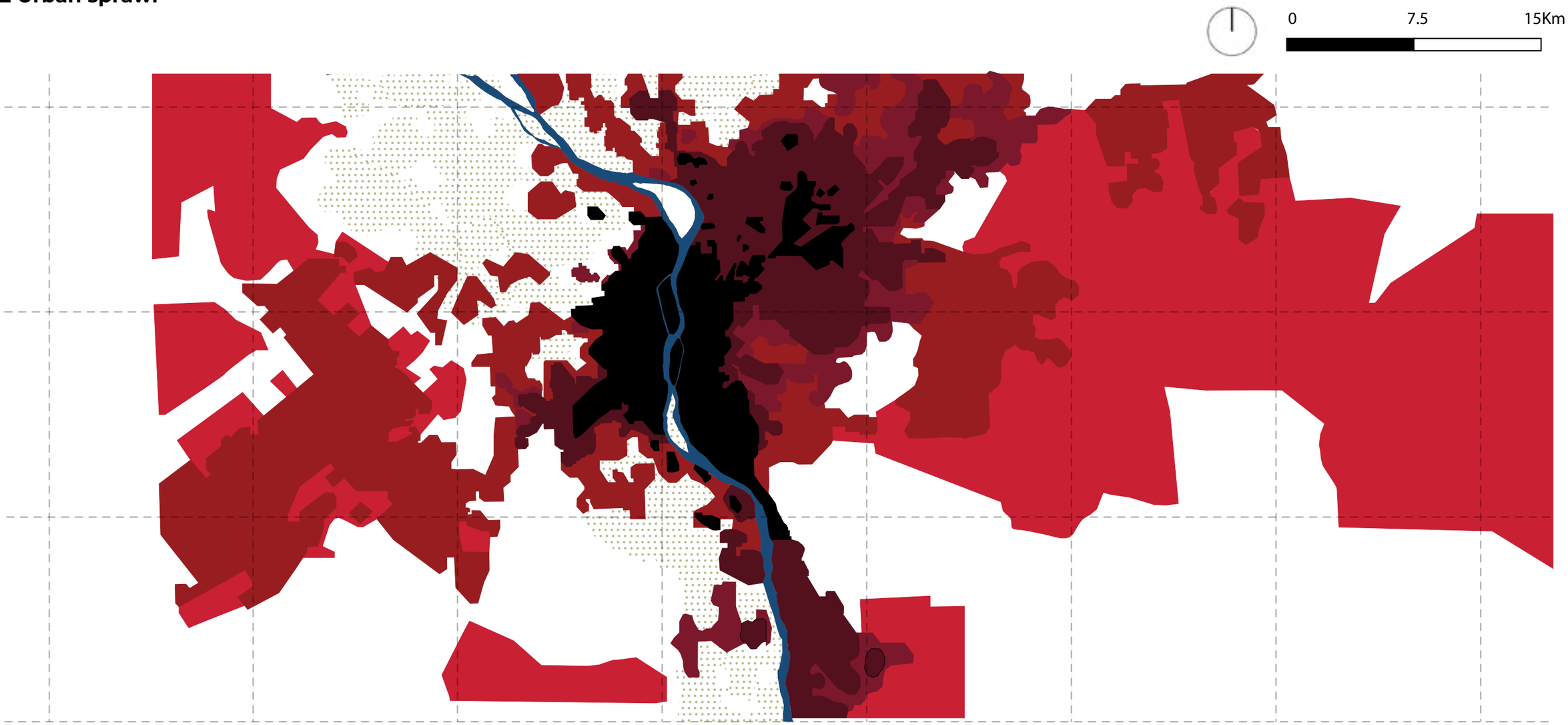


Figure 5 : Urban Sprawl Map source: Salem, Tsurusaki, Xu, & Xu, 2024.

The map illustrates the urban sprawl of Cairo from 1984 to 2021, highlighting
the city's significant expansion into surrounding areas especially between 2013-2021- this Growth happened because of the massive growth in the city population that the Urban Core couldn't contain.

Which all resulted in the expansion outward east and west into the affordable Desert land emphasizing the shift from Compact Urbanization outward to low density Peripheral Development

2.1.2 Urban typologies

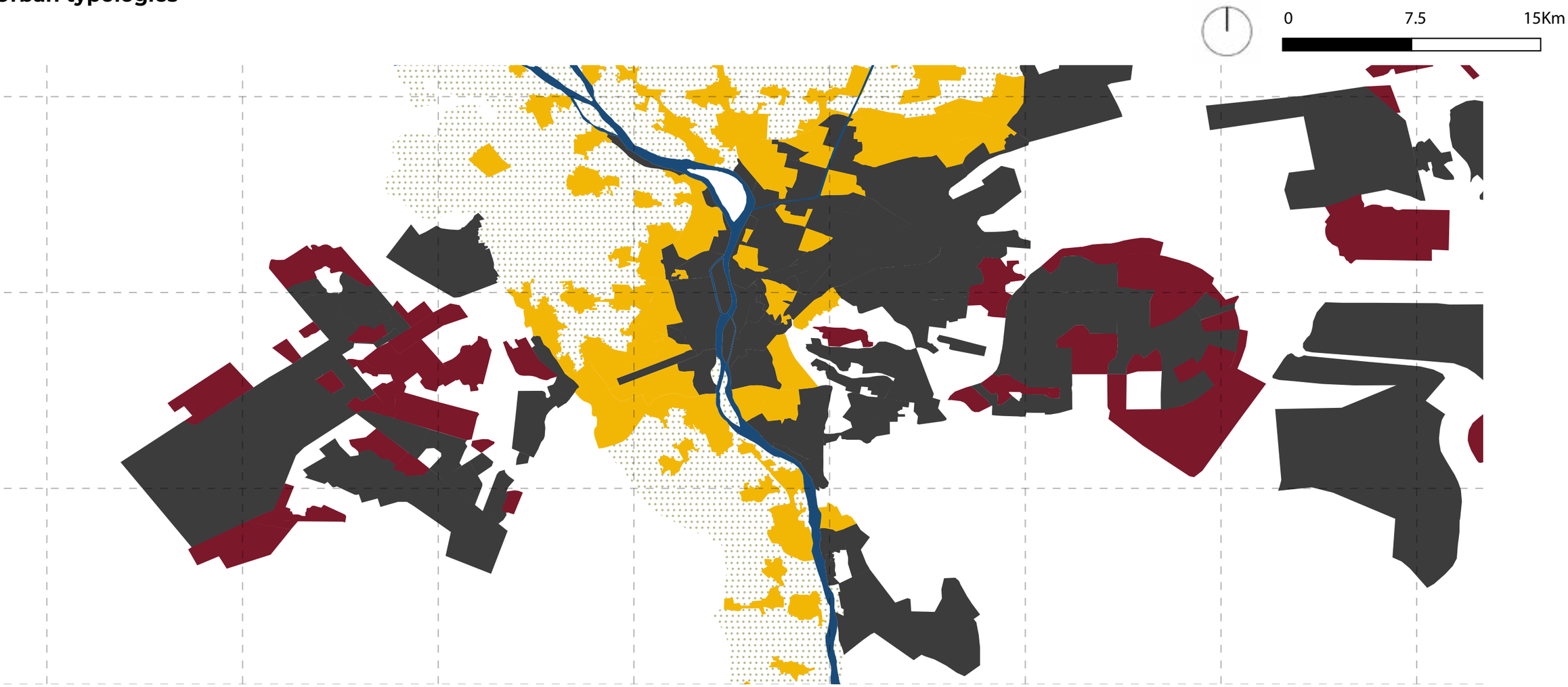


Figure 6: Urban Typologies,author's elboration on great cairo formal and informal settlments source: source : Hassan, G. F. (2012). The distribution of Ashwaeyat on the peripheries of Cairo metropolitan.

Due to the rapid urban sprawl in Great Cairo, with the economical restrains that resulted in different types of urban typologies existing all together.
The spread of informal areas onto and around the agriculture areas marks the pressure of the rapid population growth, and the government led projects in the desert has created some sort of parallel pattern of expansion co-existing with the old planned settlements.

In conclusion, these different typologies are a result of a rapid urban sprawl that shaped this constraining urban typology and uneven development processes co-existing in the Great Cairo Region.

2.1.3 Demographic trends

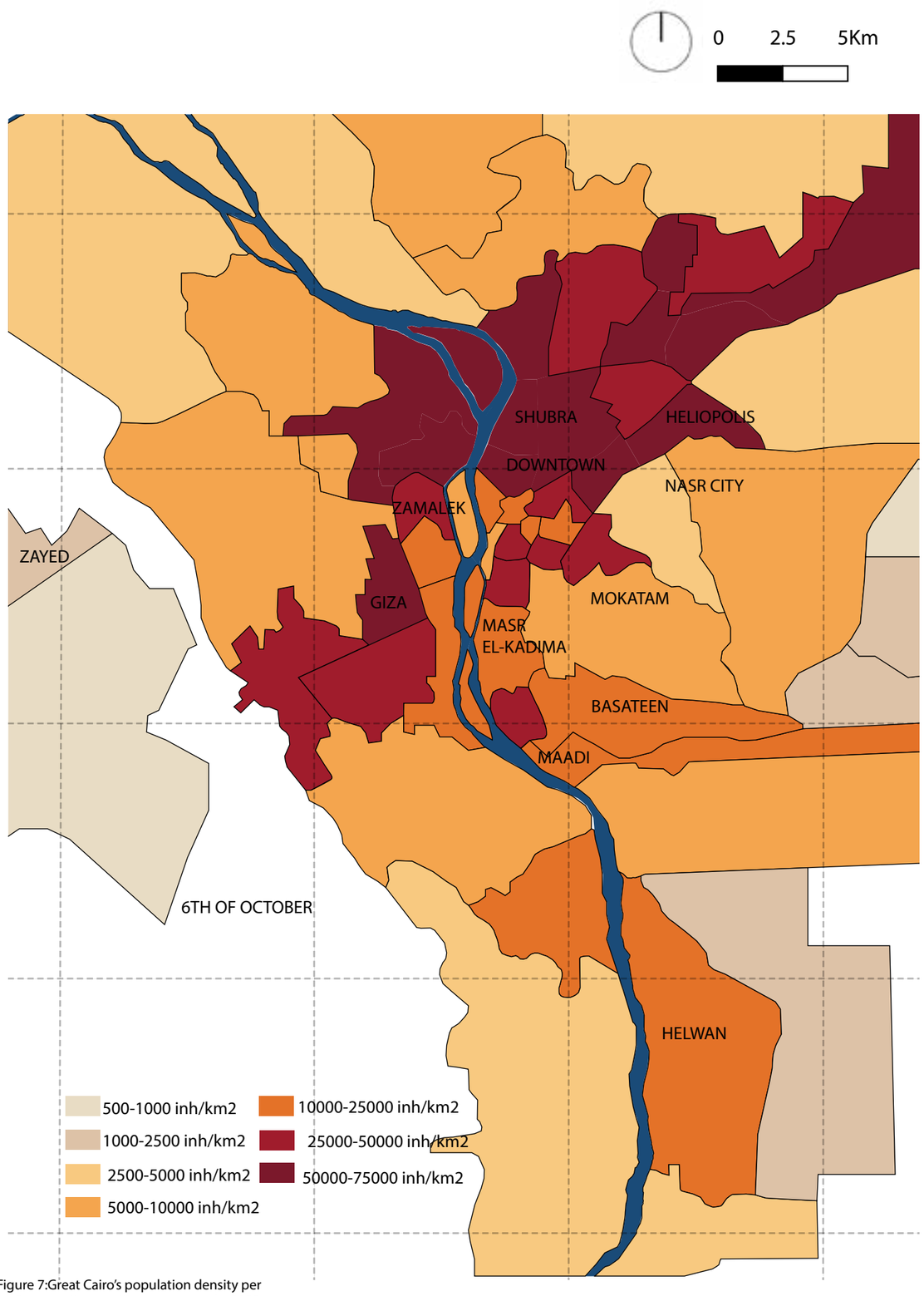


Figure 7:Great Cairo's population density per km2 source(Source: Citypopulation.de, 2023.)

The old planned area along the Nile River has the biggest density, and as the urban fabric extends outwards, the urban density becomes less, marking the areas that are still in development.

Aligning with the transition toward newer peripheral districts that remain less consolidated and continue to attract residents, but at a slower pace.

This marks the upcoming shift from compact already established center to the emerging areas around the periphery and its continuous growth that eventually will transition into fully established urban areas.

2.2 Green and blue systems

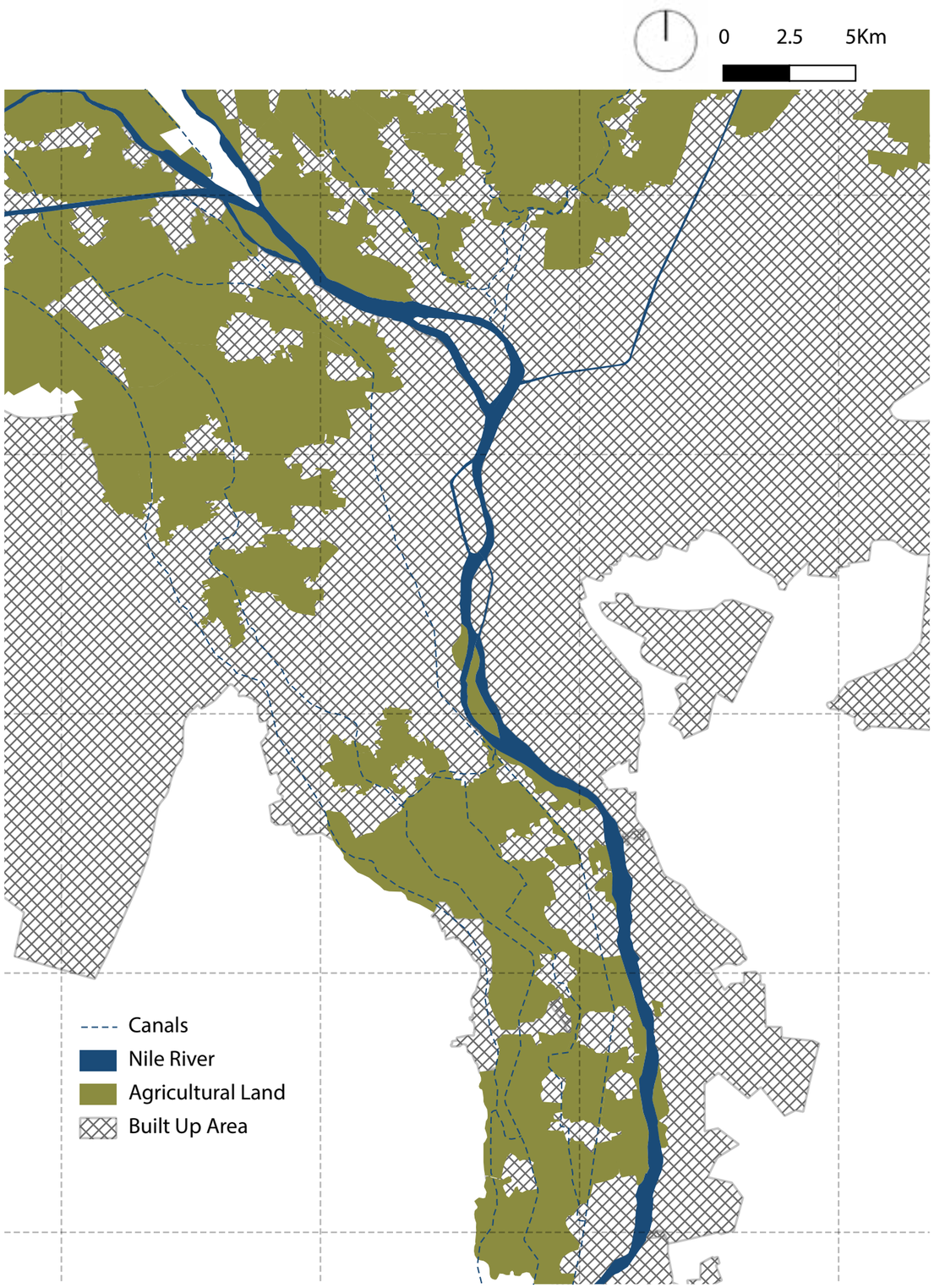


Figure 8. great cairo's green+grey+blue overlay (Source: Mekkawi, 2024, Shores of Change)

The Green and Blue systems structures in the Great Cairo Region are visibly environmentally uneven. The Nile River has historically been the foundation of Egypt, not just the Great Cairo Region. "Egypt is the gift of the Nile," written by Greek historian Herodotus, and nowadays the river remains the central lifeline of the region, supporting both the hydrological functions and the surrounding agricultural area.
However, beyond this dominant blue system, it is obvious that the green infrastructure is limited and fragmented.
The agricultural land is gradually deteriorating due to economic constraints and rural migration, unauthorized construction on agricultural land. The natural balance between water and green systems is weakening, resulting in isolated environmental elements.

As a conclusion, even if the Nile River is the main heart of the Great Cairo Region, the absence of a strong, complementary green system leaves the metropolitan landscape vulnerable to heat stress, declining environmental quality, and reduced ecological performance.

Green System
Looking at the green network, it is obvious that the old planned urban areas around the Nile River show a concentration of parks and planned spaces, while the majority lacks structured or accessible green spaces.

Moreover, the limited green share per capita, especially in dense residential areas, reveals a system that does not meet the environmental needs of this rapidly grown population.
The area suffers from a fragmented and insufficient green network. The limited continuity between existing green patches restricts their environmental effectiveness, while the extremely low per-capita green share emphasizes vulnerabilities to heat stress and poor air quality.

Blue System
Egypt's long agricultural history has always been closely tied to the Nile River; it served as the country's fundamental source of life.
The hydrographic system of the Great Cairo Region is primarily composed of the Nile, being used for irrigation canals and drainage channels that branch from it, which were made to support agriculture and regulate water flow to reach further areas.
It is important to note that the flood risk is primarily a consequence of mismatched urban growth and legacy water systems, as the water channels have been absorbed into the urban fabric and the natural buffer seems to have diminished.

2.2.1 Distribution of parks and green spaces

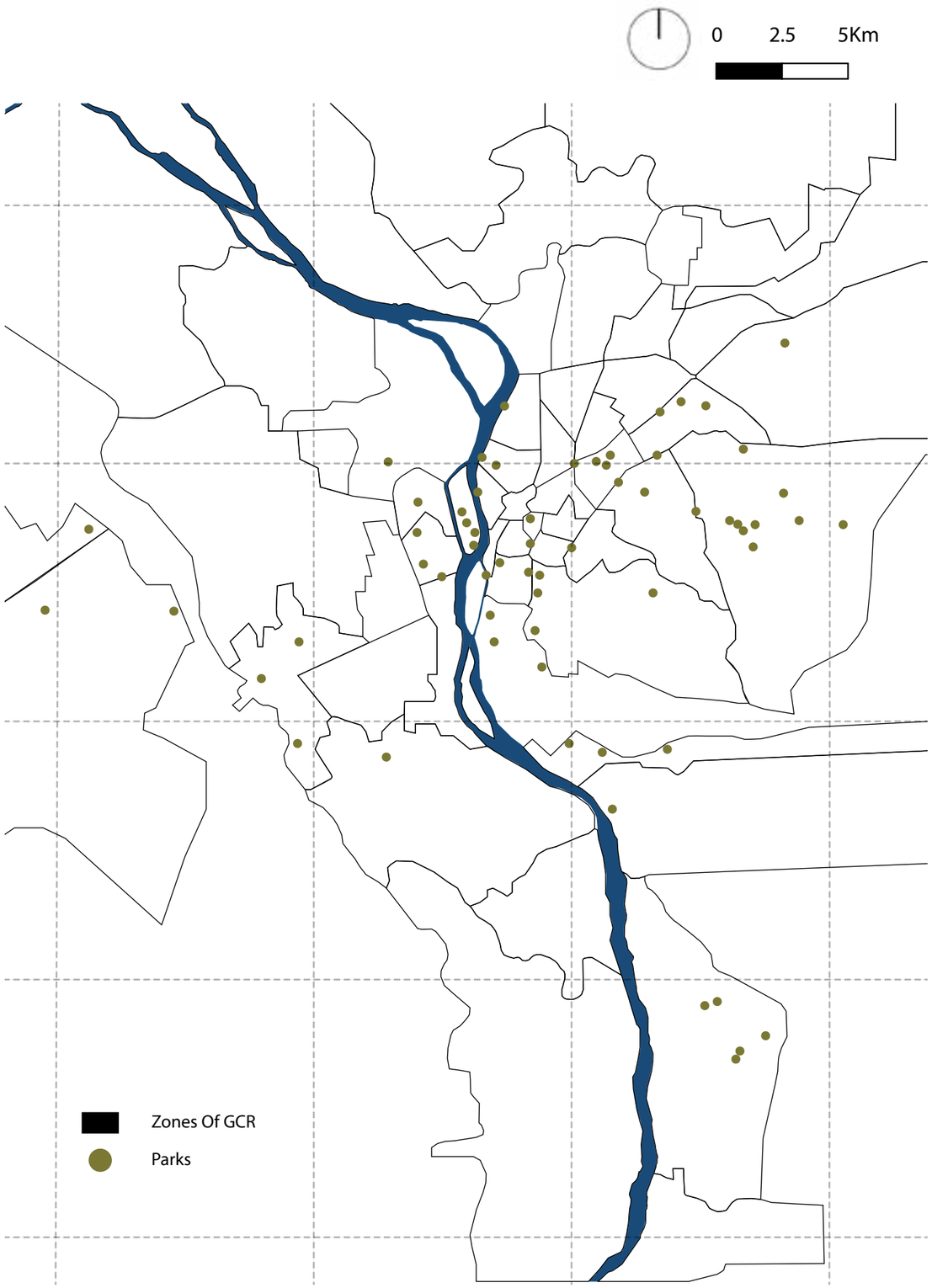


Figure9. great cairo's main parks
Source: Mekkawi, 2024, Shores of Change.

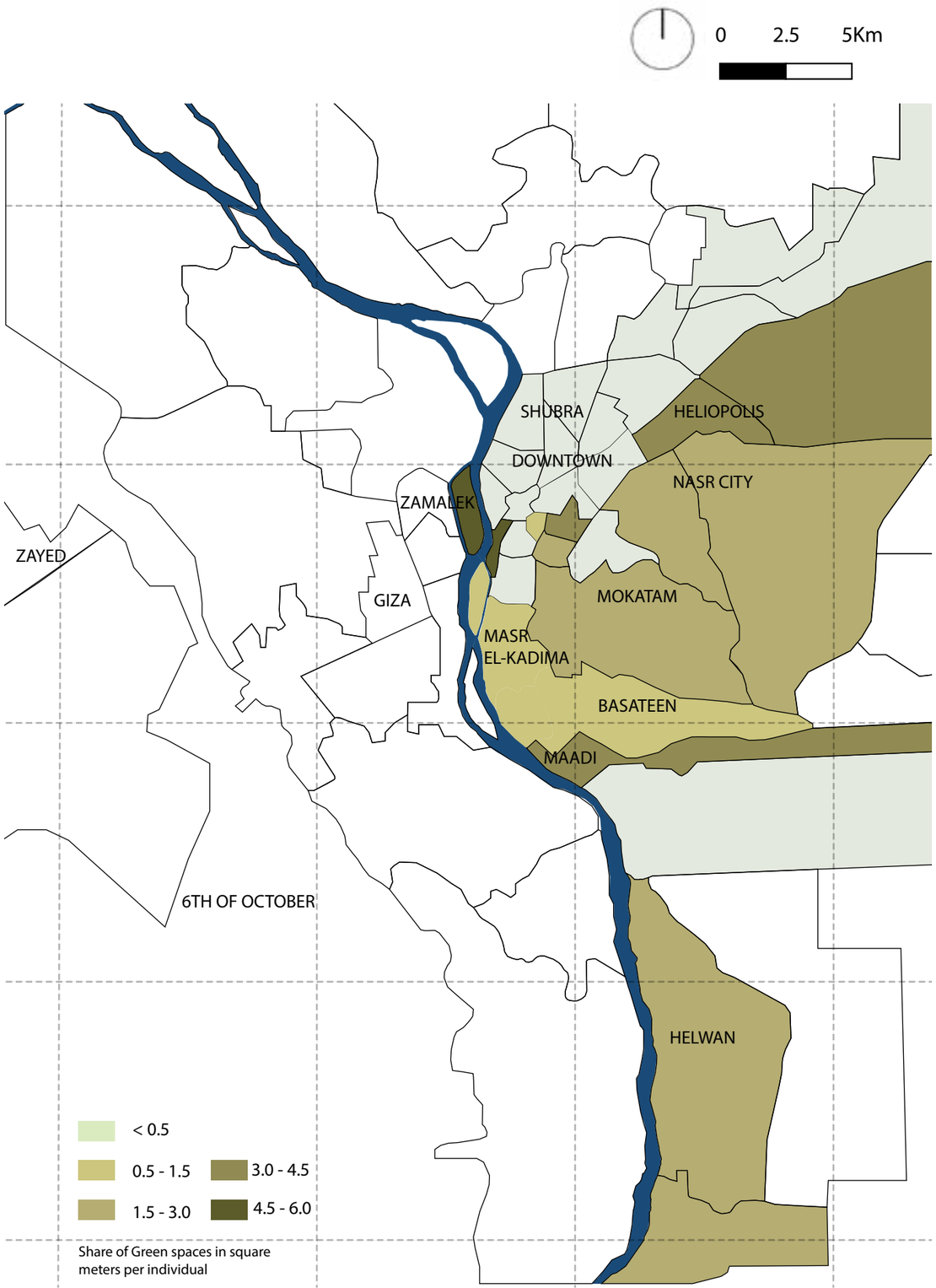


Figure10. great cairo's share of Green spaces in square meters per individual
(Source: Individual share of green spaces in Cairo based on 2020 data (Aly & Dimitrijevic, 2022)

2.2.2 Hydrographic systems and flood Risk

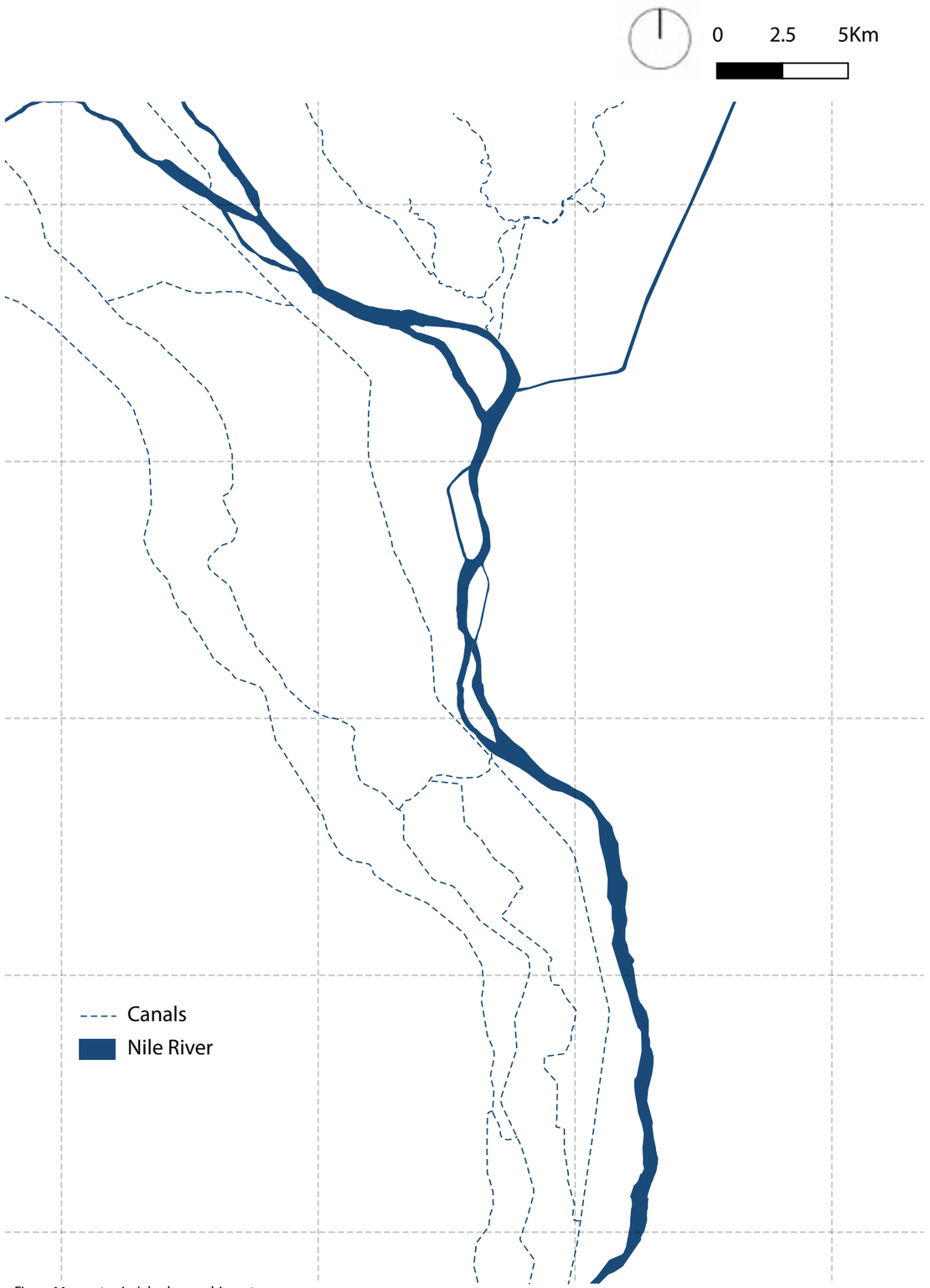


Figure11. great cairo's hydrographic system
(source: Author,map created using QGIS)

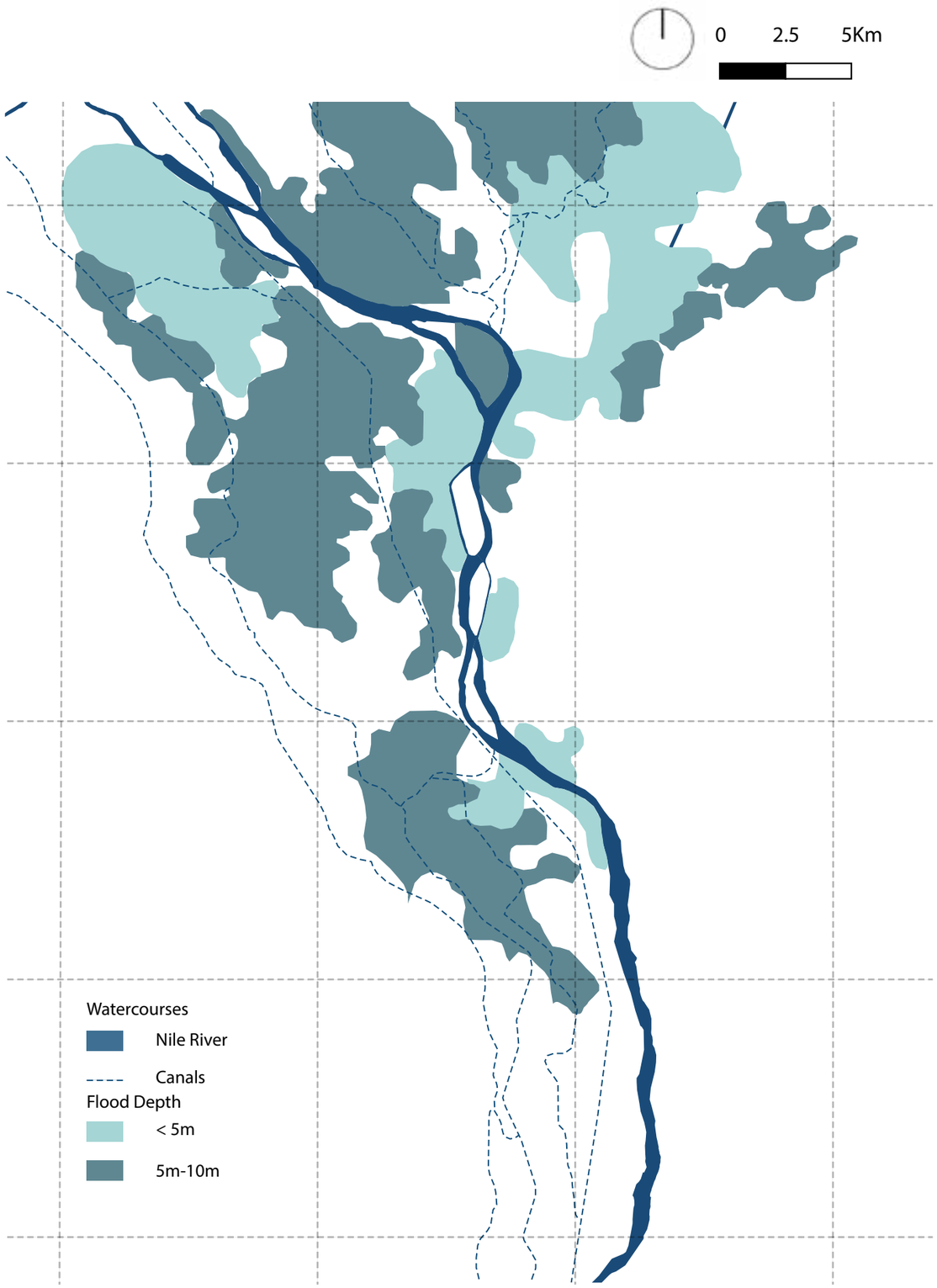


Figure12. great cairo's flood risk
Source: Scenario-based assessment of flood-prone areas at the mega-city of Cairo (Taubenböck, Wurm, & Netzband, 2011)

2.3.1 Road Network

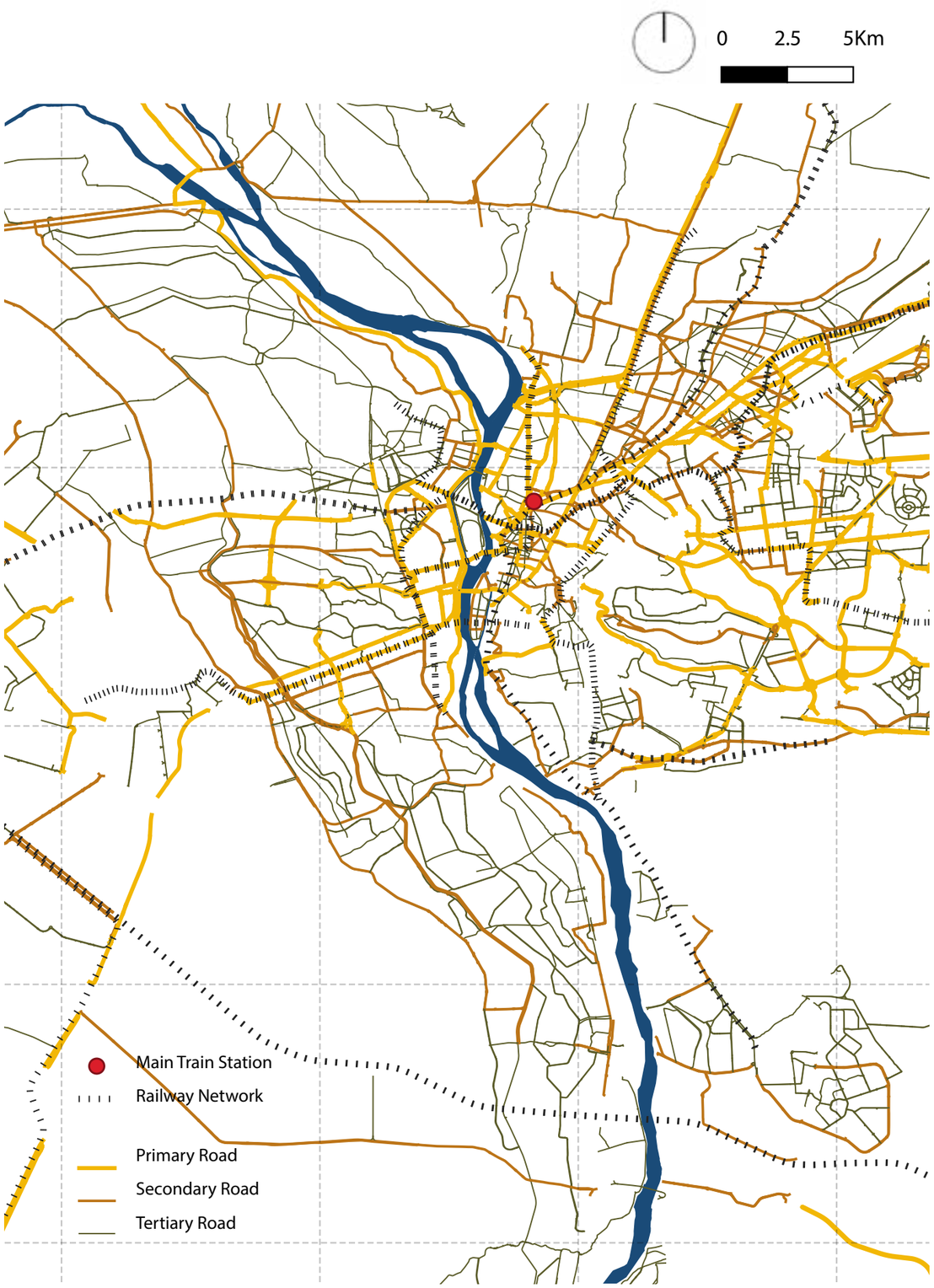


Figure13. great cairo's road network Source: Transport for Cairo, Open Data Portal (Dashboard 165), 2025.

The road network in the Great Cairo Region has a hierarchy, Showing the biggest population density is near the center along with the clusters of employment, services, and daily activity take place.

The new extensions attempt to follow the outward spread of the city. However, the pace of urban expansion continues to outstrip the development of road infrastructure, creating difficulties in mapping, planning, and regulating new mobility corridors.
Formal transport services depend heavily on primary and secondary roads, while informal transport systems, such as minibuses, extend deeper into neighborhoods by using tertiary roads.
This reveals a system where official planning only partially aligns with actual mobility demand.
What we conclude from the analysis of the road network is that while the Greater Cairo Region possesses a strong central hierarchy, its peripheral expansion lacks the coordinated infrastructure required to support a rapidly growing metropolis.

Formal Transport Systems

The formal transportation system in Greater Cairo is centered around a network of primary and secondary roads, as well as major transit lines like metro lines and bus routes, train route is vert limited and small
these systems are designed to provide structured and high-capacity transport for commuters that aims to reduce congestion in the central urban core.
Unfortunately, it does not cover the full extent of the metropolitan city, leaving the newly built cities which are designed by the Government of Transport without structured coverage.
In conclusion, the system remains insufficient in addressing the mobility needs of the expanding periphery.

Informal Transport Systems

The informal transportation system in Greater Cairo is characterized by its adaptability and widespread reach.
Microbus and Tomnaya fill the gaps left by the formal network, often providing more flexible and direct routes that serve local neighborhoods. On the other hand, this route network is an individual design by the Microbus or Tomnaya drivers, who check the routes most frequently used and make them their day-to-day routes with the possibility of change.
The informal transportation network is indispensable for the Greater Cairo Region, bridging the gaps left by formal systems and ensuring mobility in less accessible areas, but it is still insufficient in the expanding periphery.

2.3.2 Formal Transportation Systems

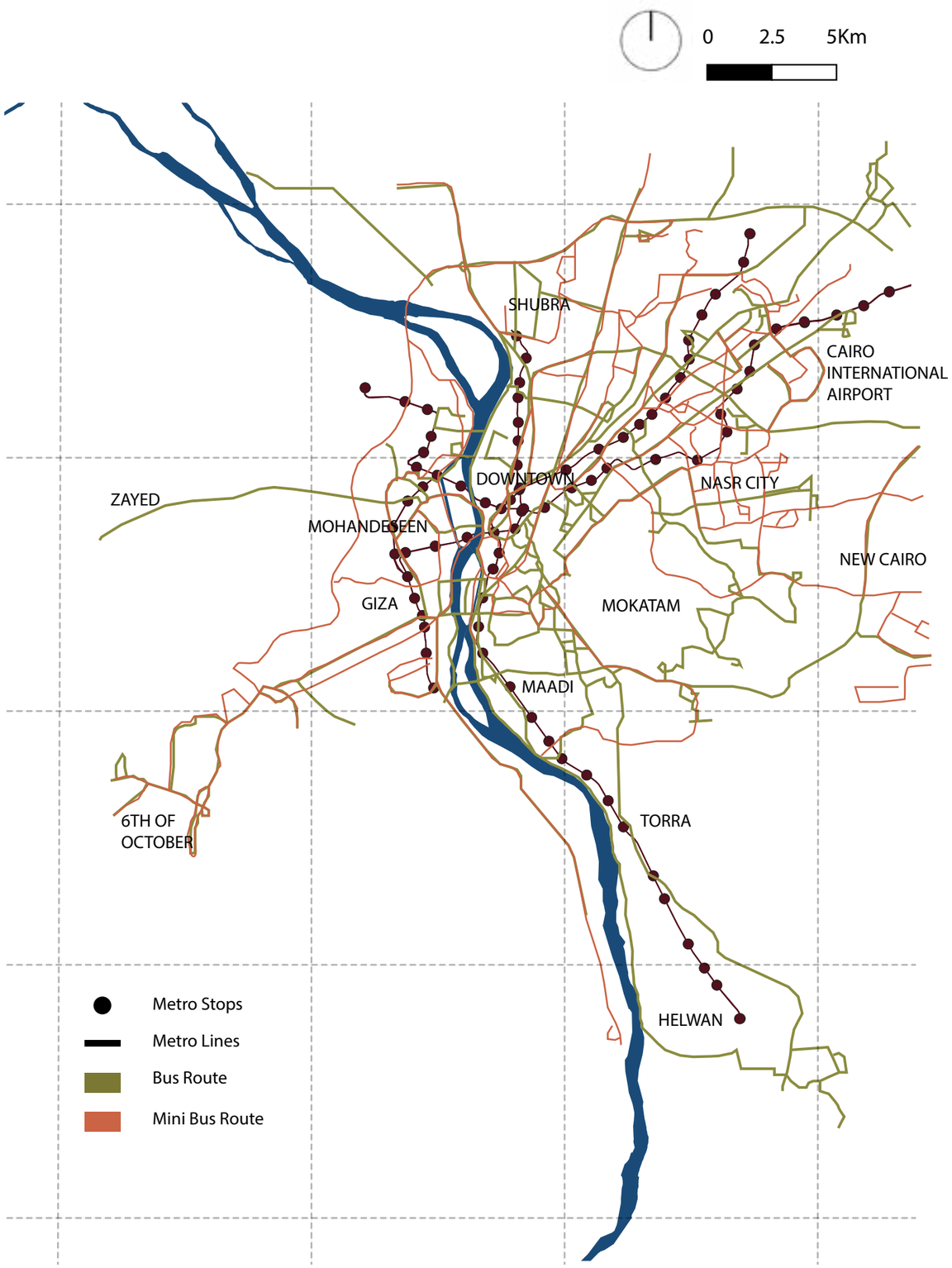


Figure14. great cairo's formal transportation system
Source: Transport for Cairo, Open Data Portal (Dashboard 165), 2025.

2.3.3 Informal Transportation Systems

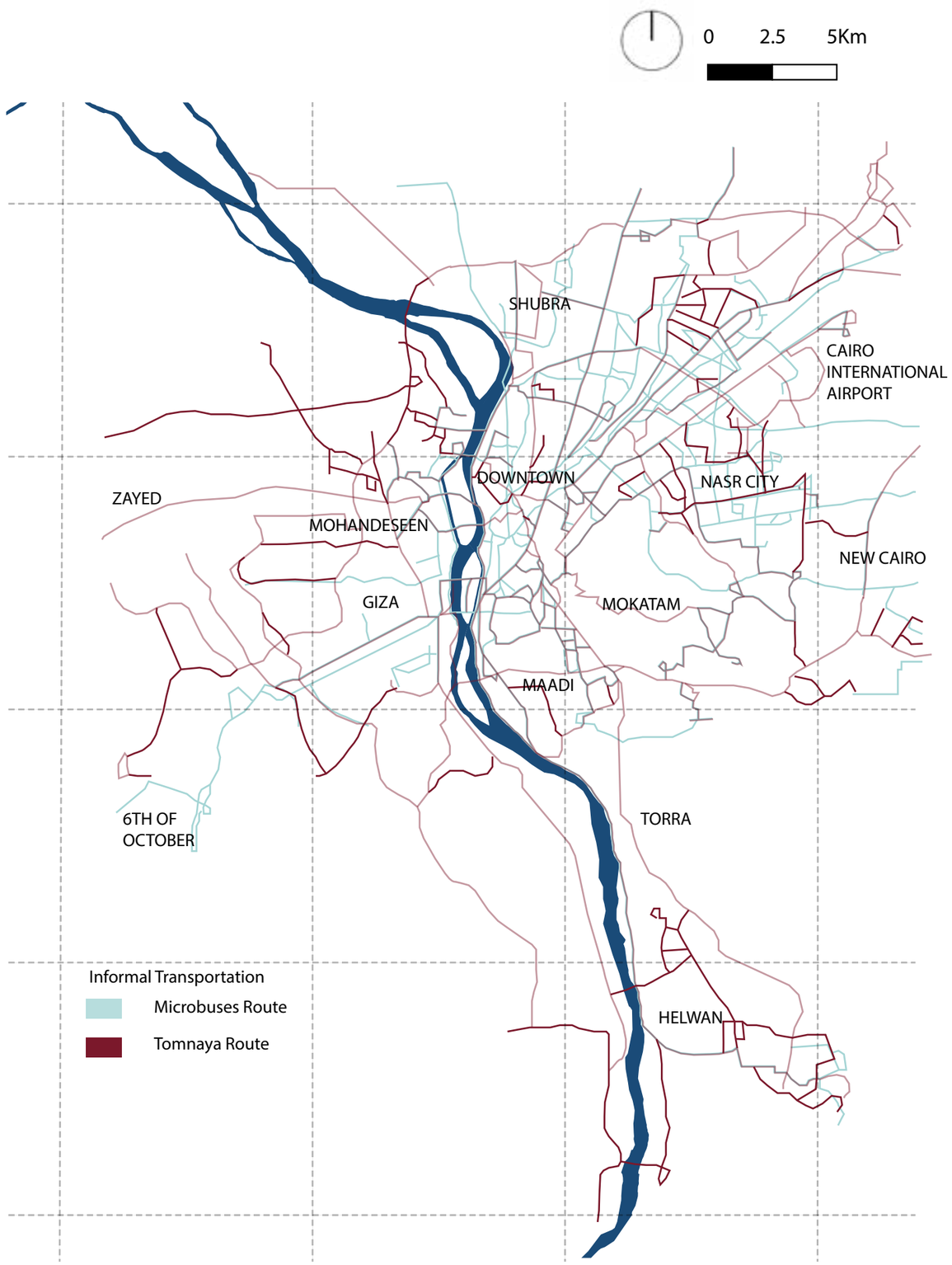


Figure15. great cairo's formal transportation system
Source: Transport for Cairo, Open Data Portal (Dashboard 165), 2025.

2.4 Mobility projects in Great Cairo Region

The grey-black colour scheme marks the existing projects in the Great Cairo Region, which are the first 3 lines of the metro network along with the first phase of LRT (light rail transit) that is up and running and finally the monorail eastern extension is in the testing phase.

The planned mobility projects across the Greater Cairo Region show a strong focus on enhancing east–west connectivity, especially the Roads leading towards the New Administrative Capital. Most of the new metro, monorail, and high-speed rail extensions exist along the eastern side of the creating there is a well-connected corridor.
In contrast, the western expansions, especially those serving 6th of October and Sheikh Zayed city shows a fewer strategic projects and slower development.

The distribution of upcoming mobility projects reveals an imbalance, with rapid pace in the eastern sector and limited investment in western settlements.
While the east is being transformed into a high-capacity, multimodal transport , the west remains dependent on the existing insufficient road corridors, lacking the transit upgrades required for its growing population.

LRT (light Rail Transit train)

The Monorail Project

Figure16. photos of the new transport systems in great Cairo region
souce : Property Finder Egypt — LRT overview and route information,Arab Contractors. (n.d.). Cairo Monorail – The New Administrative Capital and 6th of October Lines.
Daily News Egypt. (2025, August 25).

The future urban and transport planning in the Greater Cairo Region is primarly governed through a centralized, top-down institutional framework.
The key authorities that take place are:
1-**Ministry of Transport (MoT)**
Responsible for national transport policy, metro, rail, and major transport projects. It is responsible for overseeing transport planning and investment in infrastructure.
2-**National Authority for Tunnels (NAT)**
It is the chief executive body for the planning, designing, and execution of metro lines, Cairo Metro Line 4, and its extensions.
3-**Ministry of Housing, Utilities, and Urban Communities (MHUUC)**
Is responsible for dealing with new towns and expansion areas for urban development (e.g. Sheikh Zayed), land use, and transport and land use.
4-**General Organization for Physical Planning (GOPP)** Prepares national, regional, and strategic master plans, entailing long-term spatial plans that define infrastructure developments on the use of land.

Overall, the future transport and urban projects in the Greater Cairo are defined at the national level, with limited local governance involvement, which strongly influences how large infrastructure projects are planned and implemented.

Future Projects Timeline

The Metro line 4 Phase 1 is being constructed by NAT under the Supervision of The Ministry of Transport, The phase 1 construction started in 2025, with the first train delivery expected in May 2026 and fully operating by 2030 **(medium term).**
On the other hand metro line 4 phase 2 and 3 are still in the Planing Process
The BRT system started its first construction phase mid 2025 and the future expansions planned through **(near to medium Term)**
The high Speed Train is projected to start its first phase in construction by the end of the 2026

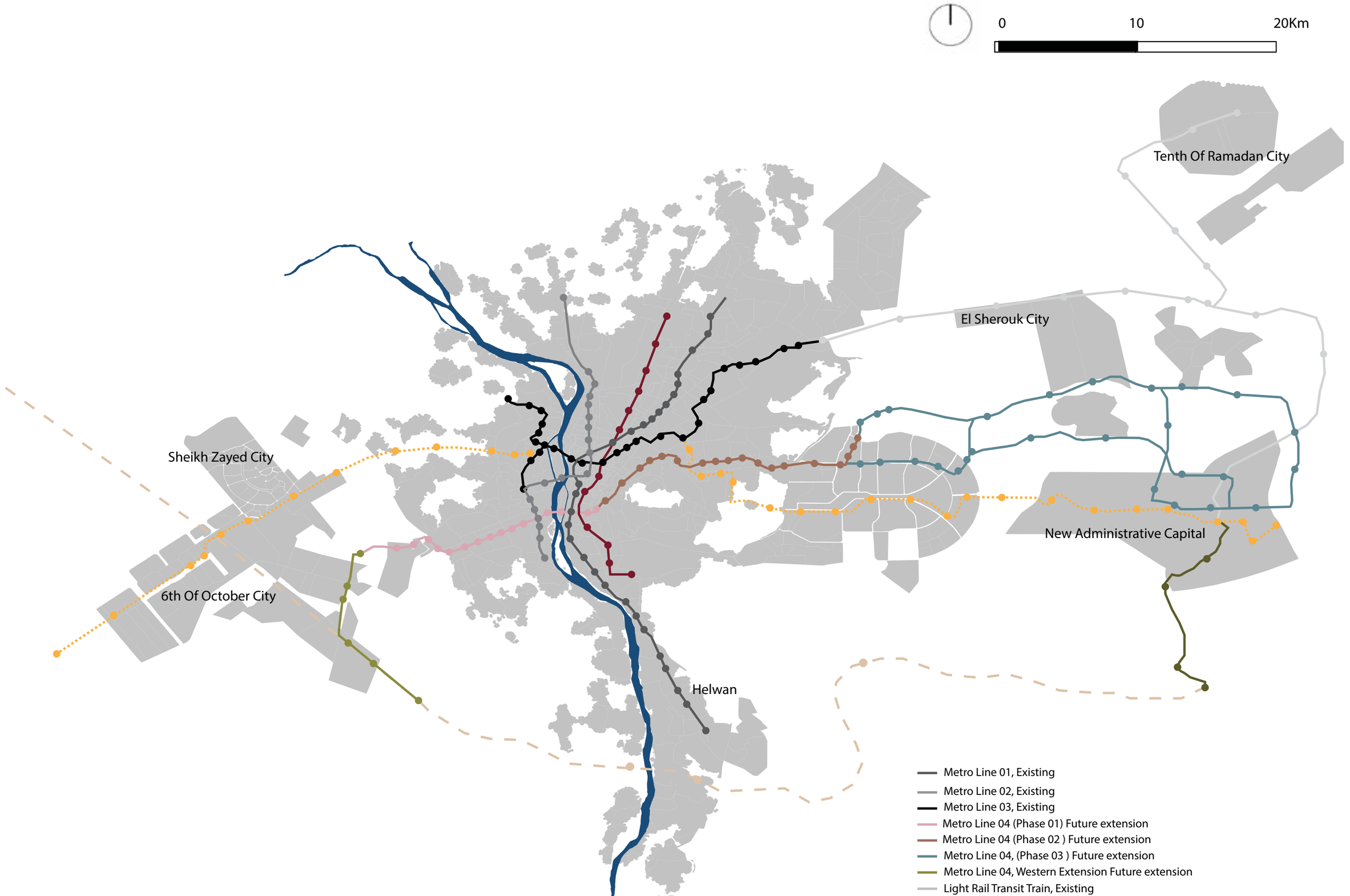


Figure 17 . Upcoming mobility projects in great Cairo region map source: Transport for Cairo. (n.d.). Transportation surveys and data collection for Greater Cairo Metro Line 4 Phase 1 East–West extension

2.5.1 Planned and Informal Urban Development: Emerging Inequalities

Based on the previous analysis, it is obvious that there is a big contrast between social classes in Egypt, particularly in the Greater Cairo Region, where most internal migration occurs.

The Greater Cairo Region was historically a planned area, influenced by both French and British urban planning principles back in the day.
Unfortunately, due to economic and political challenges, the country eventually became weaker.
As people began migrating in search of better work opportunities, large portions of agricultural land were transformed, often illegally and without planning, into urban areas.
This process gave rise to many of Egypt's informal and slum settlements.

At first glance, the social and urban inequality is striking.
In some areas there is green spaces, organized road networks, access to cars, services of all kind and larger living spaces, clearly reflected in the size and design of the buildings.
In contrast, other areas suffer from extremely small dwellings, narrow and in some cases inaccessible streets, a complete lack of green spaces, and very limited public services.

This urban fabric highlights a clear socio-environmental division in the same Area.
People from higher socioeconomic groups have greener urban environments that offer cooler temperatures, better air quality, and good mental health.
In contrast, residents of lower income neighborhoods, don't have green spaces, are deprived of these environmental and health advantages further making the inequalities in living conditions and overall well-being more visible

Maadi Informal Settlements Maadi Formal Settlements

Figure18. Satellite image of two adjacent neighborhoods in great Cairo in Maadi , one formal and one informal

Figure19.Facilities distribuation and road network in formal and informal settlements

Streets In the Informal Area Streets In the formal Area

Figure20. photos of streets typology in formal and informal settlement sources : Banna, E. (2016). Unsafe areas in Giza.
Youm7. Salih, M. (2021). Making of Ma'adi. Al Majalla)

Top View of Maadi Informal Settlements Top View of Maadi formal Settlements

Figure21. photos of top view in formal and informal settlement
Egyin. (2025). https://www.egyin.com/article/90318,Expedia. (2026). Cairo

2.5.2 Congestion Areas

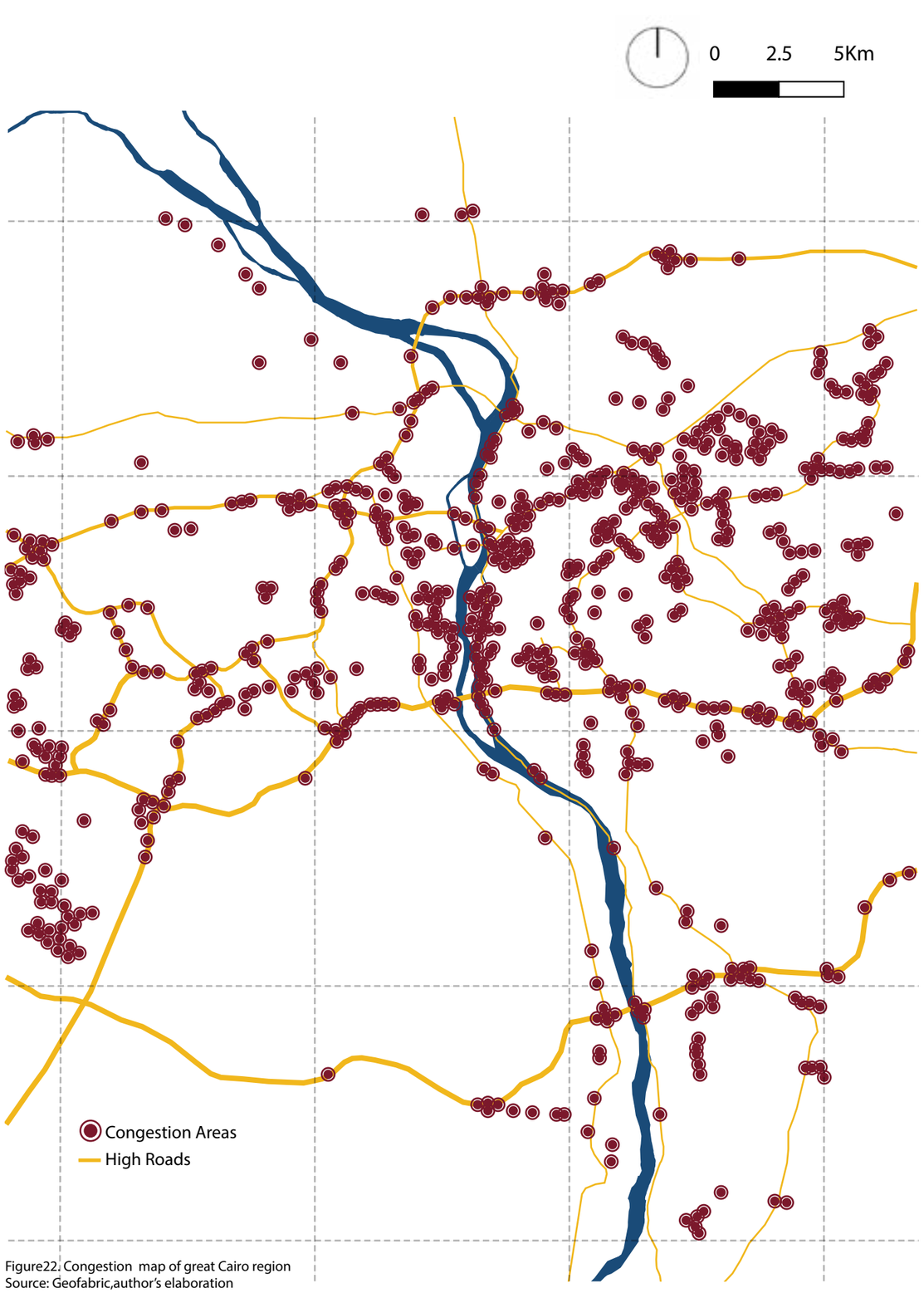


Figure22. Congestion map of great Cairo region
Source: Geofabric,author's elaboration

Figure23. Photos of Congestion areas in great Cairo region
Source: CairoScene, "As Cairo Ranks Among World's Worst Traffic Congestion…" (2025); eniGma Magazine, "How to Survive Cairo Traffic" (2025).

One of the main challenges in the Great Cairo Region continues to face is traffic congestion, that is clearly visible on the map. The most severe congestion points occur at the intersections of major highways, the one connecting the eastern and western areas to the city center to be more specific
There is over 10.4 million licensed vehicles in Greater Cairo, these limited road connections struggle to handle the daily flow of commuters.

The peak of congestion is concentrated in central Cairo, the city's main residential and employment hub, which hosts nearly 60% of the region's 21 million inhabitants.
Congestion exists along the eastern and western corridors, where many residents live but work in the center or on the opposite side of the city, intensing the pressure at highway entries, intersections and endpoints.

Beneath this mobility crisis lies the issue of poor infrastructure and outdated urban design.
The city's central road network was originally planned for a smaller population and cannot support today's number.
The narrow streets, combined with the dense and unplanned urban fabric make expansion nearly impossible.

The government has constructed new highways linking the east and west to the city center, these additions have worsened congestion because all routes still funnel into the same limited and overburdened core, which does not have the capacity to absorb such high traffic volume.

Main Results

The previous analysis shows that the Great Cairo Region is divided into east and west sides.
Most of the metropolitan density, services, and infrastructure are concentrated within the historic corridor along the Nile, while urban expansion has pushed outward into both eastern and western desert territories.

However, the previous analysis shows that these two sides, east and west, have expanded unevenly.
The east side received more coordination and higher infrastructure investment due to the New Administrative Capital that is being built there and its political importance, since it will host many governmental headquarters and services, creating a contrast with the west side, which did not receive as much infrastructure planning or coordination.

The comparison between the eastern and western sides of the Nile shows that the Greater Cairo Region is experiencing an imbalanced pattern of development.
While the east is being transformed into a major political and mobility hub, the west continues to rely on car-dependent corridors and limited public transport.
This imbalance places Sheikh Zayed and its surrounding settlements at a critical point.

For this reason, Sheikh Zayed emerges as a strategic site of intervention: it represents the western expansion's challenges, exposes gaps in connectivity and environmental quality, and holds strong potential for developing a more integrated, sustainable urban and mobility model

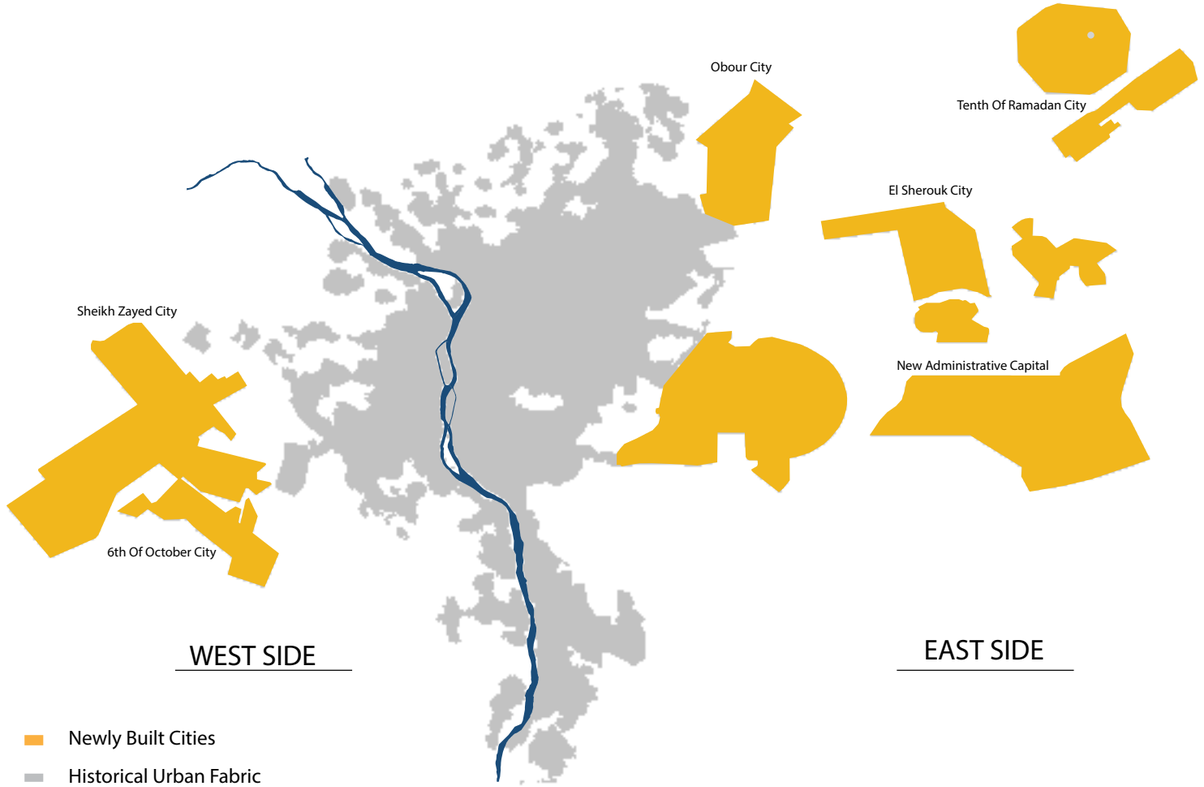


Figure 24. Map of the east and west expansions in great cairo region
source(open street map-author's elaboration)

Shifting from a Car-oriented urban structures

3.1 Active Mobility as a tool for Sustainable future Cities

Walkability as Urban Planing Tool for Sustainble Cities

Walkability serves as a critical urban planning tool that bridges the gap between theoretical frameworks and global development goals (SDG)
In David Banister's Sustainable Mobility Paradigm (2008), achieving a sustainable city requires a fundamental shift where "the street is a space (not a road) for people and social interaction, where movement and other activities take place". By designing at the "personal scale to allow both high-quality accessibility and a high-quality environment," walkability ensures that travel is no longer just a derived demand but a "valued activity in itself".
This Vision Directly Compliments the SDG "safe, affordable, accessible and sustainable transport systems for all".

So What Makes A city Walkable ?

Making a city walkable does not depend only on the presence of pedestrian lanes, it mainly depends on having designated destinations to walk to. The problem with our current city planning is its rigidity, where each area is assigned a single, specific function. For instance, cities are often divided into residential areas, working areas, entertainment areas and services areas This model forces residents to rely on cars to move from one area to another. At the same time, it makes working clusters become empty after 5 p.m., creating inactive spaces and potential safety hazards.

On the other hand, flexible planning allows different functions to coexist within the same area, resulting in a more active urban environment and making walking the natural and preferred choice.
which makes the Accessibility by proximity the Main Tool for such Planing

Rigid Planing Model

Flexible Planing Model

Figure 25.Rigid and flexible planing models source: Salem, M. (2025). What makes people walk … [LinkedIn post].

The System of Active Mobility

While walkability is the cornerstone of the human-centric city, it must be integrated into a bigger system of active mobility.
Active mobility consists of all forms of non-motorized transport mainly walking and cycling shifting the focus from **the "physical dimensions" of traffic to the "social dimensions" of people**.
According to David Banister (2008), this requires a "new transport hierarchy" where pedestrians and cyclists are placed at the top, and car users at the bottom.
Adopting this hierarchy, makes the urban environment moves away from "speeding up traffic" and toward "slowing movement down."

Why Does Active Mobility Matter?

Recent urban researches positions active mobility as the mechanism through which both sustainable mobility principles and proximity based urban models become physically achievable.
Banister (2008) calls for a transformation of street hierarchy that prioritizes pedestrians and cyclists over vehicles, Moreno (2020) as well emphasizes the necessity of organizing cities around short, efficient daily paths that reduce dependence on private vehicules.
Active mobility connects these two perspectives by translating proximity into real movement behavior and transforming streets into lived public spaces rather than traffic corridors.

The result of this approach is cycling and walking on one hand are not only transport modes but also that structure accessibility, support public health, reduce environmental impact, and strengthen social interaction in the neighborhood.
This makes active mobility act both as a mobility plan and a spatial-social context supporting resilient and human focused sustainable cities.

One of the main pillars to achieve sustainable mobility is active mobility.
As previously mentioned by David Banister (2008), distance reduction is crucial, which means that we need to look at human daily needs as a basket that must be approximate to where they live, making accessibility by proximity the core for such a goal.

3.2 Accessibilty by proximity and the 15 Minutes City

accessibility by proximity emphasizes the role of spatially reorganizing land use, services, and public space to enhance active mobility and make essential destinations reachable within short distances (Pajares et al. (2021)

So what is Accessibility By proximity ?

Accessibility by proximity (or proximity-centred accessibility) means the ease of reaching essential activities, services, and destinations within short distances and reasonable travel times, primarily through walking or cycling, rather than relying on faster, car-dependent transport - Dr. Cecília Silva (Proximity: The key to sustainable and accessible cities.)

The Covid-19, The Lockdown and the Harsh Circumstances that people had to experience was the main Drive to seek Change in our Living Environment and the focus on the fact of the lack of human based living spaces arised.
A person needs to have his day to day services within walking distance, in other terms people need to work, have their hobbies and spend time with their social circle, have access to open spaces all within a walking or cycling space from where they live.

For Instance the Unbuilt land or Abandoned areas can turn into multi-functional areas, closed schools on weekends could be open as Public Playgrounds, having proper open/Green Spaces where people can use ,overall it is a must to make the pedestrians and active mobility choice as the priority in the planing process.

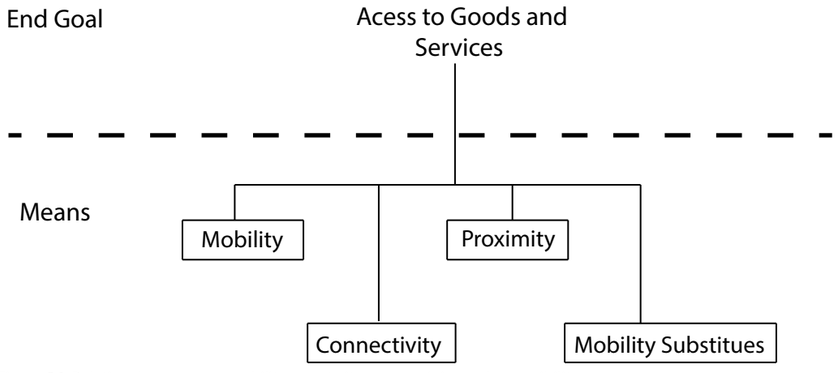


Figure 26. Relationships among mobility, proximity, connectivity and accessibility
source : McGurrin, M. (2017, February 13). A brief note on modal access across America. McGurrin Consulting.

The 15min City

When mentioning Accessibility by Proximity the 15min City is the first model that comes to mind.
The model of the '15-minute city' for urban development and urban planning, proposed in 2016 by Professor Carlos Moreno (Moreno, 2016), represents a relatively new way of thinking about urban planning that focuses on human scale and the experience of the city (Allam et al., 2022b; Liu et al., 2024; Moreno, 2016; Poorthuis and Zook, 2023). Moreno's idea, as an evolution of Banister's model and his research on 'polycentric city' and 'chrono-urbanism' (the integration of the time dimension into urban planning, combining places, movements and time), suggests an approach to design based on 'proximity'.

Its fundamental assumption is that cities should be planned so that, within a 15-minute walking or biking distance from their residence, citi-zens can meet all their daily needs: work, home, food, health, education, culture, sports and recreation (Moreno, 2022).

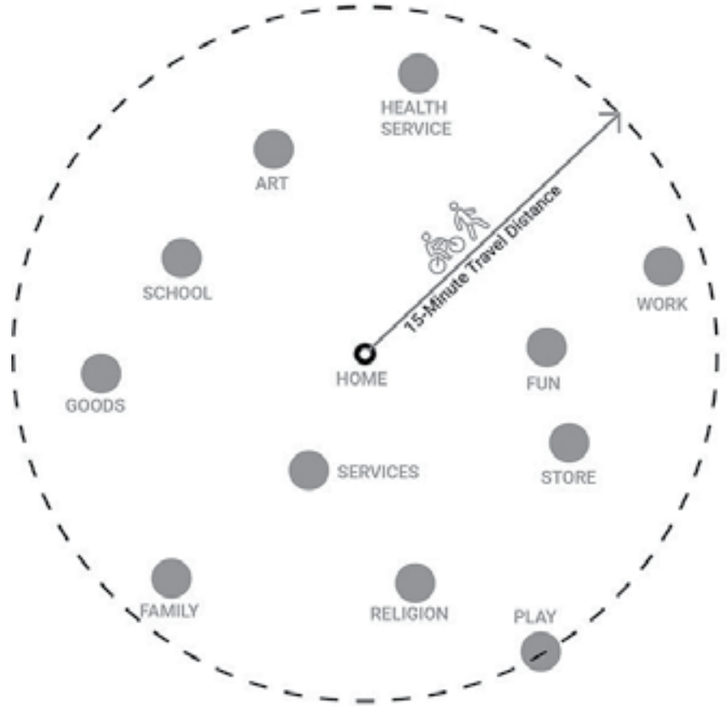


Figure 27. 15min city walkable places
Source: Urban Land Institute (2021), "De-Infrastructuring in the Era of the 15-Minute City," Urban Land

The Components of Designing a 15min City
Designing a compact, self-sufficient local areas with pedestrian/ cycling infrastructure, green spaces, and integrated services to foster sustainability, social connection, and healthier living by making cities more human-centric.

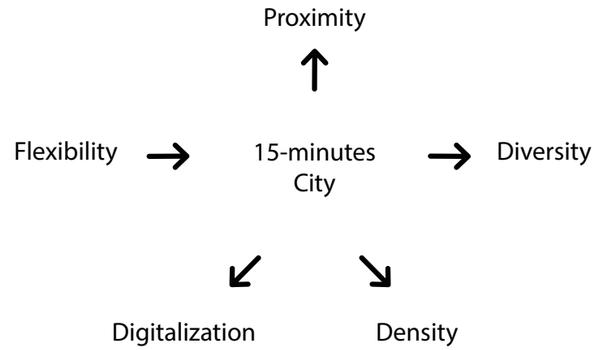


Figure 28.15min city relationship to proximity,diversity,density,digitalization and flexibility
Source:Iqbal, A., Nazir, H., & Qazi, A. W. (2025). Exploring the 15-Minutes City Concept: Global Challenges and Opportunities in Diverse Urban Contexts. Urban Science

Figure 29.15min city planing principles
Source: Dr. Benjamin Büttner: Accessibility Planning at TUM. Technical University of Munich, Flower of Proximity

Summarizing Moreno's views, he outlines the three fundamental characteris-tics of the 15-minute city are: (i) the city rhythm should align with people, not cars; (ii) each square meter of urban space should serve multiple functions and (iii) neighbourhoods should support living, working and thriving.

Figure 30. 15min city diagram summarized
source: 2030 Palette. (2024). 15-Minute City. Architecture 2030.

In the flower of proximity approach (Buttner) identifying the Human Services Needed into 6 Petals Of flower and at the center is their place of living.
Those Services Represent the "Basket" of the daily services that are: living, working, commerce, healthcare, education, and entertainment

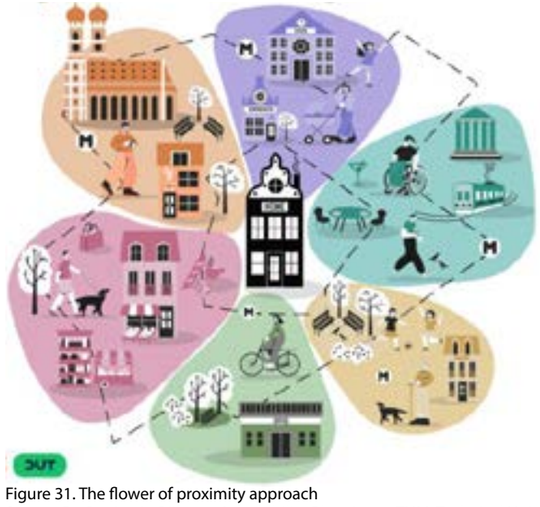


Figure 31. The flower of proximity approach
Source: Dr. Benjamin Büttner: Accessibility Planning at TUM. Technical University of Munich, Flower of Proximity

3.3 The Superblock Barcelona as a design reference

An other example working in supporting walkability and accessiability by proximity is the barcelona superblock model.

The Super Block Project

About
Urban Ecology Agency of Barcelona
(UEAB), Salvator Rueda, 2010s

Scale
The model is applied to the whole city in the densely urbanized land.

Sitaution
Barcelona is a car oriented highly populated City wih limited Public Spaces so the need to reduce Congestion, Pollution and to improve the Quality of life was a must

Strategy
Promote Active Mobility and the sense of Community
Transform internal Streets into pedestrian friendly zones and lastly Restrict the cars Inside the superblock and keep main roads for circulation purposes
The neighbourhood planning strategy is based on the five Cs: ensuring areas are Complete, Compact, Connected, Complex, and Convivial.

Principles
Putting the pedestrians at the center of the Project
Prioritsing walking and cycling over cars, Public space.
Activation making the streets plazas, green areas, and social spaces making it for every usage not just the cars.
Raising the sense of community in the neighberhood.
Scalability- the model can be replicated across multiple neighborhoods.

Figure 32. Superblock implementation in Barcelona Superblock
Source Wang, L. (2020, May 7). Superblock of Sant Antoni reclaims Barcelona streets for pedestrians. Inhabitat.

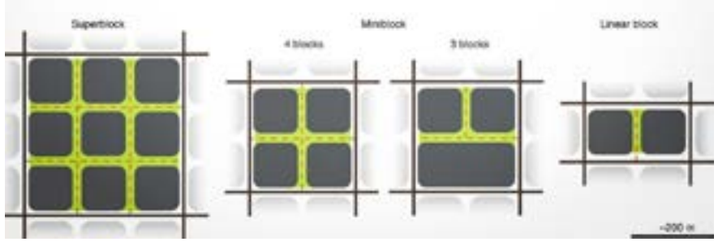


Figure 33.Superblock Principles
Source :Castrezzati, M. (2023, March 28). Barcelona's superblocks: Putting people at the centre – Literally. CityChangers.org

Objectives
Reduce Pollution, traffic and Congestion
Encourage local commerce and social Interaction
adopting healthier Lifestyles
Integrating the 15minutes city concept by making everything reachable by foot

Intervention

The model aim is to put the residents as a priority and traffic seperation
repurposing interior streets for residents, implementing low-cost, tactical urbanism solution for the first phase that develope into structural in the future phases.
The inner streets are transforming into public spaces for all usages not only cars usage,encouraging cycling, walking and making them free of cars most of the times.
Rellocating the traffic and managing the motorised vehicules to border streets to make the Inner streets Public spaces for the community.
this model on the long run aims to reduce CO_2 emissions by reducing private cars and promoting sustainable transport methods.

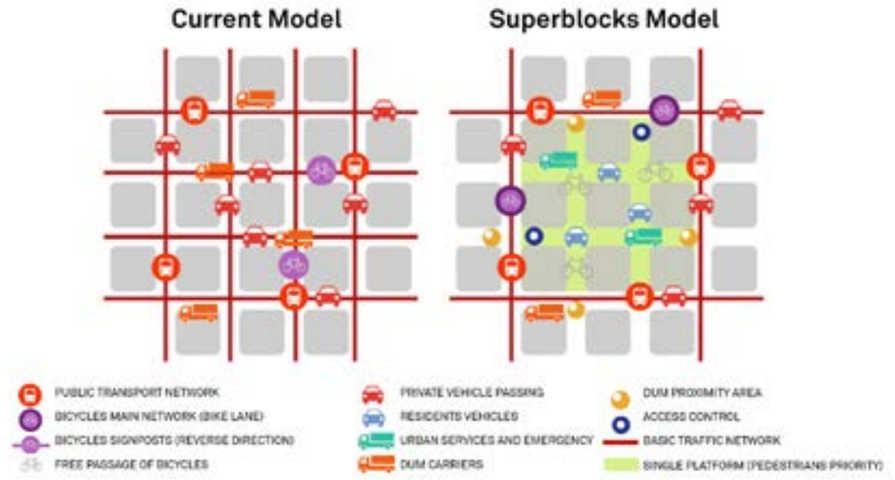


Figure 34. current model and superblock model
Source :Andrews, W. (2017). Visiting Barcelona's Superblocks. Will Andrews Design.

Sheikh Zayed city

4.1 Introducing the Sheikh Zayed City

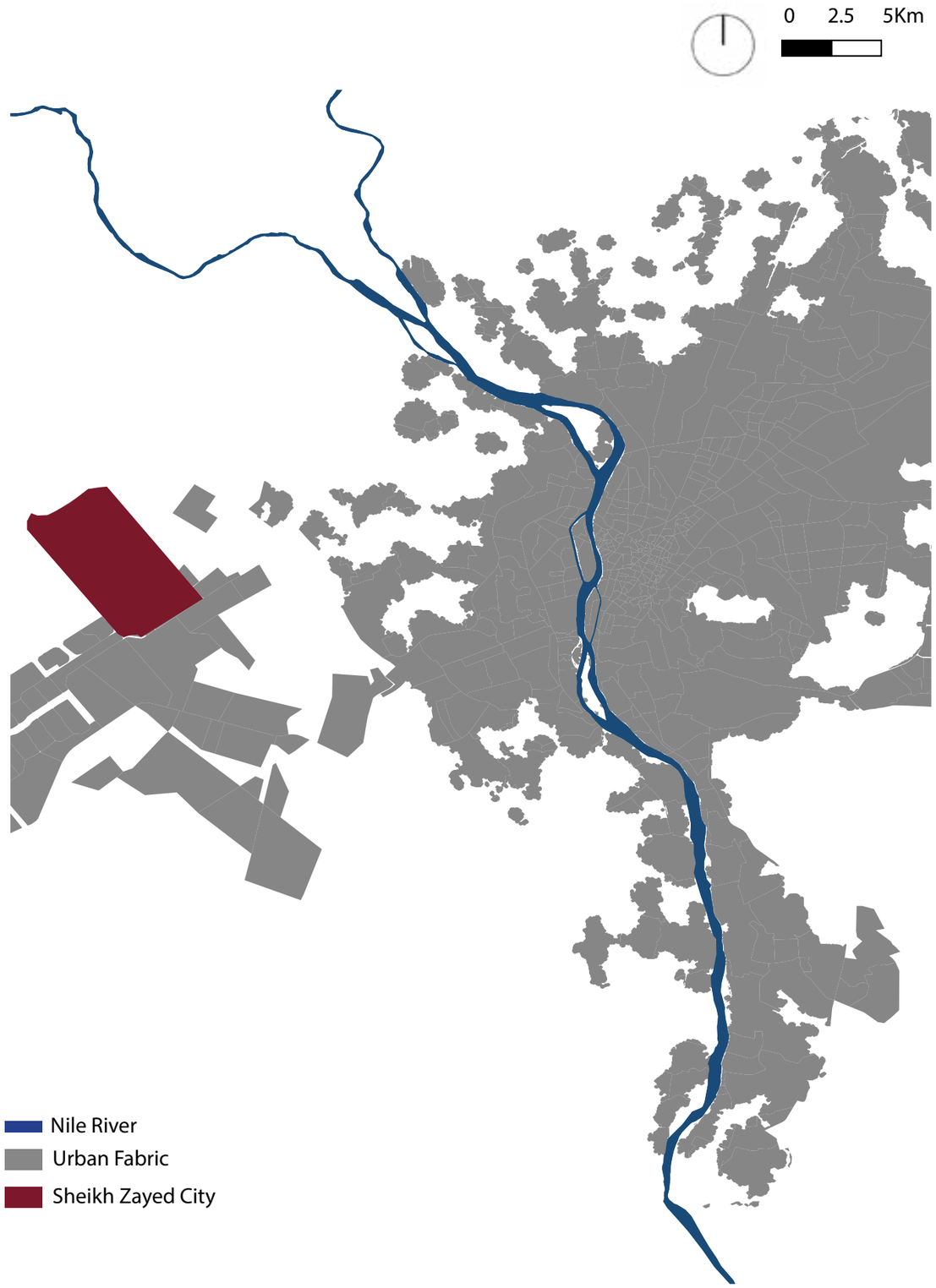


Figure 35. Location of Sheikh Zayed city.
(source: open street map-Author's elaboration)

Sheikh Zayed City is a modern planned urban area in Egypt which was established in 1995 and still is in the building and expansion process. It is on the west side of the Nile River. It is built on 10.4 thousand acres (NUCA 2023) and has a population of 330 thousand inhabitants.

So why was Sheikh Zayed City built?

It was built as a part of the strategic Egyptian government initiative to address the critical issue of overcrowding and congestion in the Greater Cairo metropolitan area and to provide new areas for urban expansion away from the central core.

Where did it get the name Sheikh Zayed from?

The city was established with funding from the Abu Dhabi Fund for Development as a gift from the United Arab Emirates to the Egyptian people. Therefore, it was named in honor of the late Sheikh Zayed bin Sultan Al Nahyan, the founder and first president of the UAE, in appreciation of his support for Egypt

Figure 36.Satellitephoto of Sheikh zayed city(source: Google earth)

It was established through Presidential Decree No. 325 (1995).

The Current Urban Fabric of Sheikh Zayed City
Sheikh Zayed City is divided into 17–20 residential neighborhoods, each containing four sub-districts. These neighborhoods vary in terms of living standards and available services.

The Approach Behind Sheikh Zayed City
-Enhancing the quality of life
-Creating various housing options for all economical residents
Sheikh Zayed has a prime location which attracts private investors.
-Modern and planned design, which is something that the historical core of Greater Cairo lacked
-It is the best option on the west side, since the historical core is very crowded. People migrate from such areas to Sheikh Zayed to seek calmness and less populated areas.

The Future of Sheikh Zayed City
2017
As Sheikh Zayed City started to grow massively, a Presidential Decree was issued No. 77 (2017).
It is about 8,650 acres.

The Reason Behind It

1- Accommodate residential growth, help absorb the increasing demand on the west side population, along with providing Sheikh Zayed's current urban fabric with its missing services.
2-Trying to integrate smart city solutions
3-To boost investments and economic activity, by releasing new developable land, the extension creates opportunity for real estate and investment projects, enhancing economic growth, which Egypt is in great need of since it is a third world country.

The process has been slowed down, but as Egypt's economy is starting to strengthen, it has started to pick up lately.

So what is happening now in Sheikh Zayed City new extension?

Since the decree, the government has been implementing infrastructure works (roads, utilities, housing development) and issuing building permits as part of transforming the new area into a full-fledged urban extension of Sheikh Zayed City, but this process took a set back due to the inflation that happened in Egypt in 2022.

2025

As of late 2025, roads, utilities (water, sewage, electricity), and network works are actively being built within the expansion area, with progress reviews and follow-ups by the Housing Minister and other official parties.

As from 2025, some investors started building in the area, but there are yet no expected finishing dates due to the risk of inflation.

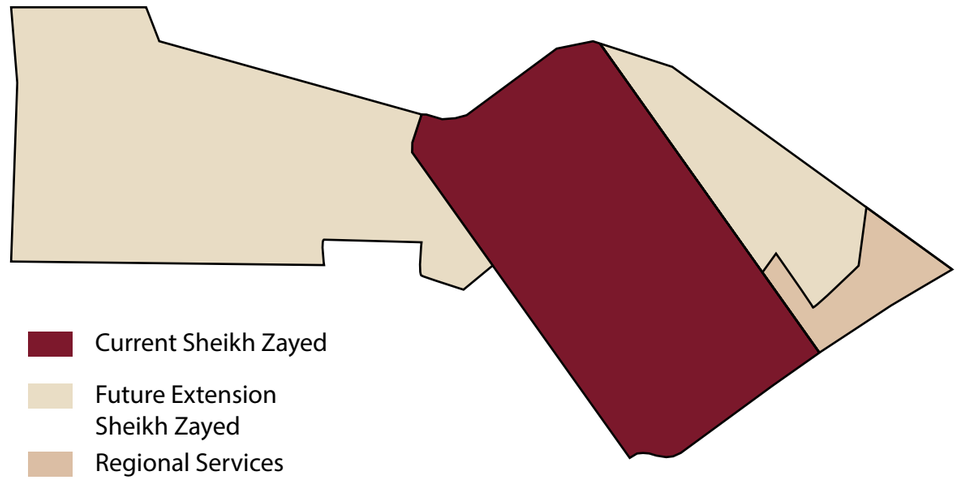


Figure 37.Plan of sheikh zayed city existing borders and new extensions borders
source: (New Urban Communities Authority, Sheikh Zayed City)

4.2 Land use and spatial setting

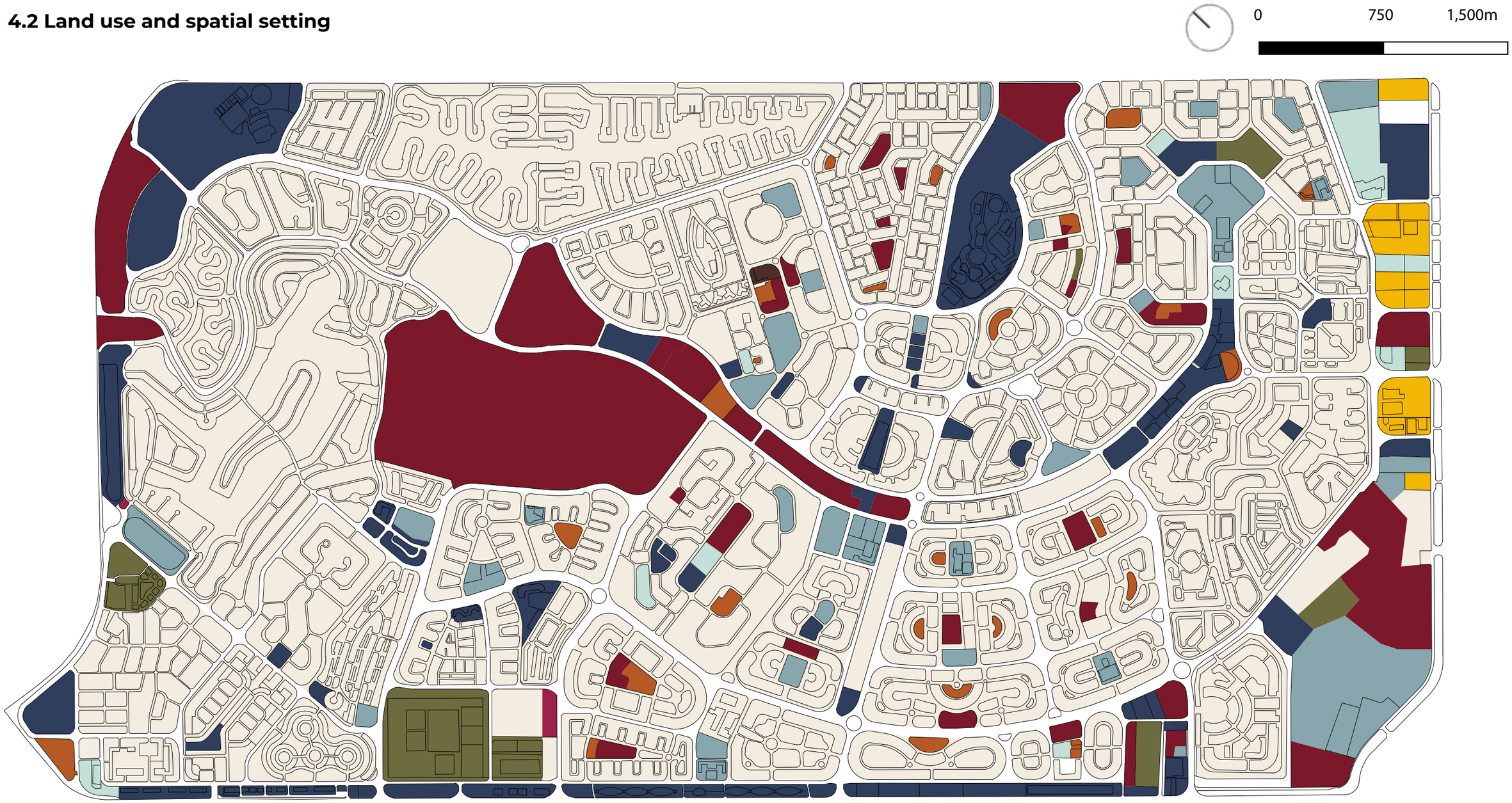
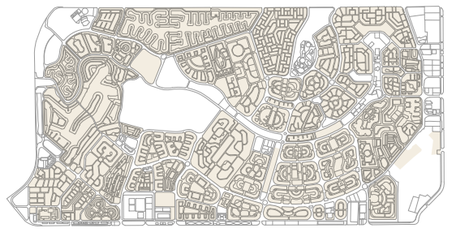


Figure 38.landuse map of sheikh zayed city
source:(open street map-author's elaboration)

Sheikh Zayed's landuse is mainly residential that is organized into well defined neighborhoods, These residential zones are supported by a small network of community level services like schools, commercial centers, and healthcare facilities.
Unfortunately , large areas within the city still remain underdeveloped or empty which creates discontinuous patches in the Planned urban fabric of sheikh Zayed City

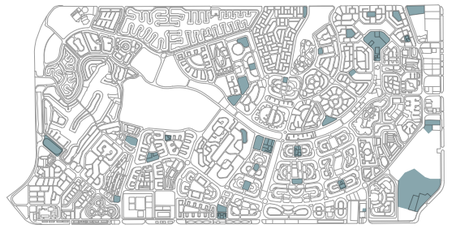
Looking closely at the land use provided in Sheikh Zayed City, it is very clear the residential areas being the primary land use and the visible disparity between other land uses.

Services: Consists of administrative and public services such as government offices, utilities, post offices, and civic facilities.
Health: Includes hospitals, clinics, and medical centers providing essential services.
Education: Includes schools and universities that serve daily or regular trips, especially for children and young adults.
Recreational & Entertainment: Include public open spaces, leisure facilities, and restaurants.
Mixed-Use Buildings: Are very few and compacted in the same area.
Mosques: Almost every neighborhood has one or two.

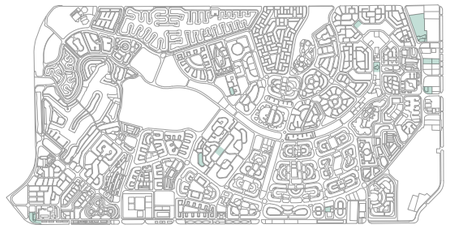


Residential Areas

Vacant Spaces



Educational Areas



Health Facilities

Mosques

Services

Mixed Usage Areas

Recreational & Entertainment Areas

The schools in Sheikh Zayed City are in good condition, and most of them are equipped with playgrounds. A lot of them have a prime location in the heart of their neighborhoods. The schools in Egypt are for all grades from age (3–18), since most of those schools are private ones.

Opportunities

- Since most of those schools are in residential areas, they can be opened in the after hours to provide playgrounds for the surrounding residence.
- Provide safety for the neighborhood due to the after-hours activities.

Figure 39.School in sheikh zayed city
Source: Marvel Internation School's Website

Target 11.7 "By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.

Sheikh Zayed City has a lot of vacant lands that are variable in sizes and locations

Opportunities

- Those vacant spaces can be used to build mixed usage areas to have night and morning activities to keep the area lively and compensate the missing services in the area

Figure 40.Vacant land in Sheikh Zayed city
source:Author's photo

Target 11.3 "Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning."

Health care facilities in Sheikh zayed city are very limited for a city scale.
there only 6 health care facilities in the city and not all of them are public

Opportunities

- some of the multipurpose buildings can have health centers or small clinic

Figure 41. Hospital in Sheikh Zayed City
Source: Healtth Egypt

Target 3.8 "Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all."

Almost every district in sheikh zayed city has a mosque which is a huge gathering point for a lot of people yet a lot of these m

Opportunities

- renovating these mosques Entrances and make it open plazas to create an open space for the community of the neighborhood whic

Figure 42.Mosque in Sheikh Zayed city
source:Author's photo

Target 11.7: "Provide universal access to safe, inclusive and accessible, green and public spaces."

4.2.1 Accessibility by proximity strategy

One of the main problems of Sheikh Zayed City is the dominance of residential areas, which makes the neighborhood very quiet, and the streets in the residential areas become empty after 5 pm.

Luckily, there is some vacant land in Sheikh Zayed which plays a major role in changing this dynamic, along with the different usage of some buildings throughout the day to have day and night activity to keep the area alive at night hours.

- **Building**

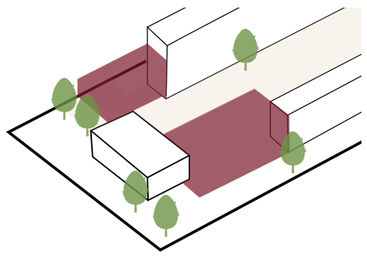
Creating multi-use buildings with the missing functions. For example, health facilities are very limited in the city and need to add more to be able to accommodate the existing population, along with the new population to be added, since Sheikh Zayed is still in the building process, and for the night have other usages like community centers and enhance the bond between the neighborhood and community, and work on the safety of the neighborhood

- **Reactivating Main Facilities with Flexible Activities**

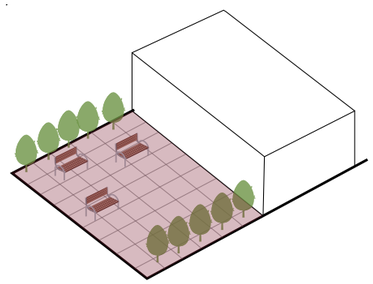
There is a presence of a big number of schools, and most of them are in good condition with sports fields included. Those schools can be open at night hours for the neighborhood to play different kinds of sports, which will help with the safety in the area.

Almost each district has a mosque or two, and those mosques come with huge entrances that are usually unused and in some cases unbuilt, which I think can be a great strategy to use those entrances to create open plazas for the people using the mosques or the community of the neighborhood to use.

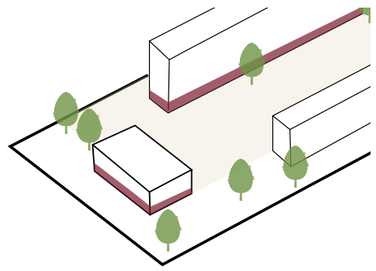
Using the vacant ground floor in some of the buildings as a third place to strengthen the neighborhood.
There is also a possibility to create mixed-usage hubs in some districts that have more vacant lands, mosques, and schools than others, which can accommodate the surrounding areas that might have less services.
these actions enhance accessibility By Proximity in the Sheikh Zayed City



Using the Vacant Land to Create different Mixed usage Buildings- Areas

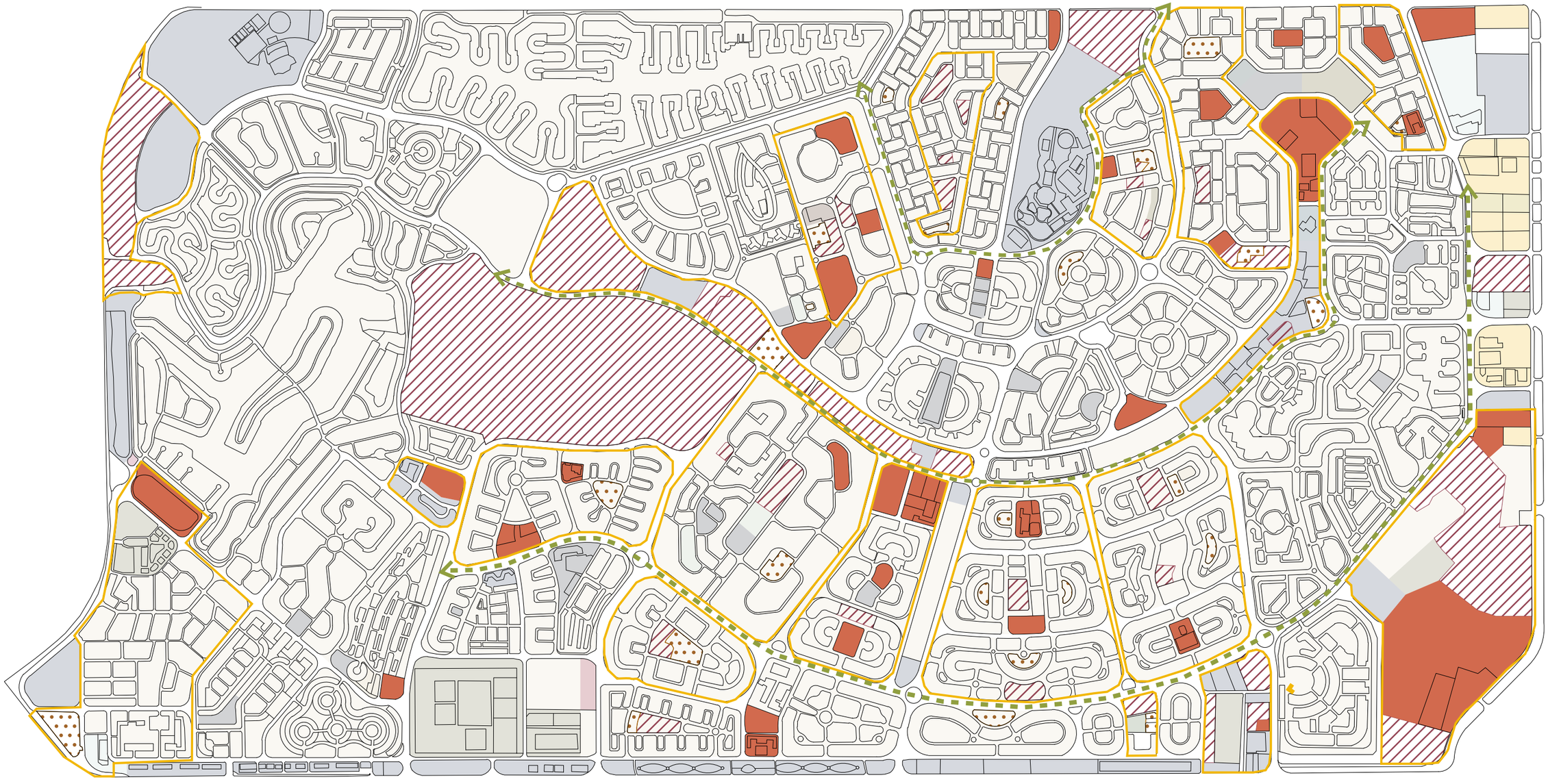


Using the Mosques Entrances As Open Plazas



Activating The Ground Floor

0 750 1,500m



Mosques

School Providing Plygrounds

Potential Areas For Mixed Use Buildings

Multi Usage Hubs

Activity Spine

4.3.1 Streets hierarchy

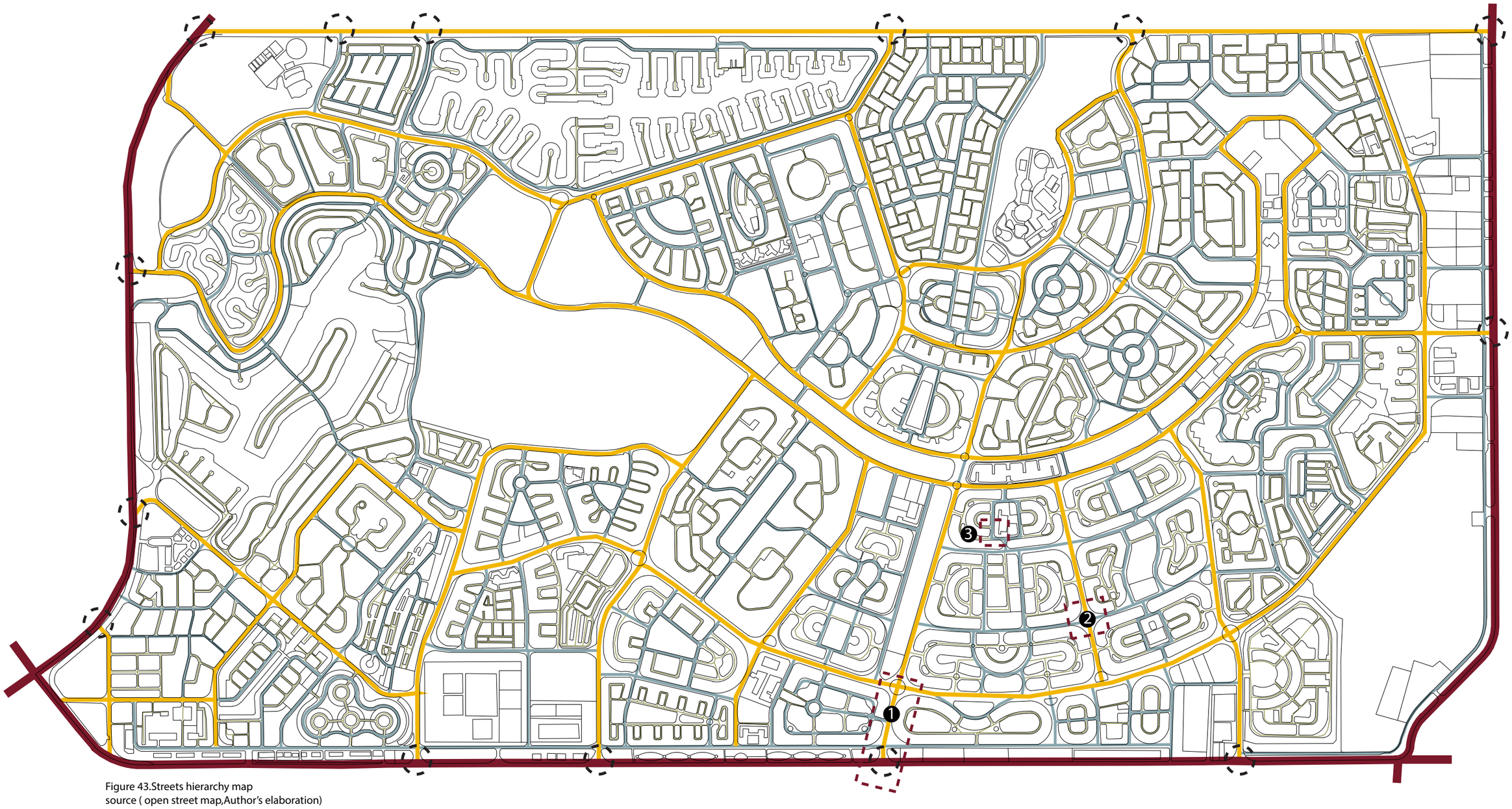
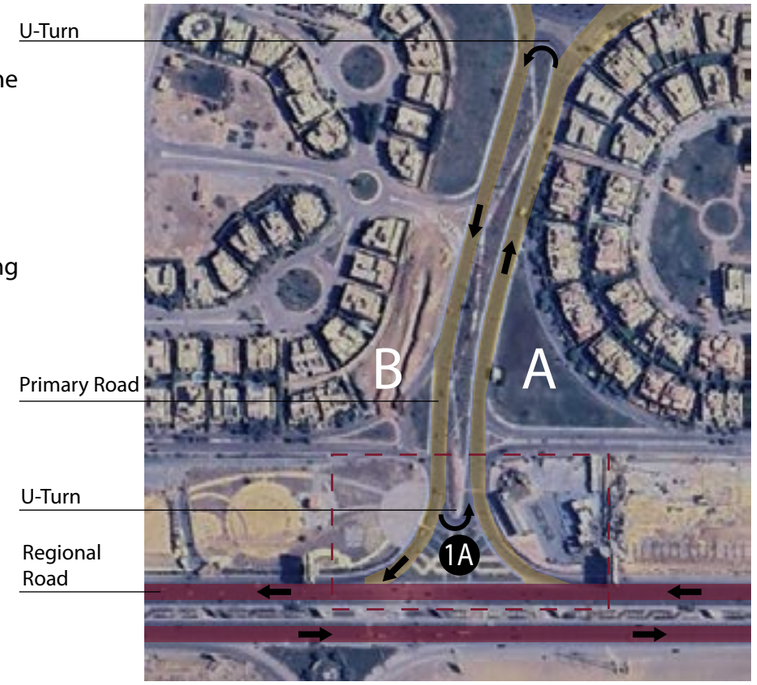


Figure 43.Streets hierarchy map
source (open street map,Author's elaboration)

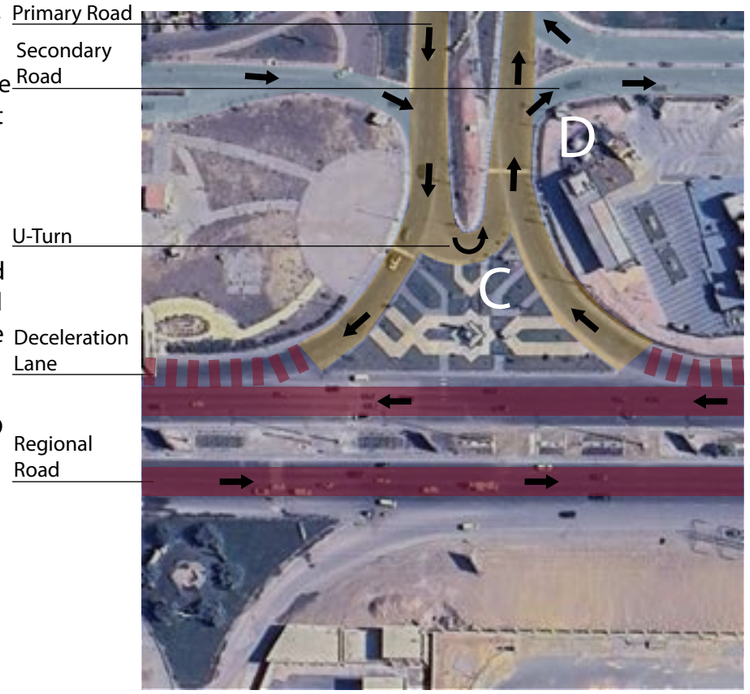
Zoom in 1- Regional To Primary

- This Transition is Found in All the Entrances in Sheikh zayed city
- The Exsting of the U-turn after entering sheikh zayed city is very cruical since the cars are already in the Process of Slowing down which sometimes cause some accidents with reckless drivers
- The inconvience of needing to drive to the first square to get from Point A to Point B longer distance and more time



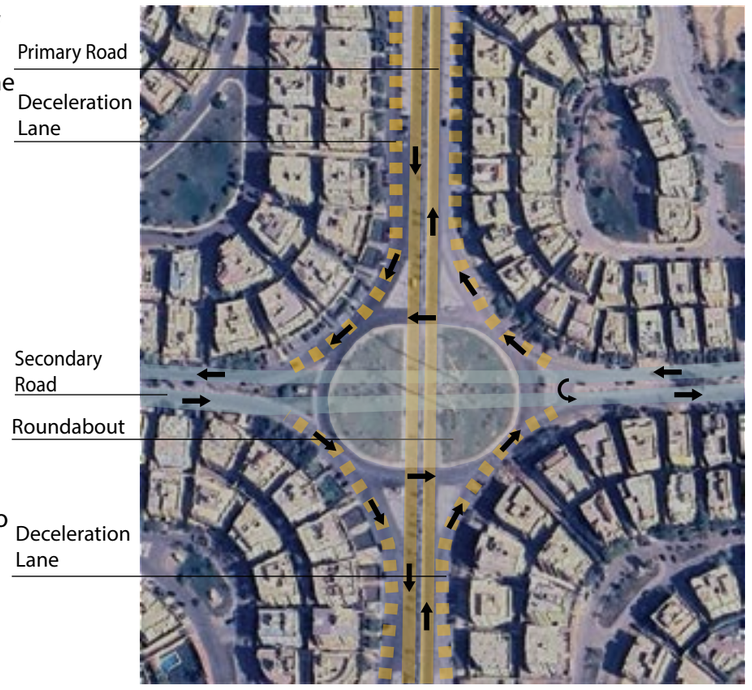
Zoom in 1A - Regional To Primary

- The Existing of Decelaration lane in such context is important but yet it is not well defined which people sometimes tend to ignore the speed limit
- The Intersection of Primary road With 2 lanes Of Secondary Road right after the Entrance with the Existing of U-Turn might cause some accidents due to the near distance between Point C and D With the Factor of fast car coming this might be a Crash Area



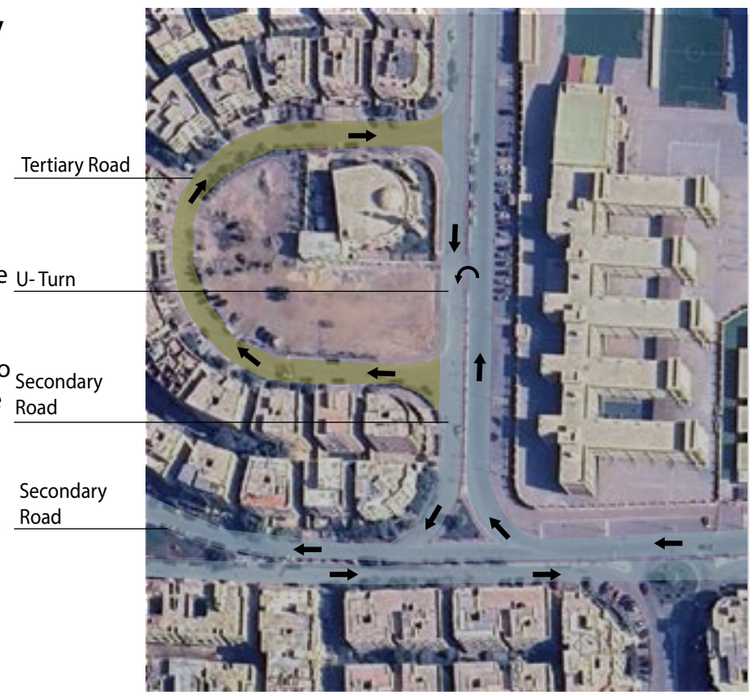
Zoom in 2- Primary to Secondary

- The existing of Decelaration lane which plays a major role in slowing down before entering the Urban Context and in the same time make the Square it self less compacted by providing a turn to the Neighboring street making the cars entering the Square less
- This Square plays a role in Speed filtering since cars are coming from high-volume transit into the local grid, using the square of the intersection to naturally lower vehicle speeds.



Zoom in 3 - Secondary to Tertiary

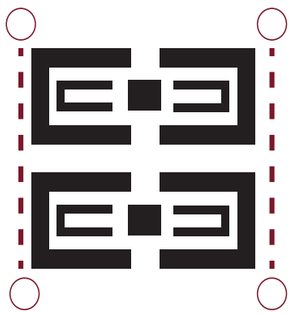
- The Decelaration lane does not exist in this intersection since this area is mainly for the residents of the neighberhood so less traffic.
- The tertiary road is just one lane which is only one direction but makes the travel distance a bit longer on the residents to get to the secondary road then to the main street
- The U-Turn right near the Entrance of the street with Cars coming might also cause some traffic especially with the Building on the right being a school so during the Exit hour this area has a high traffic



4.3.2 Streets typologies

The street hierarchy in Sheikh Zayed follows a clear planned structure that consists of each district being framed by primary roads, and those roads connect to the city's main regional corridors.
Secondary roads connect neighborhoods internally, and lastly, tertiary roads provide access to residential clusters and local services.
This road planned system reflects the city's planned origins and creates a circulation pattern.

Looking into Sheikh Zayed road typologies, it is very clear that they are more car-oriented roads, and pedestrians' needs are not being met. In the following diagram, it shows the missing necessities.

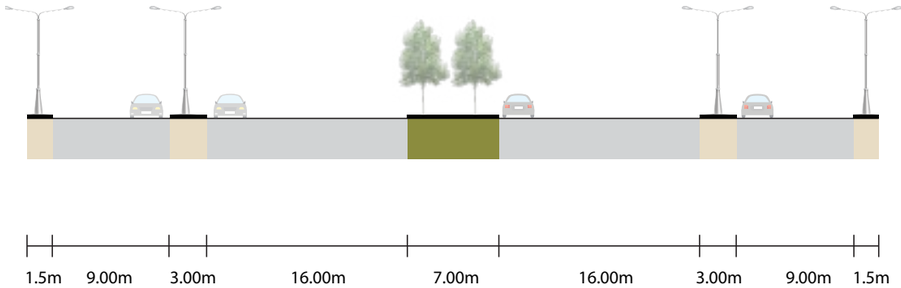


Primary Roads Surrounding The DIstricts and the Round-abouts in each Intersection

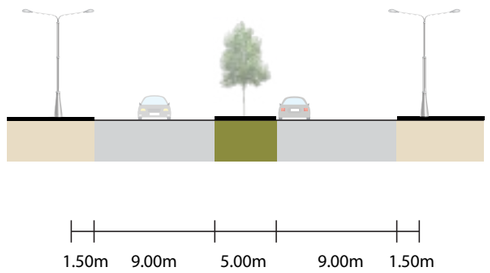
Secondary Roads connecting the Neighberhood

Teritory Roads connecting the Building Clusters

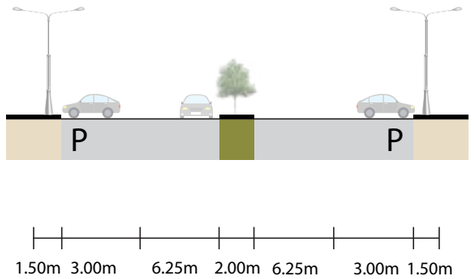
	Sidewalk	Bike Lanes	Landscaping	Bus Stops	Bus Stations	Safe Passage for Pedestrians	Lower Speed for Residential Areas	Ramps and Speed Bumps
Regional Roads	Present	Present in some Streets	Present in some Streets	Present in some Streets	Present in some Streets	Not Present	Not Present	Present in some Streets
Primary Roads	Present	Present in some Streets	Present in some Streets	Present in some Streets	Present in 2 Streets only	Present in some Streets	Present in some Streets	Present in some Streets
Secondary Roads	Present in some Streets	Not Present	Not Present	Not Present	Not Present	Not Present	Not Present	Present in some Streets
Teritory Roads	Present in some Streets	Not Present	Not Present	Not Present	Not Present	Not Present	Not Present	Present in some Streets



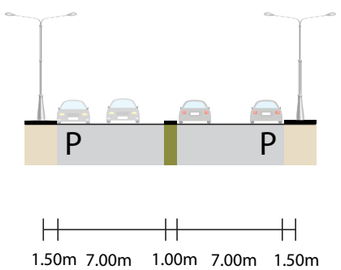
Cross Section of Regional Road



Cross Section of Primary Road



Cross Section of Secondary Road



Cross Section of Tertiory Road

4.3.3 Barriers map

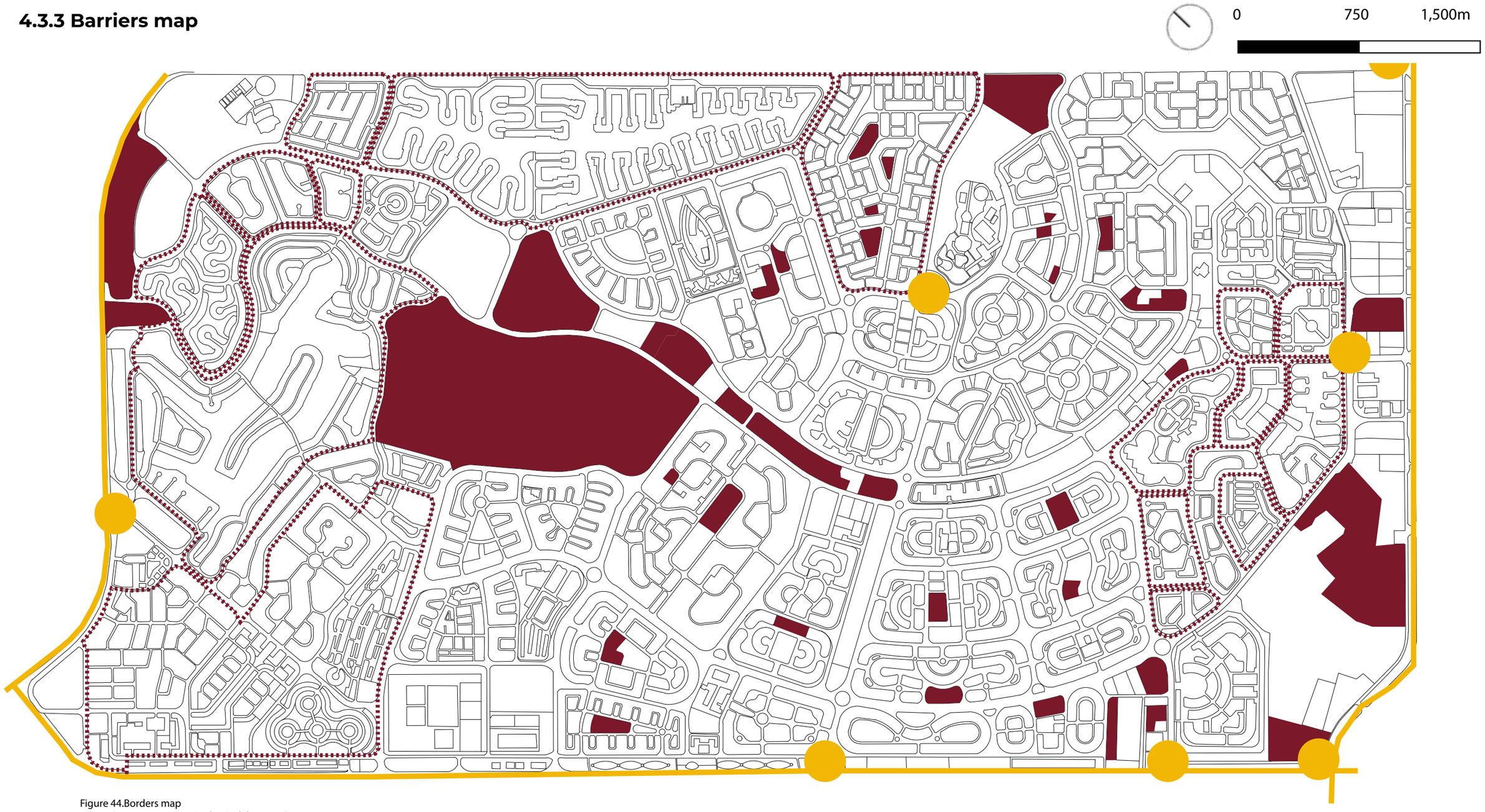


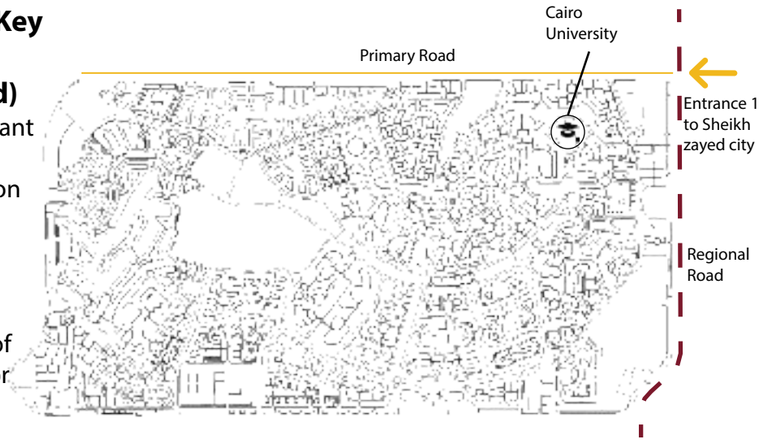
Figure 44.Borders map
source (open street map,Author's elaboration)

Sheikh Zayed City, as mentioned earlier, being a newly constructed area, has some vacant and undeveloped lands both in and around the area.
Sheikh Zayed City is to a large extent bounded by regional roads, which gives it a sense of being "enclosed." In addition, it has a number of gated communities, which cover a portion of the total area.
These are only accessible to a certain group of people that leads to a sense of fragmentation

4.3.4 Zoom in

Sheikh Zayed City – Entrance 1 (Key Mobility Node, Intersection of Regional road and Primary Road)

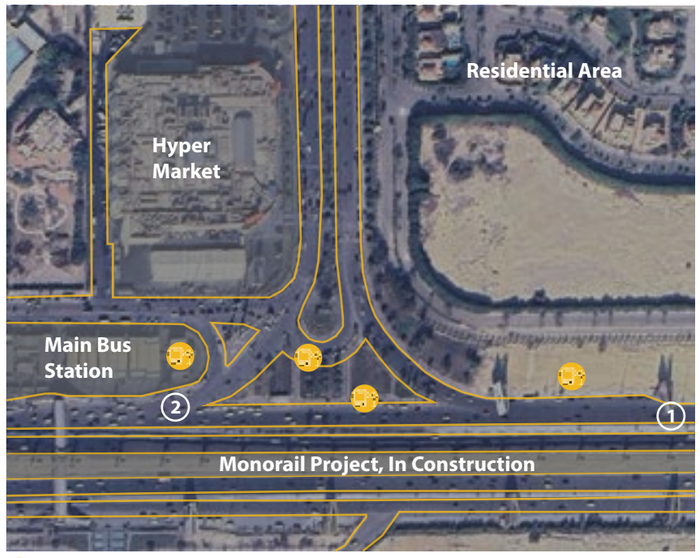
This node represents a critically important location as it represents a major entry point for Sheikh Zayed City. This junction represents the most important point between **the 26th of July Corridor (regional road)and El-Nozha Road(Primary road)** because it represents a major internal backbone of the city, connecting it to different major roads in Zayed.



Why is this a crucial Area ?

- **Concurrent Monorail Construction** Starting off with the on going construction of the monorail Project which is right infront of the entrance
- **Commercial Attraction** , it has one of the biggest Hyper Market in sheikh zayed city that is frequently visited
- **Primary Bus Hub** Sheikh zayed city has a limited amount of bus stops and the main one that serves regional and local routes exists there.
- **Unregulated Bus Stopping Area** there is many stops that bus drivers use as their bus stop weither it is inside the bus station or outside of it, used by formal and informal methods of Transport
- **University Presence** Cairo University (sheikh Zayed campus is 8min walking from this bus stop which adds up to the congestion

Zooming in on Sheikh Zayed Entrance 1

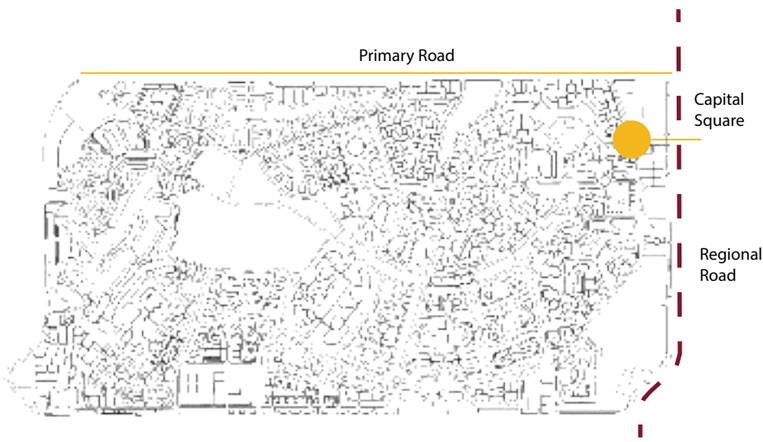


Marks the Areas where Busses Stops

1. The 26th of July Corridor works as an eight-lane road with five high-speed regional lanes and three reduced-speed lanes that channel the vehicles into Sheikh Zayed City
2. Lack of any safe pedestrian crossing near the informal stops makes people cross the roadway directly. This, together with random stopping of vehicles, causes repeated congestion and significant safety risks.

Capital Square (High-Risk Pedestrian Node)

This represents a critical locational point in Sheikh Zayed City. Capital Square acts as a major hub, where some of major roads intersect to form a center for distribution of traffic in the various districts. This makes it a key point of reference in regards to internal roads in Sheikh Zayed City.



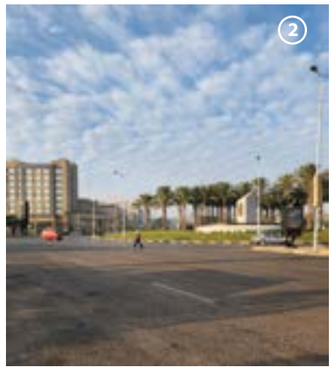
Why is this a crucial Area ?

- **High Activity Zone** It houses most of the city's mixed-use buildings, such as offices, hotels, and places of entertainment. This attracts people from nearby residential areas, making it one of the most frequented places within the day and night.
- **Major Highway Junction** Capital Square is the junction of four major two-way streets, forming a big and comprehensive traffic node. The scale and laying direction of the intersection determine high vehicle flows and congestion.
- **Unsafe Pedestrian Conditions** Due to the high pedestrian demand to access mixed use areas, people frequently cross the square. Currently, no safe crossing exists, and as such, it presents a great hazard to pedestrians.

Zooming in on High Risk Pedestrian Node

Marks the Pedesrtian Crossing Flow

1. The First Photo marks the width of the street from just one of the directions
2. Lack of any safe pedestrian crossing in the square in rush hour causes this Square to be a congestion area and also high risk for pedestrians to cross even though there is necessity to cross



Since Sheikh Zayed City is a newly built Area, it has a proper urban planing unlike a lot of the other areas in the the great Cairo region

Opportunities

- Such structural ability presents a great opportunity, as the current street network can be utilized for interventions in terms of optimizing walking and active travel that do not require any massive infrastructure upgrade.

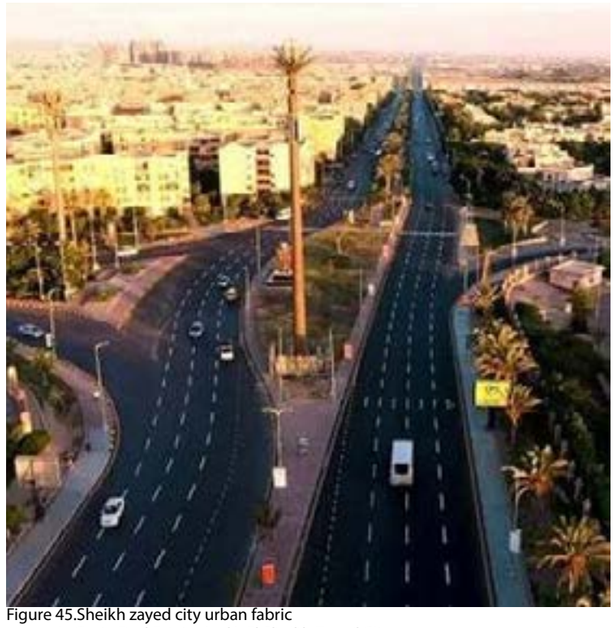


Figure 45.Sheikh zayed city urban fabric
source LaCosta Real Estate. (n.d.). El Sheikh Zayed City

Target 9.1: "Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being."

even having a clear street network is a huge opportunity, The problem here lies in the Street Structure itself

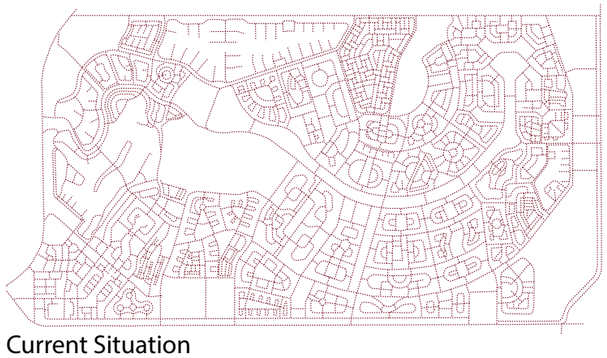
Threat

- The Streets are made car friendly but they present a human-scale failure of the same network,a lot of the streets are missing sidewalks let alone pedestrian lanes or adequate walking space and shade from one space to another

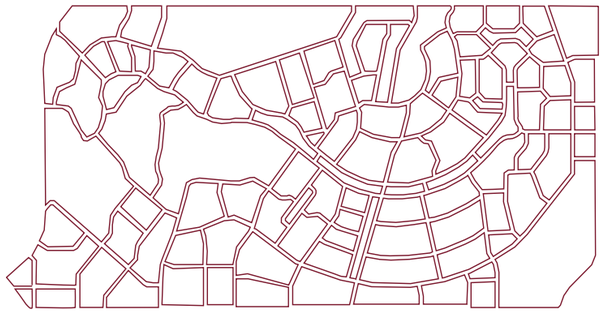
Figure 46. Car friendly street in Sheikh Zayed city
source : author's photo

Target 11.2: "This target specifically calls for "safe, affordable, accessible and sustainable transport systems for all."

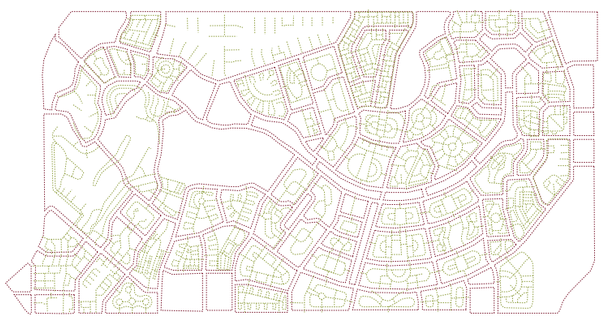
4.3.5 Streets hierarchy proposal



Current Situation



SuperBlock Strategy



Pedestrian Network

Sheikh Zayed City already has a good street network. The main problem with this network is that it succeeds as a car-oriented network but fails as a human-scale design network, and in order to correct this, the following actions are important to follow.

- **Using thesuperblock strategy**
- **Streets re-design**

The Barcelona Superblock Project, as previously mentioned, aims for creating streets for the people, not just cars, and this is done through favoring street modes to other means of transport other than private vehicles for a more sustainable city, trying to balance between traffic and the living areas.
The street hierarchy goes as followed:

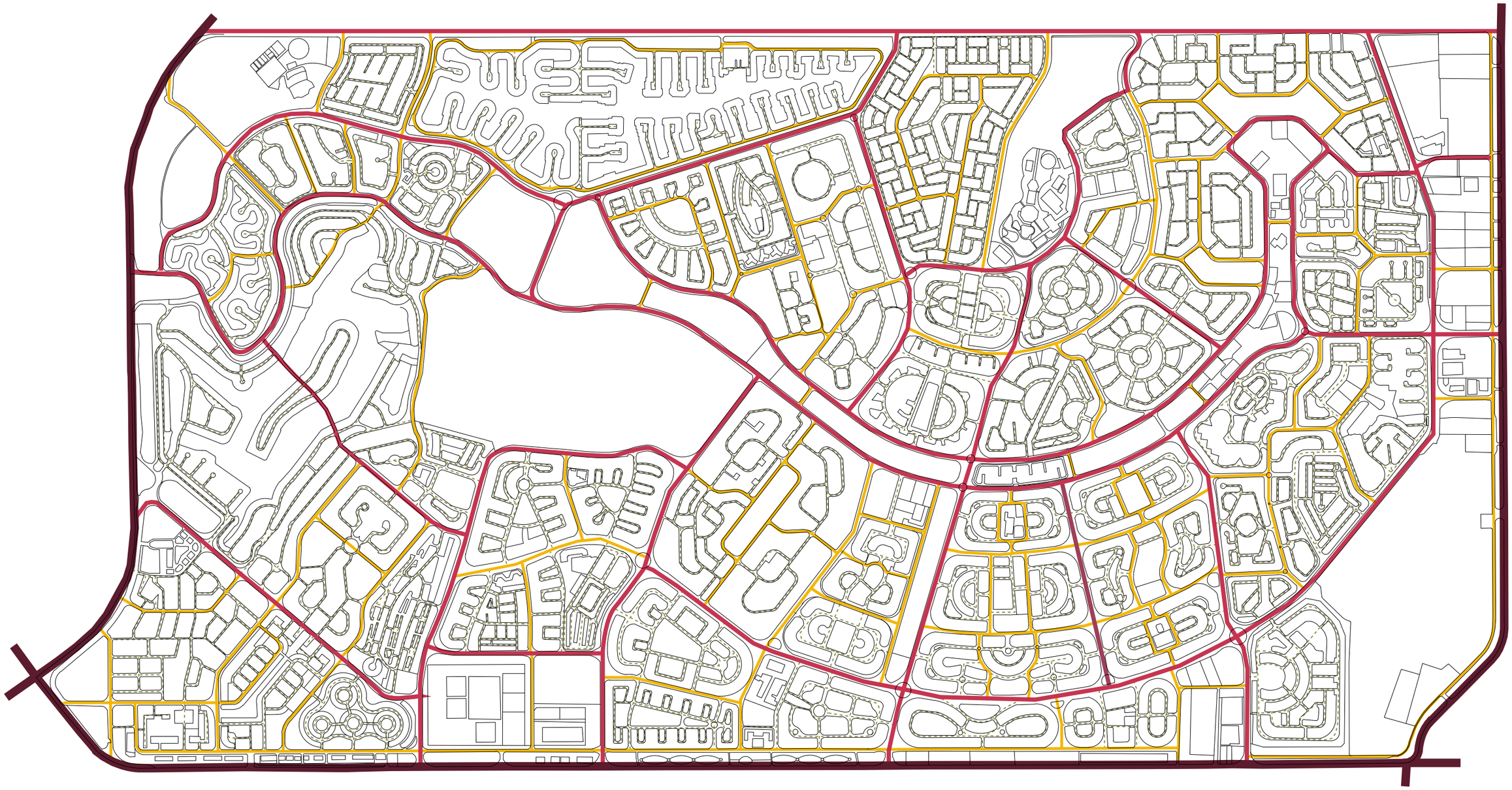
The regional mobility corridors that are the main access and where all of the entrances to Sheikh Zayed City are.

Border Streets that are allowing through-traffic, allowed public transport routes, emergency and service access. They have pedestrian roads but are not pedestrian-focused

Internatl Streets (superblock boundary streets), their main importance is for local car access and entry points to neighborhoods, and they are needed to keep the traffic managed.

Pedestrian and Cyclepath Streets, those streets limit cars; their primary priority is the residence and enhancing all sorts of active mobility.

0 750 1,500m



Regional Mobility Corridors

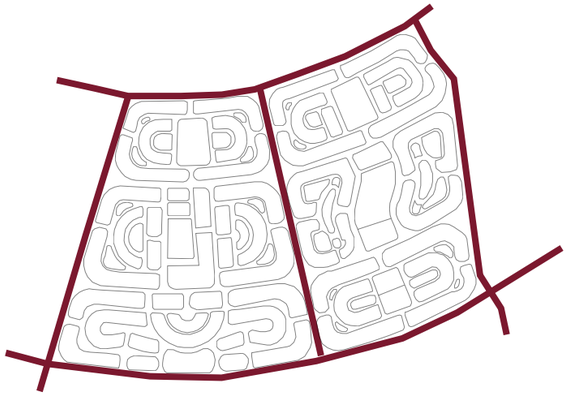
Border Streets

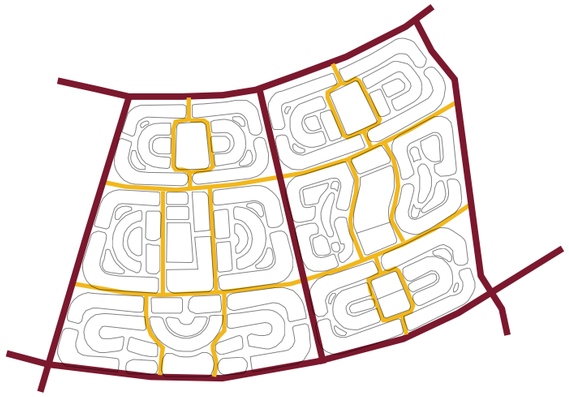
Internal Streets

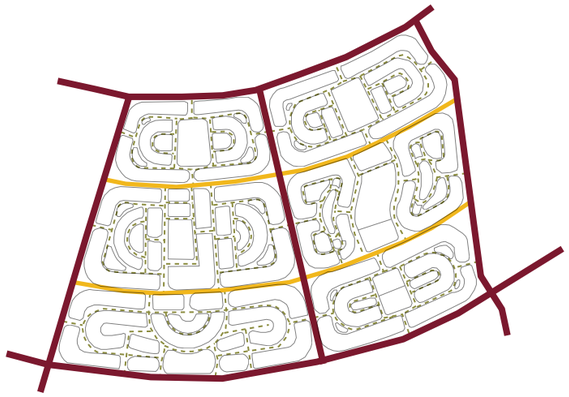
Cyclepaths and pedestrian streets

zooming in on one of the Zayed Blocks just
to highlight how the system Works

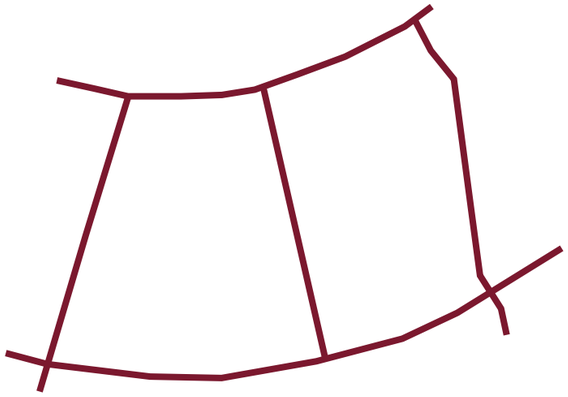
Street hierarchy Proposal

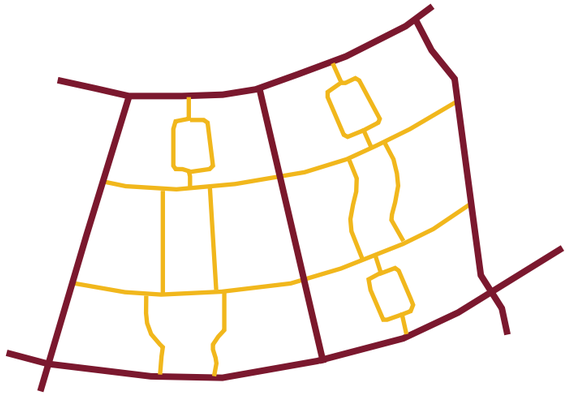


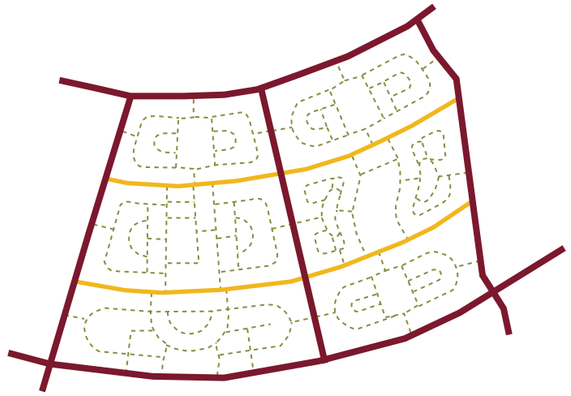




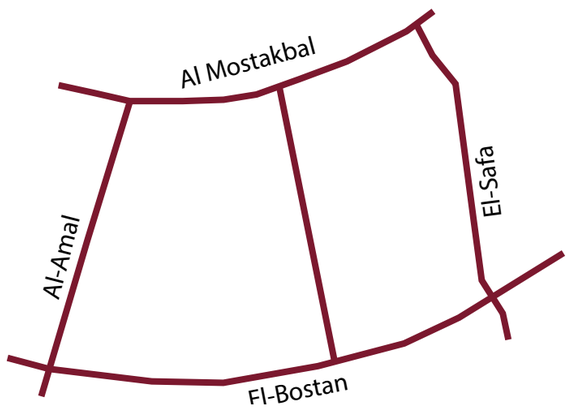
Street hierarchy Proposal

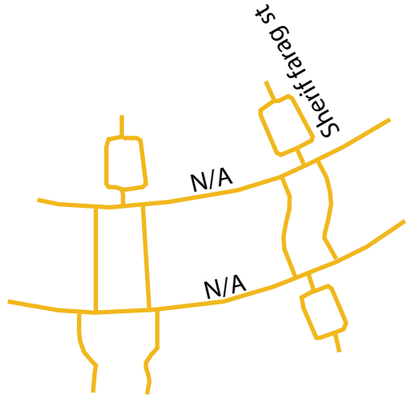


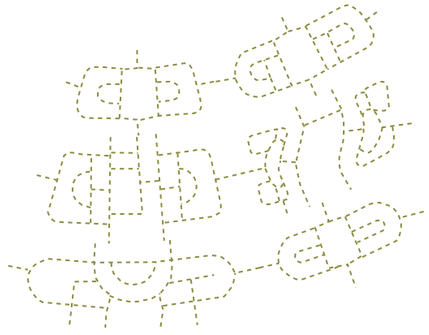




Street Names And Speed







Border Streets 40-50km/h

Internal Streets 20km/h

Cyclepath and Pedestrian Streets 10-15 km/h

4.3.6 Active mobility systems

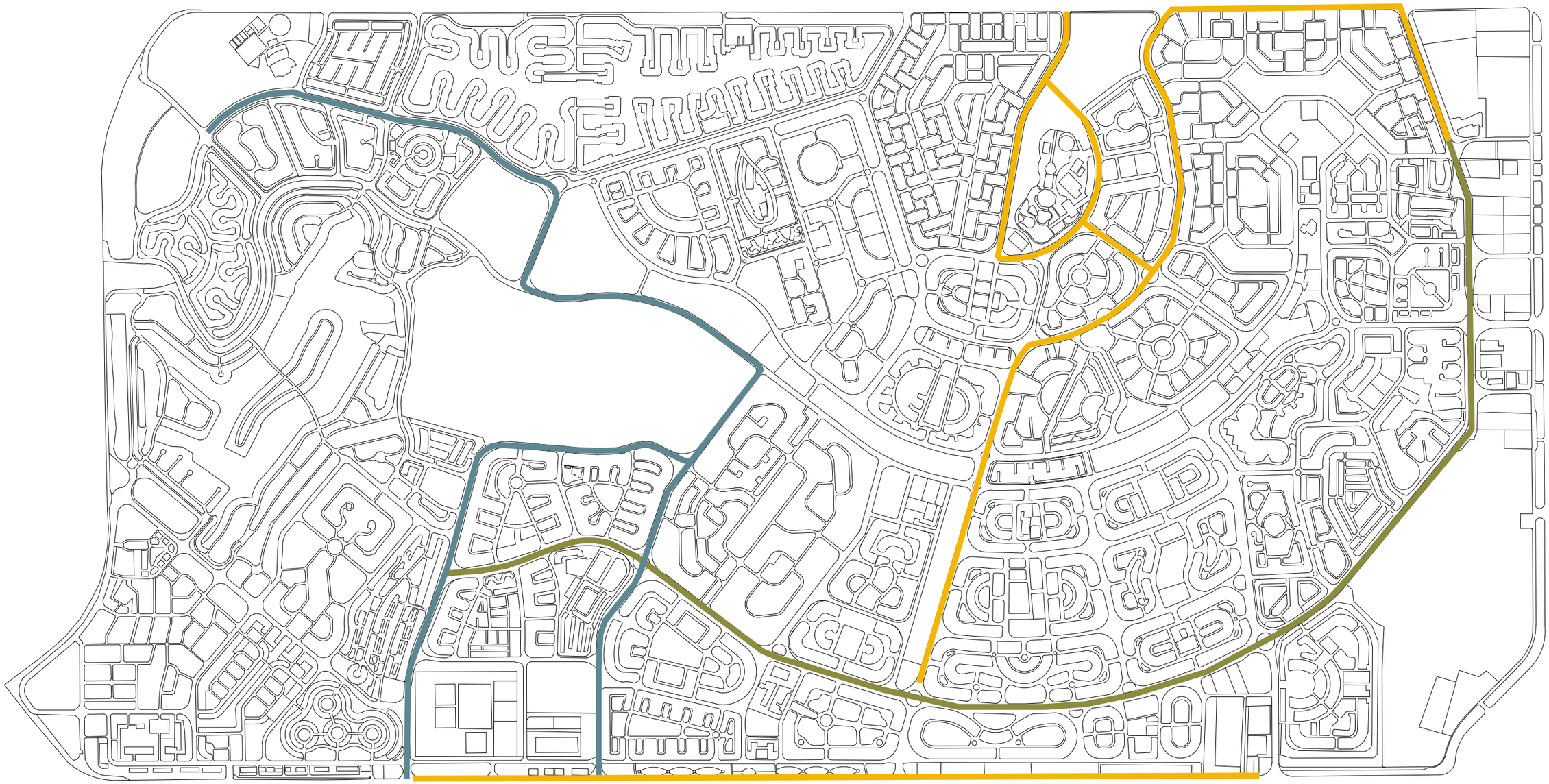


Figure 47. bike lanes in Sheikh Zayed city
Source: Elwany & Elsemary, n.d

Active mobility system in Sheikh zayed is limited in methods to only bikes and the distance of the bike lanes are limited.
While some districts contain short segments of bike lanes or pedestrian friendly streets, these paths do not contribute to forming a connected network and often end when merging into car dominant roads.

4.3.7 Transportation systems and distribution of main generators and attractors

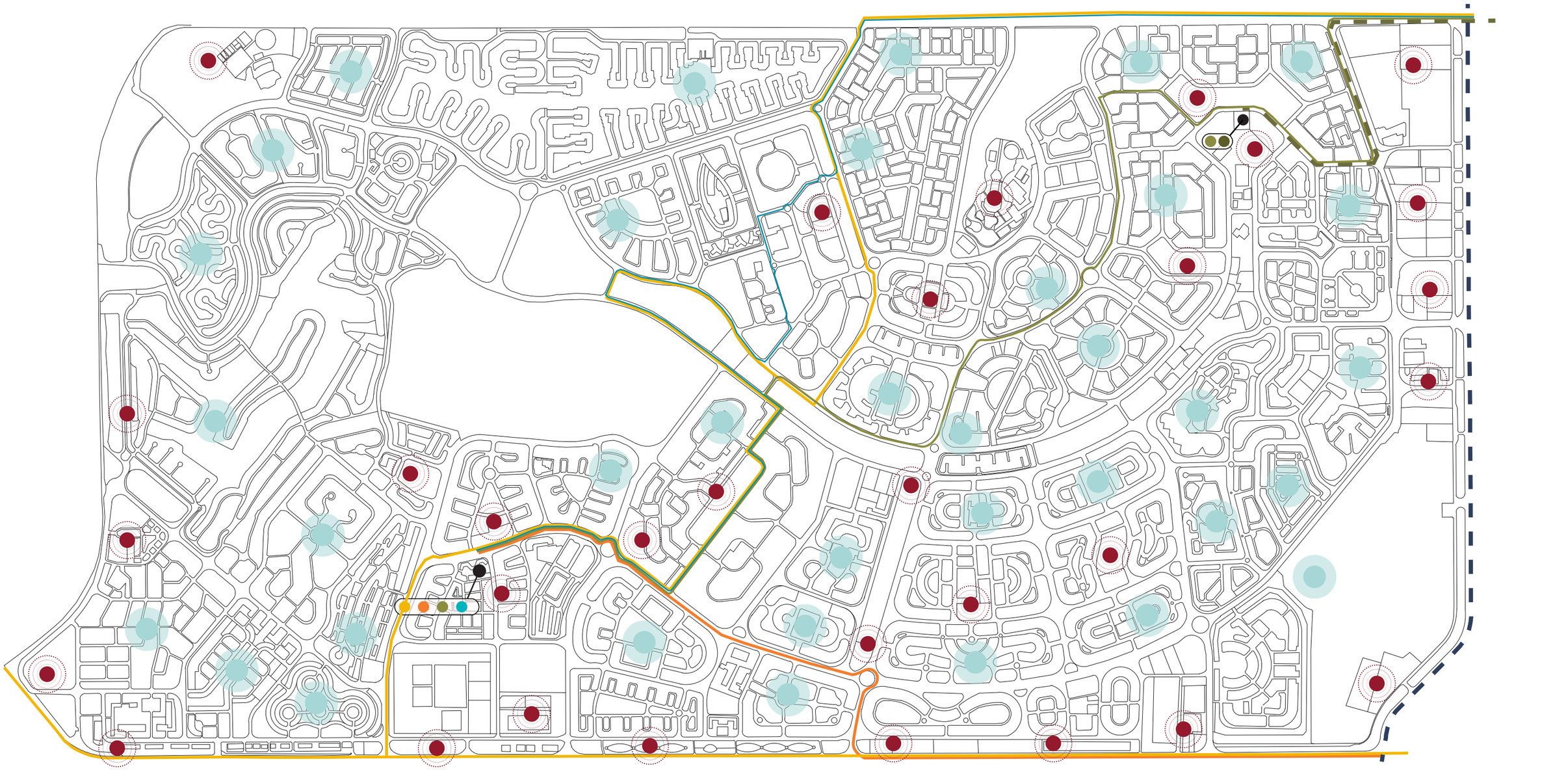


Figure 48.Transportation system , genertors and attractors map
source (Mowslat Masr,open street map,Author's elaboration)

Sheikh Zayed ha a small bike Network and very Limited bike lanes which affects the existing State of the active mobility

Threats

- Even of very few bike lanes people seem to use them for other usages for example they are being used as a parking area in this photo which affects quality of the Network

Figure 49.bike lanes usage
Source:Egyptian streets

Target 11.2: ""By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all... notably by expanding public transport."

The existing of limited amount of bus stations, with only one bus stop for Regional Transport

Opportunity

- Using the Vacant spaces to create bus stations to enhance the connectivity in the city

Figure 50.Bus station in sheikh zayed Source: taken by the author

Target 11.2: ""By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all... notably by expanding public transport."

Lack of designated bus stops, the bus line does not have a clear bus stop in order for the bus stop you need to ask the driver to stop or otherwise you miss your station

Threats

- The current limitation of regional bus stations along with Bus Lanes only cause the car dependency and congestion to be the go to mode for most of the residents

Figure 51.Lack of bus stops [illegible] Jacobs, H. (2013, April 26). The incredible, unofficial hand signals [illegible] Cairo's micro-bus drivers.

Target 11.2: ""By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all... notably by expanding public transport."

Several attractors are found in Sheikh Zayed City, including commercial and mixed-use developments, and are characterized by heavy activity and daily flows. These are currently accessed by private cars.

Opportunities

- This could be the potential for reorganization in mobility due to well-distributed attractors that improve the coverage of public transport and strengthen walking and cycling links between residential areas and everyday destinations, providing support for shifting away from car dependency.

Figure 52.open air mall in sheikh zayed
source : KARM Holding, Arkan Plaza

Target 8.2 - 8.3: "Promote sustained, inclusive and sustainable economic growth by fostering productive activities, decent job creation, and entrepreneurship."

4.3.8 Strategy to enhance public Transport and active mobility

Following the super block strategy
In order to enhance active mobility and public transport to be able to promote them as the main option not cars, we need to have active mobility and pedestrian access to generators and attractors in Sheikh Zayed City

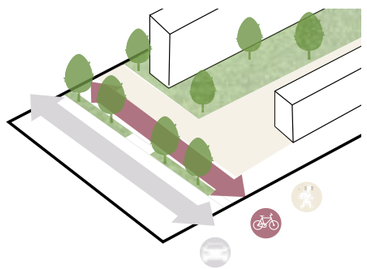
There is 3 Pillars for this Strategy

1- Ensureing continuity in the active mobility paths
- Border roads being used as primary active corridors and the location for bus stops and mobility hubs and especially at the entrances of Sheikh zayed city
- Using the pedestian and cyclepaths previously mentioned to create a continuous network throughout the city
- Having shared streets (Woonerf Logic)
- Create a continuous network of pedestrian and bike paths throughout the city

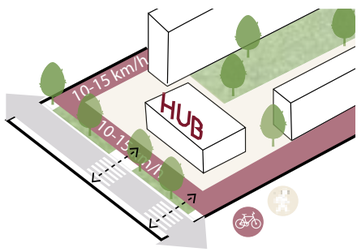
What is shared streets ?
The idea is to make cars move slowly and focus on pedestrians to provide a safer and more social public shared streets where pedestrians, cyclists, and vehicles occupy the same space without division by traditional elements.

2- Enhancing Safety and Comfort
- Safe crossing especially near big squares,bus Stations , mobility hubs and school areas
- Using the speed reduction in the internal Roads (Superblock)
- Create protected bike lanes

3-Integrating active mode with transport
- Enhancing the existing bus lines and creating bus stops since the existing line does not have any
- Devoted bus lines paths in the neighberhood , equiped stops and mo-bility hubs
- Having parking areas near the mobility hub to encourage the "park and Go " where people can park their cars and use active mobility options or bus network to get through Sheikh Zayed city



Share street, having a designated lane for each street user



Connected bike network to Mobility Hubs and providing safe crossing

Criteria Used to Place Mobility Hubs and Bus Stops

The Criteria selected are as follows:

Placement in the border streets where is usually concentrate public transport supply and road access to support intermodality. Integration and visibility considering the distribution of the main generators and attractors and mixed usage areas. Among them: mosques that will act as open plazas, schools and universities that attract a big number of youth and will have a night activity; commercial clusters and Public spaces.

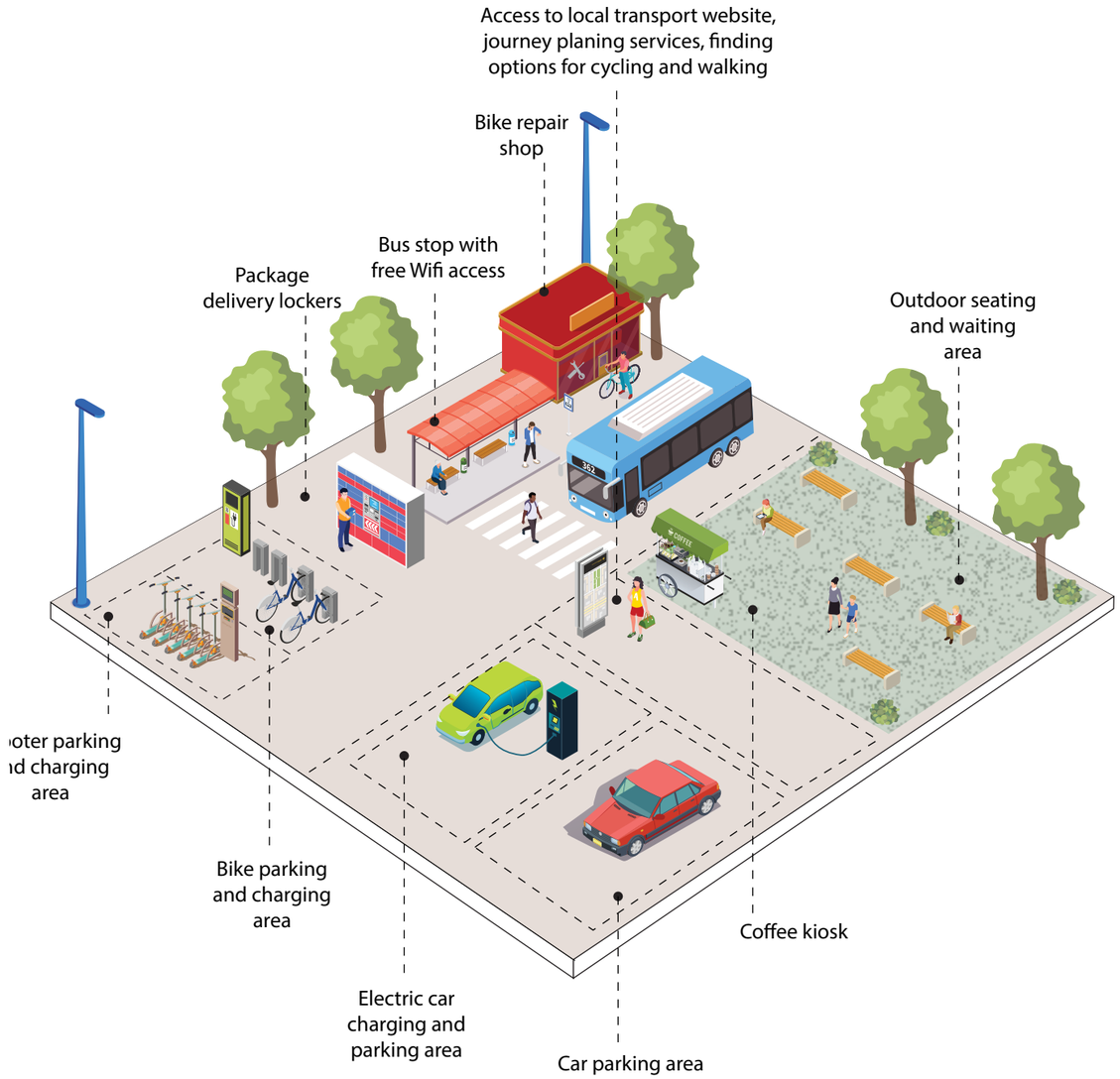
Types of Mobility Hubs

Two types of Mobility Hubs to deal with different scales of mobility demand and the urban context within the neighborhood:
• Primary mobility hub located in the main roads and close to the main attractors in order to facilitate intermodality and modal shift (from car to active mode and public transport)

• Minor mobility hub located near open plazas, schools and mosques on the barrier streets, to limit congestion while maintaining accessibility and still being out of the internal streets.

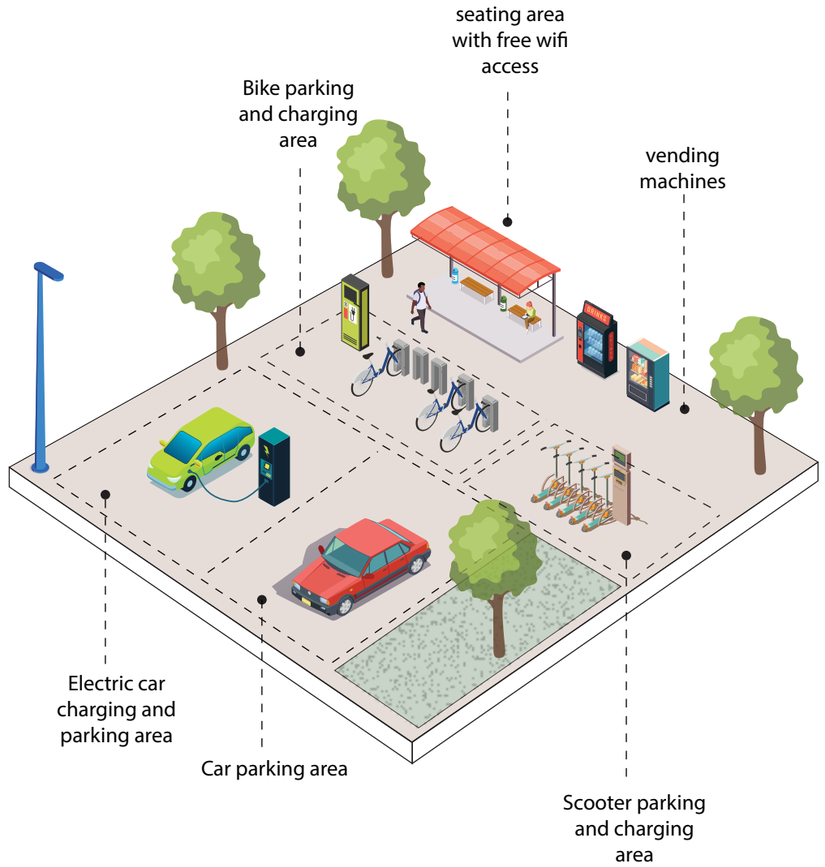
- **Primary mobility hub**

Primary mobility hubs are mainly located near the entrances and the main streets of sheikh zayed city especially near the multi usage areas those provide many alternatives to cars and facilitate the movement within the city.
A person who is coming from outside of Sheikh Zayed city or within can park their car then use the provided options such as bicycle, scooter or use the bus to get to their destination and if there is a waiting time there is designated areas to serve such purpose

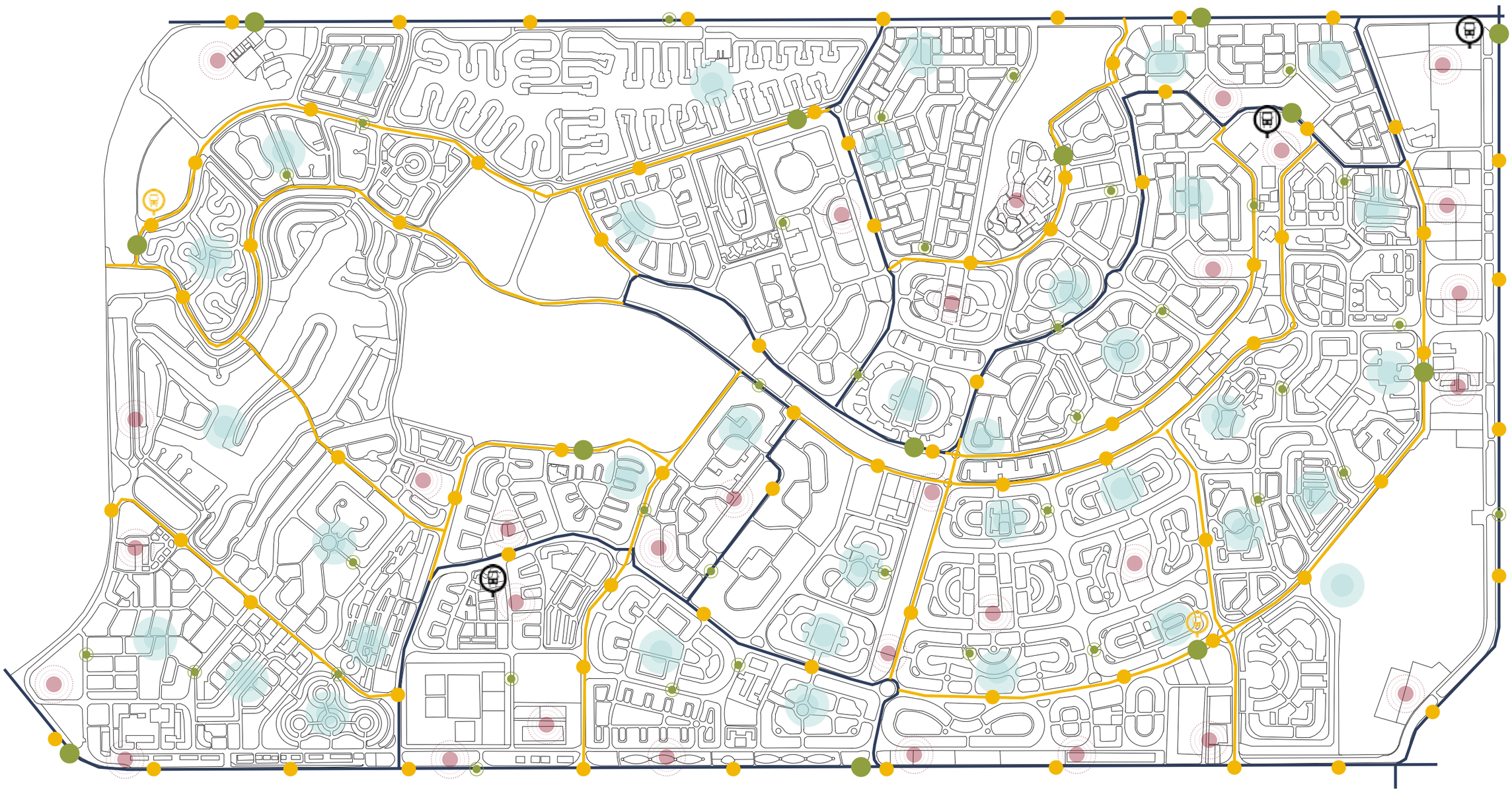


- **Minor mobility hub**

A key element in the mini mobility hub is the absence of of bus transit service, the main focus of those mini hubs is to facilitate walking bicycling, scootering or ride shares.
Users can access those hubs using their phones, there is payment options online and there options to access on site also it serves as a resting area to get a snack or a drink and continue your journey



4.3.9 Bus network and mobility hubs proposal



4.4.1 Existing green spaces analysis

Figure 53.Public green spaces in sheikh zayed
source : open street map, author's elaboration

There are no formal open green spaces or public parks in Sheikh Zayed City. This map illustrates the public green patches in the city, which are mostly created and maintained by the residents of the city rather than by public authorities. They are, therefore, not designed to encourage active mobility or be used as open spaces/parks.

Sheikh Zayed ha a small bike network and very limited bike lanes which affects the existing state of the active mobility

Opportunity

- Enhancing the quality of the existing green spaces and turn them into parks.
- Plantings some of the vacant spaces to create parks and green spaces adequate for the residents usage.

Figure 54. Green spaces in sheikh zayed
source: taken by the author

Target 11.7: "By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities."

The existing trees or small green patches are done by the residents themselve

Threat

- Species inconsistency due to the absence of landscape management

- Solar exposure is very high due to the absence of Shaded areas, they are only located near residential areas.

Figure 55. Private green spaces in sheikh zayed
source: taken by the author

Target 11.2: ""By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all... notably by expanding public transport."

4.4.2 Green network strategy

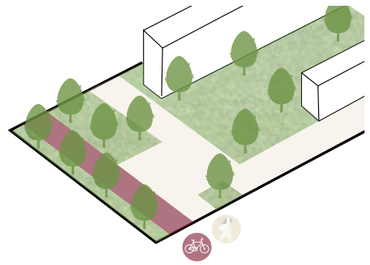
sheikh zayed city does not have green network, it has small green patches that were mainly maintained and created by the residents.

The landscape plays a crucial part in connecting the previous strategies all togther there is a few main actions that should be followed :

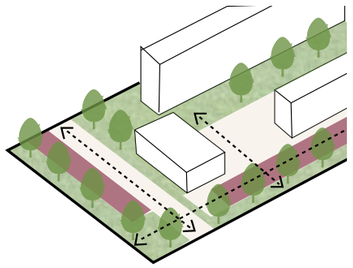
- Improving existing green spaces and transforming them into neighborhood parks that serve as community gathering spaces, while connecting these parks into a continuous network across the city.

- The main mobility corridors connecting the multi usage areas along with the pedestrian and cycle paths will be shaded and have a connected tree corridor

- The connected vacant spaces can be transformed into a green boulevard to improve thermal comfort, strengthen landscape continuity, and improve the quality of public space.



Creating parks and green pockets



Tree network to provide shade and having porosity in it

0 750 1,500m

Existing Green Spaces

Potential Areas For Parks

Green Boulevard

Trees Network

Focus Area

5.Focus area: 7th district

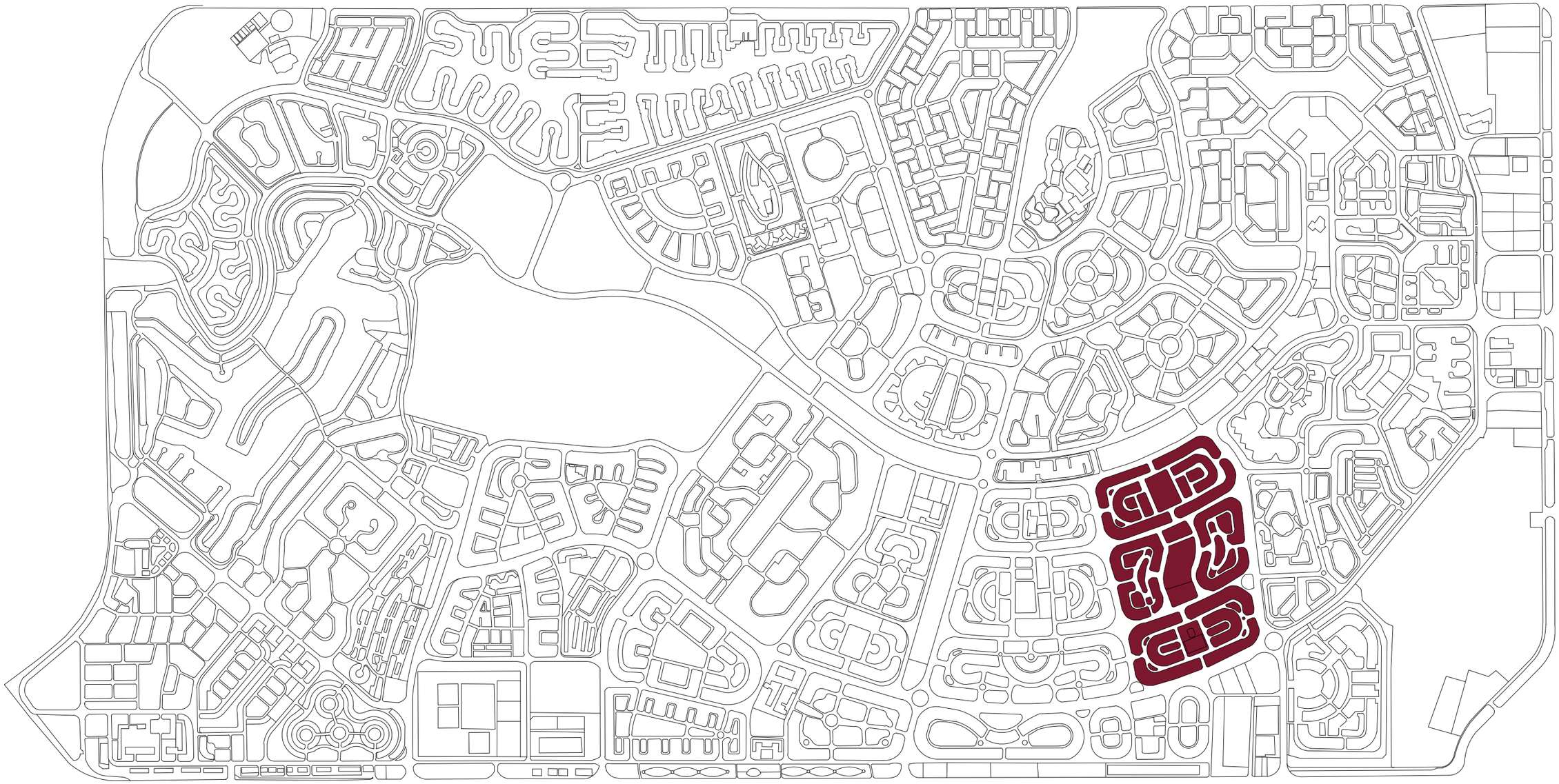


Figure 56. Focus area
source (open street map, author's elaboration)

The 7th District

The 7th district is a medium density developement, it benifits from a very strategic location since it is located near 3 primary roads, it is near the new activity corridor identified in the proposal strategies, the district has wide streets which make an impact on the urban structure.

The dominant land use within this district is residential with limited amount of services, as sheikh zayed city is still in the developement phase, this district contains several vacant plots in strategic locations which present a clear opportunity for future plans.

Green spaces in the district are mainly resident-maintained, which resulted in an inconsitent quality , there is no clear tree network within the streets, it is mainly in the primary roads and even then it is in a minimal and discontinuous manner.

Figure 57 Photos of the 7th disrtict
source: author's elaboration

Therefore the strategies that can be used in the 7th district are:

- mixed landuses
- open spaces
- green spaces and Trees network
- mobility

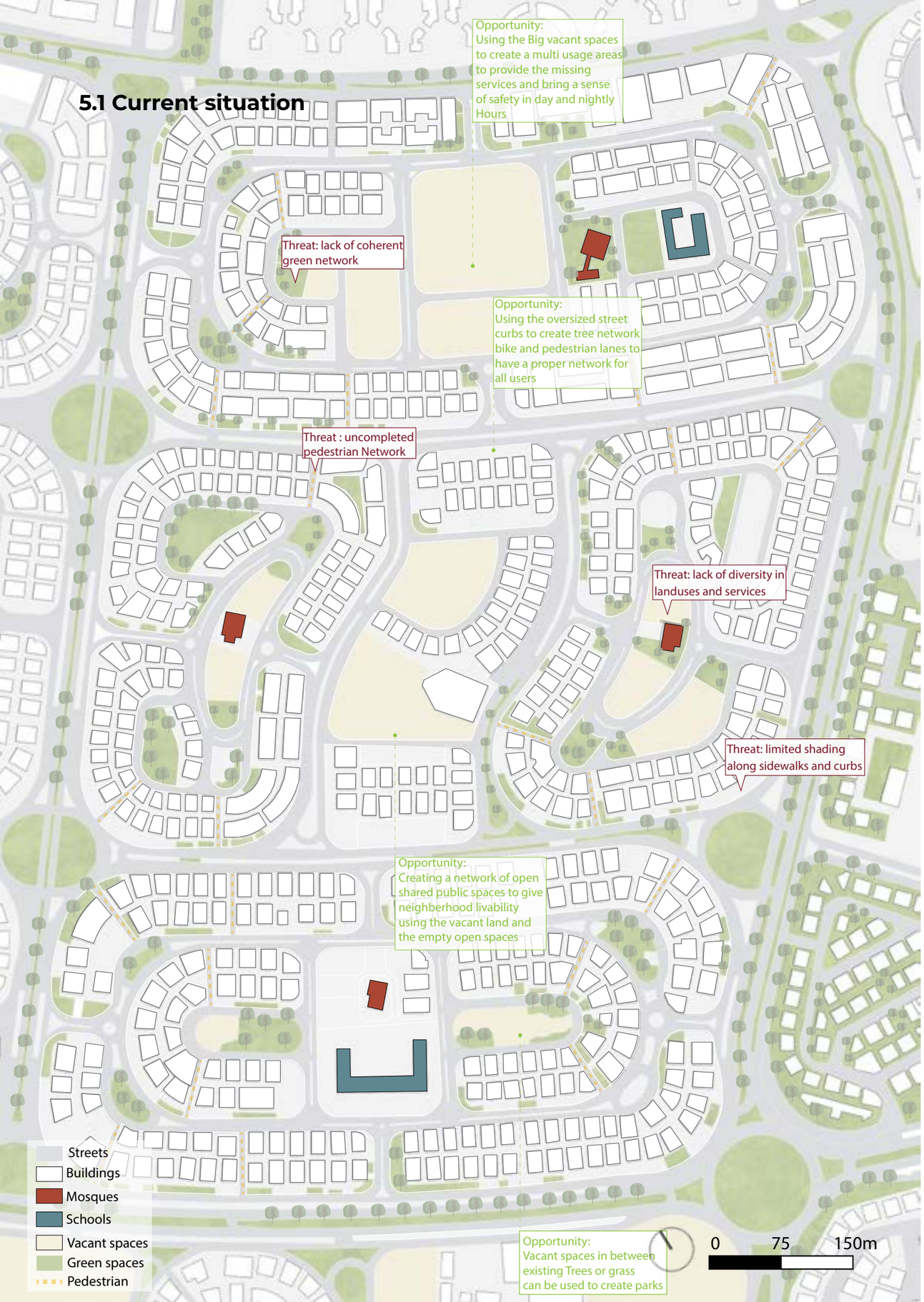
These come together to enhance the quality of life in the district, making it a more inclusive, healthier, and most importantly, more sustainable district. These results can be measured later on and analyzed to become a system that can be used in the rest of the districts as a future plan.

The shift from a car-oriented urban structure strategy focuses mainly on accessibility by proximity, making everyday needed services within walkable or cyclable distances, putting pedestrians and active sustainable mobility options as the go-to and more convenient and sustainable choice for everyday errands.

The ambition is to create open spaces and multi-use areas that make the neighborhood lively during both day and night hours, enhancing the sense of safety and livability in the district and bringing back the sense of community.

Figure 58. Residential buildings in 7th district
source : author's elaboration

5.1 Current situation



5.2 Street design strategies

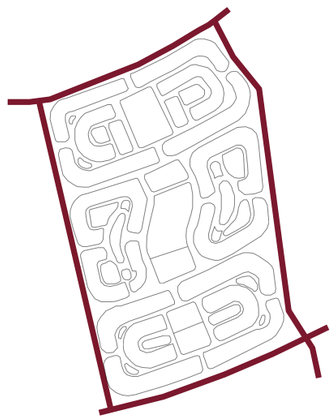
The street network of this district will be restructured following the previously mentioned Superblock strategy, which aims to re-organize the movement hierarchies to reduce the car dominance and enhance active mobility.

The streets are classified into **3 main typologies** based on their function and their sections and the level of accessibility ensured: border streets, internal streets and finaly pedestrian streets

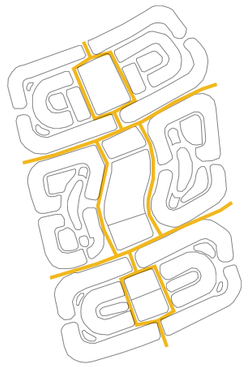
1.Border streets
They define the borders of the superblock accomodating through the traffic and the public transport.
Most of the vehicular movement is in those streets to reduce car penetration inside the residential areas and they host bus routes and bus stops, in these streets are located the mobility hubs and activity nodes.

2.Internal streets
They serve the local access of the residents within the superblock area, it is low speed streets, car usage is limited, cycle lanes are more present for supporting active mobility modes.

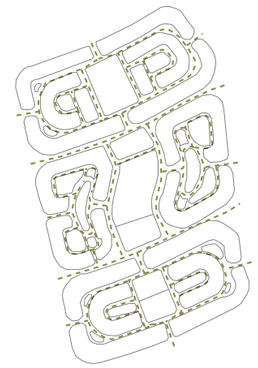
3.Pedestrian streets
Pedestrians street form the core of the superblock, prioritizing walking and social interaction, this typology eliminates traffic allowing the these streets to serve mainly the residents and active mobility modes. Shading and trees are essential to enhance comfort and support locals



1.Border streets



2.Internal streets

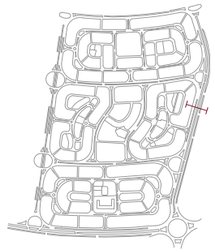


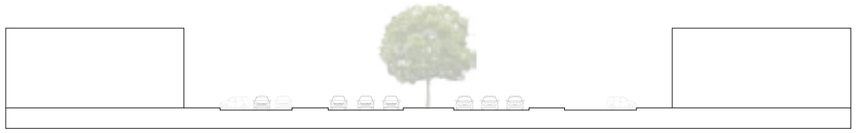
3.Pedestrian streets

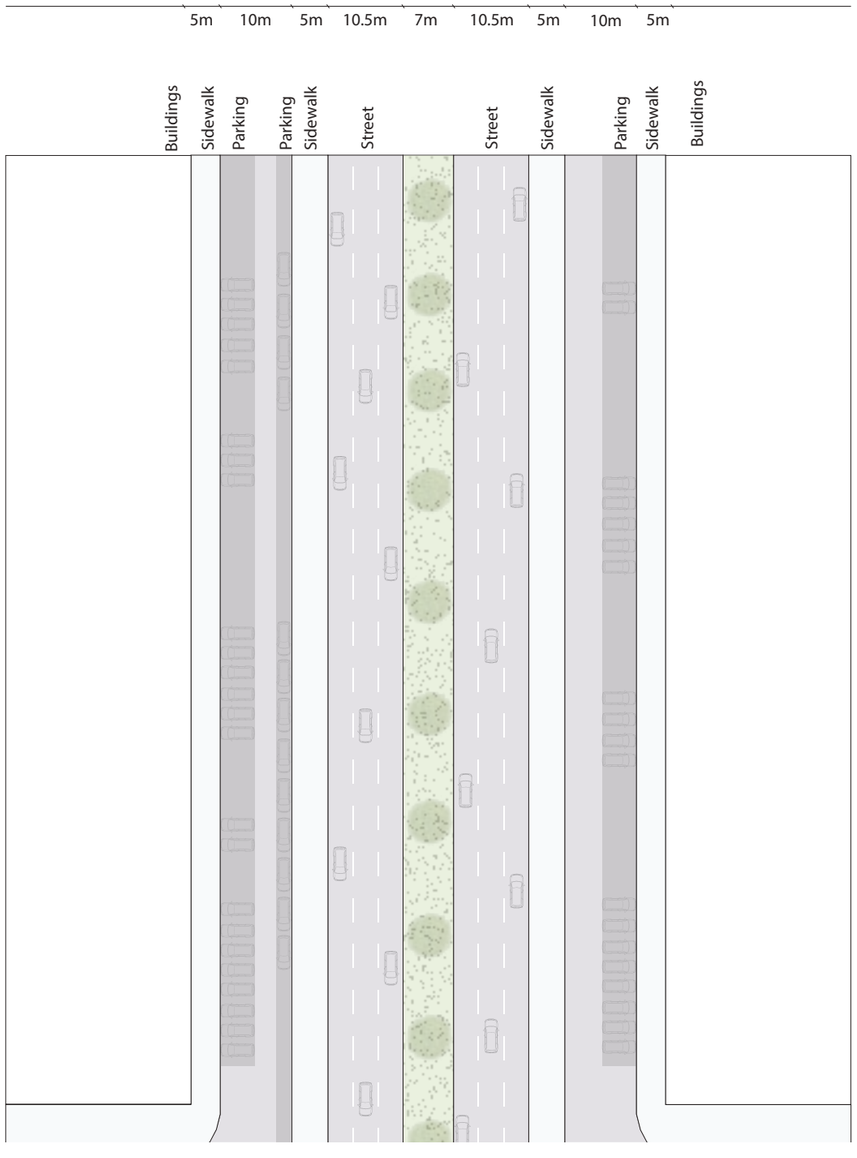
5.2.1 Border street

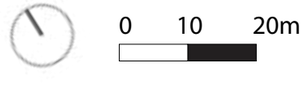
current situation

In the Current situation, the street is car dominated, the decelaration lane is being used as a parking area and for such width there is no safe crossing.

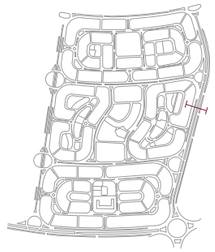


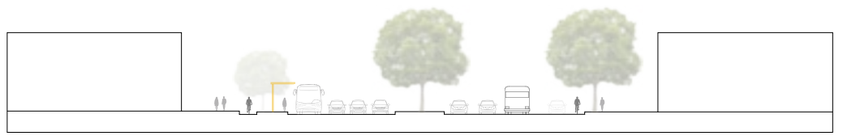


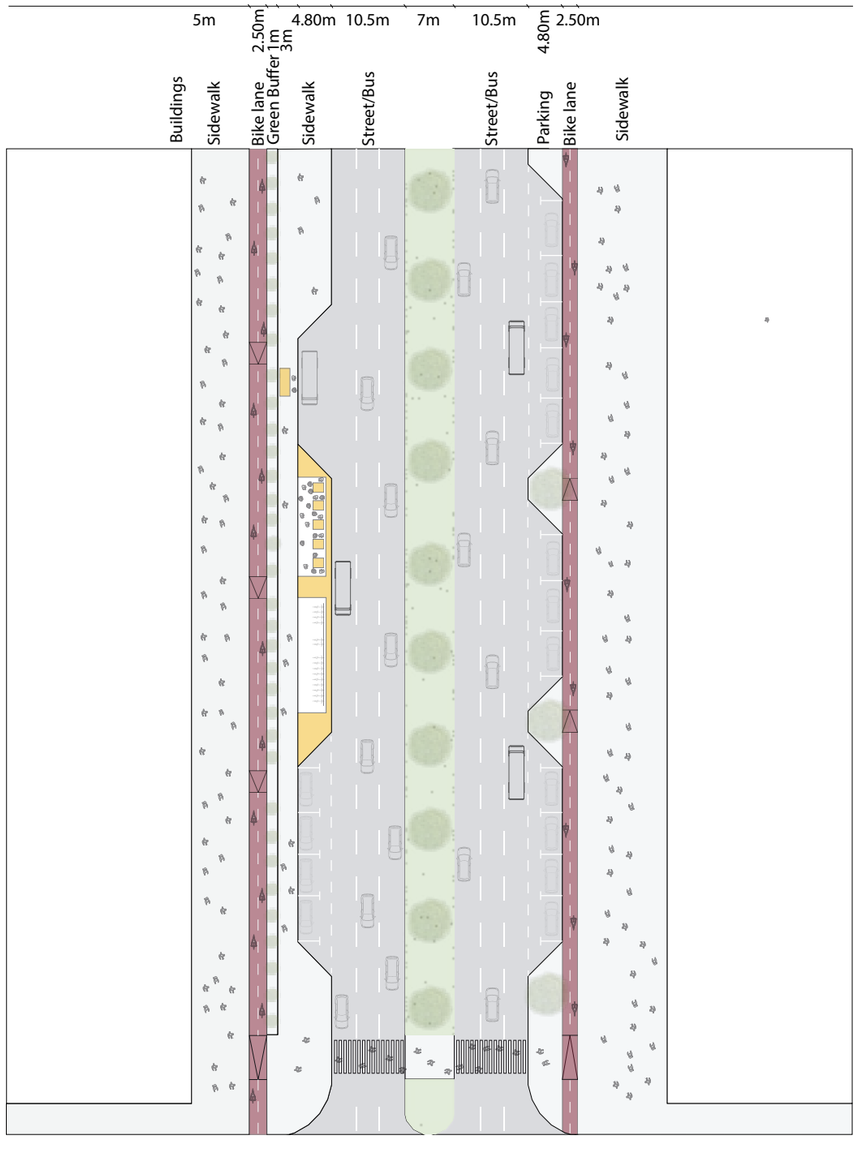


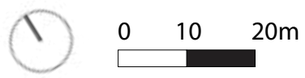


proposal

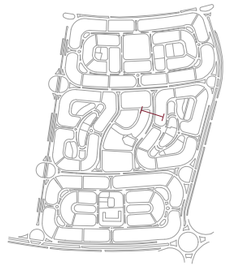




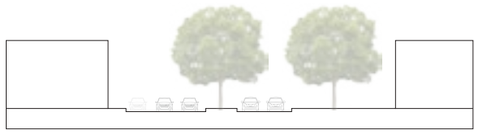


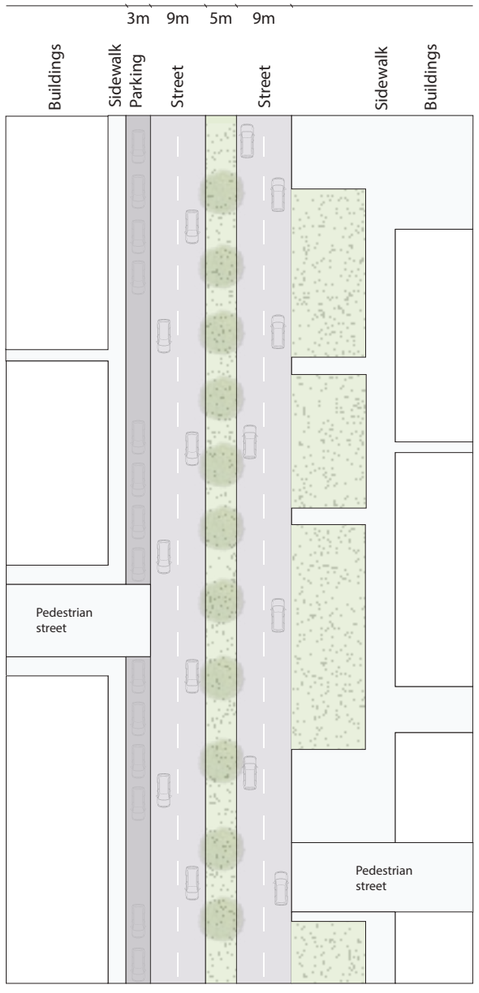


5.2.2 Internal street

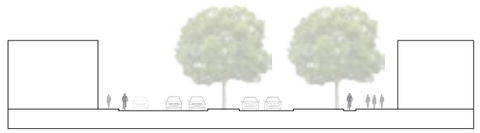


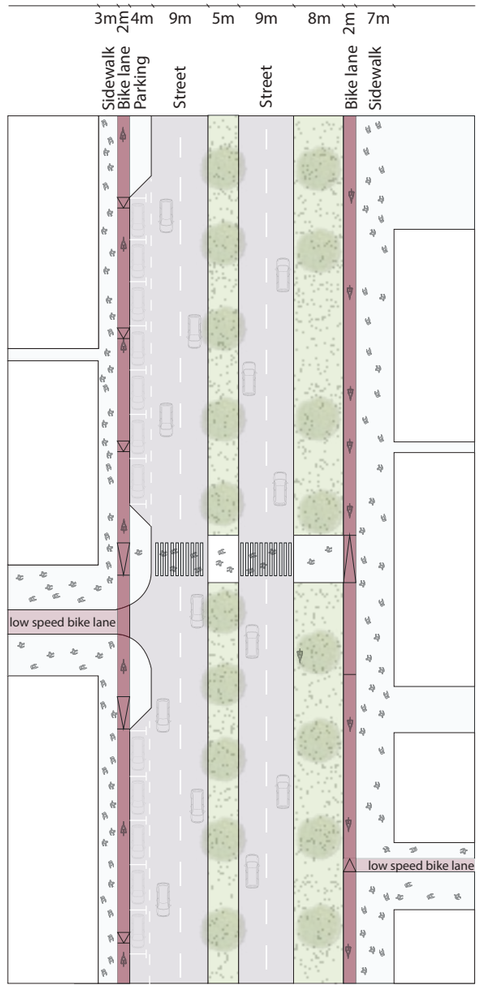
current situation



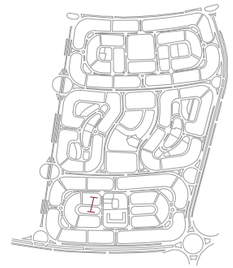


proposal

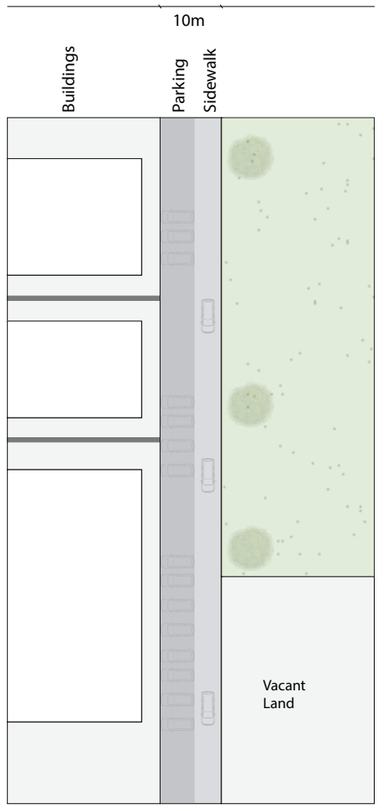




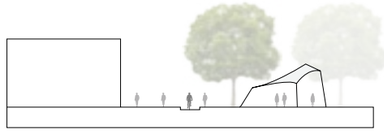
5.2.3 Pedestrian street

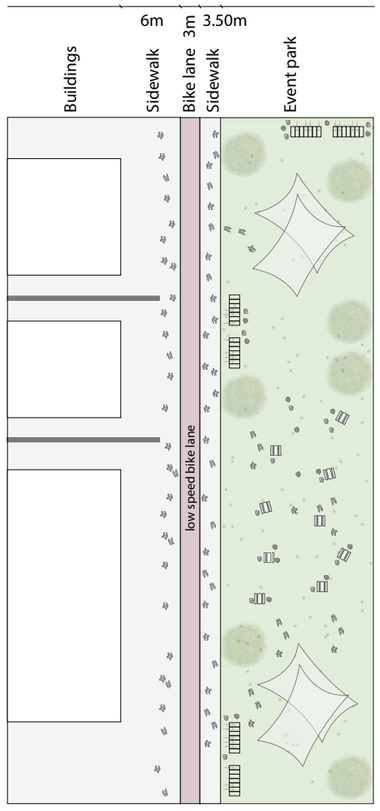


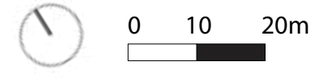
current situation



proposal







5.3 Strategies for built up areas, mobility and green infrastructures

Built up Program

The aim is to build a coheisive district by achieving proximity to diverse local facilities, The main design solutions are finalized at:

- Transforming the existing spaces such as schools become public playgrounds on the after school hours and during the weekends and creating no playgrounds in the neighberhoods with no schools.

- Supporting social life and every day interaction by creating third places using the vacant lands

- Using the vacant spaces to provide some of the missing facilities in the area for example there is a clear lack of supermarkets and medical facilities that can provided in the area

- Using the oversized and empty spaces around the mosques to create open plazas to enhance the neighberhood interaction

Mobility

The built up program set the base for the mobility program, making walking and cycling the obvious choice for movement in the disctrict with the aim of supporting sustainable and inclusive mobility through the following actions:

- Integrating parking policies on the edge of the superblock along with the border streets

- Creating bike network connecting the residential areas to the facilities previously provided with the attractors throughout the area, creating bike parkings and bike repair shops.

- Strategic location for the mobility hubs, having the bicycle parking aligned with the bike network

- To enhance and encurage walking on daily basis, pedestrians streets and pathways will be provided

Green Infrastructure

The focus is to strengthen Green network throughout the neighberhood as follows :

- Reinforcing the existing fragmented tree network and extending it to public spaces to improve the pedestrian paths and comfort and microclimatic condititons

- Activating the vacant spaces and underused green spaces, for creating green pockets throughout the neighberhood providing event parks and recreational and social community activities for the neighberhood.

- Improving the green connectivity by creating new green connection and pedestrian paths to link green spaces togther, improving the continuity and directly connect the current and future parks.

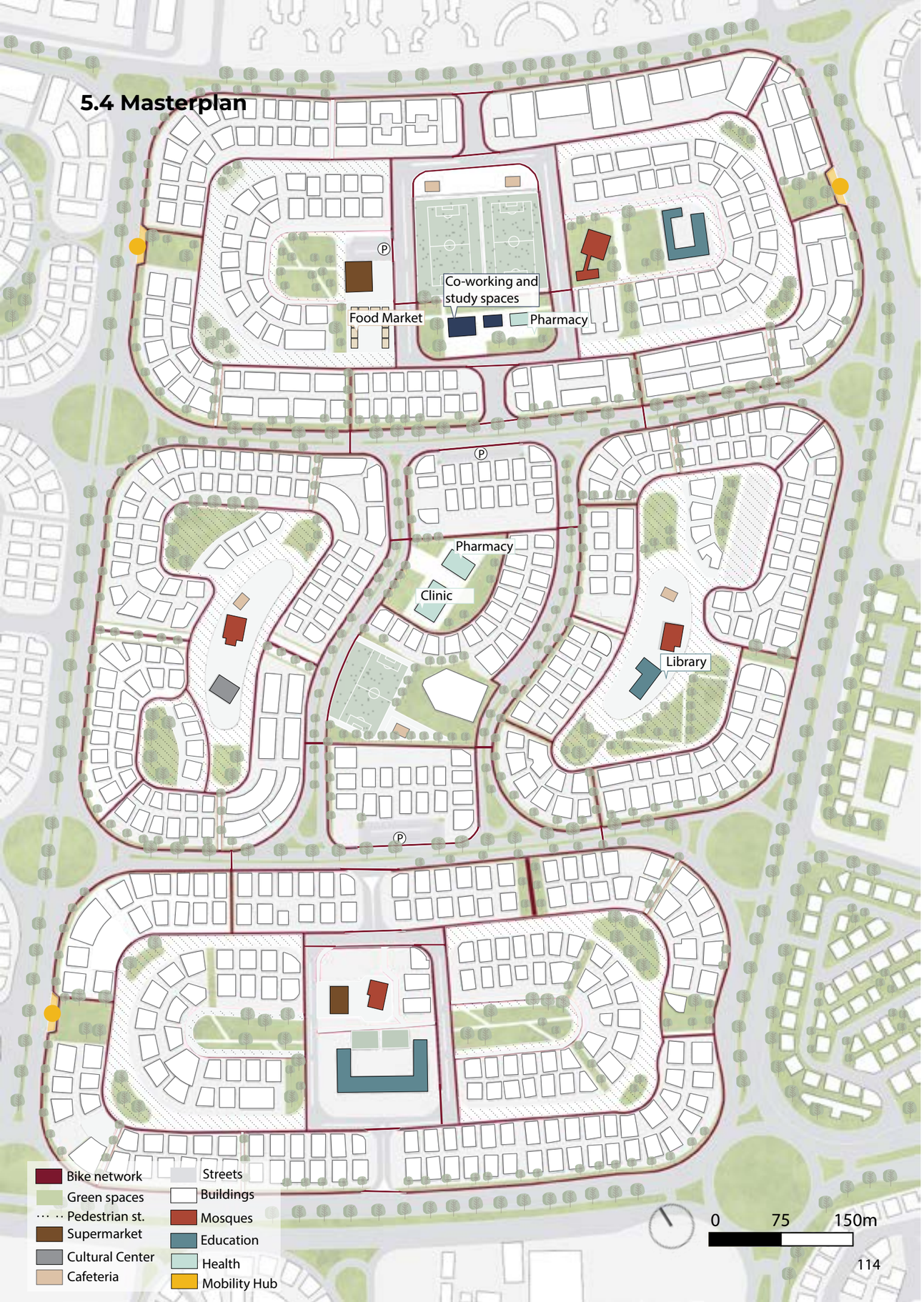
Criteria for the Placement of Trees and Green Spaces

- Climate and comfort : trees to be placed along shared streets, plazas and pedestrian paths to provide shade and reduce heat stress

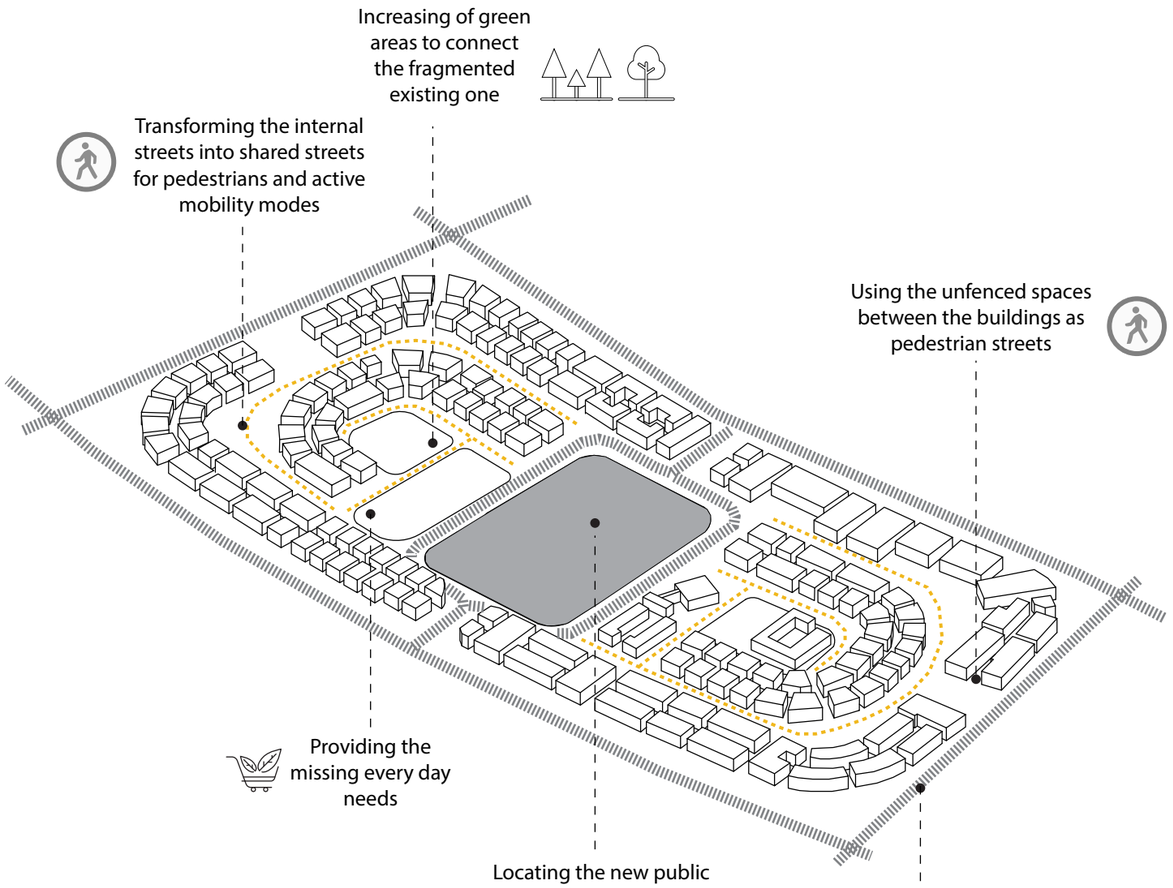
- Support of public life : in the unfenced areas and along shared streets to frame the seating areas and enhance social spaces to encourage longer stays

- Trees follow the streets hierarchy, making pedestrian streets with more trees separating the high and low speed mobility

5.4 Masterplan

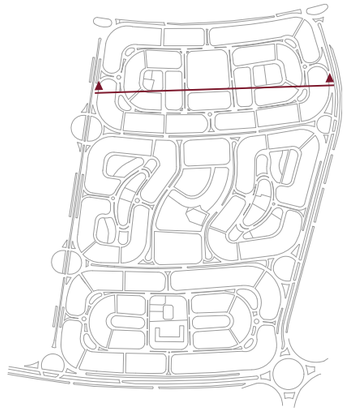


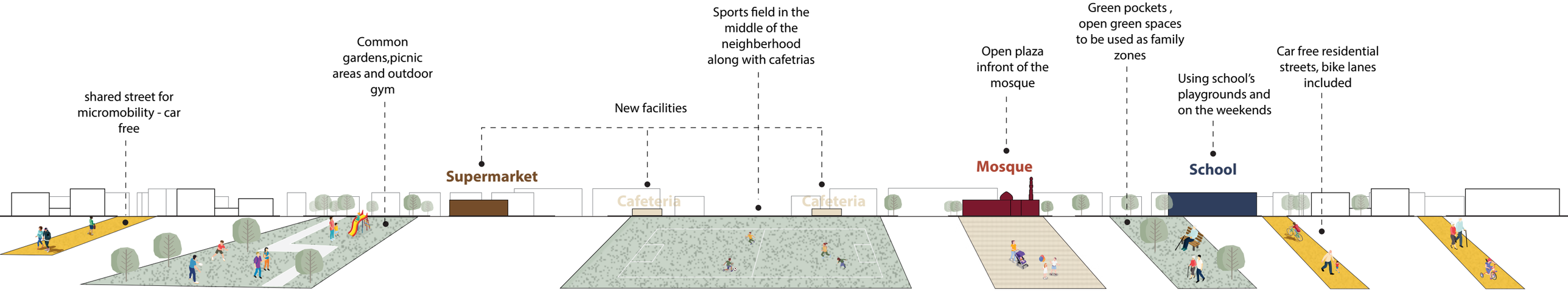
5.5 Zoom in Strategy

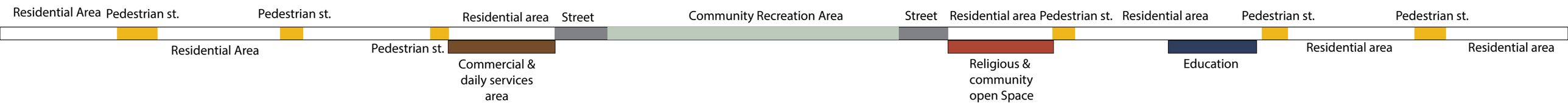


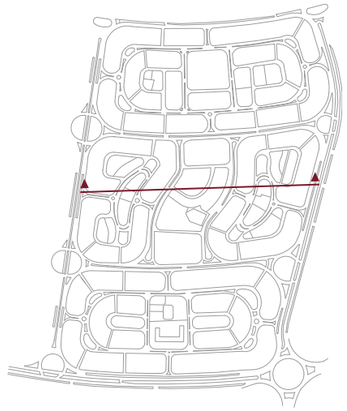
5.5.1 Zoom in master plan

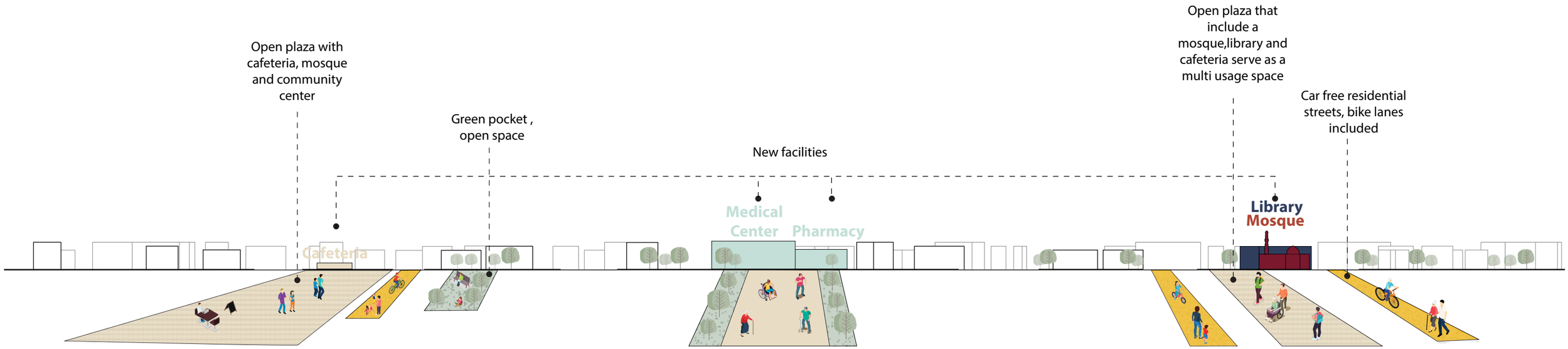
5.5.2 Sections

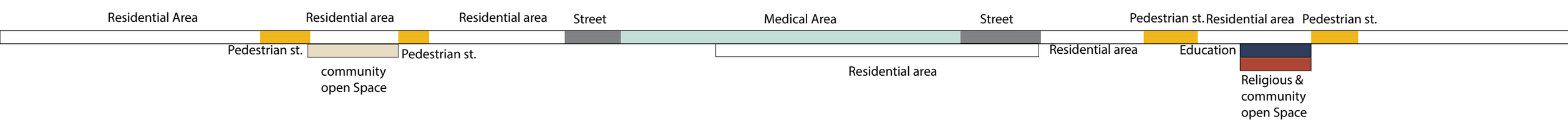









Open plaza with cafeteria, mosque and community center
Green pocket , open space
New facilities
Open plaza that include a mosque,library and cafeteria serve as a multi usage space
Car free residential streets, bike lanes included
Medical Center
Pharmacy
Library
Mosque
Cafeteria


Residential Area
Residential area
Residential area
Street
Medical Area
Street
Pedestrian st.
Residential area
Pedestrian st.
Pedestrian st.
community open Space
Pedestrian st.
Residential area
Education
Residential area
Religious & community open Space


0
10
20m

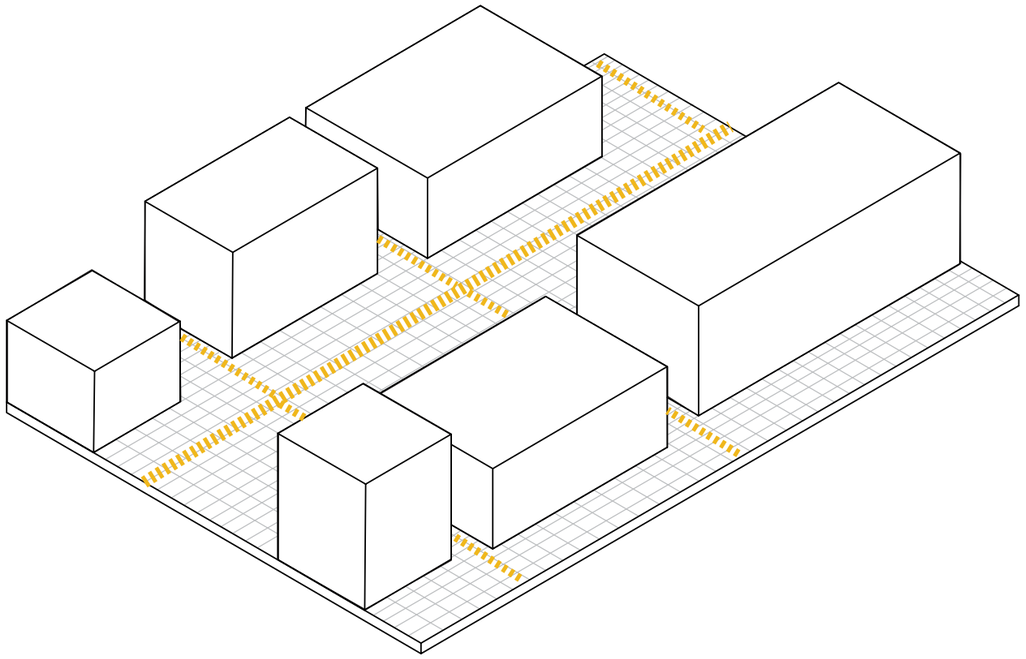
5.5.3 The In Between spaces

- **The In-between spaces**

The spaces between the buildings in district 7 is divided into 2 categorised:
1. fenced spaces
2. unfenced spaces

The unfenced spaces

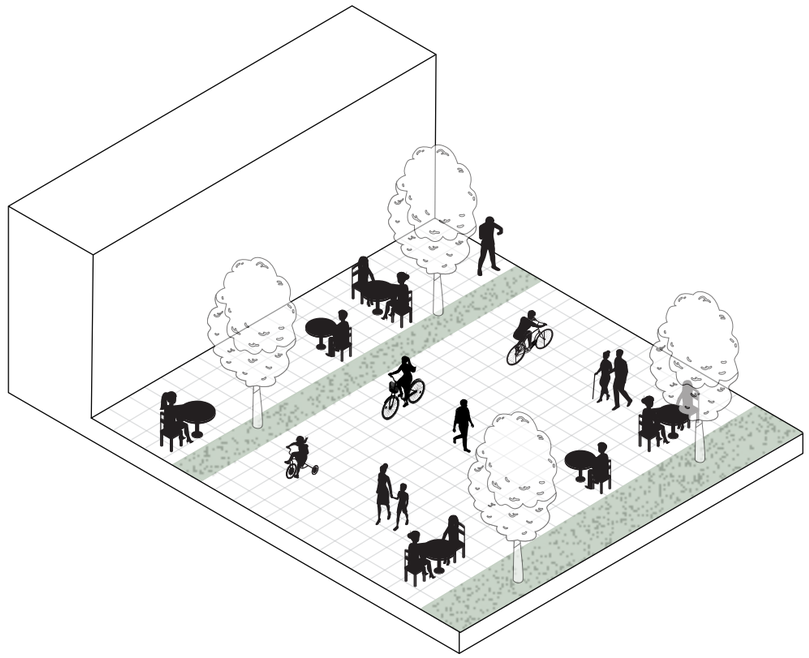
in this case it is reconceptualized as shared street, prioritzing pedestrians and cycling.
it functions as a public interface which accomodates seating areas, small green spaces, informal social activties to contribute to the everyday social life and increase porosity in the urban fabric



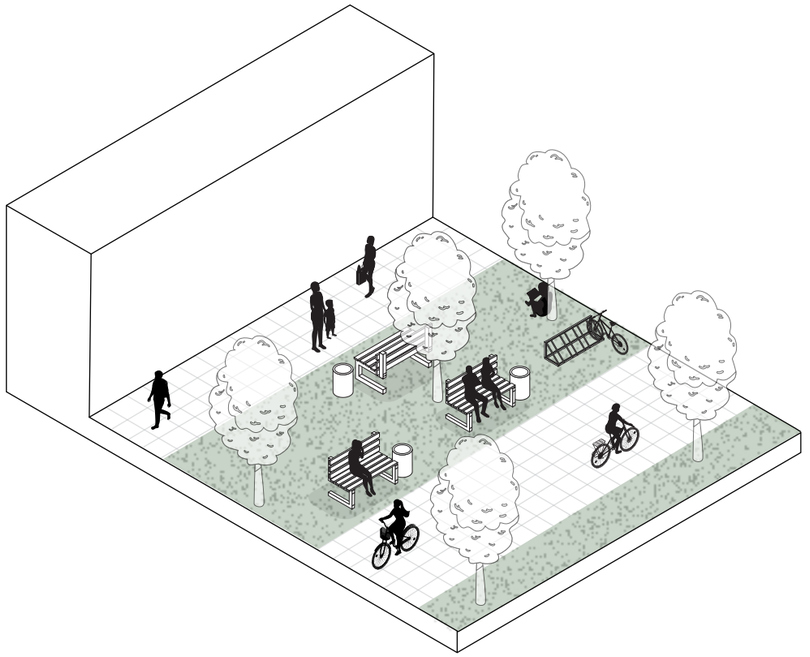
Flow of movement

5.5.4 The Unfenced spaces

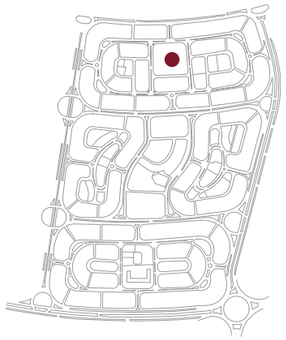
Type 1



Type 2



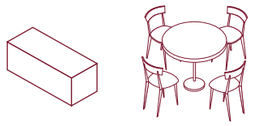
5.6- Scenarios



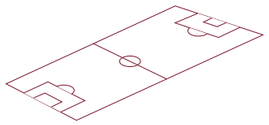
5.6.1 Sports fields

Sports Field are a local community facility that promote the everyday physical activity and enhance social interaction within the neighborhood.
they contribute to activating the vacant lands, their loction reponds to proximity principles which ensure easy access from the surrounding residential areas, they support healthier lifestyles

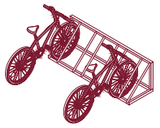
Seating areas



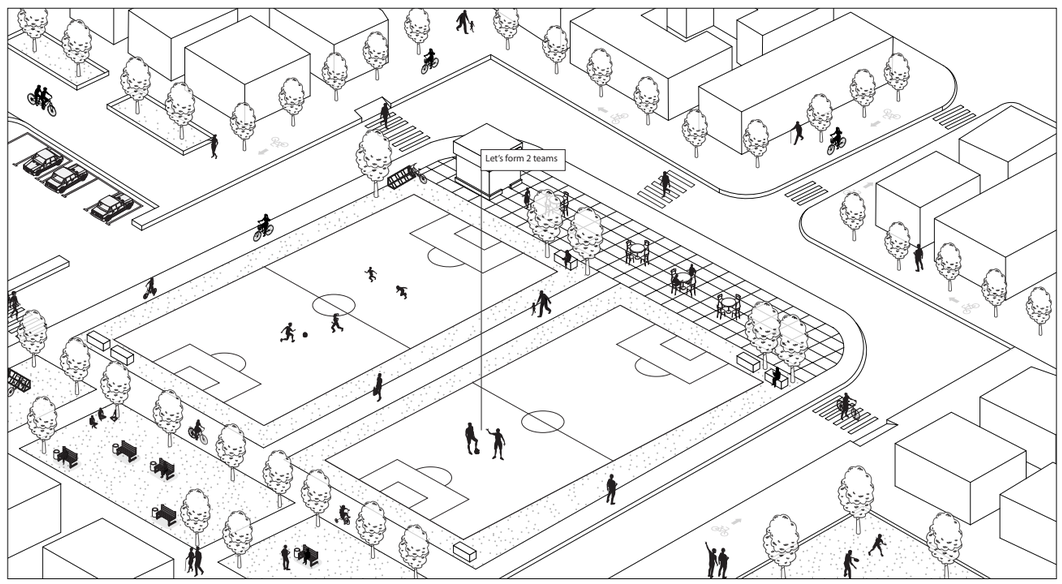
Sports Field

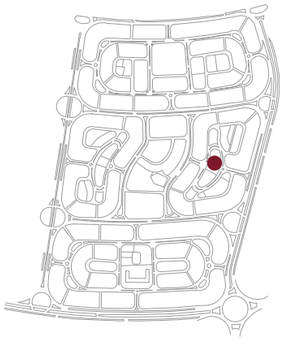


Bike Parking



Cafeteria

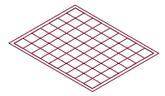




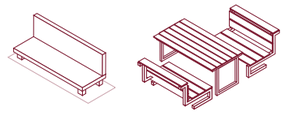
5.6.2 Mosque open plaza and pedestrian street

Previously this area was unorganised green along with vacant spaces around the mosque, following the superblock strategy the area inside the neighberhood is entirely for the people, car free zone, the aim is to promote active mobility (walking, cycling, using scooters and even skating) allowing people to be the main focus.
Different services to accomodate all age groups are provided, open plaza, kids areas, cafeteria and picnic spaces making the plaza a family friendly zone.

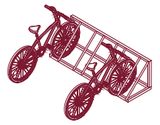
Picnic Area



Seating areas

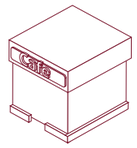


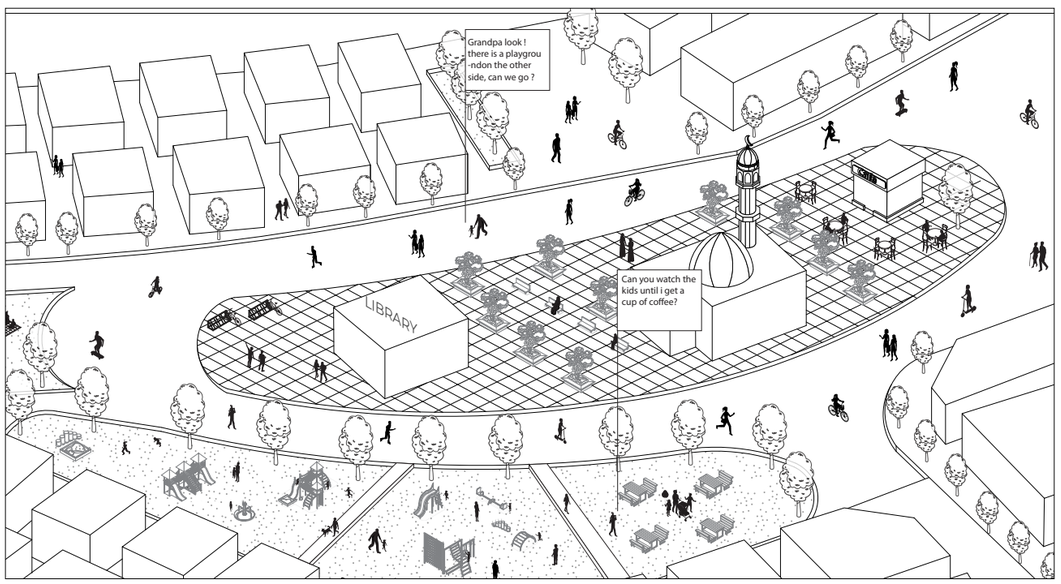
Bike parking areas

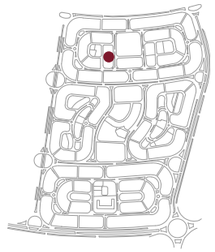


Kids playground

Cafeteria







5.6.3 Food market

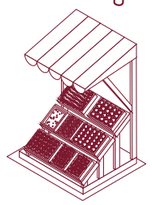
In an area that lacks supermarkets , the proposed local food market addresses the problem and works as a solution. Introducing a neighberhood scale food destination that promotes local business and reduces dependence on long car trips for the basic day to day need. Besides the food access, the market plays the role of a local social anchor as a public space for daily interactions in the neighborhood.

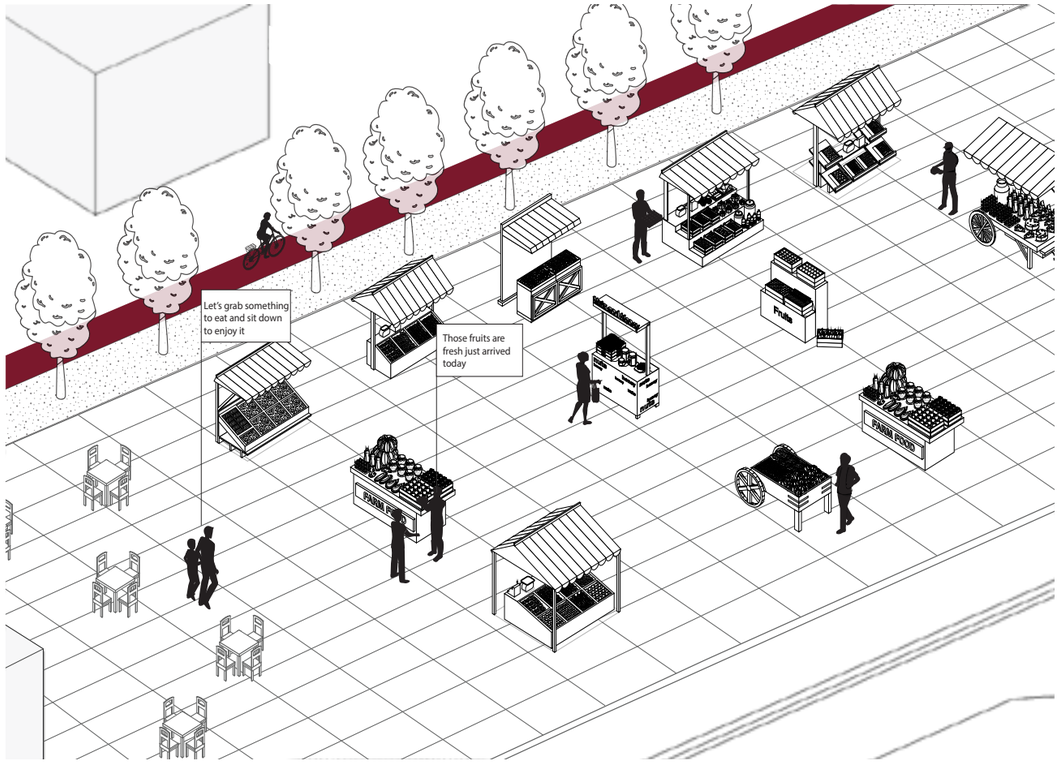
Seating areas

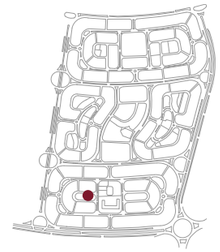
Shaded Areas

Bike lanes to make the access easier

Food kiosk



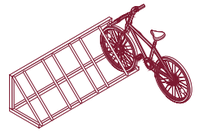




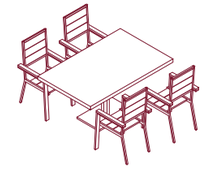
5.6.4 Park

The green spaces in District 7 are neglected and poorly maintained. The absence of green spaces does not affect only the environment, but it extends to the residents. Creating at least one park per neighborhood to provide the area with a green shared open space, with different activities such as an outdoor gym, as per this example, and including shade and water features for thermal comfort. In conclusion, providing a social interaction space for all ages.

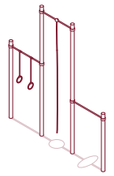
Bike Parking



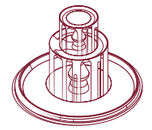
Seating areas

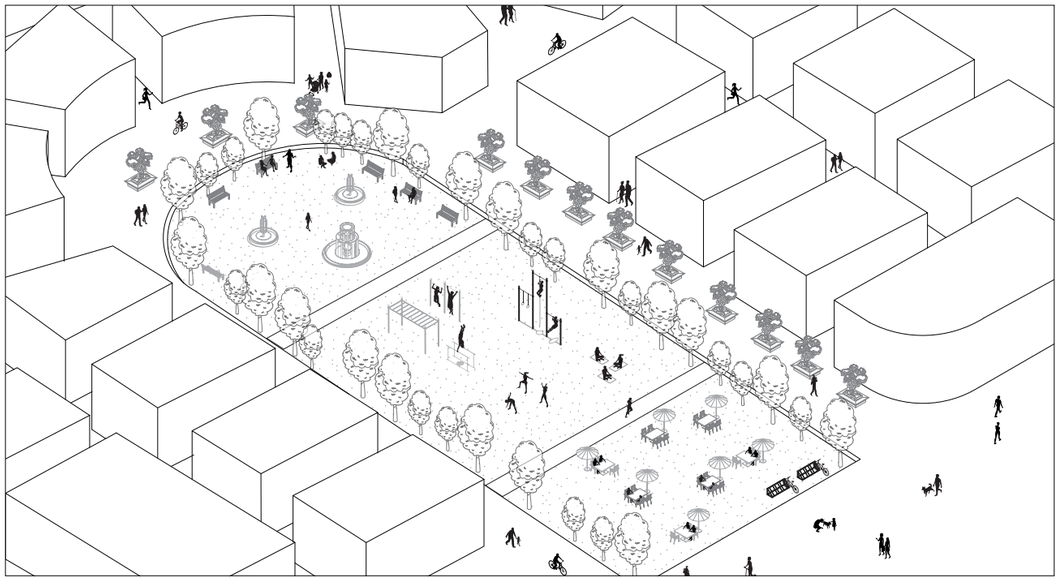


Outdoor sports Area



Water feature





5.7 Conclusion

This thises demonstrates that reclaiming the street through creating people oriented strategies and proximity based approach is mandatory to address the spatial and mobility existing challenges of car dependent neighborhood.
By integrating mobility systems, different landuse varities, green infrastructure.The project shows that the street function is not limited to cars but active and social spaces.There is 2 approaches adopted-first rethinking mobility hierarchies and the second redefining public and in between spaces which ensures accessibility,social interaction and environmental comfort within the spaces created.

Key findings :

- People oriented street design creates an inclusive, accessible and resilient neighborhood that caters to the everyday needs of different user groups.
- The integraton of multimodal mobility systems with public spaces creates an effective framework for reducing car dependency while enhancing the everyday movement and accessibility.
- Creating 2 types of mobility infrastructure (primary and local) in mobility hubs allows different scales of movement to exist and works on balancing the connectivity within the district with first-last mile needs
- Green infrastructure should be treated as a climate and social tool instead of a decorative element to improve thermal comfort and create a public life to enhance the quality of the urban environment
- The reconfiguration of the in between spaces and streets supports a smooth transition from private, shared and public realms strenghthening permability within the area

Broader significance

While the specific topic is Cairo metropolis, the proposed framework offers a transferable model for the other car oriented neighborhood especially with the new cities that currently in the building process.
the thesis demonstrates the importance of bottom up approach how different scales, people centered interventions can enhance the long term urban,social and environmental aspects.
By prioritizing proximity shared spaces and multimodal mobility, this approach advocates for an urban planing paradigm that places the every day life of the citizens as the core of the neighborhood future

Sources :

- Figure 1
- photo 01 : AZVision News. (n.d.). The Soviet legacy: Egypt restores factories built with USSR help, from https://en.azvision.az/news/33351/the-soviet-legacy-egypt-restores-factories-built-with-ussr-help.html
- photo 02 : Flickr. (n.d.). Baehler Building replaced Savoy Hotel circa [Photograph].
- photo 03: Artforum. (n.d.). Circling the square: Architecture and revolution in Cairo, from https://www.artforum.com/features/circling-the-square-architecture-and-revolution-in-cairo-197121/
- Salem, M., Tsurusaki, N., Xu, X., & Xu, G. (2024). Revealing the transformation of spatial structure of greater Cairo: Insights from satellite imagery and geospatial metrics. Journal of Urban Management, 13(4), 565–579. from https://www.sciencedirect.com/science/article/pii/S2226585624001274
- Hassan, G. F. (2012). The distribution of Ashwaeyat on the peripheries of Cairo metropolitan [Figure]. In Regeneration as an approach for the development of informal settlements in Cairo metropolitan. Alexandria Engineering Journal. https://www.researchgate.net/figure/The-distribution-of-Ashwaeyat-on-the-peripheries-of-Cairo-metropolitan_fig6_257497926
- Wagdy, A., Morsi, A. A. G., & Amer, M. (2015). Distribution of the formal and informal settlements in Cairo [Figure]. In Daylighting Optimization for Informal Settlements in Cairo, Egypt. https://www.researchgate.net/figure/Distribution-of-the-formal-and-Informal-Settlements-in-Cairo_fig11_288100996
- Citypopulation.de. (2023). Population statistics for Greater Cairo (Al-Qāhirah al-Kubrā). Citypopulation.de – World population statistics. https://www.citypopulation.de/en/egypt/greatercairo/
- Mekkawi, H. M. A. A. (2024). Shores of change: A multidisciplinary revitalization of Cairo's Nile waterfront through NBS and placemaking (Master's thesis). Politecnico di Milano. https://hdl.handle.net/10589/230583
- Aly, D., & Dimitrijevic, B. (2022). Public green space quantity and distribution in Cairo, Egypt. Journal of Engineering and Applied Science, 69(15). https://doi.org/10.1186/s44147-021-00067-z
- Taubenböck, H., Wurm, M., & Netzband, M. (2011). Scenario-based assessment of flood-prone areas at the mega-city of Cairo [Figure]. In Flood risks in urbanized areas – multi-sensoral approaches using remotely sensed data for risk assessment. Natural Hazards and Earth System Sciences, 11, 431–444. https://www.researchgate.net/figure/a-Scenario-based-assessment-of-flood-prone-areas-at-mega-city-Cairo-b-Urbanization-on_fig4_50828921
- Transport for Cairo. (2025). Open Data Portal (Dashboard 165). https://data.transportforcairo.com/catalogue/#/dashboard/165
- Geofabrik. (2026). OpenStreetMap data for Cairo/Egypt (downloaded for GIS mapping). https://download.geofabrik.de/africa/egypt.html
- Transport for Cairo. (2024). Transportation Surveys and Data Collection for Greater Cairo Metro Line 4 Phase 1 East-West Extension Project. https://transportforcairo.com/projects/transportation-surveys-and-data-collection-for-greater-cairo-metro-line-4-phase-1-east-west-exte/
- Salem, M. (2025). What makes people walk … [LinkedIn post]. https://www.linkedin.com/posts/mostafasalem_aetaecaey-aesaewaefaeyaef-aesaewaefaeyaefabraehaetaezaepaeuaey-activity-7379032166602719232-JQjR
- Iqbal, A., Nazir, H., & Qazi, A. W. (2025). Exploring the 15-Minutes City concept: Global challenges and opportunities in diverse urban contexts. Urban Science, 9(7), 252. https://doi.org/10.3390/urbansci9070252
- Andrews, W. (2017). Visiting Barcelona's Superblocks. Will Andrews Design. https://www.willandrewsdesign.com/?p=5502
- New Urban Communities Authority. (n.d.). Sheikh Zayed City. New Cities Authority. https://www.newcities.gov.eg/know_cities/Sheikh_Zayed/default.aspx
- Elwany, A. A., & Elsemary, Y. (n.d.). An approach to improve land use and urban mobility patterns in Egyptian communities: Case study of El-Sheikh Zayed City. Engineering Research Journal, Faculty of Engineering, Helwan University. https://erj.journals.ekb.eg/article_303074_f141993209b693cb389f7d41d7d770a4.pdf
- Mwasalat Misr. (n.d.). Sheikh Zayed City transport portfolio. https://mwasalatmisr.com/ar/portfolio/sheikh-zayed-city/
  (mwasalatmisr.com)