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# Last Mile connectivity

## Dar es Salaam

Studio  
compilation



# 00. Terminology

**BRT:** Bus rapid transit

**CBD:** Commercial business district

**Street (informal) Vendors:** unofficial work condition without conditions that safeguard the safety and integrity of the individual

**Integrated fare system:** Possibility of combining in a public transport journey different transport modes with a unique ticket

**Intermodal Hub:** place where different transport means are integrated and passengers can easily change between them.

**Last mile connectivity:** Final connection from the last public transport station to the final destination.

**Monocentric city:** where most of the activities and services that inhabitants need are placed in only one region in the city.

**Polycentric city:** where the activities and services are accessible for the population in different places within the city.

**Centrality:** diversity of land uses

**NMT:** Non-motorized Transportation

**MRT:** Mass Rapid Transport

**EV:** Electric vehicle

**E-Bike:** Electric powered bicycle

**E-3 Wheeler:** Electric three wheeler

**E-MOBILITY:** Electric mobility

**Social cohesion:** Linkage of members from different social groups.

**Spatial segregation:** Visible or invisible division among the spaces that different social groups inhabit.

**SWOT Analysis:** Strengths, weaknesses, opportunities and threats' Analysis

**TOD:** Transit oriented development

**TAZARA:** The Tanzania Zambia Railway Authority

**TRL:** Tanzania Railways Limited



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# Get to know us

# team



MARAM

My name is Maram. I am from Amman, Jordan. I did my Bachelor degree in Architectural Engineering at University of Jordan and worked as a design architect and projects coordinator. Currently, I'm pursuing my Master degree in Urban Design at TU Berlin. I'm focusing my attention on the social and environmental implications of circular constructions and how mobility justice endeavours can enhance the process of social and spatial justice.



CAROLINA

My name is Carolina. I am from Medellin, Colombia. My background is in Architecture and I am currently doing my master's in Urban Design. I enjoy working in complex contexts where social and cultural conditions are challenging and a fundamental part of a change towards translating the interventions into complex and interdisciplinary urban projects.



HANNES

My name is Hannes and I'm from Lüneburg, Germany. I did my Bachelor degree in Urban and Regional Planning at the TU Berlin and I'm currently about to finish my Master in Urban and Regional Planning. My main interests in the field are research about the transformation of urban space in an international context as well as the design and development of sustainable cities, which put the health and wellbeing of their citizens at first.



# 1. Introduction

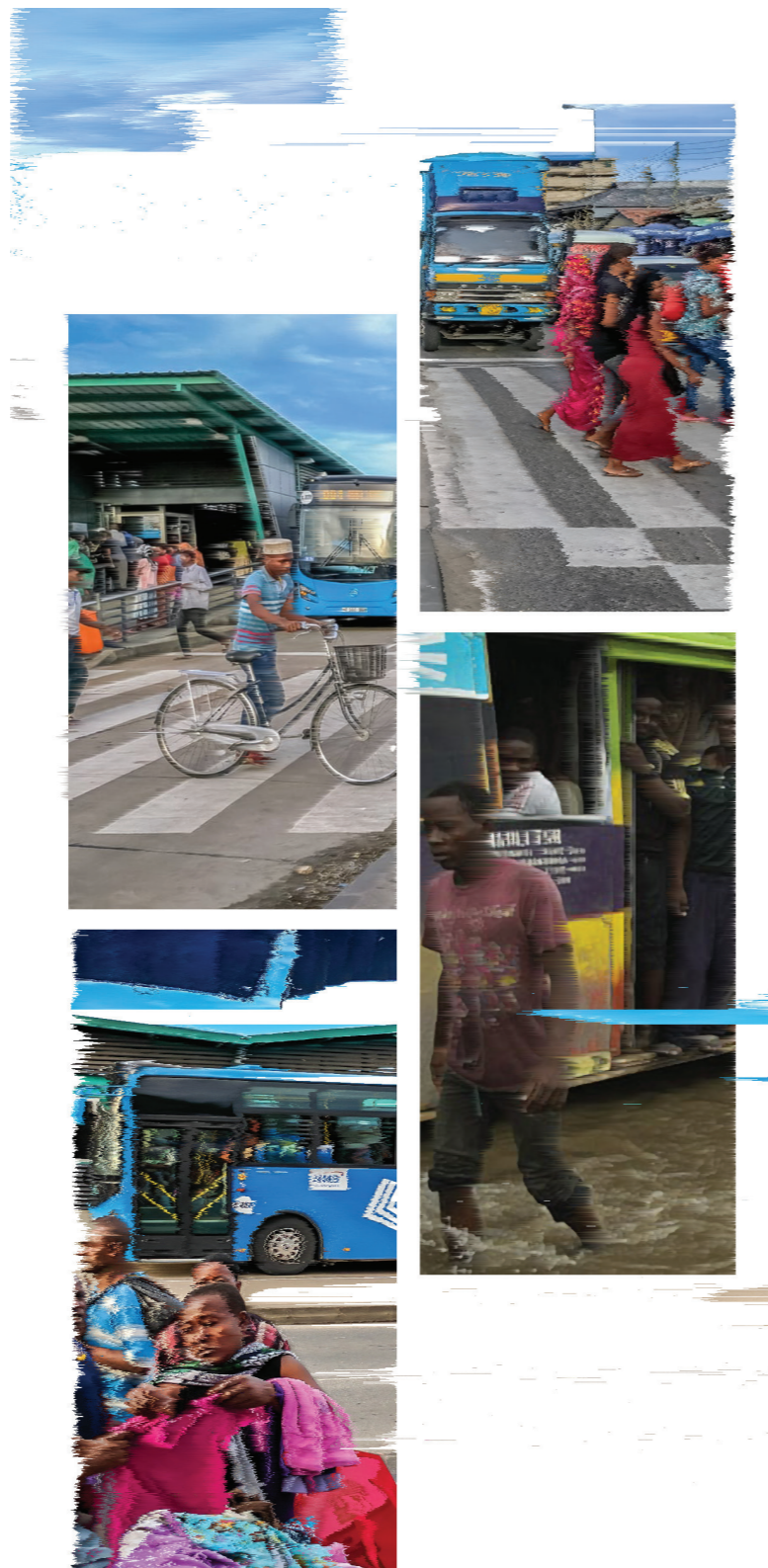
# 1 Introduction

## 1.1 Project Frame

Dar Es Salaam is the utmost growing city in the Africa, where the rapid influx of population is projected to reach 76 million inhabitants by 2100. The city is stressed with severe climate change events, fossil fuels mobility patterns, and insufficient public transport systems, where last mile connectivity is still inattentive.

The “Urban Living Labs” studio facilitate the transition of a living lab concept that enables experimentation, multi-stakeholder cooperation and testing of specific solutions in a place-based context. Likewise, it supports this process through a perspective on transformative living labs focusing on improving urban mobility solutions, connectivity and fostering local innovation to contribute to sustainable urban development. This involves working towards solutions which reinforce linkages between urban planning, design, access to public transport and electric mobility for a benefit of diversified socio-economic groups, (Habitat Unit website).

In a response to the environmental policy strategies and the urban agenda of Dar Es Salaam, a new interventions in the city and mobility structures are a must. Our planning vision for the city 2050 is framed through the application of a resilient multi-modal transport system incorporation with “3-E-Wheelers” as a sustainable last-mile mobility solutions to increase efficiency and attractiveness of the public transport system. This system will be connected with the existing BRT System to fill the gaps in the first and last mile trips. The exiting BRT stations and terminals are already served by fossil fuels 3-wheeler-taxis, but E-mobility can easily swap them in the micro-local context and incorporate into the existing system. The new multimodal transport system will cover 5 different locations in the city (central/ downtown, commercial, residential and sub-urban).



Img 1: Dar es Salaam

## 1.2 Solutions Plus + Parter Cities

The project SOLUTIONSplus sets up a global platform for shared, public and commercial e-mobility solutions, and to kick the transition towards low carbon urban mobility through innovative and integrated electric mobility solutions in large urban areas, besides addressing user needs and local conditions in Europe, Asia, Africa and Latin America.

The studio “Urban Living Labs” works closely in tandem with the SOLUTIONSplus project. This project builds on the Urban Electric Mobility Initiative, which was launched by UN-Habitat and the Wuppertal Institute at the UN Climate Summit 2014. It also closely cooperates with a sister project funded by the Global Environment Facility (GEF) and managed by the International Energy Agency (IEA) and UN Environment. Together the two projects create a joint global urban e-mobility programme that will significantly boost the development of innovative solutions, their replication and scale-up.

Through the regional platforms and the continual collaboration with the projects partners and associated planners, we as “TU Berlin students” were able

to define the project aims to develop highly effective and innovative approaches to urban e-mobility and multi-modal transport systems in both cities of Dar

Es Salaam and Montevideo, ensuring that mobility systems and interventions from this project deliver on the Paris Agreement, meet the Sustainable Development Goals and address the New Urban Agenda in Europe, Asia, Africa and Latin America.

**“Accelerate transformational change towards sustainable urban mobility through innovative and integrated electric mobility solutions”**

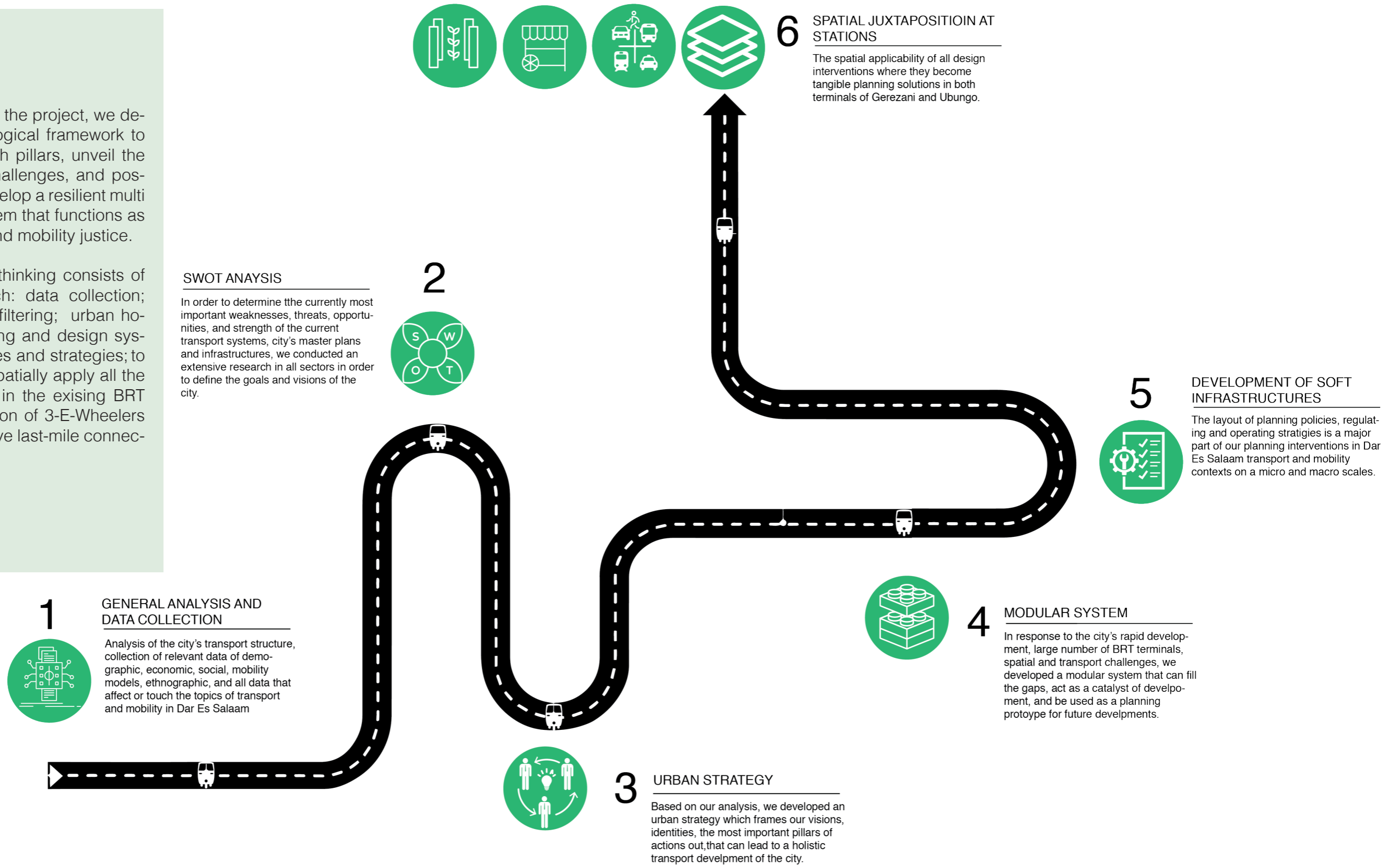


Img 2: Partners cities - Solutions Plus

### 1.3 Methodology

In a way to approach the project, we developed a methodological framework to cover all the research pillars, unveil the current problems, challenges, and possible strengths to develop a resilient multi modal transport system that functions as a catalyst to social and mobility justice.

The methodological thinking consists of 6 stages of research: data collection; data evaluation and filtering; urban holistic thinking, planning and design system; planning policies and strategies; to finally position and spatially apply all the design interventions in the existing BRT terminals with adoption of 3-E-Wheelers as low carbon effective last-mile connectivity solutions.



Img 3: Project's Methodology

# 2. Dar es Salaam





# 2 Dar es Salaam

## 2.1 Project outline

### E mobility for last mile connectivity

“The demonstration project in Dar Es Salaam will focus on E-mobility for last-mile connectivity. The demonstration aims at integrating 60 electric feeder/E-3-wheeler and distribution services with Dar es Salaam’s BRT (DART) to support first/last mile connectivity. The E-3-wheelers (newly built 50 imported/provided by DART and 10 newly built with Valeo components), will be an integral part of public transport. Under SOLUTIONSplus, the deployment of E-3 wheelers will happen at 5 DART stations considering urban locations: a) in the city centre, where fossil-fuelled 3-wheelers are currently banned for environmental reasons and where accessibility to/from the BRT stations can be limited due to longer distances; b) in peri-urban areas where combustion-fuelled 3-wheelers are currently very common as feeder-modes. Also, a feasibility study on the electrification with respect to vehicle specifications (range, speed), charging infrastructure (type and location) will be carried out. As part of this, state-of-the-art data collection methods using geo-localization devices will be applied for a detailed derivation of the systems specifications. Subsequently, an implementation plan for the introduction of e-3-wheelers will be developed. This will follow a systemic approach and include the development of business models (vehicle ownership, rental schemes, and maintenance), the charging infrastructure and localization.”(Solutions plus, 2021)

To meet the different expectations from an academic context, but also the ideas from our partners in Dar es Salaam, we will develop an Urban strategy based on our analysis and come up with several different interventions and measures from the macro to the micro scale, which work as modules for short-term and long-term interventions. This way, we give our partners a variety of possibilities they can decide on, according to local circumstances, land ownership, and financial situation.

Therefore, this compilation shows concepts and solutions for the implementation of E-3-wheel

ers in the public transport network in Dar es Salaam in order to foster E-mobility and improve last-mile connectivity. As well, as different soft infrastructures that should be implemented to guarantee the operation of the physical interventions.

## 2.2 Introducing the city

Dar es Salaam is the largest city and former capital of Tanzania. Dar’s population is over 7 million inhabitants, and its growth rate is 4,39% meaning that by 2100 Dar will be the most populated city in the order.

Dar is a city with a mono-centric structure. The city’s growth originated in the city center, where now the CBD is located and went further inland from here. Therefore, the areas closer to the old heart of the city are more dense and consolidated, while as we go further outside, we can see a lot of urban sprawl and informal settlements.

The most common form of transport in Dar es Salaam are the public buses, called dala dala, which are often found at the major bus terminals of Makumbusho, Ubungu, and various other areas around the city. Since the introduction of the motorcycle transit business known as “Bodaboda”, most people prefer this type of transportation, which allows them to get into the city faster compared to the mini busses which face a lot of traffic. Other types of transport include motorcycles and bajaj. To improve the mobility and public transport within the city the first BRT line was introduced along the main city corridor. Also with the purpose to decrease car congestion and become Dar in a polycentric city. Equipping several BRT terminals to meet the necessities of the population close to them avoiding long commutes for the inhabitants who live further away from the CBD.

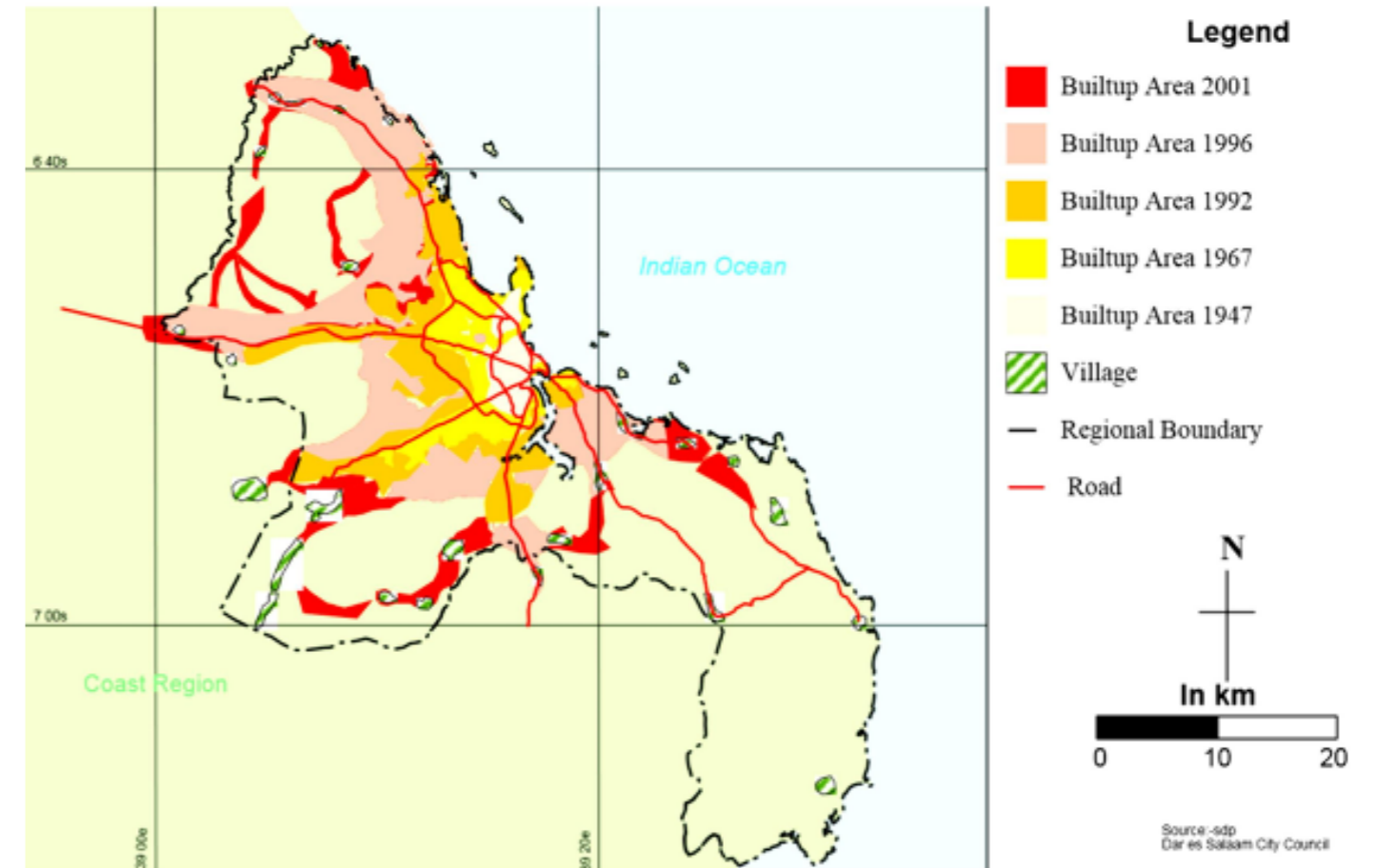
Other modes of transportation also take place within the city of Dar, such as the railway and the ferry as the maritime transport.

## 2.3 Basic Data

### Spatial growth

During time, the city’s spatial expansion has happened through the infill and densification process rather than expanding further away

from the major roads. A combination of land use pattern structured along the major roads has created a “sprawled city.” The pockets of land between these arterial roads are still in the process of integration and densification, thus resulting collaged urban form of Dar es Salaam.



Img. 4: Spatial Growth



## Dar Es Salaam Master plans through history

### 1949

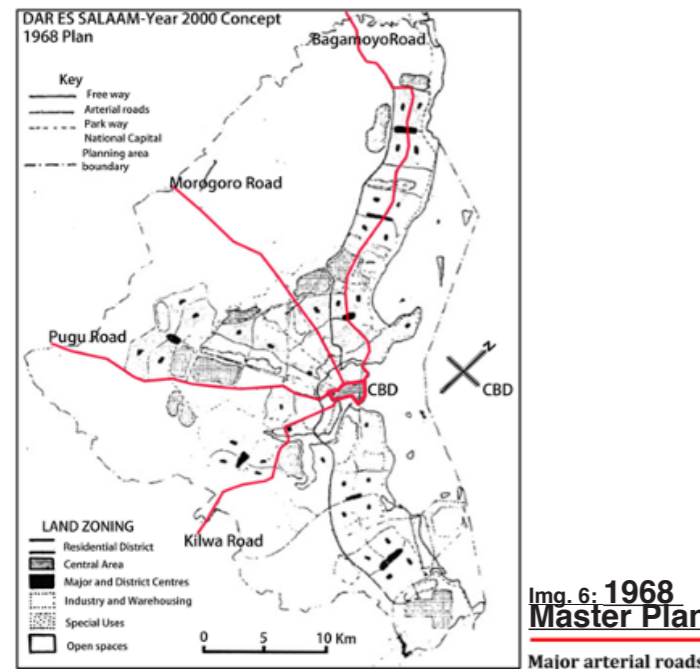
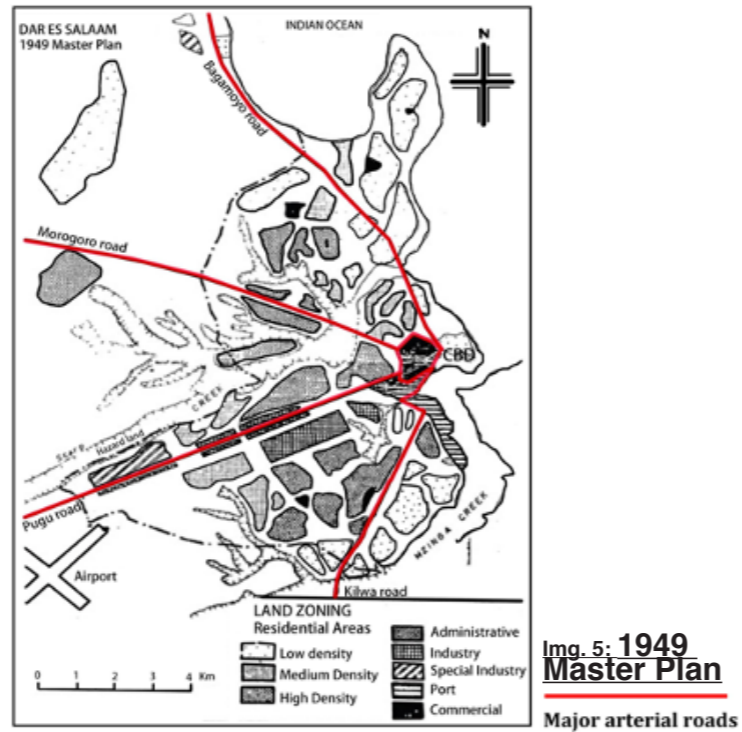
This master plan was developed by Sir Alexander Gibb and Partners of London.

It was postwar plans for other major towns in British East Africa.

It envisioned Dar Es Salaam as the administrative and institutional centre of the British colonial territory.

Health and safety were also the main concerns, but it increased the social and physical segregations.

Streets were originating from the commercial areas.



### 1968

This master plan was reflected the altered social and political conditions within the country at that period. It aimed at breaking down the exclusive racial and income barriers of its colonial past. The master plan failed to achieve concrete changes in the planning because of the growth problem.

The roads networks also were still originated from the commercial centres and the port through the city.

So the city is unable to accommodate the rapid influx of people led to unplanned housing.

### 2012 - 2032

It was proposed to replace the old master plan of 1979. It tried to address difficulties of the previous master plans, expressed local and national goal, would contribute to the growth and prosperity of Dar es Salaam toward a world-class city of excellence, and most important: it was a new land act that inhibits people from occupying and developing unplanned areas.

The new master plan focused on three main themes for the city: personal development, col-

lective memory, and creation of a national commercial hub.

Also this Master Plan regulates and organize the relocation and concentration of residents into specific residential areas.

However, the new master plan was not implemented and JICA proposed a new plan.

The draft covers four major areas (urban structure and land use, road transport, public transport and traffic management) projected to be implemented in three phases in a period of 21 years until 2040.

### 1979

This master plan came as a response to many problems:

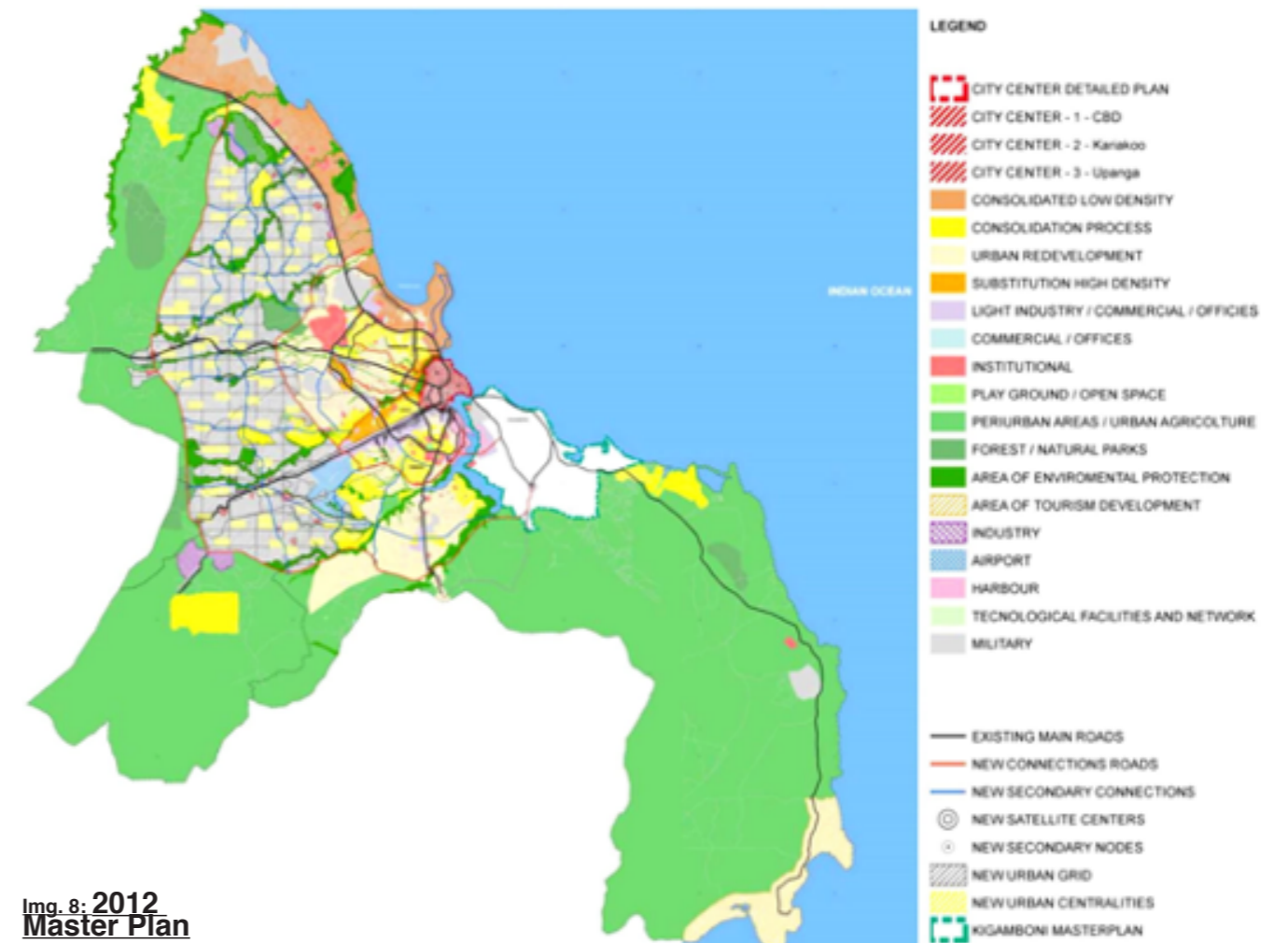
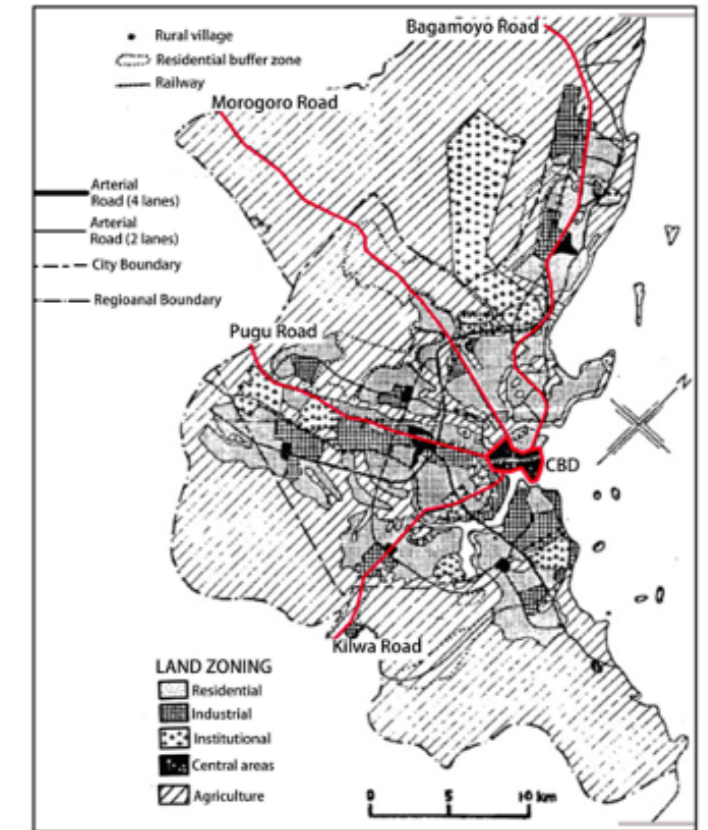
The decline of agricultural production, economic crisis, impacts of war with Uganda, the acceptance of Squatting according to the revision of the Housing Policy.

The new master plan was developed by by Marshal Macklin. It focused on 3 areas to be developed starting from the squatting areas.

The plan was also population attained/targeted rather than fixing target period (years). This master plan followed a hierarchical planning approaches, focused on the residential areas and the provisions of open spaces based on that.

The plan also encouraged the location of industries throughout the urban area to balance job opportunities and labor force.

**Img. 7: 1979 Master Plan**



## Informal Growth

All the previously proposed master plans for Dar es Salaam generally gave projections on the future growth of the city while trying to promote and enforce well-planned zoning of land use, services, and infrastructural development. The plans continuously fail because they are not comprehensive, and do not address the local issues of economic development, population growth, and administrative capacity in implementation. (L.L. Peter, 2019)

As mentioned before the previous master plans failed and led Dar es Salaam to have rapid informal growth.

The slums have been increasing exponentially since 2012. This informal residence development is not properly built, usually are at risk areas susceptible to landslides, and floods. Furthermore, these informal settlements are placed in spaces of

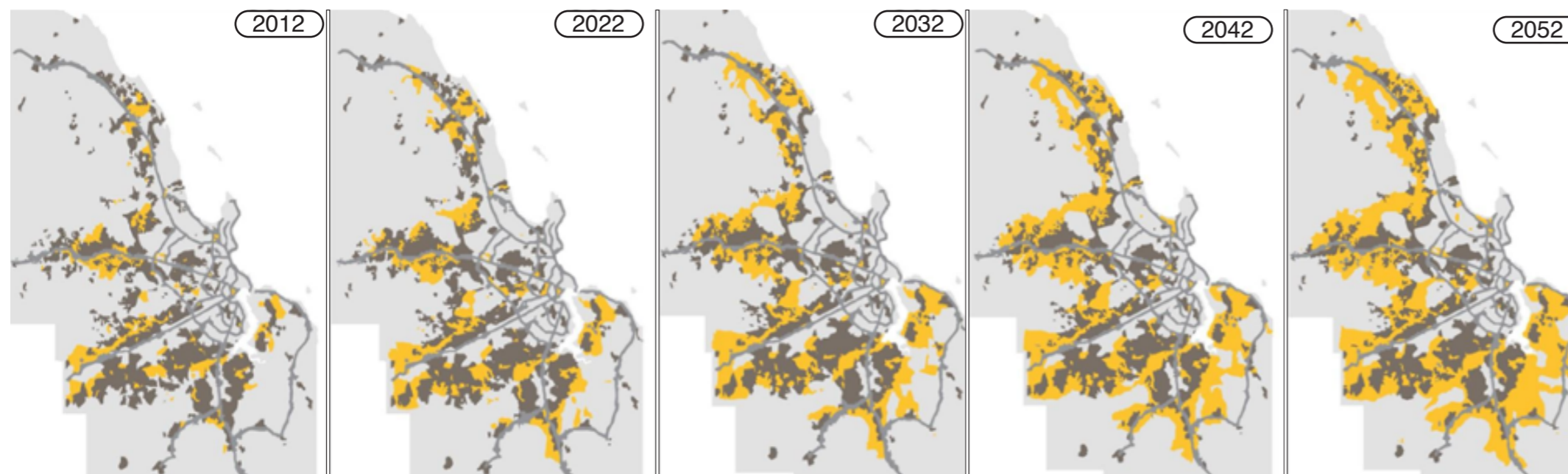
great

environmental value deteriorating the green and blue infrastructure of the city. Therefore the conditions of these settlements are not proper. And this expansion is not going to stop shortly. Massive internal migrations take place every year from the rural area to the city in search of more opportunities. This migration has spatial consequences and also reflected in the economic and cultural practices in

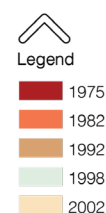
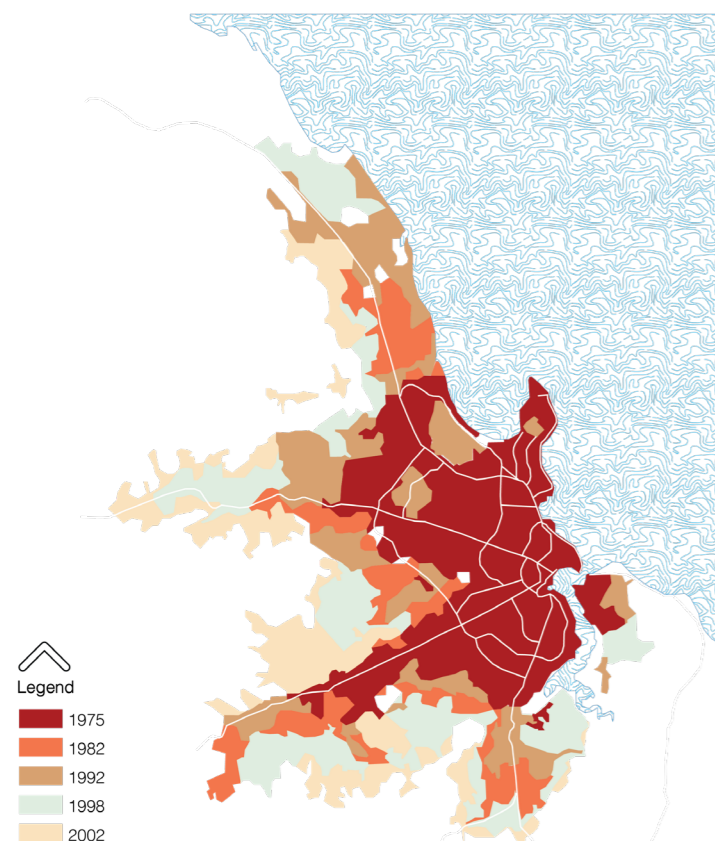
the city.

“Studies carried in 1995 showed that about 70% of the population of Dar es Salaam is accommodated in informal settlement (URT, 2000). Sliuzas, et al. (2004) noted high informal settlement growth rate as opposed to the planned residential land use class across time. Reviewing the two land use classes in two time ranges, i.e. 1982-92 and 1992-98, the annual growth rates for planned residential were 3.0 and 2.1, while it was 4.7 and 9.1 for informal settlements respectively. Sliuzas, et al. (2004) also claims densification of informal settlements via incremental housing construction as a major aspect of informal settlement development process apart from expansion.” (Abebe, 2011)

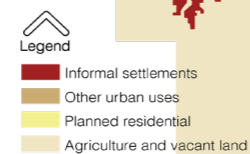
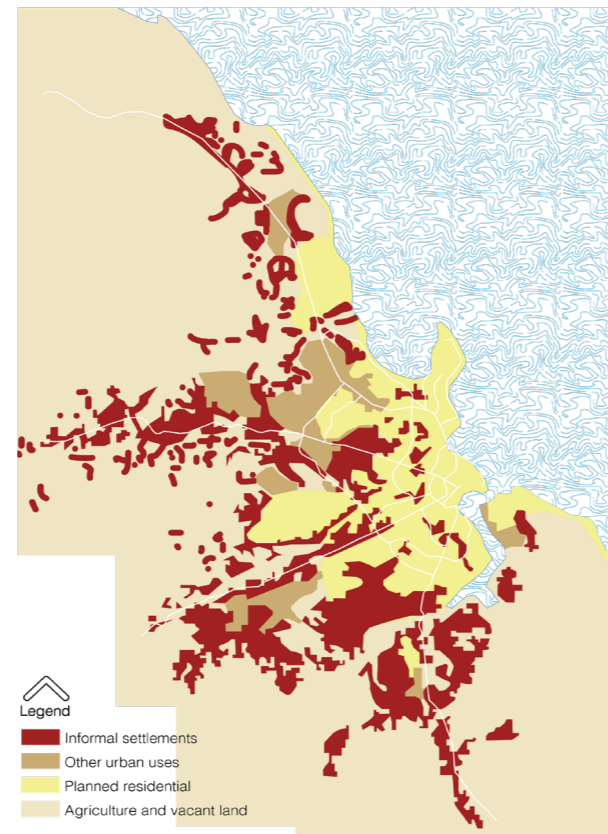
Img. 9: Informal settlements



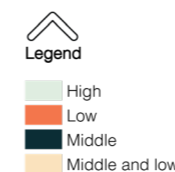
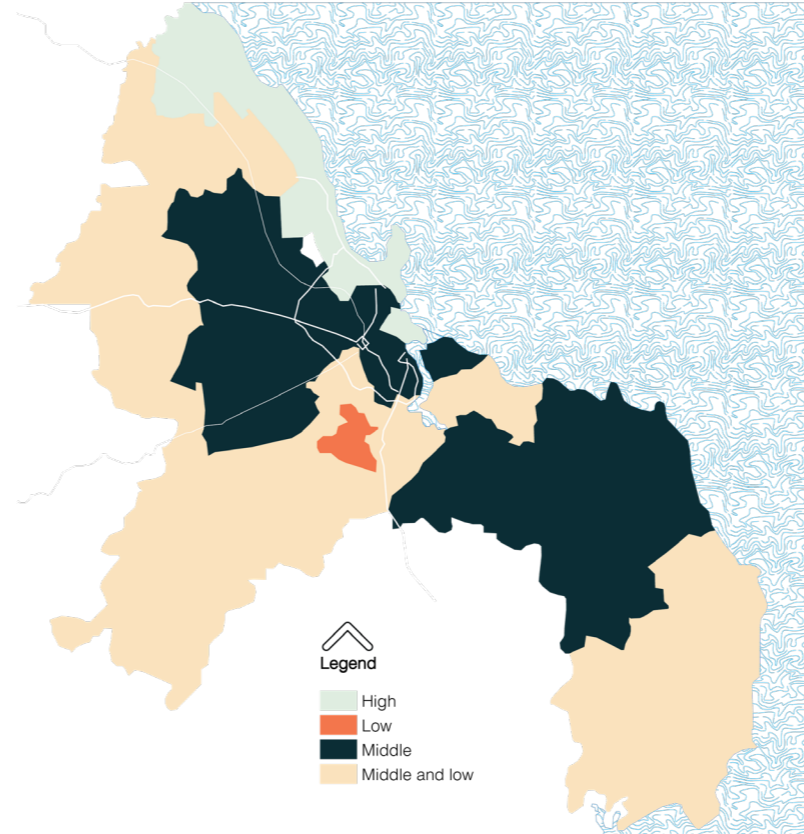
Img. 10: Spatial growth



Img. 11: Informal settlements



Img. 12: Levels of income



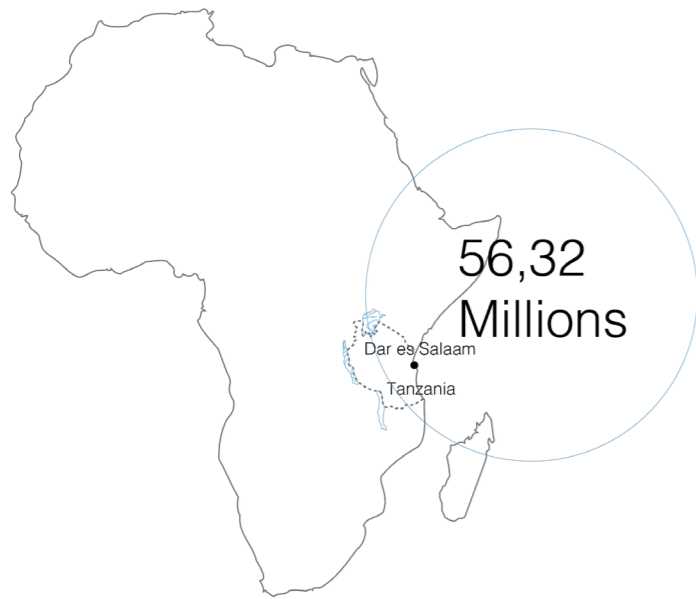
## Informality

As mentioned before the informal growth is projected to grow rapidly in the next decades with the displacement of the rural population with this, one can expect also the arise of informality within the city. In the maps below one can see the relation between the spatial growth, the informal settlements, and the grade of income.

The city growth from the CBD of the city and expanded initially through the inner land. The most recent growth has been around the main entrance road to the city. In the map of the informal settlements, the informal settlements overlap with the most recent development in the city.

Therefore, while the high and low-income areas are localized near to city center, the middle and low income corresponds to the informal settlements where poor communities are.

**Demographics and population**



**Fig. 13: Dar's population**

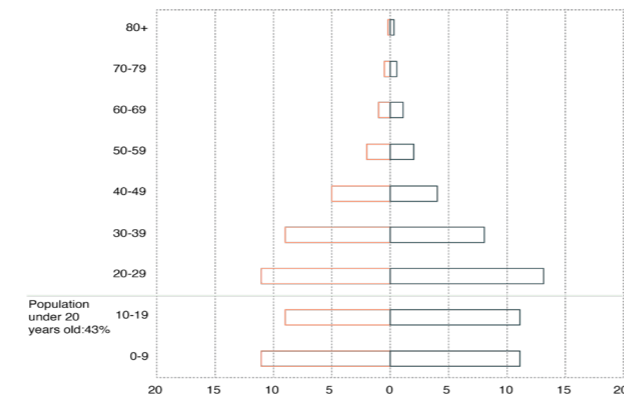
The estimated population of Tanzania in 2018 was 56.32 million. For The city of Dar es Salaam, the estimate is 7 million inhabitants. (World Bank,2018)

Even though, Dar's population doesn't seem large compare to other cities around the globe, but it is the third fast-growing city in Africa and number ninth in the world. "The city's metro population is expected to grow to over 5 million over the next three years. The population is expected to grow so much, that Dar es Salaam is expected to be the second-largest city by population in the world by 2100, with a predicted population of 76 million. The annual growth rate is expected to average 4.39% through the year 2020." (world population review - Dar es salaam, 2021).



**Fig. 16: Dar es Salaam growth rate**

**Fig.14: Dar es Salaam growth rate**



**Fig.15: Age average Dar es Salaam**



**City profile**

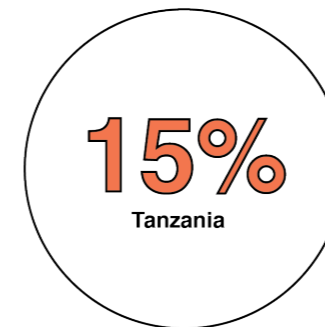
More than six million people in Tanzania live in an urban slum. This number is increasing by six percent every year. 70% of Dar's population live in poor.

The average age of the city population is around 20 around 43% of the inhabitants, this also translates to people not having specialized labor workers having high rates of unemployment or informality itself.



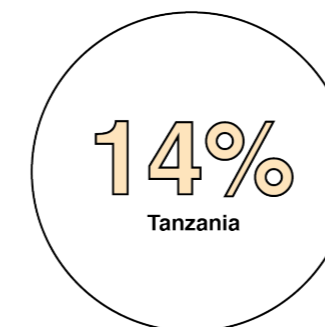
Dar es Salaam's population lives in poor, unplanned settlements. About half of these residents live on less than \$1 per day.

**Fig. 17: Poverty percentage**



The unemployment rate is approximately 15%, although underemployment is widespread.

**Fig. 18: Unemployment rate**

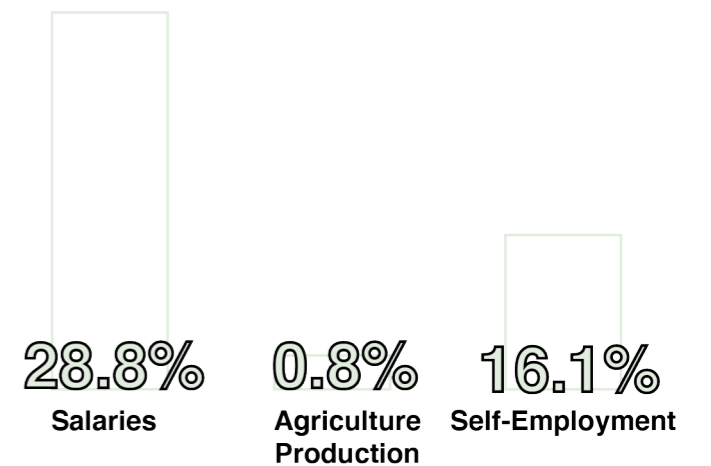


only 14% reported working in formal, wage-earning jobs (Kushner, 2013).

**Fig. 19: Work formality**

**Youth unemployment** is a serious issue in the region. Only 15% of the youth population is unemployed Approximately and just 14% reported working in formal wage-earning jobs. It is also important to highlight that the given data is from previous years to the global pandemic. Hence, one can assume that these levels have increased exponentially due to the current situation.

Within agriculture, there is little variation in poverty by type of crop grown. Among households whose main source of cash income is from the sale of food crops, 40% are poor, whereas 39% of households dependent on the sale of cash crops are poor. Those dependent on the sale of livestock and livestock products have a lower rate of poverty (around 30%). Households are diversifying out of agriculture seeking to improve their well-being. 28.8% have an income from salaries, 16.1% of self-employment that in the poorest household it translates into work informality It would appear that the less poor households are diversifying to take advantage of economic opportunities, while the poorest households are diversifying out of desperation and for survival. Data by residence indicates that rural households have made gains from non-farm self-employment between 2000/01 and 2007, but mean monthly incomes in rural households are still much lower than incomes among urban households (PHRD, 2009)



Distribution of Household Monthly Income by Source of Income, by Poverty/Wealth Quintile and Area of Residence 2007

**Fig. 20: Youth unemployment**

## Percentage of people with disabilities in Tanzania

**“Definition:** Definition and analysis of disability in this report is based on Convention 61/106 of the United Nations on the Rights of Persons with Disabilities. According to the convention, “persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others”. Prevalence of disability in this report is based on population aged 7 years and above.

**Prevalence of Disability:** 7.8 percent of the population aged 7 years and above had some form of activity limitation. Prevalence is higher on the Mainland (7.8 percent) compared to Zanzibar (5.9 percent) and is higher in rural areas (8.3 percent) than in urban areas (6.3 percent). There were no significant differences in disability prevalence among males and females. Prevalence among males was 7.7 percent compared to 7.8 percent for females

**Disability by Gender:** Disability among males at 8.5 percent was higher than that of females (8.2 percent), while in the urban areas, females were more likely to have higher disability (6.7 percent) than males (5.8 percent). Proportion of persons with disabilities ranges from 2.7 percent in Manyara to 13.2 percent in Mara region.

**Transport:** The majority of the people with disabilities in both Mainland and Zanzibar report never having any problems with the accessibility of transport in the last 12 months. Around a fifth of all people with disabilities (Mainland and Zanzibar) reported problems with the Prevalence of disability Tanzania 2008 Disability Survey Report 76 access to transport always and often. These are likely to predominantly be people with difficulties in mobility (walking and climbing stairs). The exception were urban Zanzibar dwellers who were the least likely to report problems often or always. The smallest proportion of people with disabilities reported problems sometimes or seldom (under 20 percent).” (Prevalence of disability,2008)

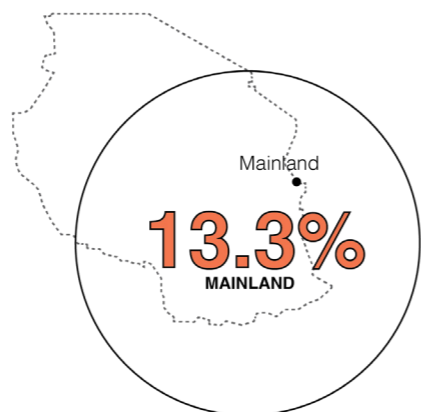


Fig. 21: Prevalence of disability - Mainland

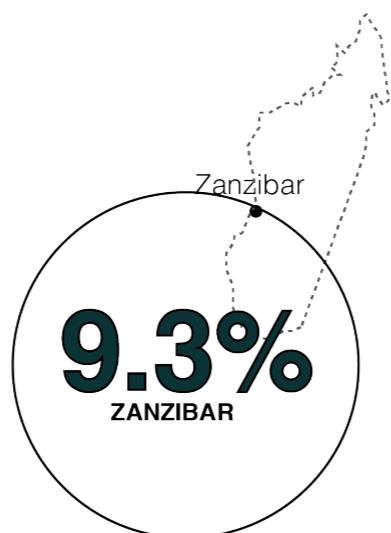


Fig. 22: Prevalence of disability - Zanzibar



Fig. 23: Prevalence of disability - Average

## Voice telecom and internet rates

“The Internet penetration rate in Tanzania doubled between 2013 and 2019, reaching 46 percent in 2019. That same year, 85 percent of the population were using a voice telecom service.

**“Around 19 million internet users in Tanzania accessed the world wide web last year through their mobile phones”**

**Mobile phone usage in Tanzania:** Tanzania’s mobile industry has been growing since the early 2000s. Out of the 42 million mobile voice subscriptions registered in 2018, roughly half

the devices were used to access the internet, indicating the comparatively high number of basic cellphones throughout the country. Apart from voice calls, mobile phones in Tanzania are primarily used for SMS and mobile money services, provided by telecom operators like Vodacom, Tigo and Airtel.

**Distribution of web traffic:**In 2018, over 95 percent of Tanzania’s 23 million internet users accessed the internet via mobile phone. A similar distribution of web traffic can be seen in other leading African digital markets like Kenya and Nigeria, where mobile phones generated significantly more traffic than PCs. With its 43 percent internet penetration rate, Tanzania was well above the estimated African average penetration rate of 24.4 percent in 2018.”(Statista, 2019)

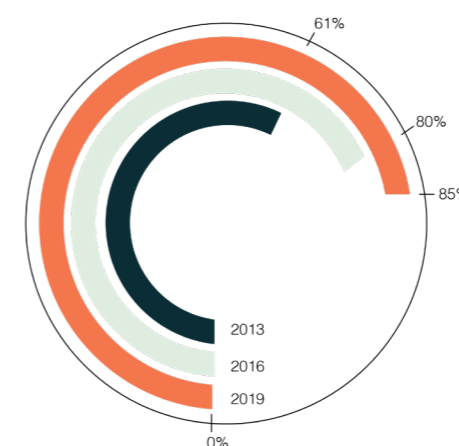


Fig. 24: Voice telecom - Tanzania

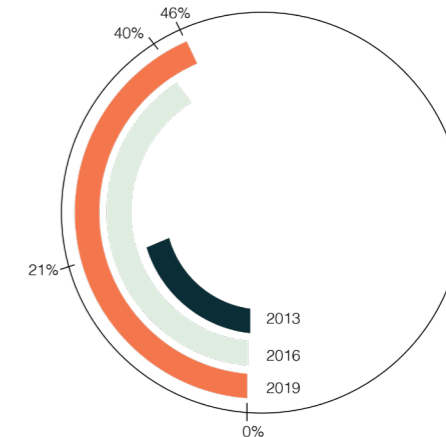


Fig. 25: Internet - Tanzania



## 2.4 Vision and goals

### **Transit-Oriented development**

Dar es Salaam is seeking transit-oriented strategies that can improve public transport as well as the non-motorized transport infrastructure to discourage the use of private cars and some unorganized modes of transport such as Daladala buses even though they are quite convenient for the population due to the high number of cars and multiple routes, but still those modes are not a regularized system. Strategies of integration between the different transport entities and companies are necessary in order to guarantee a homogenized transport system.



Transit-oriented development

Make people favor public transport over the private car with various strategies

### **Efficient and affordable public transport**

The current BRT lines and the future development phases should embody an integrated fare system. Since the Rapid buses, just navigate the main roads and other modes of transport such as: Daladala, 3-wheelers and motor-taxis are serving feeder routes so they increase reachability. Integrated fees system will allow fair prices for a Journey and do no extra charge in each mode of transport.



Efficient and affordable public transport

### **Implementation of an Urban rail system**

In order to strengthen the public transport system and create a multi modal networks, an urban rail system should be developed and connected to the BRT stations.



Implementation of urban rail system



Improved public transport with vendor facilities at transport routes

### **Street vendors**

Implementation of organized vending spots around BRT stations and corridors to spatially include them in a trial to avoid the informal occupancy of the public space, sidewalks, or bike routes.

Local vendors can be successful business model that act as an active frontages of the stations.



New road hierarchy in CBD which is Pedestrian and NMT-focused

Decentralization and poly-centrality

### **Decentralization**

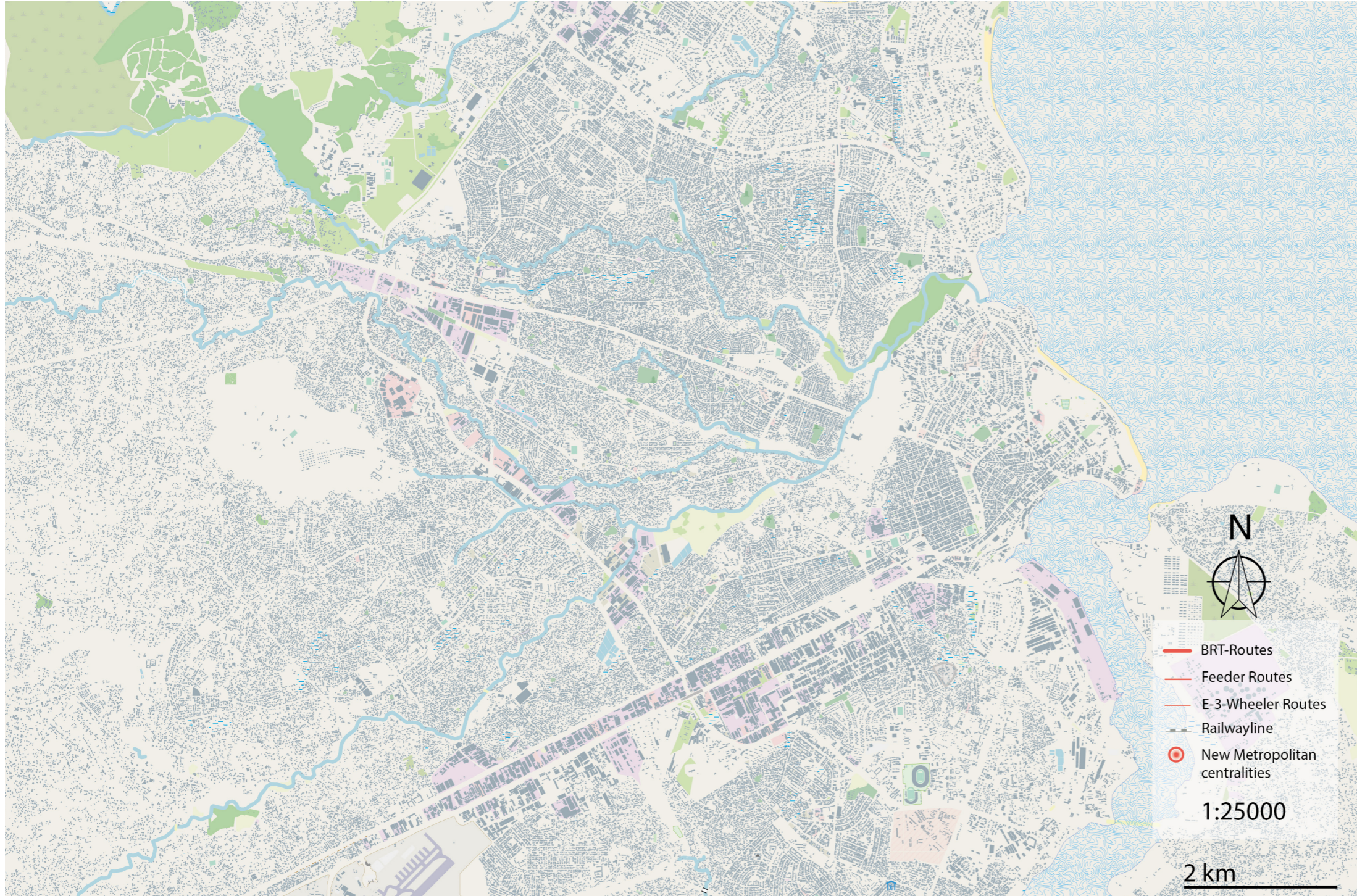
The construction of satellite centers helps to reduce the mono-centric trend, creates new opportunities for peripheral centers, decentralizing the urban center functions, and redistributing traffic flows.

Increasing the urban quality through the implementation and improvement of pedestrian and bicycle routes, and through facilitating easy access to public transport.

# 3. Analysis



# 3 Analysis



**3.1 Urban Context**

**Img. 26: Dar es Salaam's city map**

## City Structure

Dar es Salaam's growth originated in the east of the city at the bay, where now the CBD is located and went further inland/westwards from there. The city structure in the CBD and surrounding areas is very dense and consolidated. Buildings here are mostly formalized, while going further outside the city, there is a lot of urban sprawl

and informal settlements. The city developed around the CBD, which is why the road structure is monocentric. Despite the CBD being the old-est part of the city, with its first buildings being built in the 1860s, the architecture in this part of the city is now already heavily overformed by buildings from the era of the 1940s and later. The cityscape here is still changing very dynamically. (The government of Tanzania 2018: 306-311)

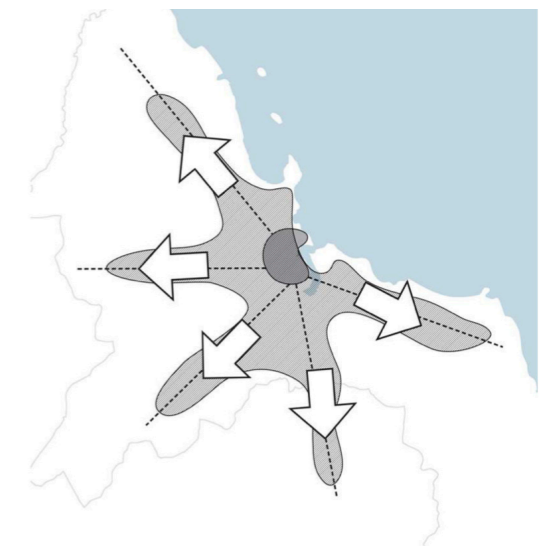
This mono-centric structure is causing the main roads leading in and out the CBD to be severely congested during the day. (The government of Tanzania 2018: 9) Dar es Salaam's public transport system, which mainly consists of Daladala Minibuses depends on using this heavily congested roads, which is why the system is currently completely overstrained and insufficient.



**Img. 27: Informal settlement in Dar es Salaam**



**Img. 28: Developed city center of Dar es Salaam**



**Img. 29: Monocentric structure of the city**



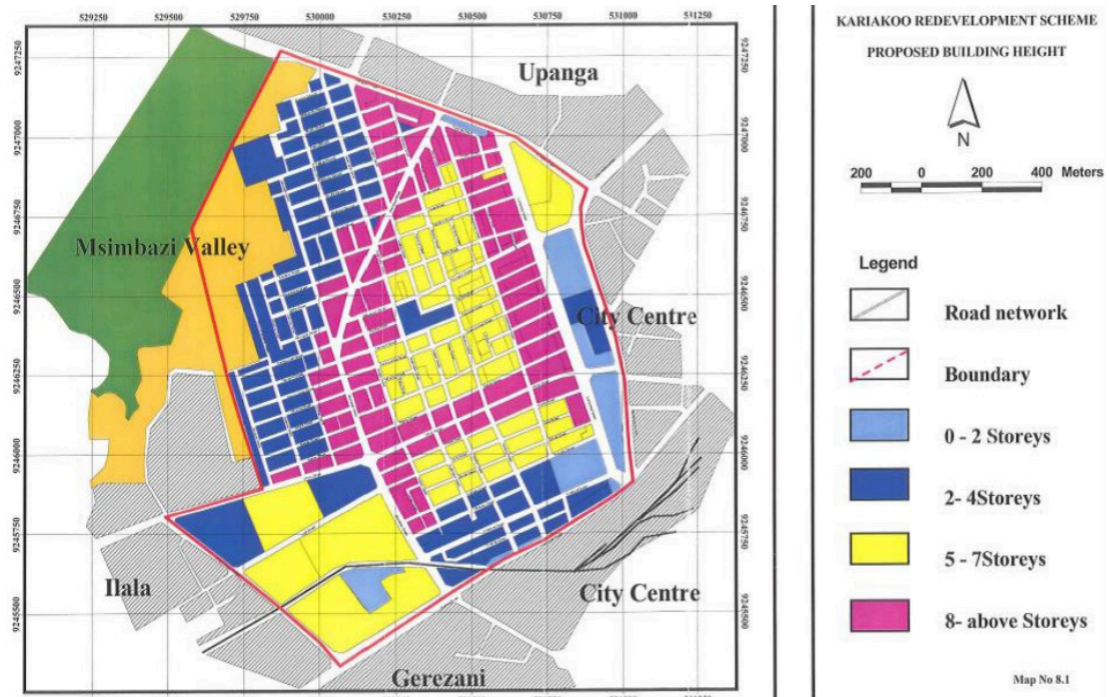
**Road infrastructure**

The current road infrastructure in Dar es Salaam is in a bad condition, as only 25% of the roads are paved and mostly are poorly maintained, which is also a factor why the city's roads are super congested. This obstructs the mobility and reachability for vehicles, pedestrians and cyclists alike. (Appelhans and Magina 2020: 85-86). In many cases all road users from pedestrians and cyclists, to street vendors and vehicles of all sizes, have to share the same road infrastructures, without any separation between, which leads to a low road safety.

**Img. 30: Plan for densification around BRT corridors 1**



**Img. 31: Plan for densification around BRT corridors 2**



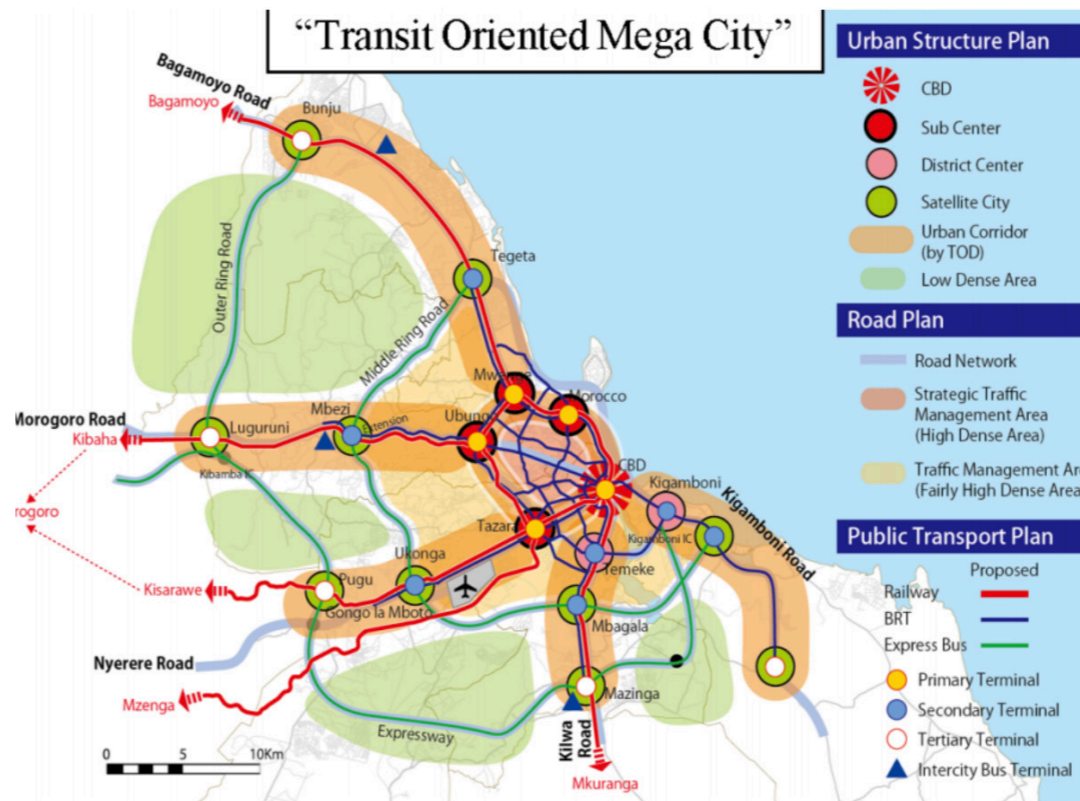
**Climate change**

As a matter of fact, Dar is already experiencing the consequences of climate change quite heavily in the form of severe floods and rising temperatures. But the city can't handle these effects of climate change really well, as much of the inner-city land is sealed and the city lacks green infrastructures. This promotes the urban heat island effect and makes it difficult for the flood water to drain. In Tanzania, climate change is predicted to lead to increased occurrence of extreme weather events, including rainstorms, droughts and sea level rise. While rainstorms and sea level rise are likely to

**Img. 32: Green Infrastructure Dar es Salaam**



**Img. 33: Developed Plan - TOD**



lead to increases in frequency and severity of flooding, this will have an effect on any sort of transport infrastructure operating and being installed in these areas. Climate adaptability and the decarbonization of transport infrastructure for climate protection must be therefore given high priority in the conceptualization of urban transport. (Appelhans and Magina 2020: 83-84)

**Future Developments**

In order to overcome the current bad traffic situation, the city is pursuing the strategy of transit oriented development, for which new ur-

ban sub centers and growth corridors around the BRT-stations are to be developed and the land next to the stations and BRTcorridors is to be densified as can be seen in graphics 5 and 6. (The government of Tanzania 2018: 10-11.).

The heterogeneous urban growth and changing environmental conditions resulting from climate change in Dar es Salaam require locally suitable and flexible transport solutions. The key factor to addressing this is adaptability, which allows the transport system to remain flexible in the face of shifting urban layouts, flooding and other impacts.

**Img. 34: Floodings affecting the BRT system**



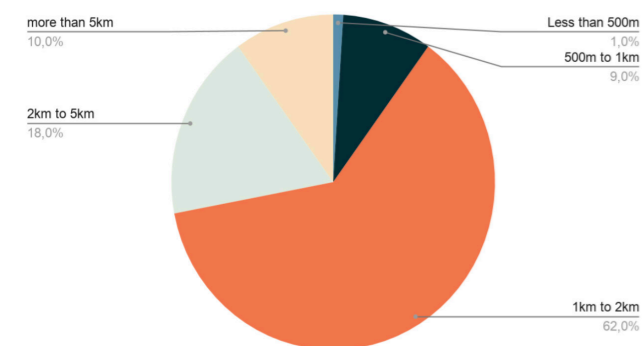
### 3.2 Mobility Analysis

#### Mobility behaviour

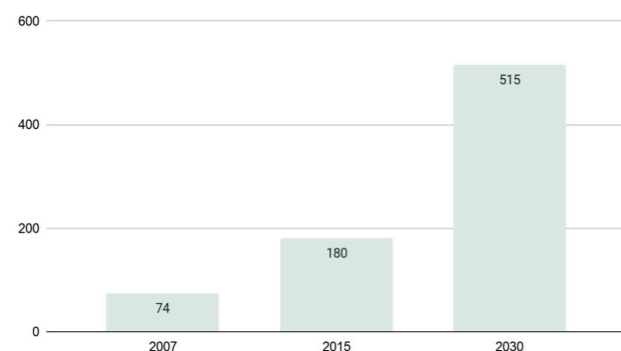
Despite only 12% of all trips being taken with private vehicles and still relatively low car ownership rate in the city, the roads are already heavily congested, which is about to worsen even more in the future due to the rapidly growing population and the rising car ownership rate, which comes along with economic growth. The bad traffic situation and congested roads despite the low amount of private vehicle

trips is even more surprising, when you keep in mind, that 71% of Dar's residents are working within 2km of their home, so don't even need to commute over far distances. But with rapid economic growth and globalization it is likely, that even more people will find jobs further away from their local neighborhoods. Although 88% of all trips are being undertaken by public transport or with non-motorized transport, both infrastructures are in a bad condition. (Dar es Salaam City Council 2008: 8-19)

Img. 35: Distance to work



Img. 37: Vehicle ownership rate

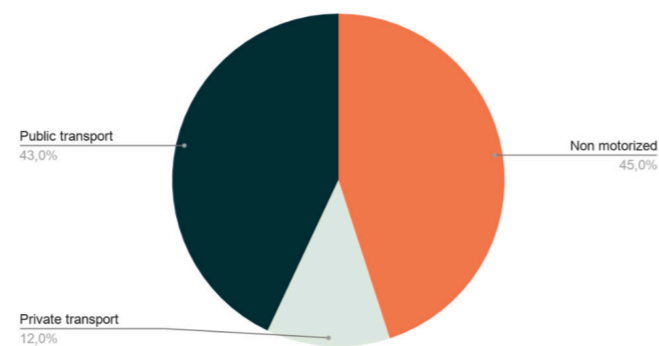


#### Current state of the public transport system

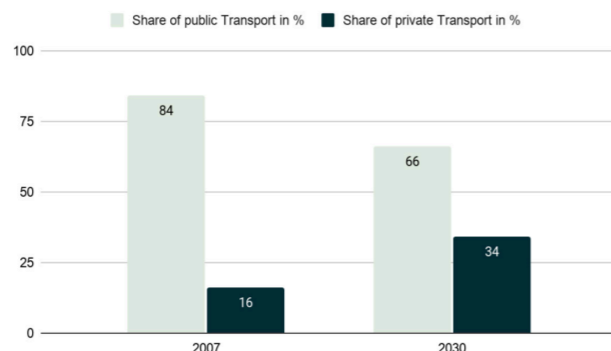
Data collected from 10,000 commuters in a Dar es Salaam Transport Master-plan study found that 80% are dissatisfied with the overall present transport arrangements, long waiting time, no comfort and poor safety standards. Respondent journey time (including waiting and access time) averaged 95 minutes indicating that on average 3 hours a day is taken for commuting by Daladala. Traffic speeds are in the order of 10-12 km/hr. (African development bank group 2015: 7)

This shows very well, how Dar's public transport system is currently operating far above capacity, while being constrained and costly, mainly because

Img. 36: Modal split 2016



Img. 38: Motorized transport



it is depended on the congested road infrastructure of the city (The government of Tanzania 2018: 5).

In addition to the congested road system, there is another factor, which makes public transport in Dar es Salaam inefficient and inconvenient. Namely the bad connection between all different modes of transport. There are no commonly organized stations for 3-wheelers, Daladala buses, BRT buses and trains, so transfer for passengers is very inconvenient. Also, all operators have their own routes, schedules and tariffs, which are not organized commonly, which leads to competition between BRT buses and Daladala buses on many routes, making the system even more inefficient.

#### Non-motorized transport

The infrastructures for non-motorized transport are in a very bad condition. Most of the smaller roads don't even have a dedicated sidewalk or cycling lane, and if there are sidewalks they are often not maintained and full of potholes. Also, in many cases the sidewalks are occupied by other users like street vendors and building permits have encroached further onto the road space over time so that cycling and walking have increasingly lost their designated areas in the city's roads structure, which makes it very difficult for the pedestrians and cyclists to navigate through the city. Walking

and cycling have not yet been sufficiently considered in transport policies in Dar es Salaam which does not have a non-motorised transport policy to date. This also means that the 1.5 percent of all trips conducted by bicycle are not adequately catered for and the potential of this transport mode remains unexplored. Nevertheless walking is still a very popular mode of transport, despite the bad conditions, just because it's the cheapest way to get around and most of Dar's residents don't have much money to spend on transport (Appelhans and Magina 2020: 88)

Img. 39: Lack of proper infrastructure for non-motorized transport



Img. 40: Bad road infrastructure



Img. 41: Dangerous traffic conditions

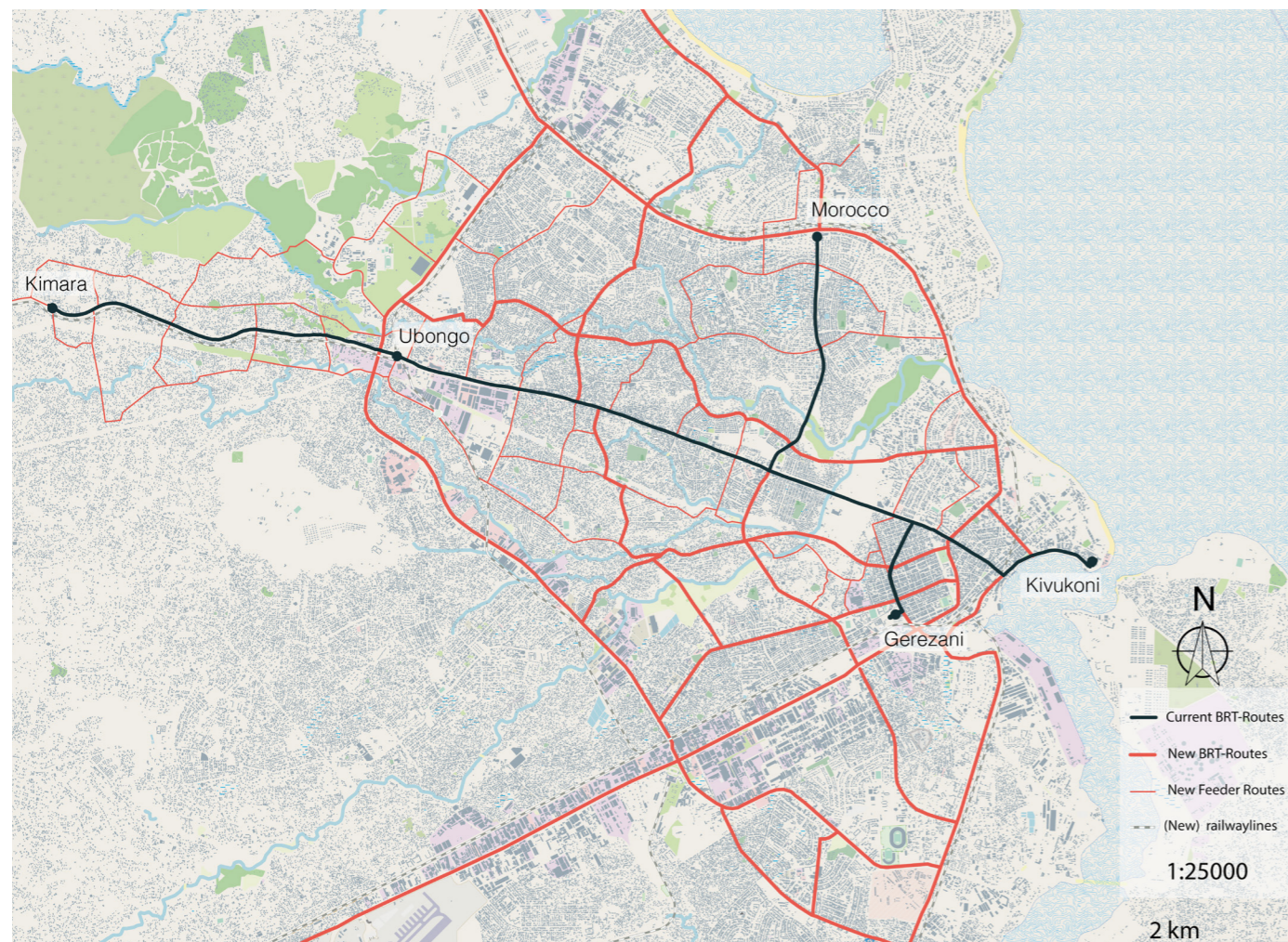


## BRT -System

In an effort to ease the prevailing congestion and make Dar es Salaam a more sustainable and liveable city, the BRT system was introduced. Dar's Rapid Transit (DART) project consists of six phases to implement the Bus Rapid Transit (BRT) system. Phase 1 has been completed and the first line has been operating since 10 May 2016, with 29 stations and five large terminals, namely Kimara, Ubongo, Morocco, Gerezani and Kivukoni. There are 147 vehicles in service, operating at a fixed fare of TZS 650 per trip. So far, the project has been a success, as it is well accepted by the population and has seen a continuous rise in daily ridership, which has now crossed the 200,000 passengers per day. It is even famous beyond its national borders and Dar es Salaam welcomed several city officials from other cities in east Africa, which want to learn about it. (Appelhans and Magina 2020: 90-92.) In 2018, Dar es Salaam was the first African city to receive the Sustainable Transport Award by the ITDP.

Although the new transport system has helped to increase public infrastructure functionality, it has not yet been fully adapted to the city's massive passenger volume. Moreover, natural hazards and extreme

Img 46: BRT and railway network

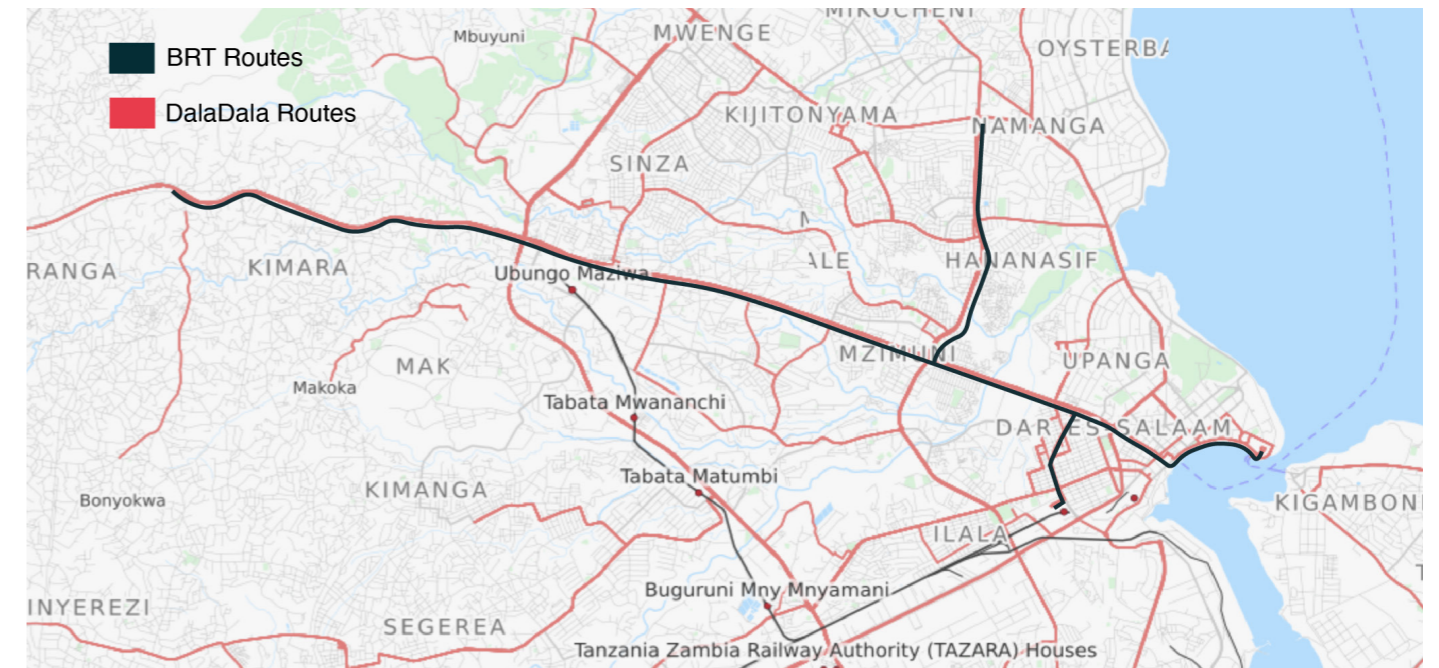


events like recurring floods, and their cascading effects, pose a huge challenge to the bus system's operation, as the new bus system has already been severely disrupted several times. (Krüger et al. 2021: 4)

In the future, the city will introduce a large number of new BRT and Feeder lines, adding up to at least 137km of BRT network (Krüger et al.: 2021: 14). But many of the small-scale neighborhoods can't be serviced by MRT systems due to lack of space, here the transport system is in competition with land uses linked to livelihoods and survival. Furthermore, the remote outskirts do not have sufficient passenger volume to make MRT financially viable. MRT is also inadequate to cater for short-distance transport needs within neighborhoods (Appelhans and Magina 2020: 83-84)

It has further become evident that the BRT can't function as a standalone public transport system. The technology itself lacks certain properties that would ensure the necessary adaptability, decarbonization and accessibility of a functioning transport system under conditions of rapid urbanization, climate change and socioeconomic disparity (Appelhans and Magina 2020: 95)

Img 47: BRT and DalaDala Network



Img 48: BRT bus in the city center



Img 49: BRT terminals



### DalaDalas, 3-wheelers and commuter trains

in Dar es Salaam. They form a decentralised mini-bus system, with vehicles in private ownership, and provide 61 percent of all trips. The 6,820 registered Daladals operate on 362 licensed routes. There are however, unlicensed vehicles and registered Daladals that operate off the designated routes informally. (African development bank group 2015: 3) Vehicles also operate without transport schedules and begin the trip when a sufficient number of passengers have boarded, while stops can be requested by passengers on the routes. This public transportation system has, hence, been widely criticized for poor standards of comfort, safety and convenience for bus travellers. (Appelhans and Magina 2020: 87)

Furthermore, motorized two- and three-wheeler taxis (motor-taxis) are very common. They are being used by the population for shorter distances and they enable feeder connectivity into DART. In areas unserved by buses, motor-taxis are the only publicly available mode of transportation and hence offer a de-facto public transport service fill-

ing a gap in the transport system. For future developments, it makes sense to take a closer look at the 3-wheelers, they are compared to 2-wheelers, more sustainable as they have the capacity to carry three passengers plus the driver and provide easier access for disabled persons. They also provide much-needed employment opportunities. Till date, the market had already created an estimate of about 50,000 direct jobs. (UEMI 2020)

Additionally, there are running a number of Commuter Trains in Dar, which are currently run by the TRL and the Tanzania and Zambia Railway (TAZARA), constructed from 1970 to 1975, started operating officially in 2012. But the trains are rather slow and only provide a limited number of trips per day on two routes on six days per week. (Appelhans and Magina 2020: 90). For the future development of the city it is planned to build several new railway lines and stations in order to establish a well-functioning commuter rail system, which is also well integrated and connected to the other modes of public transport (The government of Tanzania 2018: 195).

Img. 50: DalaDala Bus in service



Img. 51: DalaDala Buses at station



Img. 52: 3 e-wheelers station



Img. 53: Urban Railway

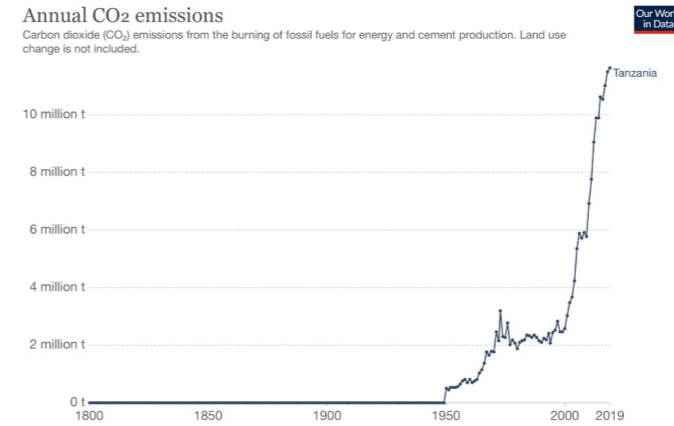


### Environmental aspects

The current public transport system in Dar is very unsustainable as it is powered by fossil fuels, which leads to high emissions of CO<sub>2</sub> and other air pollutants. In Dar es Salaam city, residents living in the vicinity of major roads, such as the Morogoro, Julius Nyerere, Bagamoyo and Nelson Mandela Roads, are likely to be exposed to long-term concentrations of nitrogen dioxide (NO<sub>2</sub>), inhalable particulate matter (PM) and other air pollutants that exceed the World Health Organization (WHO) guidelines, thus causing respiratory diseases for citizens. As more than 50% of the city's CO<sub>2</sub> emissions come from the transport

sector, contributing further to climate change, there is great urgency but also potential, to make Dar es Salaam a much more healthy and liveable city by replacing combustion engines with electric ones. The city government has already realized the problematic situation and came up with several strategies and monitoring in order to improve air quality (The government of Tanzania 2018: 133-134) Also the Tanzanian government has already indicated to prospectively to support electrification as a means to achieve sustainable mobility and to accomplish its commitments with regard to the Sustainable Development Goals (SDGs) and the New Urban Agenda. (UEMI 2020)

Img. 54: Rising CO<sub>2</sub> emissions in Tanzania



### Transport and planning policies

The urban transport system that emerged over time can be described as a heterogeneous system with many different actors connected through loose couplings and shifting hierarchies. While the BRT was introduced to raise the capacities, the various transport modes are still not comprehensively coordinated or sufficiently linked to wider urban development, A multitude of different authorities govern urban transport in Tanzania and several authorities are involved in regulating road transport. However, none of them is explicitly responsible for land-use planning for transport planning and transportation issues. (Appelhans and Magina 2020: 92-93)

It becomes obvious, that Dar's transport problems are directly related to the existing land-use planning practices and land-use plans. As such, these have situated most services in the CBD rather than in residential neighborhoods; which gives rise to high concentrations of population and vehicles in the center. (Appelhans and Magina 2020: 94) However, until now transport planning and urban development in Dar es Salaam have not been sufficiently linked until now. (Appelhans and Magina 2020: 83)

Img 56: Lack of transfer structures between BRT and railway



Img. 55: Pollution in Dar es Salaam



### Proposals

A better coordinated governance of urban transport is needed, as a major deficiency in managing urban transport is the lack of a coordinating institutional authority. It should also expand its outlook to include the transport modes that have so far not been sufficiently considered in the transport concepts, such as NMT and water-bound transportation modes. Linking transport planning and urban development goals: Transport planning in Dar es Salaam needs to be firmly rooted in the urban realities. It has to cater to range of different needs transport planning and urban development will have to align and interact more closely in the future. Thereby, a multi-institutional and trans-sectoral approach will be necessary.

Dynamic local mobility patterns have to be accommodated, in order to provide transportation systems that can address local needs, further research needs to be conducted in the field of mobility patterns. Hybrid transport system: Maintaining a multi-modal transport system is essential to ensure that all areas of the city remain accessible. Climate-friendly transport: Although this might seem like an obvious point, transport provision in Dar es Salaam will need to look into climate-friendly technologies and NMT as low-emission modes (Appelhans and Magina 2020: 95-97)

Socioeconomic disparities on a spatial but also individual level and the exclusion of certain population groups need to be addressed by making public transport inclusive. This includes accessibility for different individual physical needs, accommodating a variety of transport patterns, providing safe transport for a diverse population, affordability of transport fares, expanding reach to meet the requirements of all neighborhoods, providing for the needs of different livelihoods. All of this can be summarized and furthered under the term accessibility. (Appelhans and Magina 2020: 85-86.)

### 3.3 Station Analysis



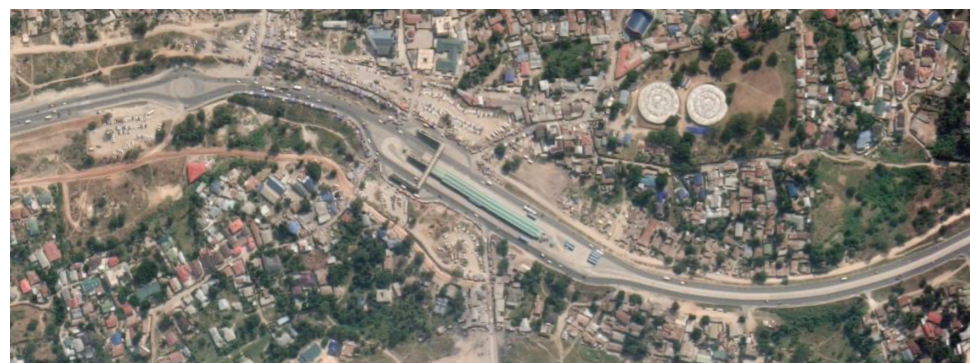
Img. 57: Morocco Terminal



Img. 58: Ubongo Terminal



Img. 59: Gerezani Terminal



Img. 60: Kimara Terminal



Img. 61: Kivukoni Terminal

### Environment and structure of stations

The BRT terminals, we further examined exist in quite heterogeneous environments. Inner city terminals like Morocco, Kivukoni and Gerezani are surrounded by consolidated residential buildings, institutional and commercial land use, whereas Ubongo and Kimara are in an environment of rather unconsolidated settlements with a chaotic land use structure, which makes it hard to find standardized solutions for all terminals. Also, there are two different styles of station design. Morocco, Ubongo and Kimara are designed in a linear way and the boarding platforms are in the middle of the street or highway, whereas Gerezani and Kivukoni are loop loading stations and therefore closed up areas at the side of a road. This design of the terminals is very problematic as it leads to a seclusion of the stations, causing a physical and psychological barrier for the people, which is dividing the neighborhoods. For pedestrians and public transport users it is really effortful and time-consuming, to cross the

road or to reach the boarding platform, because stations only have one or two entrances and walking distances are quite long due to the complicated detour via the pedestrian bridges. This makes the stations poorly accessible and further contributes to the problem of low road safety, as there are hardly any safety measures and people often just cross the busy roads to reach the stations.

Despite the ambitious plan of the city, to develop the land around the stations into new urban sub centres, for the moment, the land around the examined stations is still very unorganized and underdeveloped, especially at stations in the more unconsolidated part of the city. The density of the built-up land is quite low as there are mostly around one or two story buildings and much of the surrounding space is used as parking lots or doesn't seem to have any function at all.

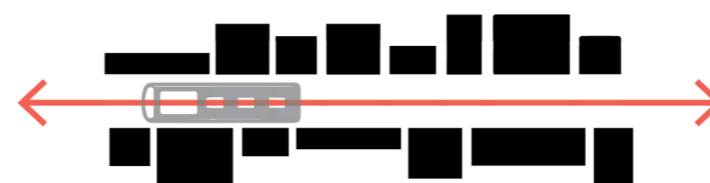
Img. 62: Undeveloped Land



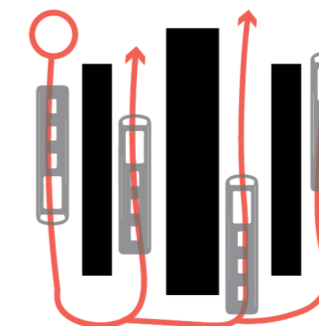
Img. 64: Unproper accesibility BRT Terminal



Img. 65: Station typologies



Linear Loading Stations  
Ubungo, Kimara, Morocco



Loop Loading Stations  
Kivukoni, Gerezani

## Street vendors

This underdeveloped land around the terminals is often used by the high numbers of informal vendors who are concentrated around the stations and have to work under harsh and uncertain conditions. In many cases the situation is very chaotic, because the vendors don't have a dedicated space for vending, they often just occupy the sidewalks, which creates a conflict with other users like pedestrians and cyclists. This overcrowding of the place prevents the development of other modes of transport.

The construction of the BRT system was an additional pull factor for street vendors because the establishment of the BRT terminals has intensified the role as a suburban center for Kimara and Ubongo and has therefore led to an increase in the number of street vendors along the stations. Many vendors had already been on site before the introduction of the BRT because of the high customer flow, but others have moved their sales locations to the new terminals because of the BRT.

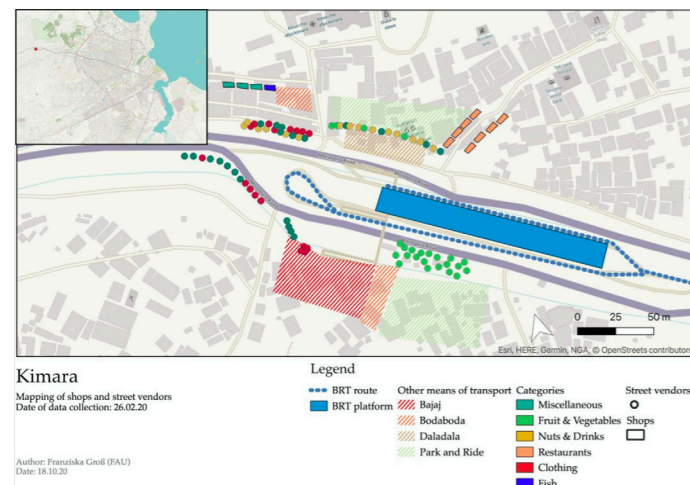
As a matter of fact, many BRT terminal stations are completely fenced, so there appear to be only a few street vendors in its immediate vicinity.

It is generally prohibited to sell goods within or in the immediate vicinity of the access points to the BRT stops. Thus, passengers of the BRT are generally not reached as customers. The main customers for street vendors in this area are users of Daladala and 3-wheelers.

The livelihoods of street vendors are characterized by great uncertainties, as their predominantly informal sales activities are depending on daily demand and political restrictions. In addition, some vendors were evicted from their former "regular" locations because of the construction of stations, buildings and related restrictions on street vending. The number of street vendors in Dar es Salaam has, nevertheless, increased significantly in recent years. To keep track of the approximate number of street vendors, officially registered street vendors must pay an annual fee in certain streets where they operate. However, there is a high percentage of unlicensed street vendors, which are tolerated during election years, but their situation may change after elections. (Krüger et al. 2021: 19-21)

In summary, a wide range of goods is offered in the immediate vicinity of the BRT stations and their surroundings offer attractive and new sales areas for street vendors. Despite political restrictions, fences and controls for sales in nearby areas of the BRT stations, the number of street vendors with a remarkably diversified assortment of goods has obviously increased in recent years. The development of attractive sales areas as a part of the BRT implementation has created a kind of suburban center and new sales hotspots. (Krüger et al. 2021: 19-21)

**Img. 66: Concentration of street vendors**



**Img. 68: Street vendors - Ubongo**



**Img. 67: Sidewalk situation - Ubongo**



**Img. 69: Ubongo terminal from the inside**



**Img. 70: Kimara terminal from the inside**



**Img. 71: Kimara terminal**

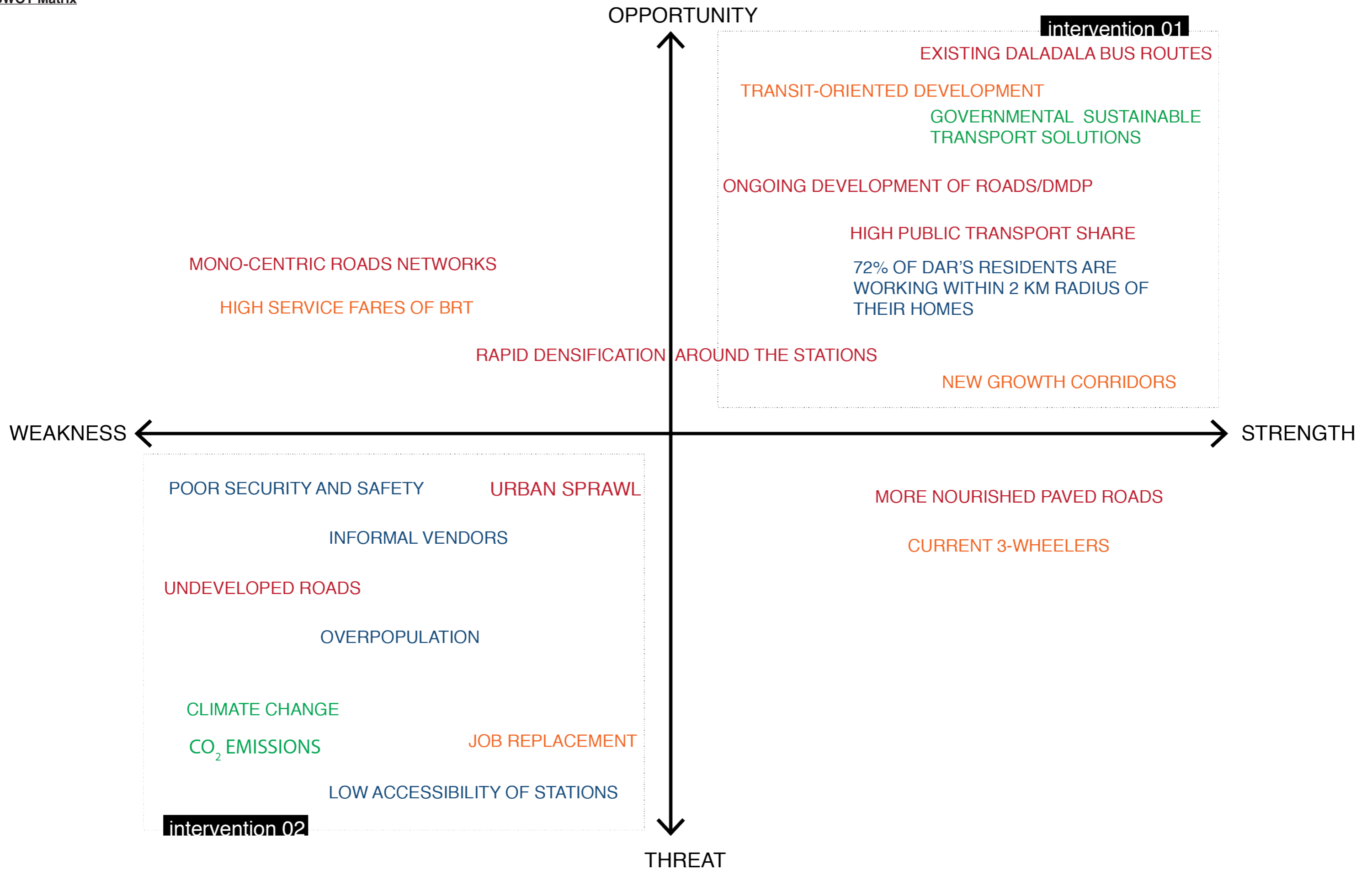
### 3.4 SWOT Analysis

- The Dar es Salaam Metropolitan Development Project “DMDP” 2015 - 2022, that targets the development of roads networks, alleviation of congestion hotspots, while also supporting public transit
- 72% Of Dar’s residents are currently working within 2km radius of their homes, so nom long commutes are needed
- 3-wheelers are already pretty common and a popular means of transport
- The modal share of public transport users is already very high and only very few people (12%) use their private car for commutes.
- Dar has a rapidly growing economy
- A public mass rapid transit system in form of a BRT system is already in use and further development phases

- Underdeveloped road network
- Mono-centric road structure
- The current public transport system, is overstrained, inefficient, uncomfortable and slow
- Heavily congested roads
- Poor or non existent infrastructure for non-motorized transport
- Weak integration of informal structures and economies, which creates harsh and uncertain conditions for street vendors
- unorganized public space leads to street vendors occupying sidewalks and chaotic situations
- Fares for BRT-System are not affordable for everyone
- Poor road safety in general but especially at BRT-stations
- BRT-stations are poorly accessible
- BRT-station are badly connected to other modes of transport
- No commonly organized transport network, which leads to competition and inefficiency

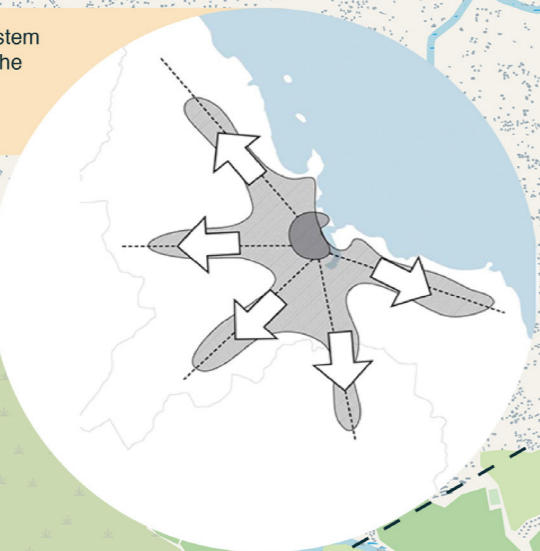
- The current Masterplan for the city is already aiming at making the public transport system more efficient and sustainable
- The Masterplan also foresees the upgrade of the insufficient road structure
- The current informal network of buses and 3-wheelers can be used as a base for planning formal routes
- The city is promoting electric modes of transport, which will help reduce the high emissions
- Through the strategy of transit oriented development and the development of new urban sub centres, Dar es Salaam is aiming at reducing traffic volumes and foster public transport
- Currently, the land around the BRT stations is not very developed, so there is huge potential to execute the city’s strategy of transit oriented development and the creation of new urban sub centres
- Dar es Salaam aims to become a sustainable, competitive, human-centric city that provides equal access for everybody to basic services like transport.

- The rapid influx of population of about 5% per year
- Increasing vehicle ownership rate and rising share of private vehicles in the modal split
- Dar es Salaams electricity network lacks power
- Risk of job displacement for existing DalaDala and 3-wheeler drivers
- The rapid growth and densification, especially around station in the more unconsolidated part of the city might overstrain the future public transport network
- BRT stations and corridors pose a huge physical and psychological barrier, which can divide neighbourhoods
- Due to climate change, flooding events and heat waves are about to occur more often in the future
- High air pollution and CO2 emissions from the transport sector, leading to health risks for residents and contributing further to climate change





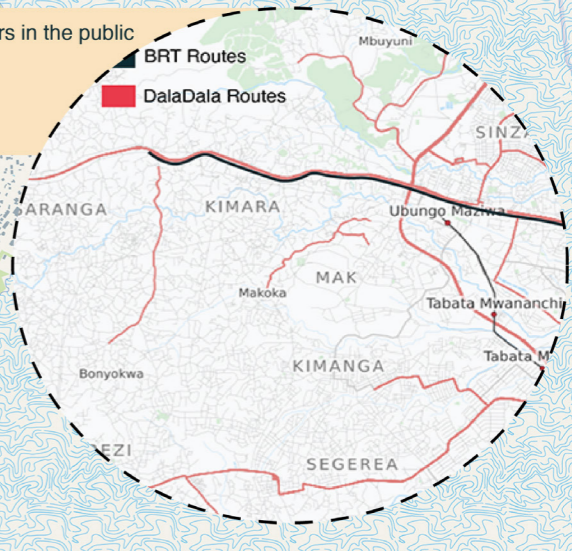
Monocentric road system that doesn't answer the whole city transport structure needs



Weak accessibility of disconnected stations



Competing operators in the public transport sector



Severe traffic congestion that produce huge amounts of CO2 emissions that nearly touch 47%



Public transport is insufficient to tackle the rapid influx of population



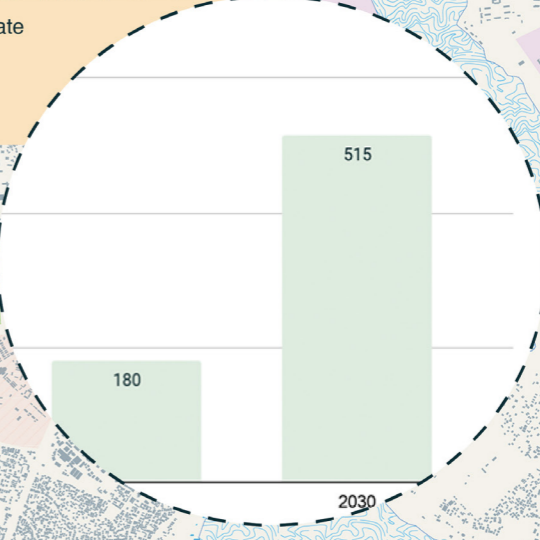
Poor roads safety measures and design.



Unorganized public transport network with disconnectivity between the different modes of transport



Rapid increase in private cars ownership rates



1:25000

2 km

Kimara

Ubongo

Morocco

Kivukoni

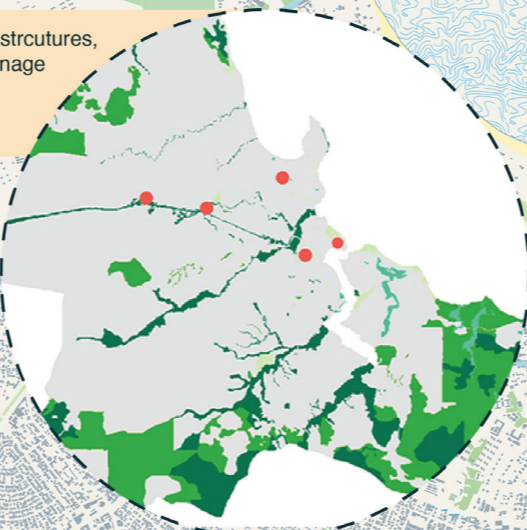
Gerezani



Undeveloped infrastructure for alternative or non-motorized mobility models



Lack of green infrastructures, therefore poor drainage infrastructure



Severe climate change events in the form of strong floodings and heat waves



Kimara

Ubongo

Morocco

Kivukoni

Gerezani

Harsh and uncertain conditions for street vendors where they formalise a state of chaos at the stations.



User conflicts on sidewalks around the stations: who owns the space?!!



High CO2 emissions and air pollution result from the non-sustainable transport sector



Underdeveloped land around stations :urgent need for holistic „Land Readjustment plan“



1:25000

2 km



# 4. Concept



# 4 Concept

## 4.1 Urban Strategy

Through an extensive analysis of the different urban mobility, social, economic, and environmental layers, we were able to identify the main weaknesses and threats in each layer that needs to be addressed and avoided with urgent planning and design interventions in order to achieve the development strategy of Dar Es Salaam 2050.

As mentioned before in this compilation, the city's urban structure lacks a tangible human infrastructure and also lacks solidarity between different mobility networks where every model is a split, besides the huge marginalization of the informal vendors and all the associated land development failures.

The environmental implications are also crucial to our urban and mobility gentrification endeavors.

The urban strategy is framed within the realization of a human-centric city, social and economic cohesion towards social and economic justice, through a resilient transport network that will fill the gaps in the urban transport fabric of the city, that will also achieve the maximum reachability and connectivity.

This strategy focuses on 3 main pillars:

**1. multi-modal transport system:** that creates a unified and integrated system of BRT, DalaDala buses, moto-taxis, 3-e-wheelers, etc.

**2. Land readjustment:** that focuses on higher densities around the stations and commercial activities that carry different business models around as active frontages of the stations that will create new economic opportunities in the city that can act as a catalyst to minimize the informal footprints and lead to less marginalization of people and areas.

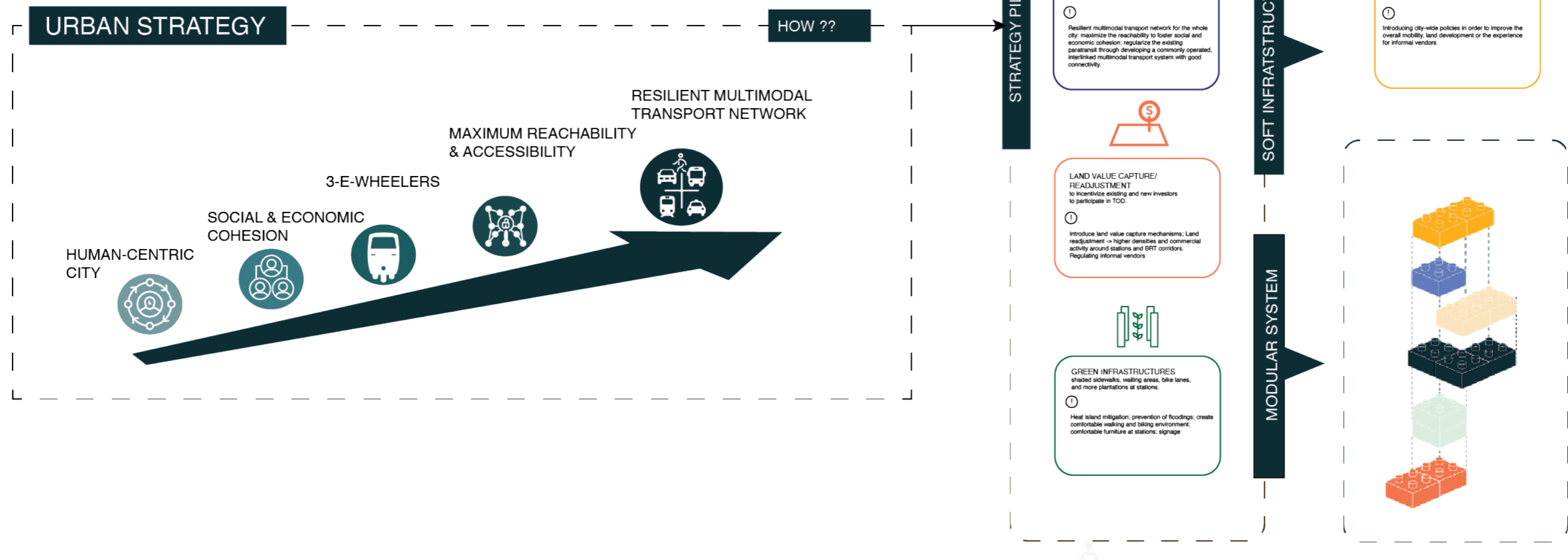
**3. Green infrastructures:** targets the mitigation of heat island effect and continual flooding through designing shaded and green stations, also the adoption of 3- e vehicles instead of fossil fuel vehicles, and creating walkability and cycling infrastructures.

Consequently, all these pillars can be achieved through the solidarity between soft infrastructures that act as soft resilient organizational tools and the modular system as the design tool.

Why modular systems?

As we have different 5 stations with different urban, mobility, and typological contexts so we proposed 6 modules. These modules can be easily modified and adapted to be easily juxtapositioned in the different 5 stations and also can meet the singularities of each station.

img 72: Kimara terminal



Concept

## 4.2 Soft Infrastructures

### 4.2.1 Multimodal Transport

To exercise our urban strategy we came up with several new policies and measures on the city scale which are called soft infrastructures. As our approach is not specifically focusing on one area or station, but the city as a whole, the soft infrastructures are overarching policies and regulations, which enables the implementation of the modules.

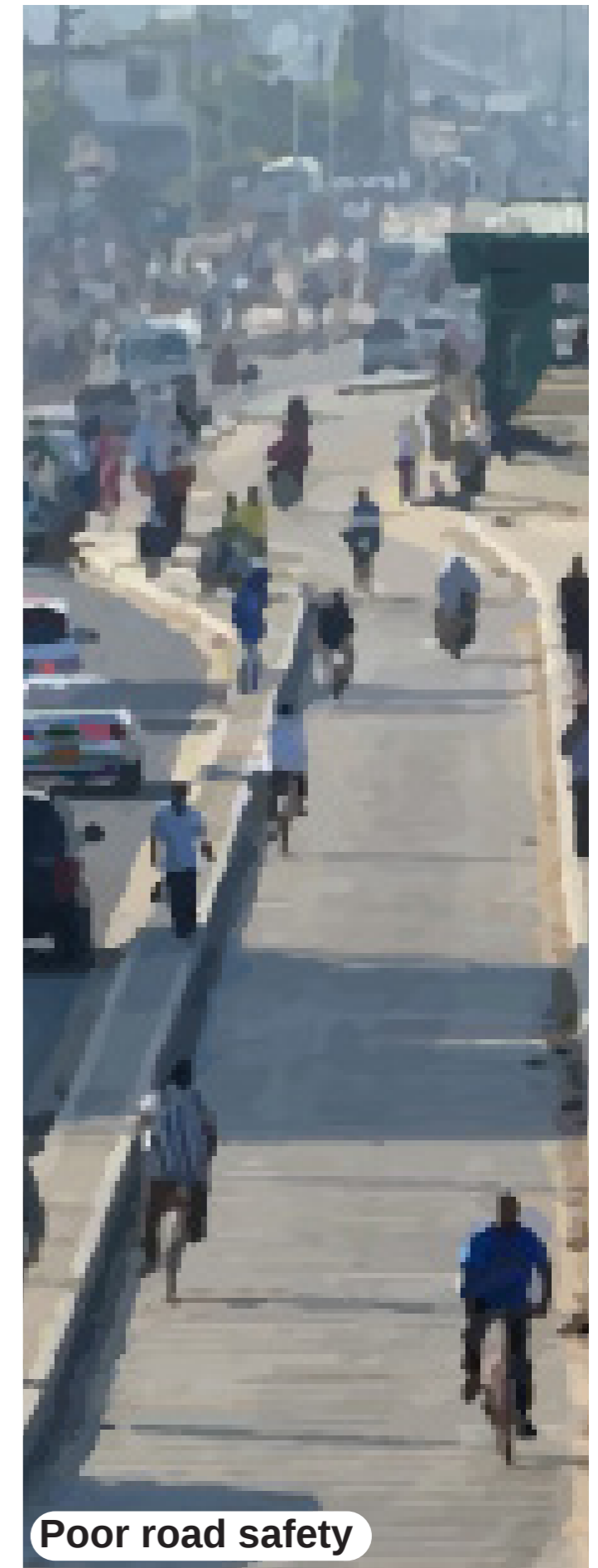
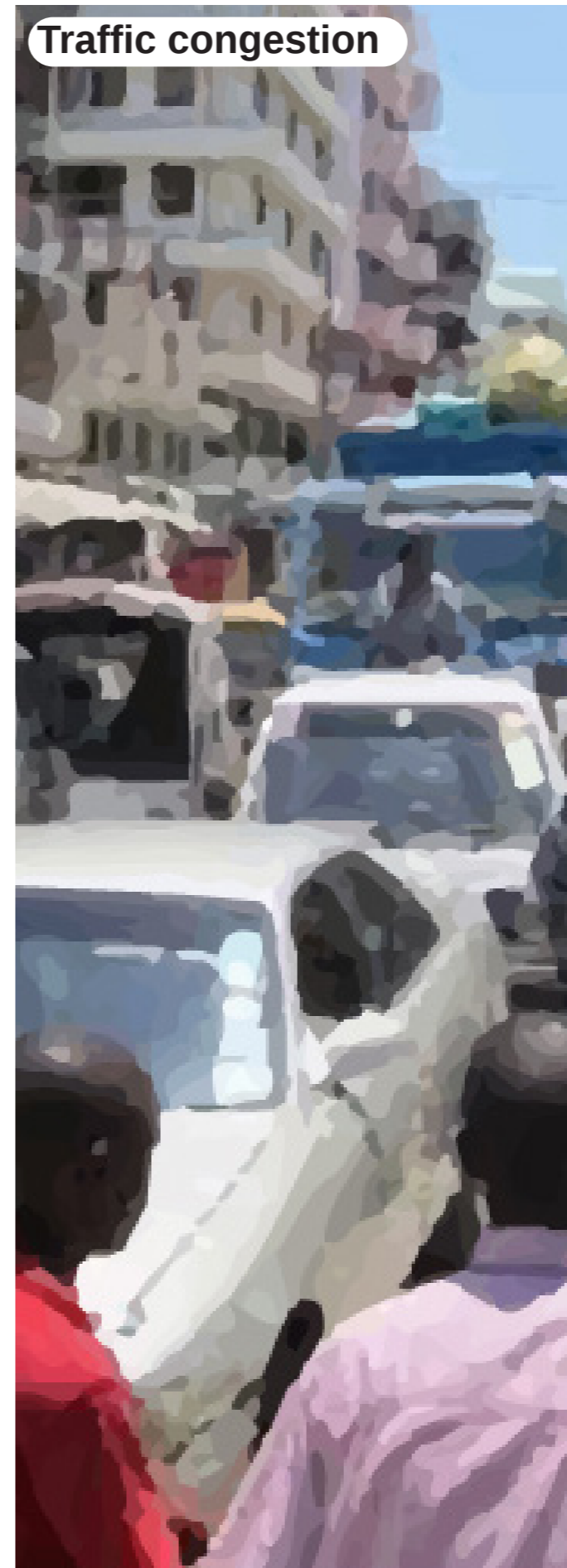
Regarding our first pillar - multi-modal transport, the aim is at achieving the vision of a commonly operated seamless multi-modal transport system with an integrated fare system, coordinated routing and schedules, and high comfort for users.

This can only be achieved in the long run. Therefore we came up with several small steps which all lead towards this vision. Starting with low-threshold actions like meetings between the different stakeholders and operators. Where they can discuss current issues and future ideas and start research about mobility patterns and mobility needs in Dar. At this stage also the implementation of GPS trackers in buses and display boards at stations would be conceivable, as it is an easy measure to improve the customer's experience.

In the second stage, the introduction of a higher-level city-wide transport authority is suggested, to create superordinate mobility concepts and plans for the city. This authority could then integrate all different transport providers and their operations into one formalized system and set fixed routes and schedules according to local mobility needs. We also suggest introducing a hierarchy, and order for the operations so that different operators are not competing against each other. For example, BRT buses only operate on the major trunk routes, the smaller feeder buses on medium-sized routes, and the 3-wheelers only operate within the neighborhoods in order to improve last-mile-connectivity.

In the last stage, to further improve the comfort for users we suggest introducing an integrated fare system, so customers can easily change between different modes of transport and pay

a fixed price for their commute, no matter how many times they change or how far the trip is. This could be supported by the implementation of and new payment methods like smart cards or payment via an app. A newly created app could then also serve as a kind of "mobility guide" for the city which will find the easiest and fastest way for you to commute within the city, using all different modes of transport.



# Multimodal transport

## 1. low-threshold planning measures

1st Phase

Bringing all stakeholders (Da-laData Driver associations; 3-Wheeler driver associations; Urban railway officials; DART officials; city planners, etc.) together on one table to discuss about current issues and future ideas

Launch joint research projects and mobility surveys in the field of local and supralocal mobility patterns, to provide transport options according to the local needs

Introducing GPS trackers on vehicles in combination with live tracking via app or on display boards at stations, in order to increase reliability and transparency of the system.

## 2. Close cooperation between the different stakeholders and formalization

2nd Phase

Introduce higher-level city-wide transport planning to create superordinate mobility concepts and plans for the city



## 3. Integrated measures to increase comfort for users

3rd Phase

Creation or nomination of a higher-level transport authority, which integrates and coordinates all transport providers and their operations into one uniform and formal system and sets routes and timings according to local mobility needs

Cooperation and agreements between the different transport providers regarding the operation of set routes for certain operators, following the road hierarchy -> BRT buses serving the trunk roads, mini/feeder buses the medium-sized roads and 3 wheelers only operating within the neighbourhoods

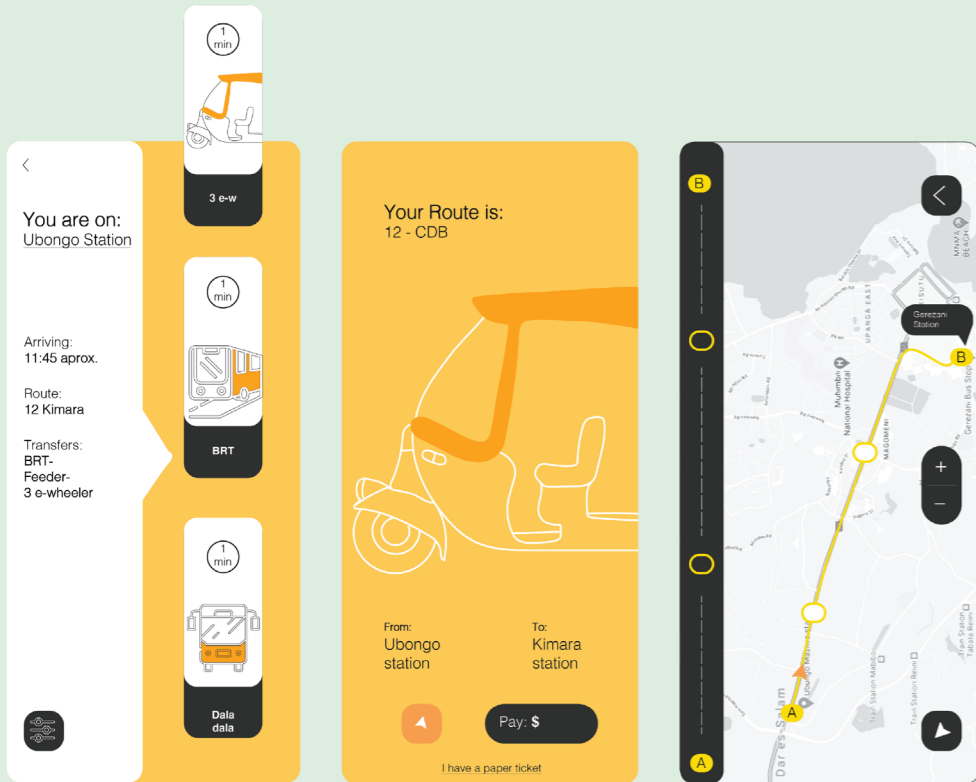
Introducing an integrated fare system for all modes of transport after the „one fare for all model“

Introducing new convenient payment methods like smartcards and payment via app

Creation of an app or website, which provides user with information about all available services, routes, fares and schedules and enables integrated route planning and ticket purchase via the app/website

### Achieved vision:

A commonly operated seamless multi-modal transport system with an integrated fare system after the „one fare for all model“, coordinated routing and schedules and high comfort for users



## 4.2 Soft Infrastructures

### 4.2.2 Land Readjustment

To support the cities strategy of transit-oriented development, we suggest that the land around stations should be readjusted and densified to consolidate transport hubs and centralities within the city.

In a preparation step, accurate land use and land ownership maps for the areas shall be produced and the private sector shall be incentivized to develop this land, only through close collaboration with the city.

The city should regulate the building activities by setting strict building regulations and zoning laws. The land directly around the stations should be mainly used for commercial, institutional, and civic purposes and should have higher floor space ratios than the surrounding residential areas in order to strengthen the center character of the stations.

In this development process land value capture mechanisms shall be introduced to allow the city of Dar es Salaam to profit from its own TOD strategy. Through the setting of certain rules and standards and its close collaboration with the private investors, consequently the city can skim off newly generated land values and reinvest this money back into the city.

However, in the design process, we have deliberately refrained from making concrete design proposals for the surrounding area to be able to focus more on the design of the actual stations.

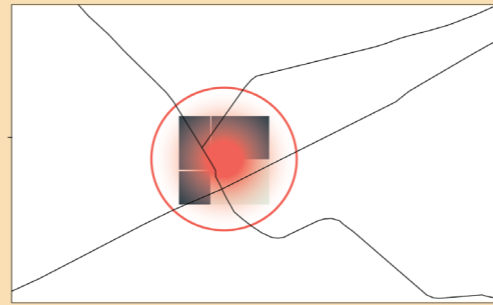


# Land readjustment

## 1. Prepare the land for development

1st Phase

Produce accurate landuse and landownership maps for the whole city, but especially for the development corridors

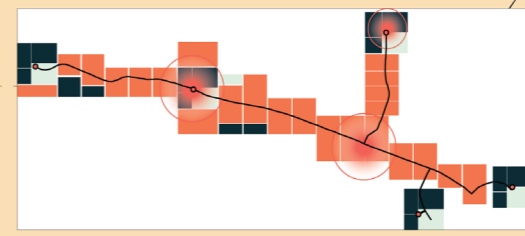


Incentivize the private sector to Develop the land around stations, but only in close collaboration with the city

## 2. Strategic development

2nd Phase

Develop the land around terminals into new urban centralities (Kimara, Ubongo, Morocco and future terminals outside the city center)



Favor a high percentage of commercial, civic and institutional uses within the urban centralities

Propose higher densities in the new urban centralities -> higher floor numbers than in the surrounding residential areas.

Regulate the building activities land use for the land around stations, by setting strict building regulations and zoning laws

Limit the residential use within the urban centralities and shift it to the residential areas around them

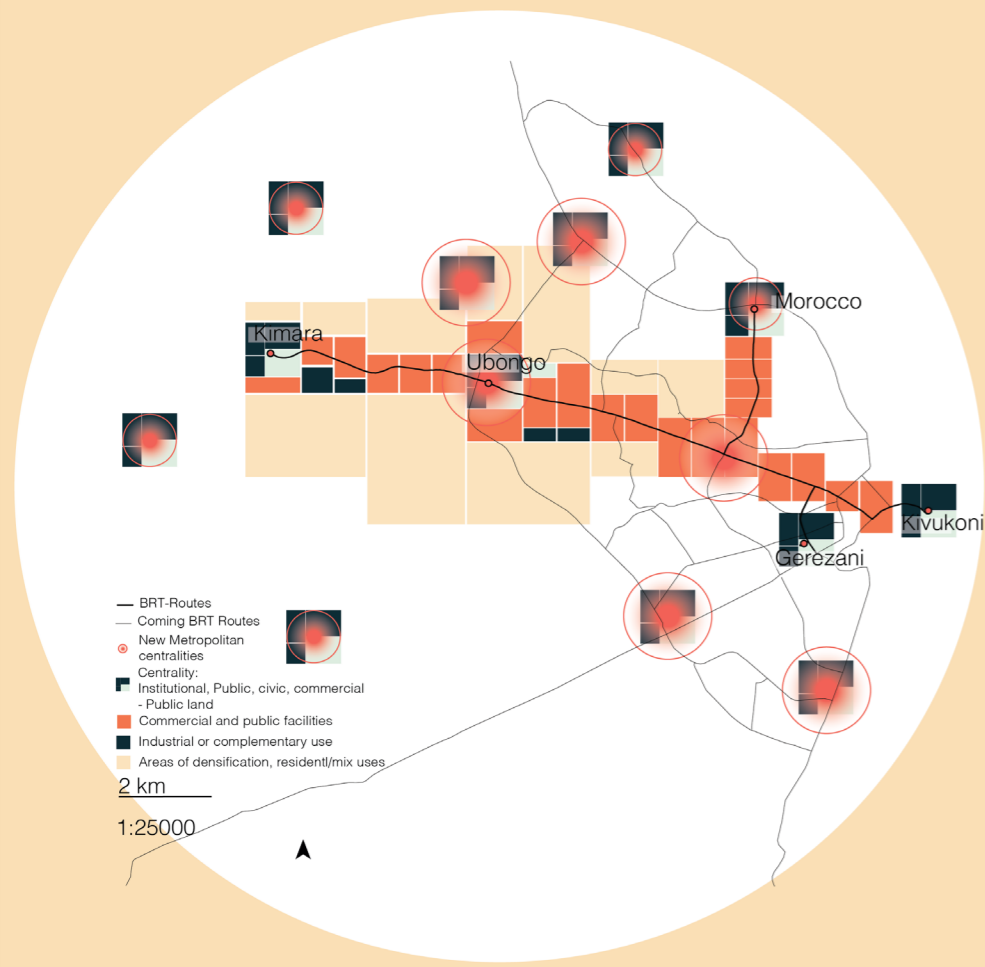
## 3. Land value capture mechanisms

3rd Phase

Introduce land value capture mechanisms to skim off newly generated values and reinvest them back into the development of the city

After the development of the land around terminals, this effect will trickle down and development along the BRT corridors will take place

**Achieved vision:**  
The development of new centralities around the terminals, with higher densities and landuses, which strengthen the center effect, through a close and fair collaboration between the city and private investors.





## 4.2 Soft Infrastructures

### 4.2.3 Street vendors

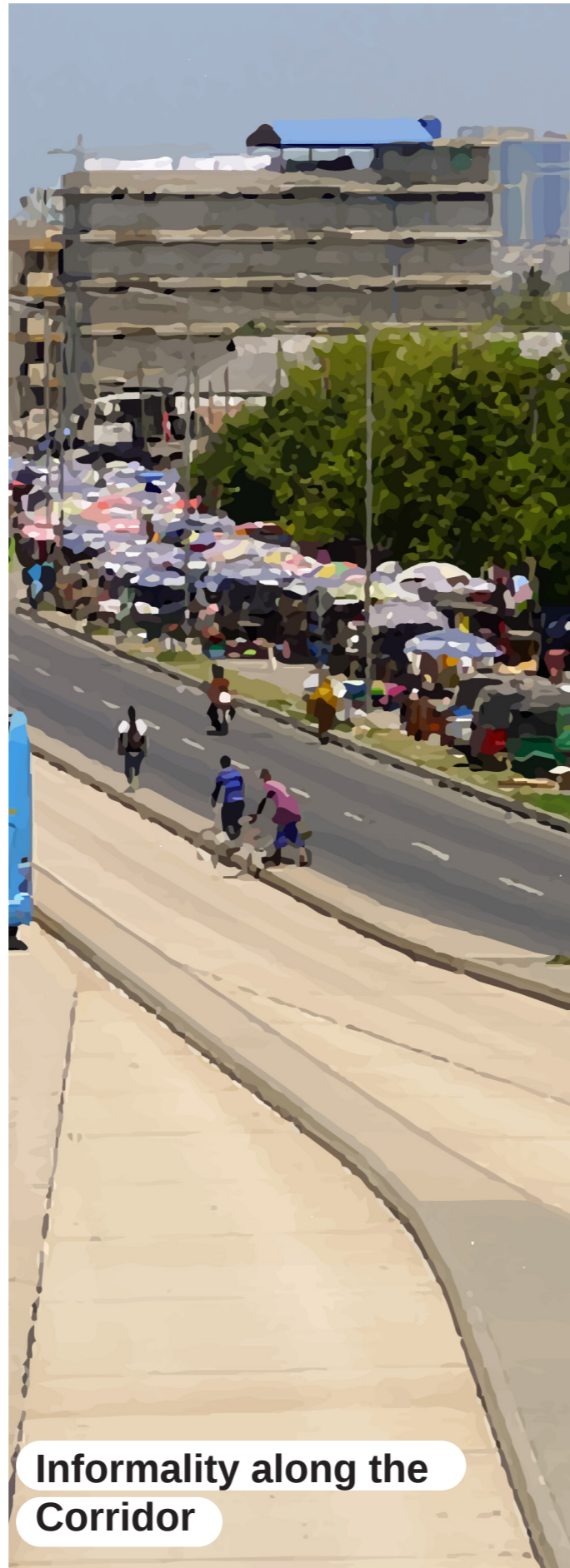
To organize the existing chaos of sidewalks around stations and improve the harsh and uncertain conditions for the street vendors. As a first step, the city should define specific vending zones near the stations.

These zones should not be in conflict with any sidewalks or cycling paths, but should provide enough spaces for vendors and should be placed in attractive locations. Therefore, we suggested to use the same spots which are being used now and formalize them.

In the following step, a new legal framework needs to be created which grants the street vendors official access to public space and the right to sell within those zones. The right to sell should be granted to existing vendors and people from the neighboring communities.

Though, the exact organization of this licensing process should be performed by neighborhood communities and informal vendor associations, in order to keep interference with the government's law and make the vendors gain trust in the government.

In a further step to make the vending zones even more organized and appealing, one could provide the vendors with blueprints and even material for standardized vending modules, which they can easily construct themselves and would further improve their vending experience.



# Multimodal transport

## 1. Organization of vending zones

1st Phase

Reorganize the existing chaos at sidewalks by creating separate spaces for vendors pedestrians and cyclists

Define specific official vending zones in the public space around the stations, which do not interfere with any sidewalks or cycle lanes. These zones should be oriented to the currently existing vending zones.

## 2. Creation of legal framework

2nd Phase

In order to improve the existing harsh and uncertain conditions for street vendors, establish a legal framework, which grants the vendors official access to the newly organized vending zones and gives them the right to sell there

## 3. Further cooperation with informal vendors

3rd Phase

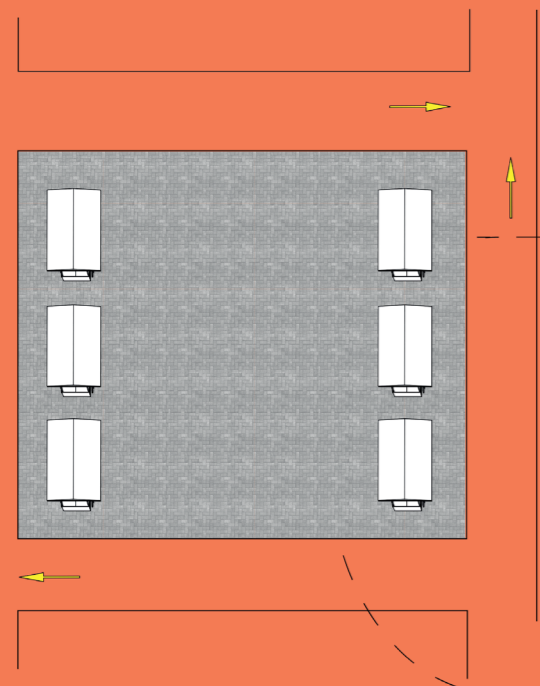
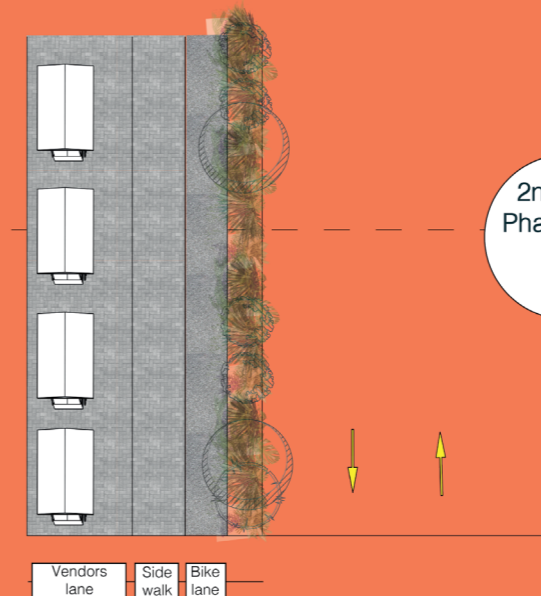
In order to keep interference with the government low and make the vendors gain trust in the governmental plans, the licensing process should be self-organized by local community groups or informal vendor associations with low thresholds

The right to sell within these zones should be provided to all existing vendors but also people from neighbouring communities should be able to apply for these licenses

In order to improve the optical appearance of the vending zones and the workexperience for vendors, one could provide them with blueprints and even material for specially developed high quality vending modules, which can be self constructed in an easy manner

Further cooperation with informal vendor associations in order to find out specific needs and fears and integrate this marginalized group better into the city society on the long run

**Achieved vision:**  
More organized, but still active, appealing sidewalks and public spaces around stations through the creation of official vending zones and a new legal framework, which improves the conditions for informal vendors.



### 4.3 Modules

While conducting a city's intensive analysis, we identified important urban elements that were missing or needed to be improved as a common factor in all 5 stations.

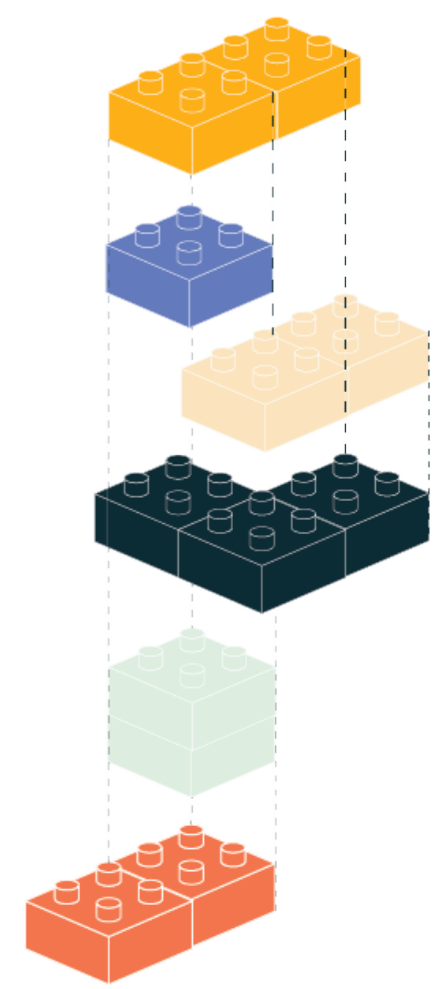
Hence, we came up with the idea of proposing a modular strategy to fill the different necessities and to facilitate the future reproduction and expansion of the current BRT system since Dar is growing exponentially.

Therefore we propose 6 modules that correspond to, ( connectivity and accessibility, green infrastructure and walkability, street vendors, urban furniture, 3-E-wheelers stations, and future E-buses charging platforms) these modules were properly designed and according to our methodology.

		<b>Connectivity and accesibility</b> Leveled crossings Multiple entrances Short transfer Speed limits Traffic lights
		<b>Green Infrastructure and walkability</b> Bike and pedestrian lanes Comfortable walking enviornment Green instructures
		<b>Urban furniture and public facilities</b> Lights Benches Trash cans
		<b>Informal Vendors</b> Ambulatory modules Semi-stacionary modules Stacionary modules
		<b>3 e-Wheelers stations</b> Passengers platform Charging modules 3 e-wheelers station
		<b>E buses stations</b> Bus parking lot Charging modules

Typology 1	Gerezani Kivukoni
Typology 2	Ubongo Kimara Morroco

Reachability  
Densification plans

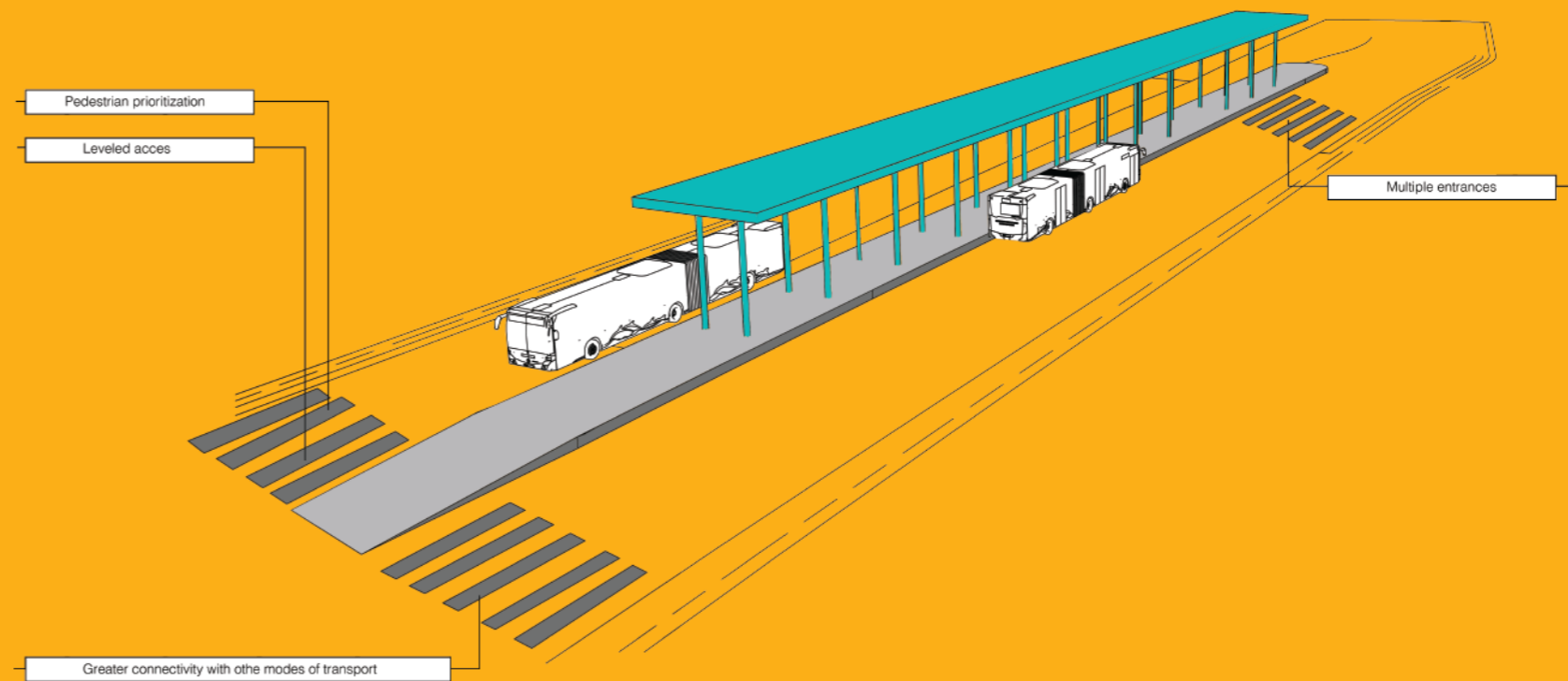


## 4.3 Modules

### 4.3.1 Connectivity and Accessibility

Connectivity and accessibility: an upgrade is needed for the existing BRT stations in terms of connectivity and accessibility. To make the BRT stations not only more accessible but also safer, we proposed to implement same level crossings on at least 4 sides of each station.

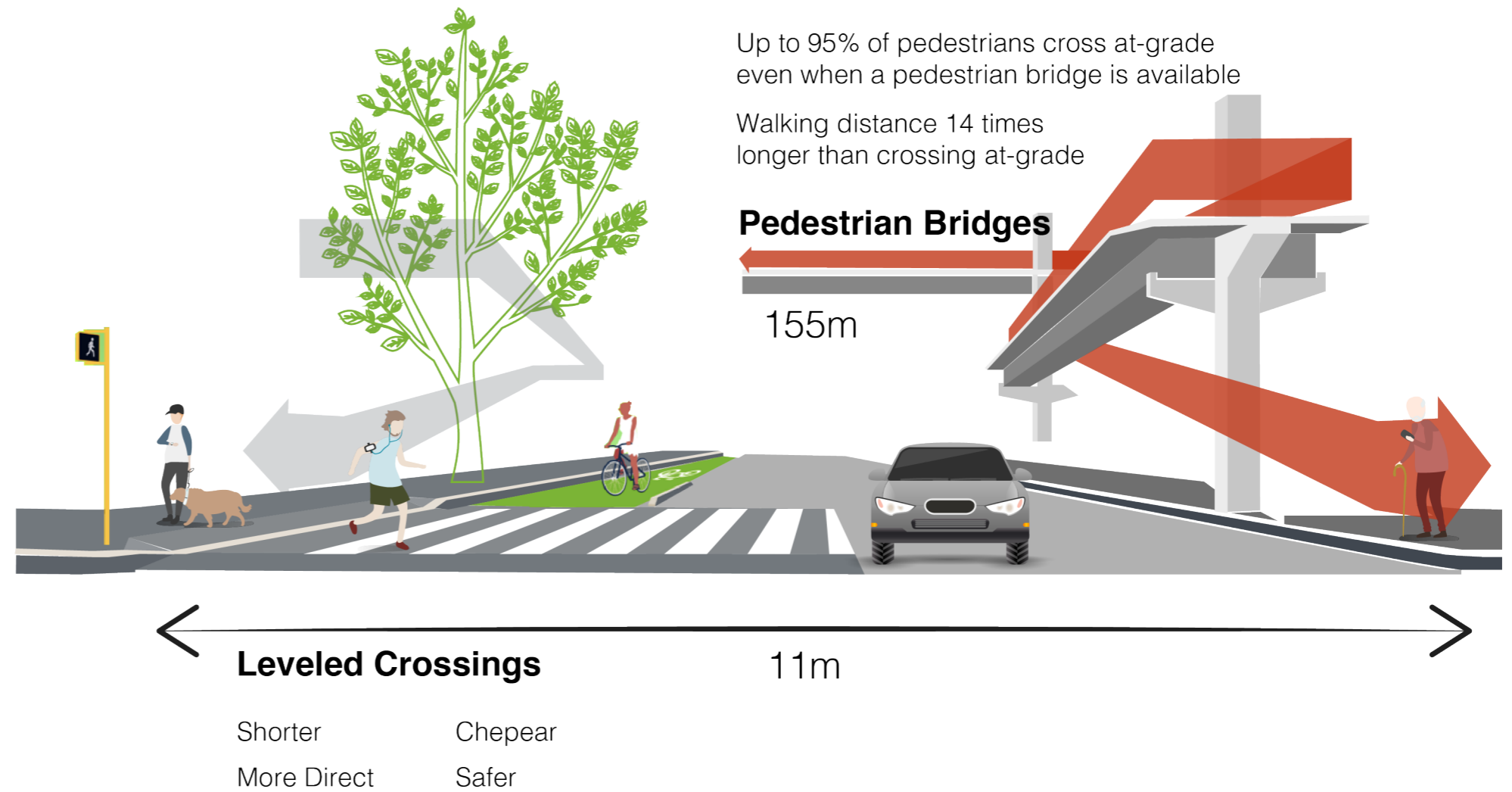
These crossings are leveled, so people with disabilities can use them easily. They are marked and traffic lights will ensure a safe crossing for pedestrians. In addition to that, slow speed limits shall be enforced around the stations, by signs, speed bumps, or speed cameras. Also in the terminals, we can find different transport modes but there are no concrete available connections.



## 4.3 Modules

### 4.3.1 Connectivity and Accessibility

Therefore we would like to emphasize why the leveled crossings are important. According to the institute for transportation & development policy, 95% of pedestrians cross at grade even when a pedestrian crossing is available, risking their lives. The path through a pedestrian bridge is over 10 times longer than an average at a grade crossing, so we understand the efficiency of leveled crossings and how they play an important role in the safety of pedestrians.



## 4.3 Modules

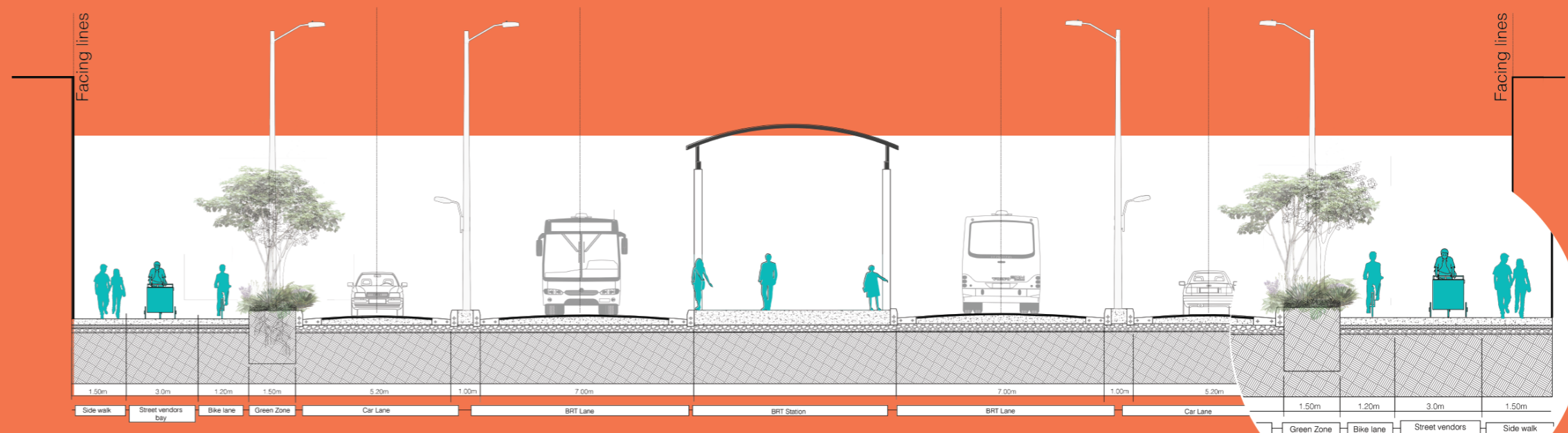
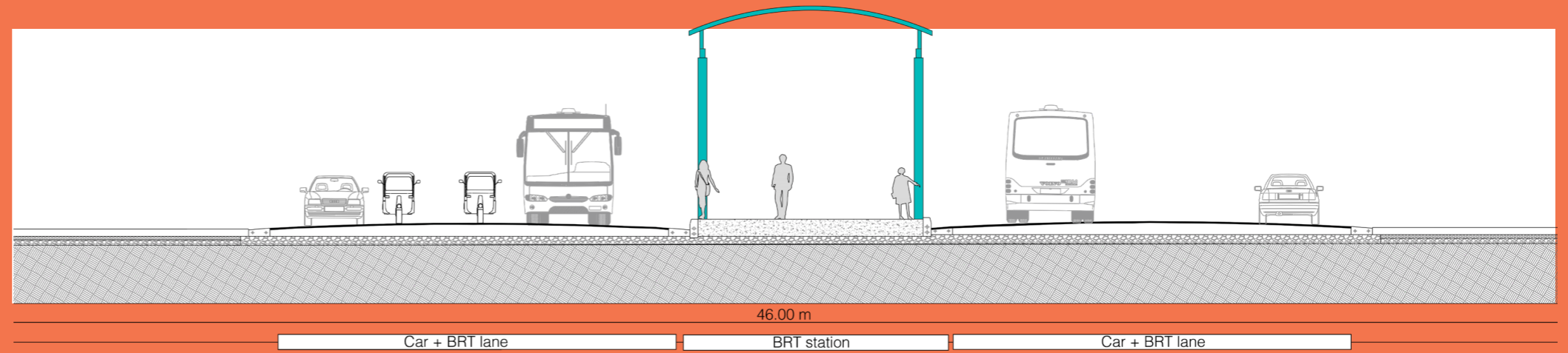
### 4.3.2 Green Infrastructure and walkability Proposed collector street

As previously mentioned, Dar lacks green infrastructure that supports the comfort of pedestrians, also a well-designed sidewalks, although walking is the second mode of transport that is in user-service.

Therefore, we developed different typological sections. We proposed a green infrastructure interventions along the BRT corridor, where we placed green infrastructures on both sides of the corridor and can be adopted in future developments. Also street vendors are common entity around the terminals so we proposed a vendors bay along the corridor since in the near future we expect even more activities than the ones that are taking place now. Finally an obvious definition between car's lanes and the BRT lanes in order to guarantee the efficiency of the system.

Just to compare, this is the current section of the BRT corridor with approximately 46 m and it doesn't have any defined activities.

Finally, the last image would also be the section for the BRT corridor whenever there's a pedestrian crossing so the implementation of proper traffic lights is fundamental.



Typology BRT Corridor  
When there are not pedestrian crossings

Street vendors bays will take place along the BRT corridor.

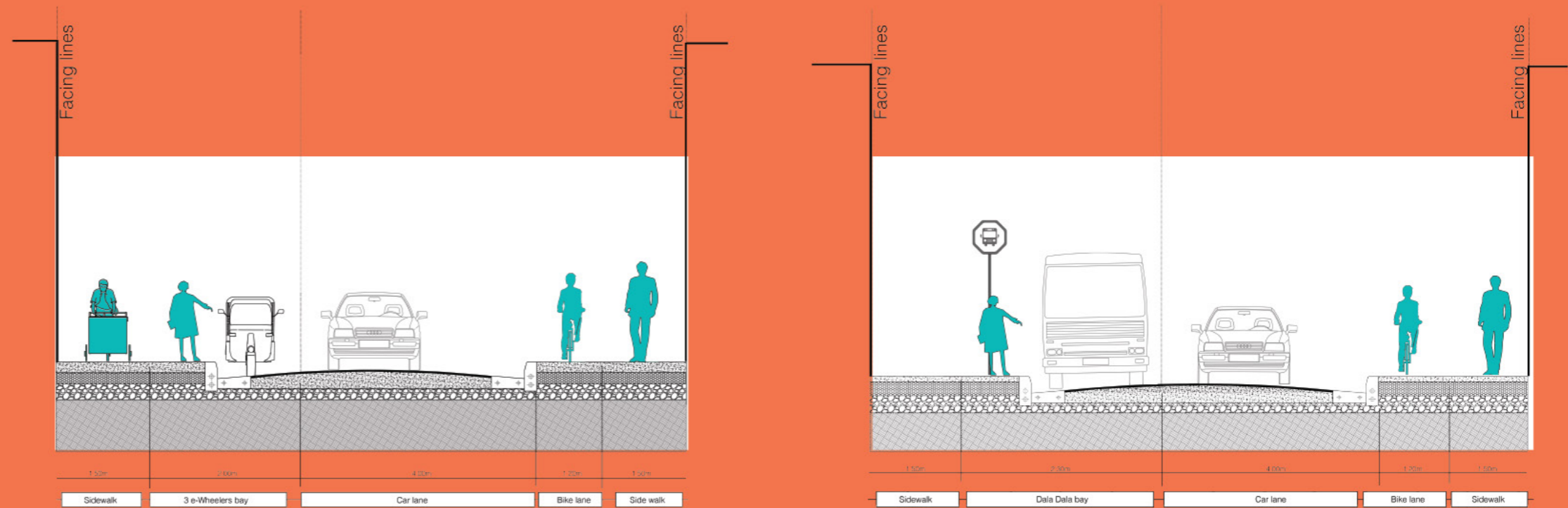


Typology BRT Corridor  
When there are pedestrian crossings

## 4.3 Modules

### 4.3.2 Green Infrastructure and walkability

This typological section is an approach for the secondary and arterial roads., where we proposed to implement bays for 3-E-wheelers and the feeder buses or Daladals in order to have established stops without any big infrastructure but rather a signage system to indicate and avoid traffic misleading.

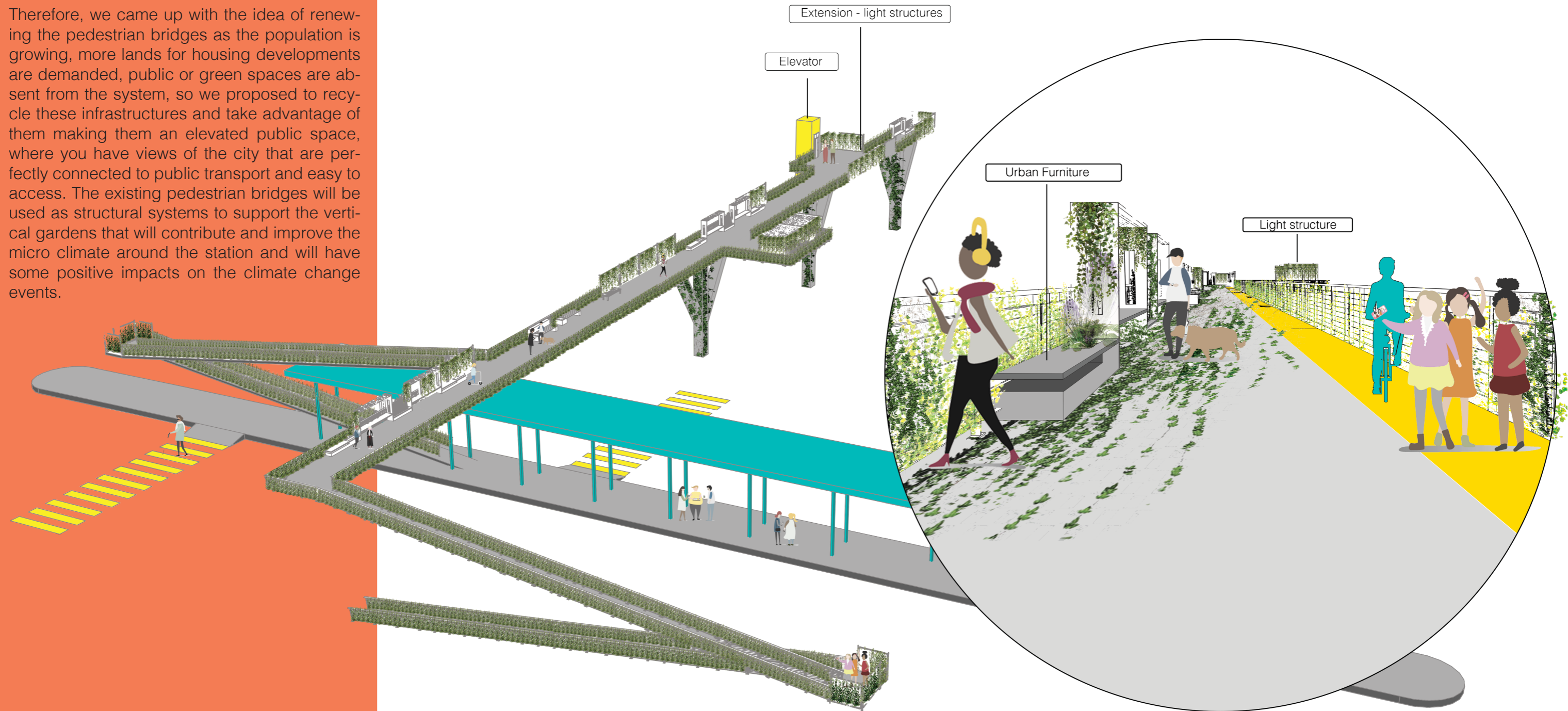


## 4.3 Modules

### 4.3.2 Green Infrastructure and walkability

The pedestrian bridges have been a big topic in our project since the BRT lines were recently built and it would be really controversial to propose a demolition plan for them, but we as urban planners firmly believe that leveled crossing are fundamental in our interventions.

Therefore, we came up with the idea of renewing the pedestrian bridges as the population is growing, more lands for housing developments are demanded, public or green spaces are absent from the system, so we proposed to recycle these infrastructures and take advantage of them making them an elevated public space, where you have views of the city that are perfectly connected to public transport and easy to access. The existing pedestrian bridges will be used as structural systems to support the vertical gardens that will contribute and improve the micro climate around the station and will have some positive impacts on the climate change events.





### 4.3 Modules

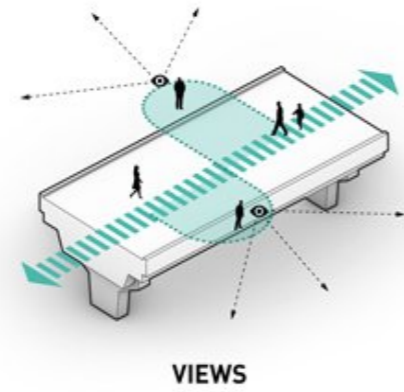
#### 4.3.2 Green Infrastructure and walkability

##### Predestrian Bridges renewal

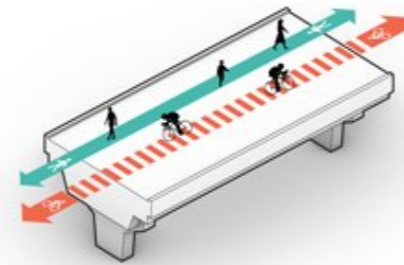
The renewal and recycling of these pedestrian bridges have been increasingly popular around the world. Since they are not the best solution. This is an example in Shanghai, where they extended the bridge with light structures and designed a program within the bridge in order to make it a public space.

##### Vertical Gardens

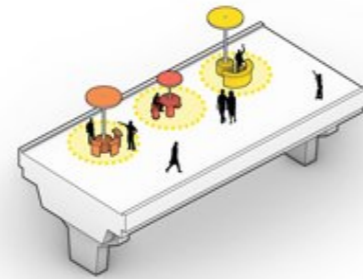
Vertical gardens are also being successful interventions in cities in Latin America were in places like Mexico City and Medellin where there is no enough space to build big green parks like Europe, so they are currently reusing the existing infrastructures to act against the climate change impacts.



VIEWS



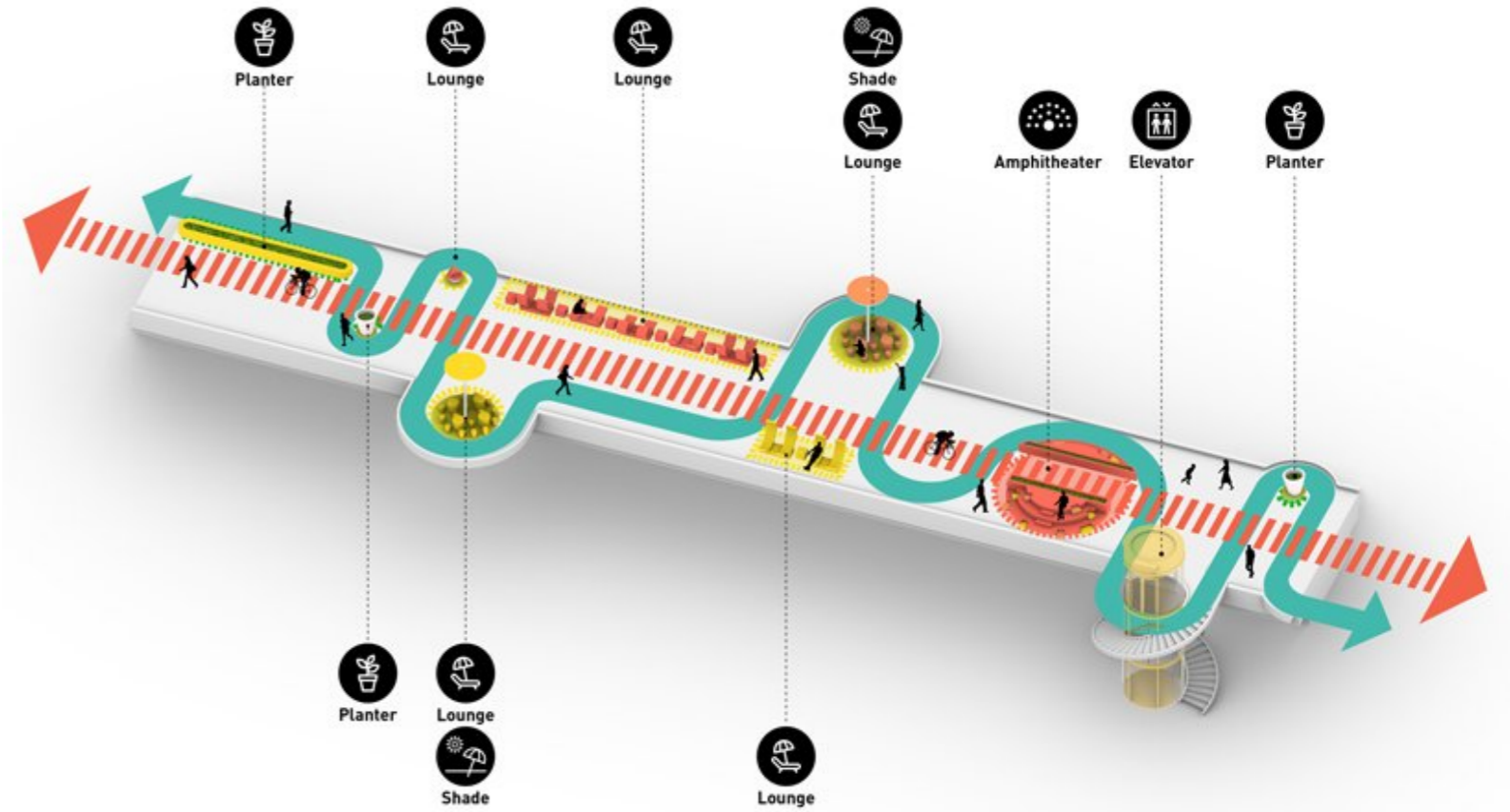
CIRCULATION



MARKET

##### High Loop:

A proposal for the renovation of the PUJILU bridge located in downtown Shanghai.



##### Vertical Gardens – metro infrastructure: CDMX - Medellin

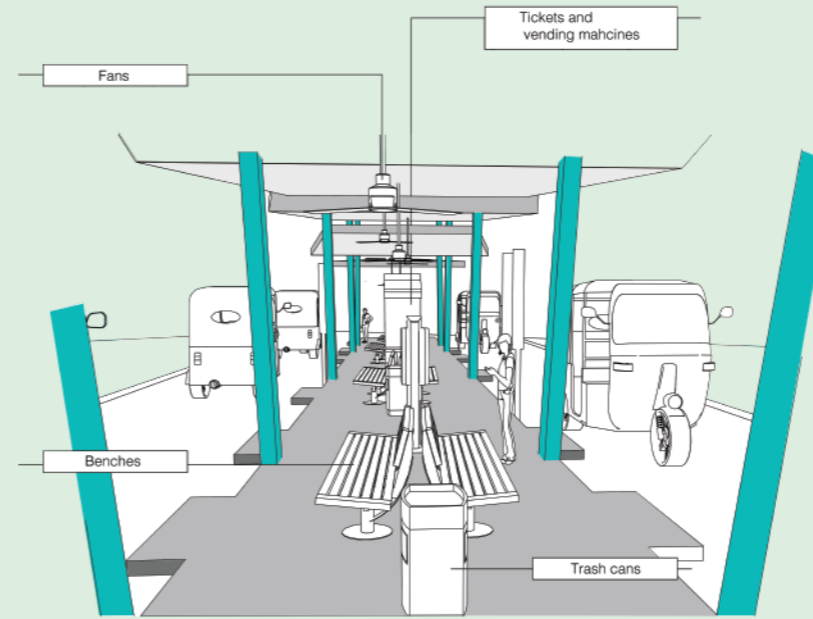


## 4.3 Modules

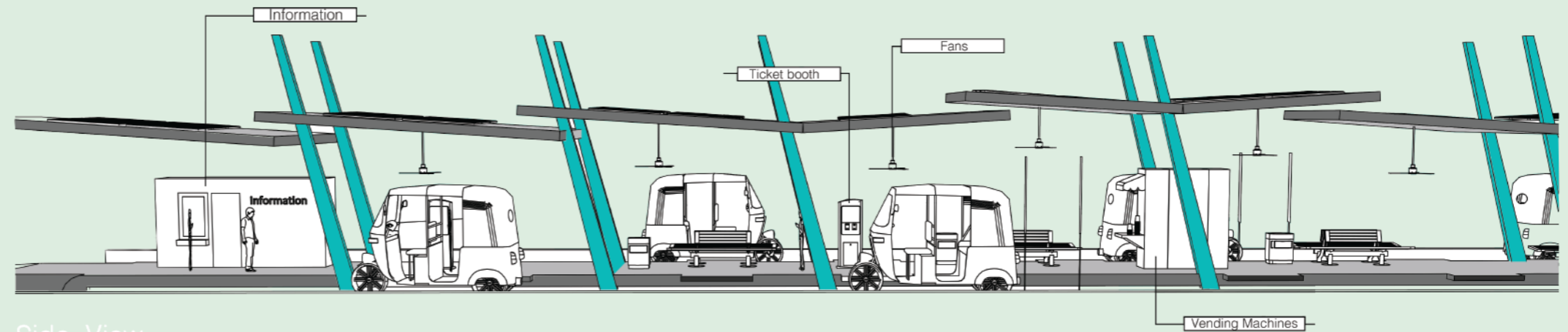
### 4.3.3 Urban Furniture

With this module, we are proposing basic furniture for the stations such as: green fences wherever mobility and pedestrian's flow is necessary; fans to provide urban comfort at stations and to reduce the high temperatures; benches; and trash bins.

It is important to highlight that some of these elements have been implemented in some of the other already developed stations, but it is necessary to equip all the existing and future stations with this furniture to guarantee the comfort of the users.



Front View



Side View

## 4.3 Modules

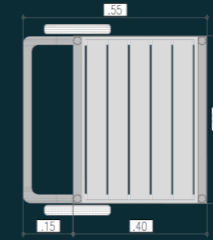
### 4.3.4 Street Vendors

As we mentioned in the soft infrastructure the inclusion of street vendors in the terminals and along the corridor is an important pillar in our project.

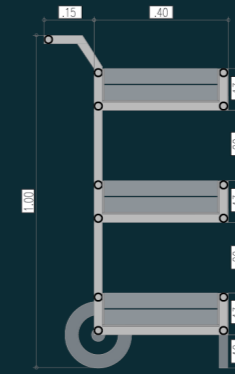
We came up with 3 different types of modules and design solutions . The first one is ambulatory. It can move around the city and park wherever permitted like the vendors bay.



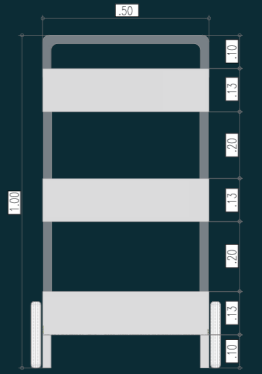
Type 1  
Ambulatory Module  
Walkable and portable



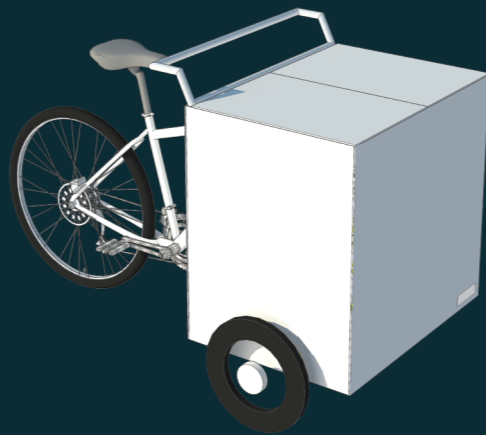
Top View



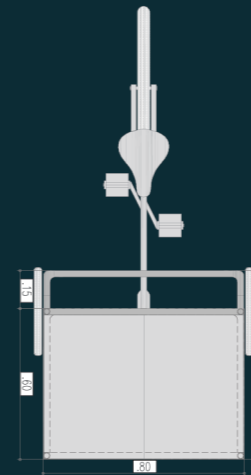
Side View



Front View



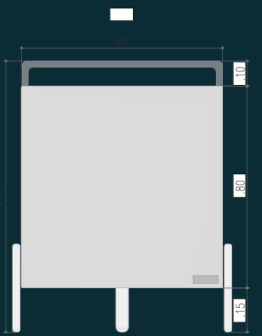
Type 2  
Ambulatory Module



Top View



Side View



Front View

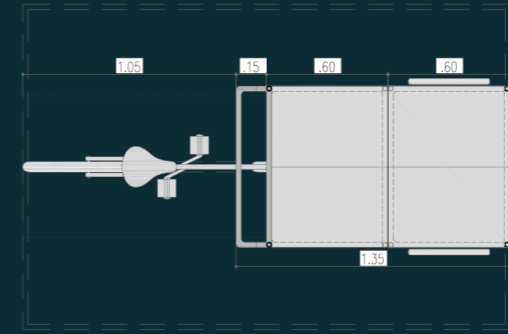
## 4.3 Modules

### 4.3.4 Street Vendors

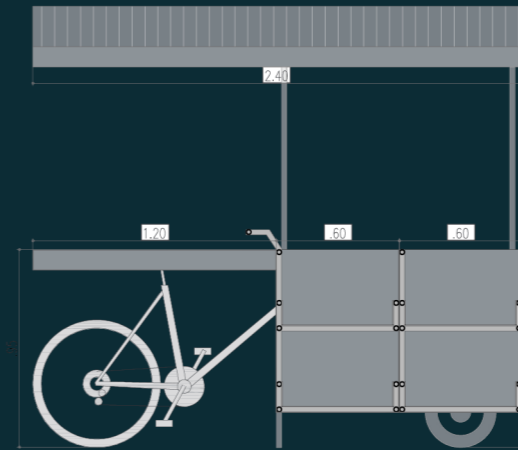
We also proposed within these modules a semi stationary module that is also moveable, but a little bit bigger depending on what types of goods you would like to sell.



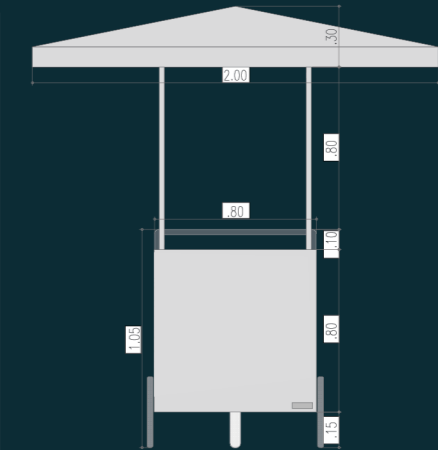
Type 1  
Semi- Stationary Module



Top View



Side View

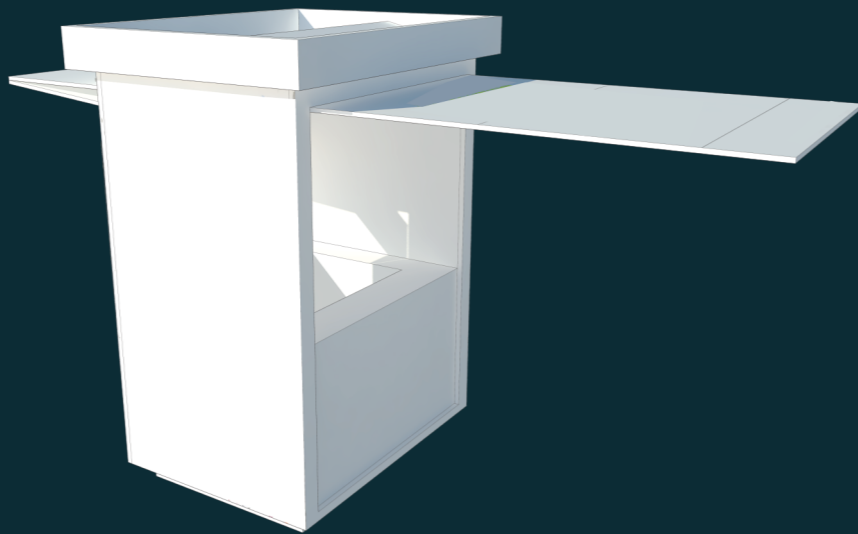


Front View

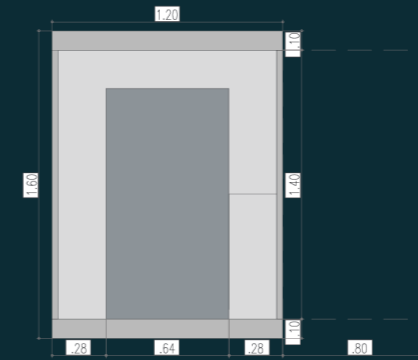
## 4.3 Modules

### 4.3.4 Street Vendors

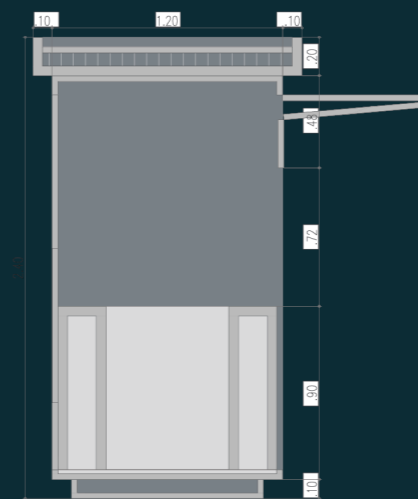
Finally, we have proposed the stationary module, that as we mentioned in our soft infrastructure that will be just in open public spaces and of course it is fixed structure.



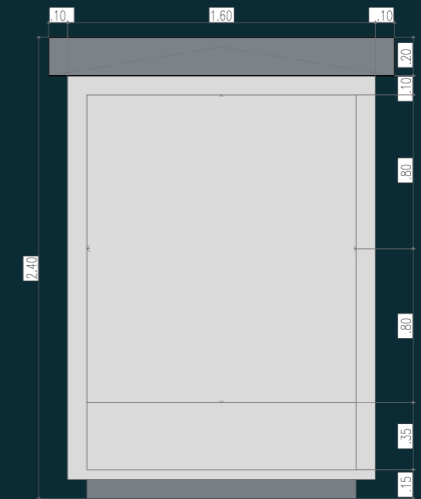
Type 1  
Semi- Stacionary Module



Top View



Side View



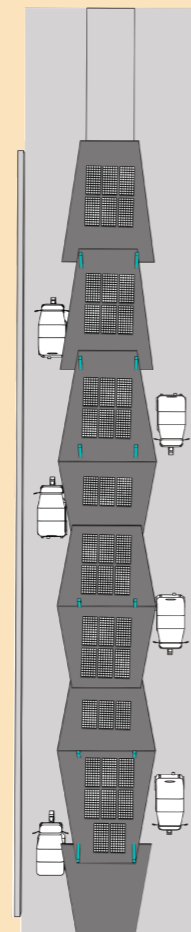
Front View

## 4.3 Modules

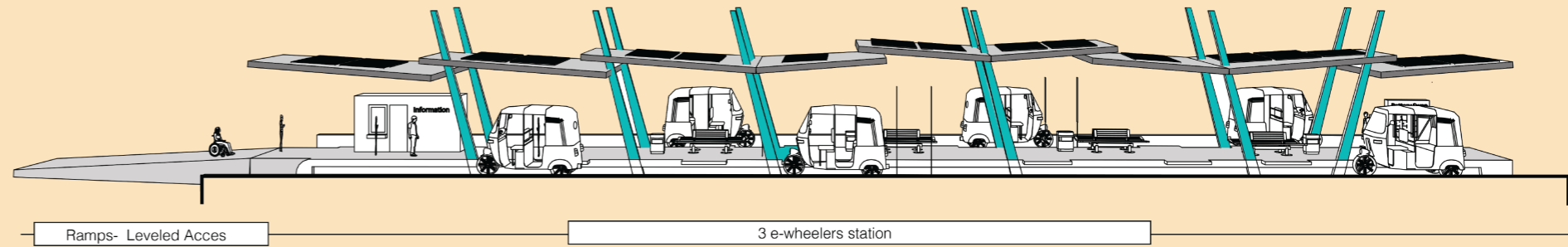
### 4.3.5 3 e-Wheelers platforms

We have proposed a fully designed and planned typology for the 3 - wheelers platforms. We propose a battery swapping system in order to avoid long hours of charging the 3- wheeler that usually take 5 hours of charging time and this puts the whole system of 3-E-wheelers in off-service. So the driver easily replace the empty battery with a fully charged one.

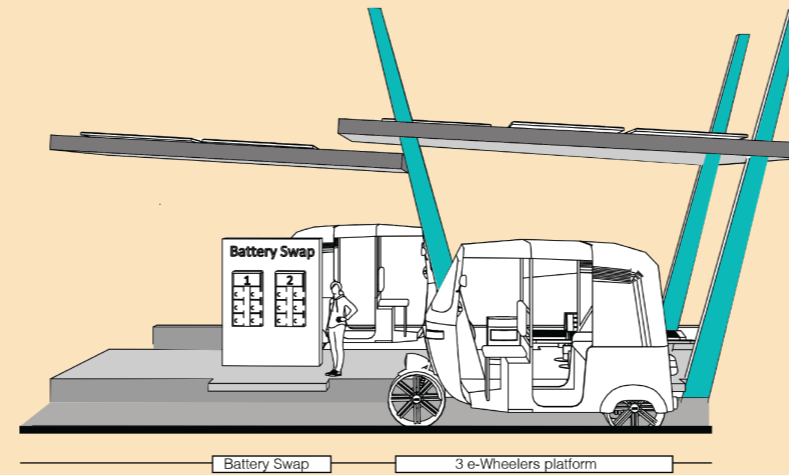
Also the platforms are equipped with urban furniture and fans that can achieve urban confort at stations.



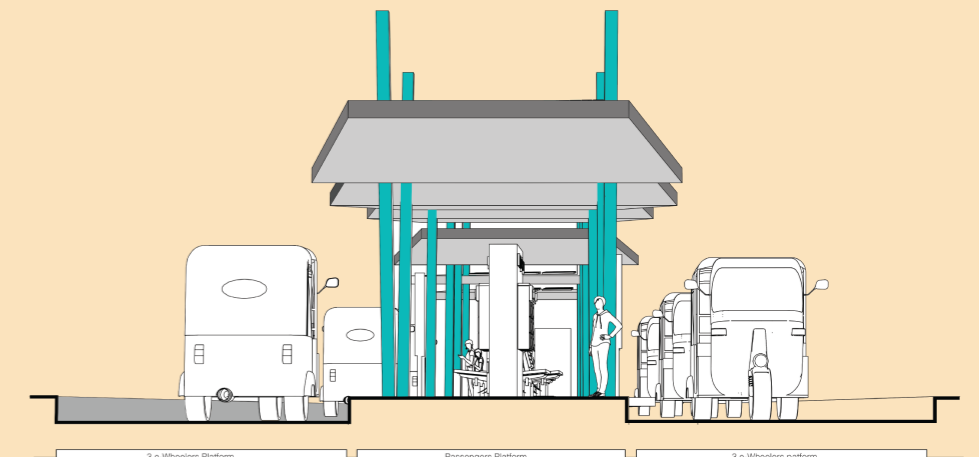
Top View



Side view



Battery swap

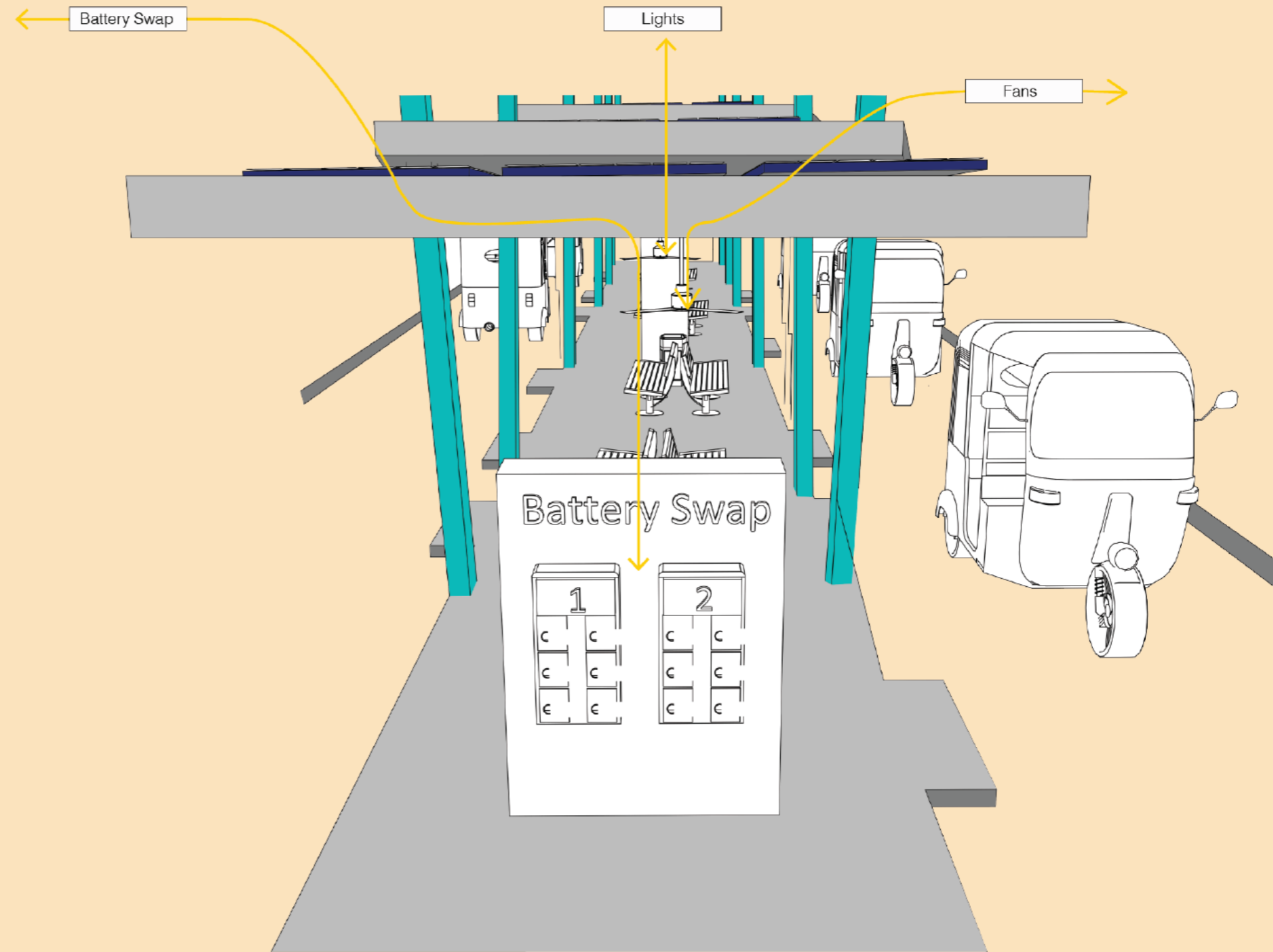


Front View

### 4.3 Modules

#### 4.3.5 3 E-Wheelers platforms

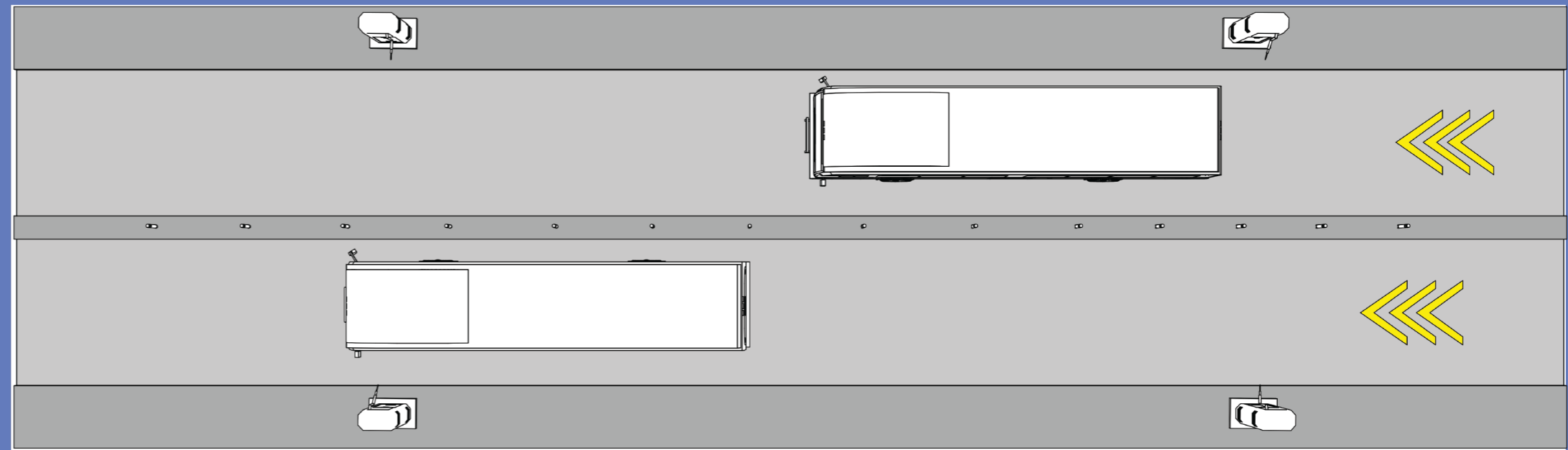
Most importantly we proposed the implementation of solar panels in our new designed platforms, using the roofs of the E-wheelers station. Dar city has 11-12 of sunny hours all day, so this produced energy will not only be used for the operations of the station but also as main charging source of the batteries swapping machines.



## 4.3 Modules

### 4.3.6 E-buses charging platforms

Considering the governmental sustainable transport intentions to upgrade the BRT Buses to E-buses, we embedded the needed charging infrastructures in our planning processes and design interventions.



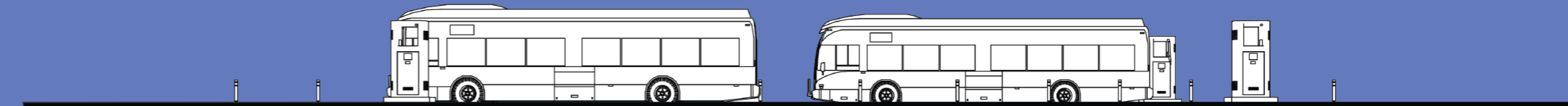
E - Chargers

E- bus Parking lot

E- bus Parking lot

E - Chargers

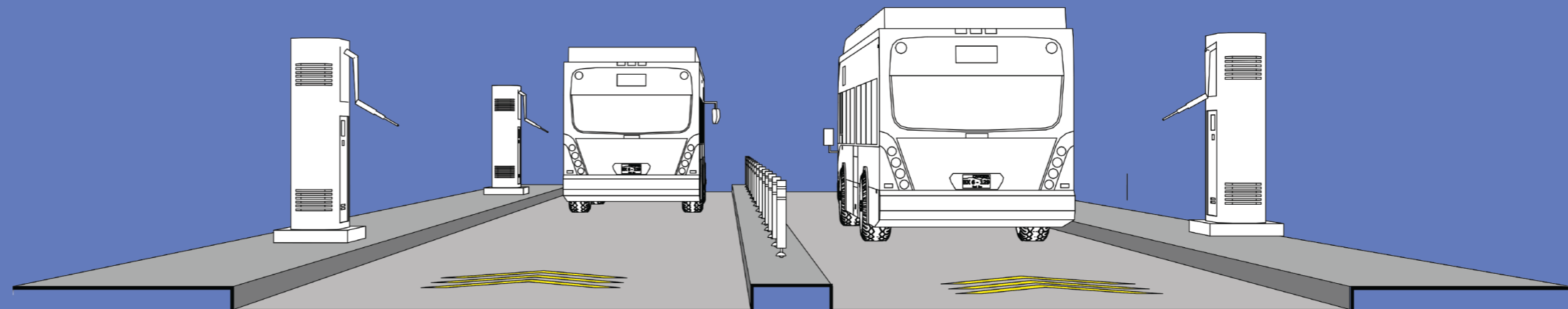
Top View



E- Charging Platforms

E- Charging Platforms

Side View

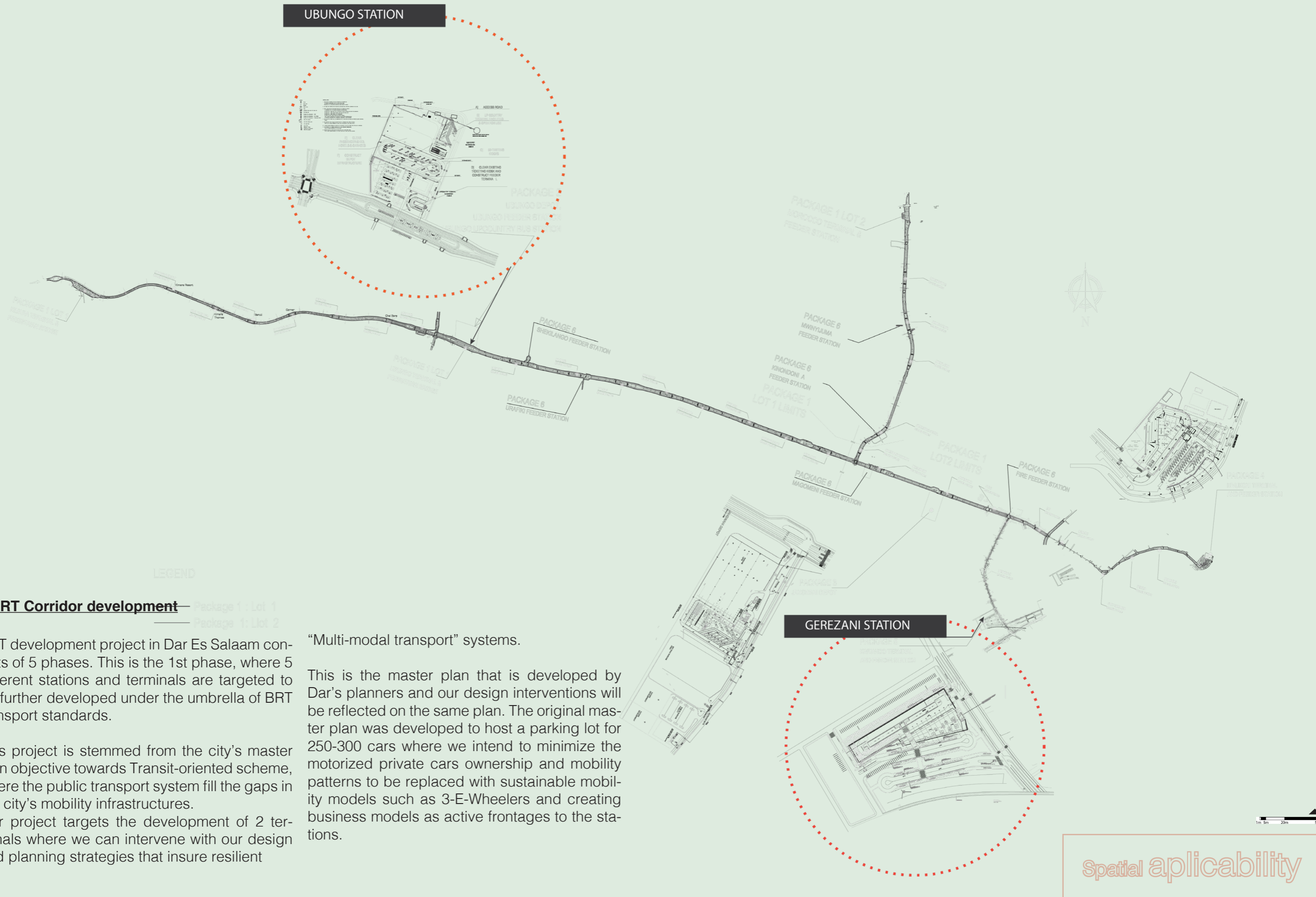






# 5. Applicability

# 5 Spatial Applicability



## DART Corridor development

BRT development project in Dar Es Salaam consists of 5 phases. This is the 1st phase, where 5 different stations and terminals are targeted to be further developed under the umbrella of BRT transport standards.

This project is stemmed from the city's master plan objective towards Transit-oriented scheme, where the public transport system fill the gaps in the city's mobility infrastructures. Our project targets the development of 2 terminals where we can intervene with our design and planning strategies that insure resilient

"Multi-modal transport" systems.

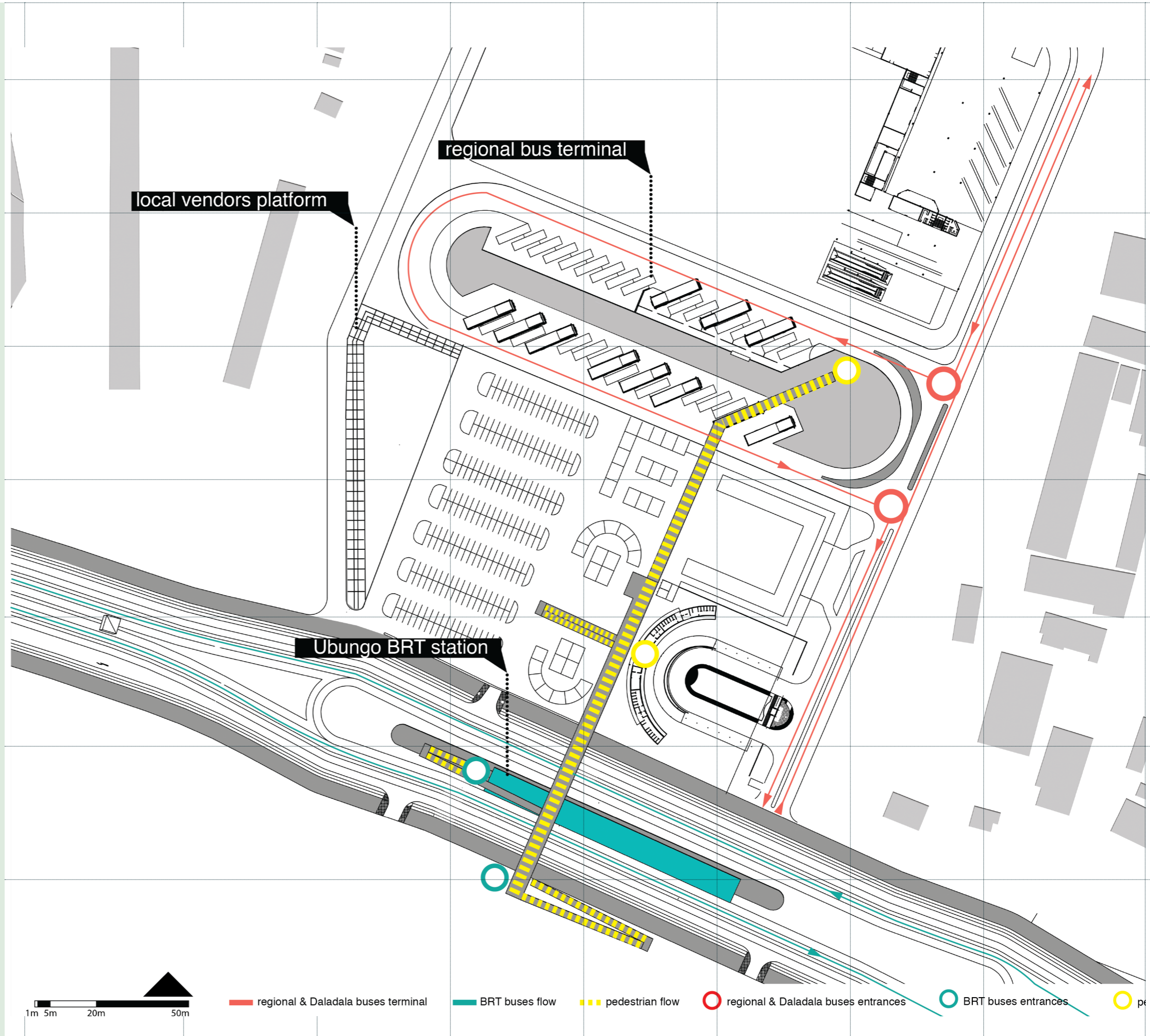
This is the master plan that is developed by Dar's planners and our design interventions will be reflected on the same plan. The original master plan was developed to host a parking lot for 250-300 cars where we intend to minimize the motorized private cars ownership and mobility patterns to be replaced with sustainable mobility models such as 3-E-Wheelers and creating business models as active frontages to the stations.

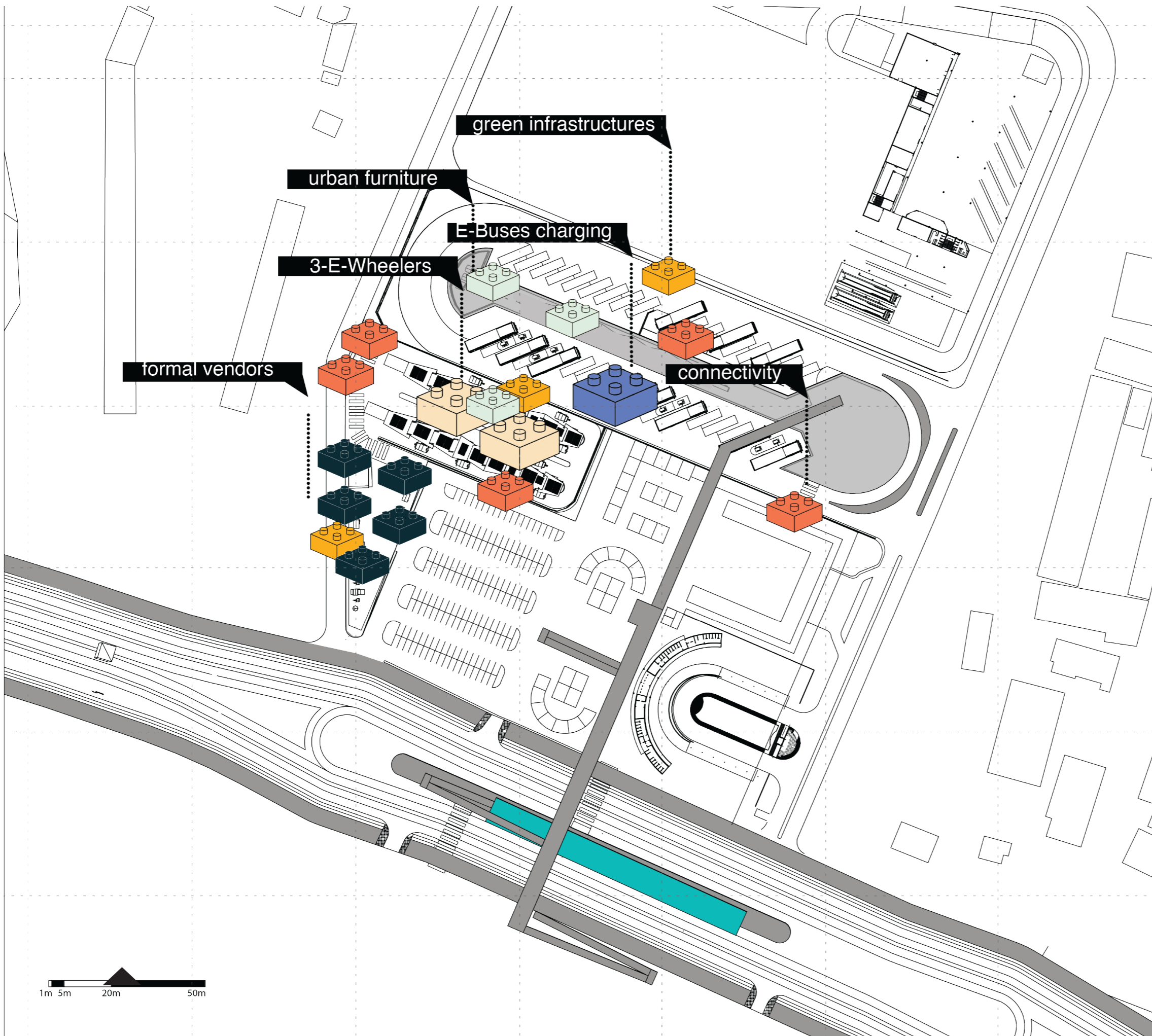
## Original Master Plan - Ubungo

This is a zoom-in to the original master plan of Ubungo as developed by Dar's planners.

This master plan shows the different mobility models of BRT, regional, and DalaDala buses. The master plan hosts loading (in-service) platform of Daladala and regional buses, and another stayover platform. The BRT station has a restricted and impractical access for pedestrians by a bridge that connects BRT with the regional and Daladala buses platforms.

A local market spot is designed for local vendors to be incorporated within the station but a huge space of the station was wasted as parking lot for cars, where this contradicts with the city's urban agenda.





### **Design Intervention**

This is our developed master plan that shows our design intervention zone which is adjacent to the regional buses platforms.

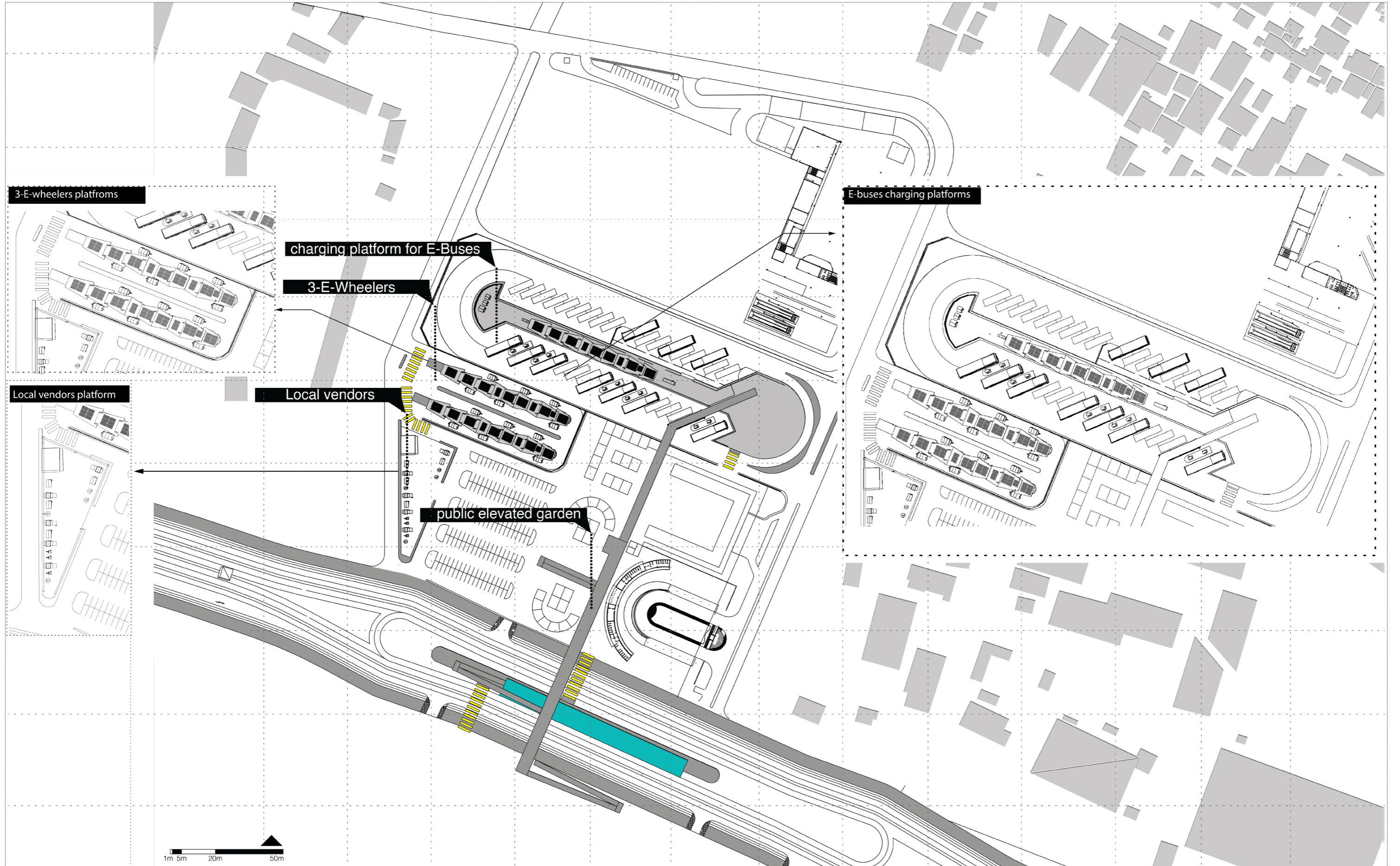
In Ubungo minor changes were made to the pre-developed master plan so we intervened within the existing regional platforms to provide charging machines in the pre-planned stayover platforms of the regional buses.

We designed two 3-e-wheelers platforms in this station that feed 2 different neighborhoods, using the feeder routes because Ubungo is a terminal station that is daily accessed by thousands of passengers.

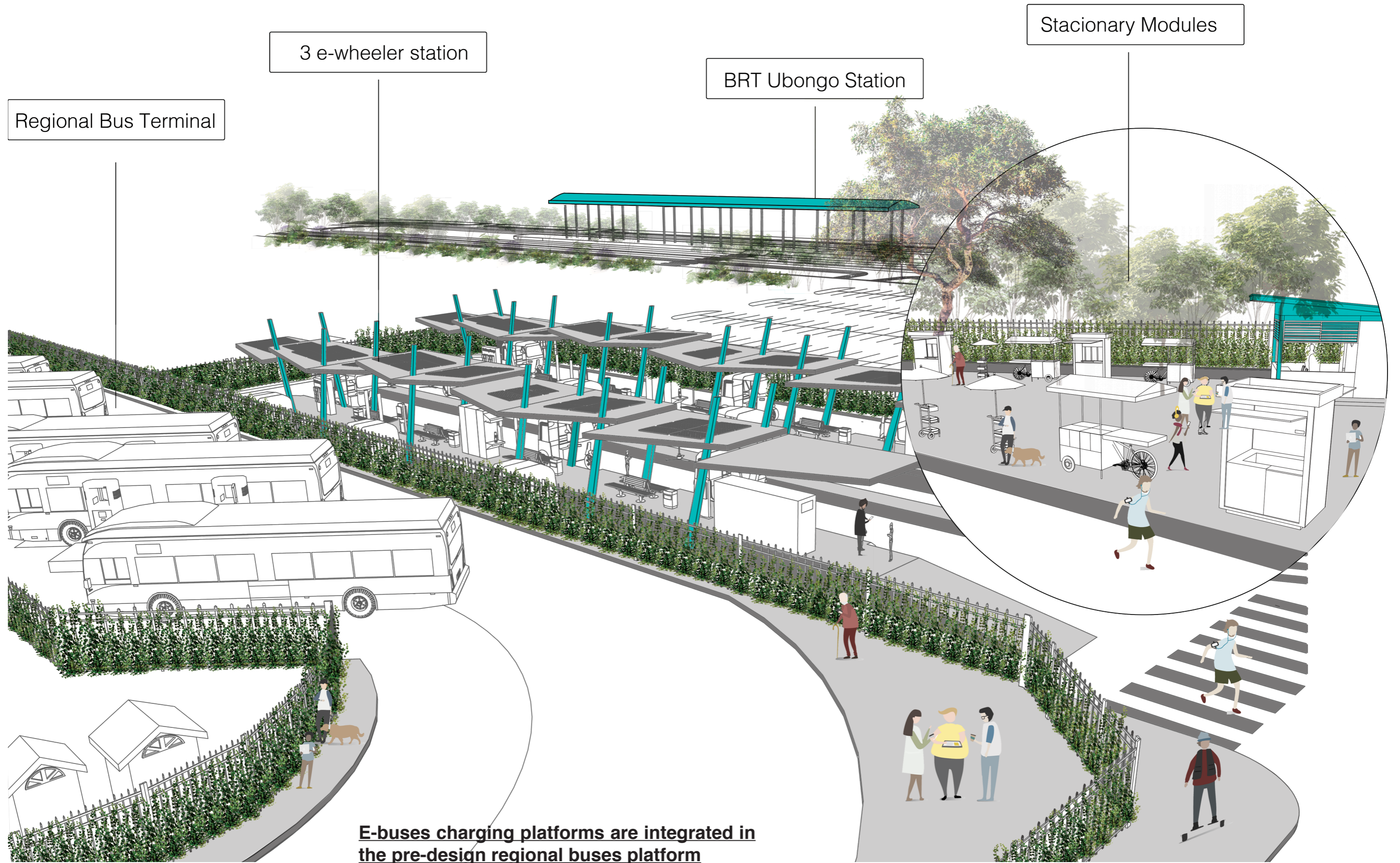
The platform of the formal local vendors in this station is a large platform because we want to create profitable business models that can act as a catalyst to less marginalization of those vendors and provide stable revenues for them, not only but also to create more secured and vivid stations.

The station is designed to be freely pedestrian accessed through same-level crossings and traffic lights where they can move freely within the station without any restrictions, keeping into consideration the safety mobility measures that are applied where needed.

# Developed Master Plan

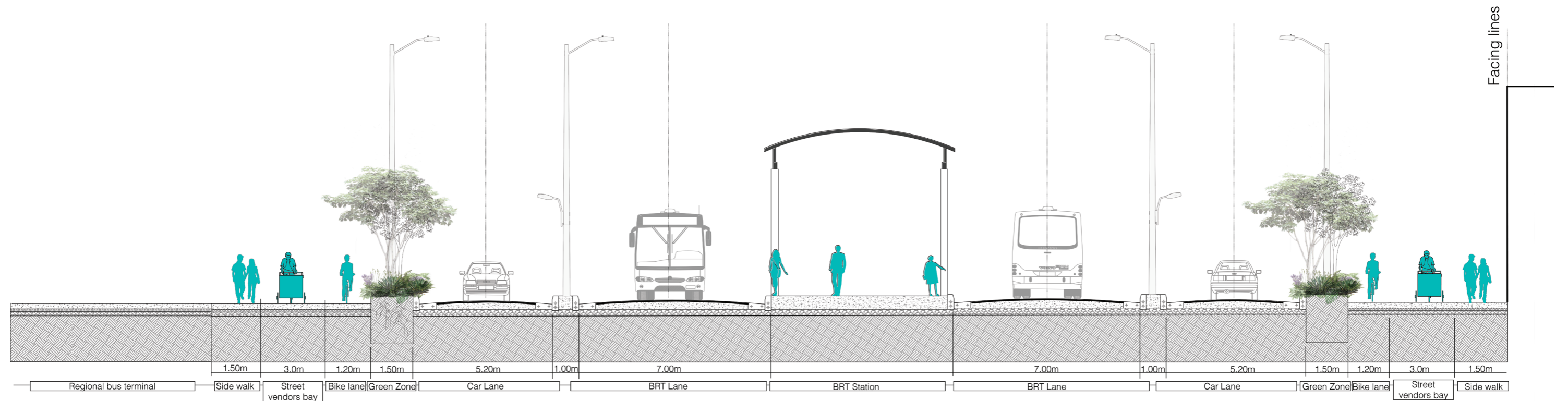


**Ubongo Visualization**



**E-buses charging platforms are integrated in the pre-design regional buses platform**

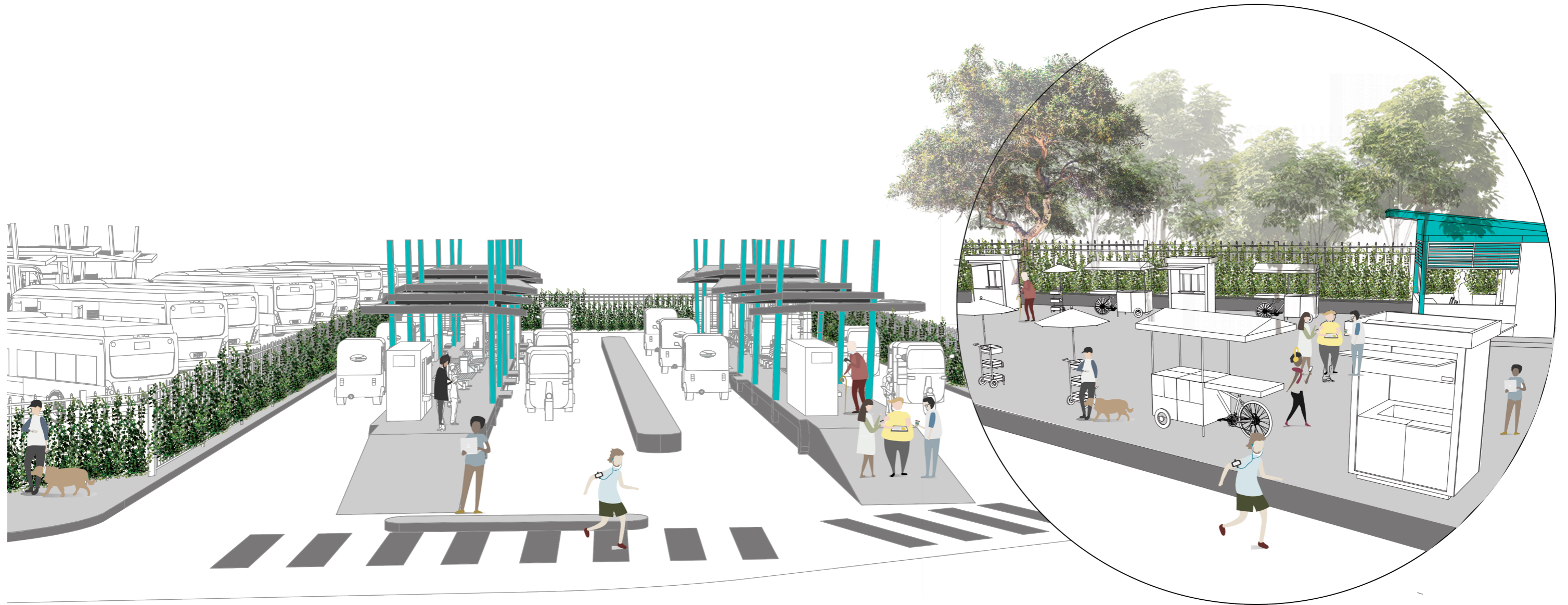
## Ubongo Visualization



Our planning and design interventions include also the development of the street section in the city, where the current street section lacks a defined cars and 3-wheelers lanes, shaded and designed sidewalks to host walkability, cycling, safety, and commercial models. So our developed street section typol-

ogy is focusing to incorporate all these activities on the same platform where every mobility and human factor is taken into consideration.

## Ubungo Visualization - 3 e-wheelers platform and street vendors bay



This 3D shot shows the designed 3-E-wheelers platform in Ubungo terminal, where we designed 2 platforms to answer the last-mile mobility connectivity with high efficiency. These 2 platforms feed two different neighborhoods.

The platforms are provided with proper waiting areas that are serviced with urban furniture solutions from shaded seats, ticketing machines, fans that provide urban comfort, and most importantly the battery swapping machines that insure the continuous efficiency of 3-E-wheelers fleet.

The platforms are accessed by same-level crossings and ramps for passengers with disabilities where we target a human-centric city and strategic planning approaches.

Green infrastructures solutions are followed in the design through the use of the station roof to host P.V.C that generate electricity to operate the platforms and also charge the empty batteries inside the battery swapping machines. Also the greening the station is another vital aspect that is implemented around the platform to provide safety measures that are wrapped with urban comfort.

Local vendors are one of our pillar interventions that act as immediate catalyst to minimize the marginalization processes through building a proper business models for them in the station.

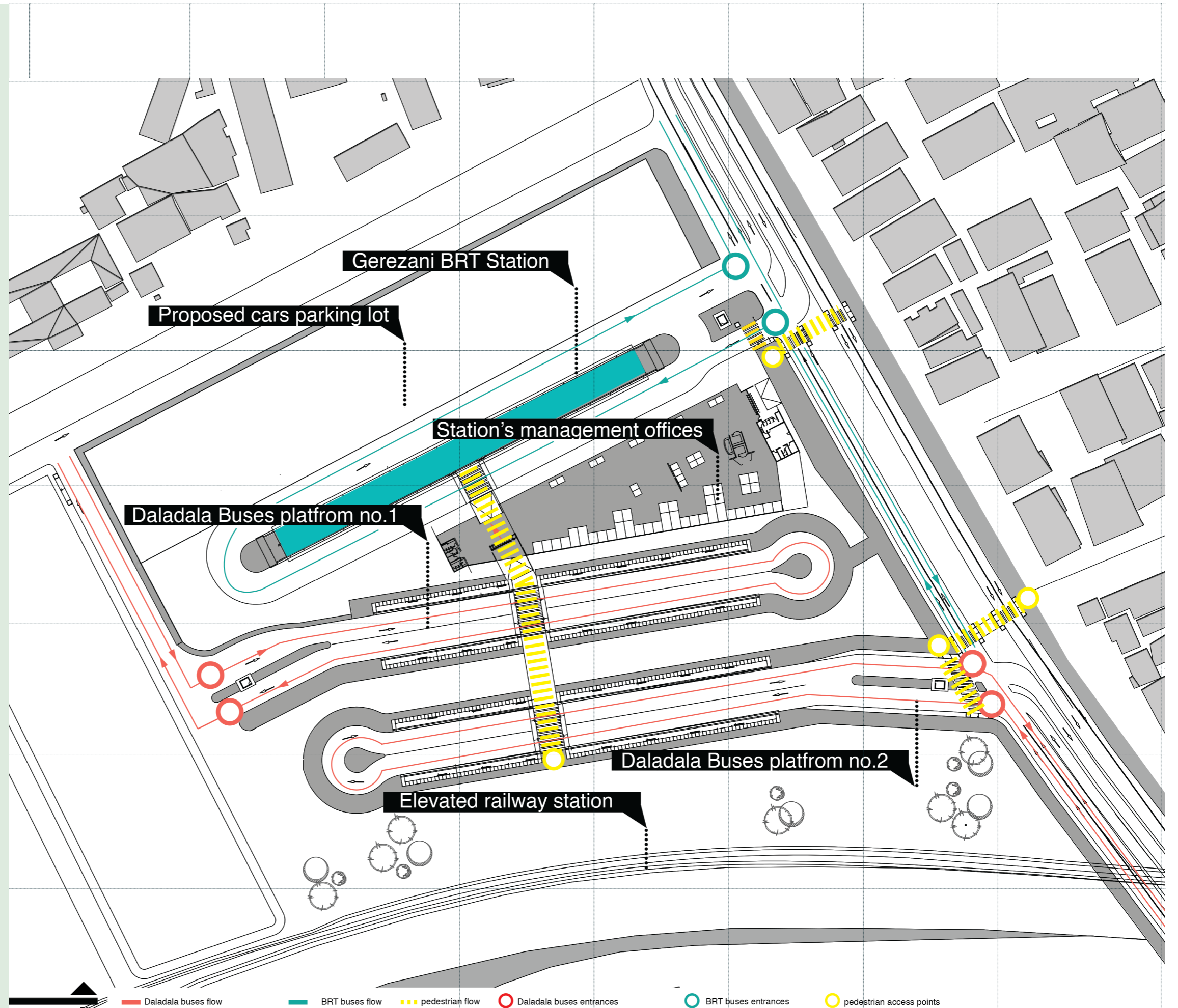


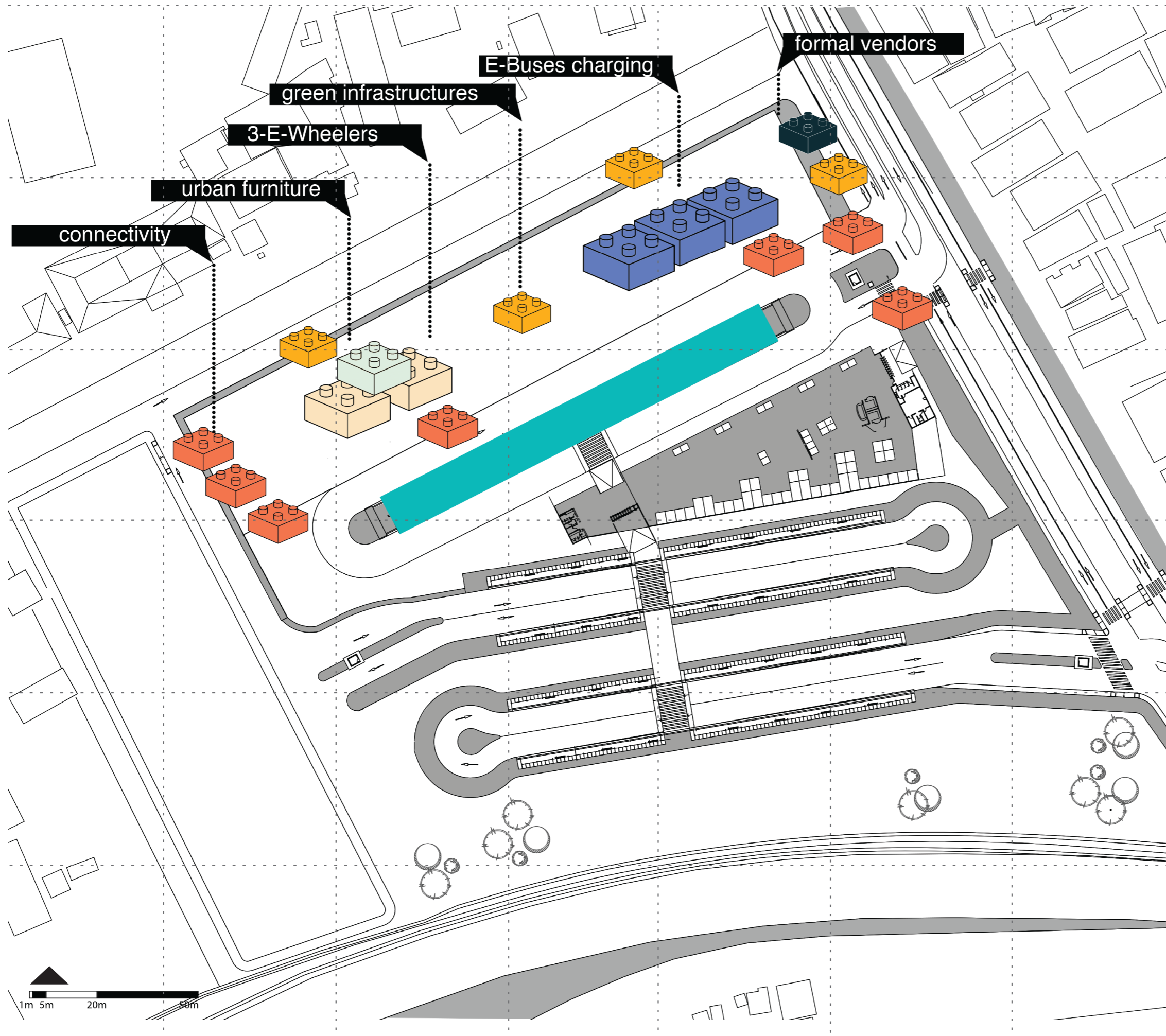
## Original Master Plan - Gerezani

This is a zoom-in to the original master plan of Ubungo as developed by Dar's planners.

This master plan shows the different mobility models of BRT, regional, and DalaDala buses. The master plan hosts loading (in-service) platform of Daladala and regional buses, and another stay-over platform. The BRT station has a restricted and impractical access for pedestrians by a bridge that connects BRT with the regional and Daladala buses platforms.

A local market spot is designed for local vendors to be incorporated within the station but a huge space of the station was wasted as parking lot for cars, where this contradicts with the city's urban agenda.





### **Design Intervention**

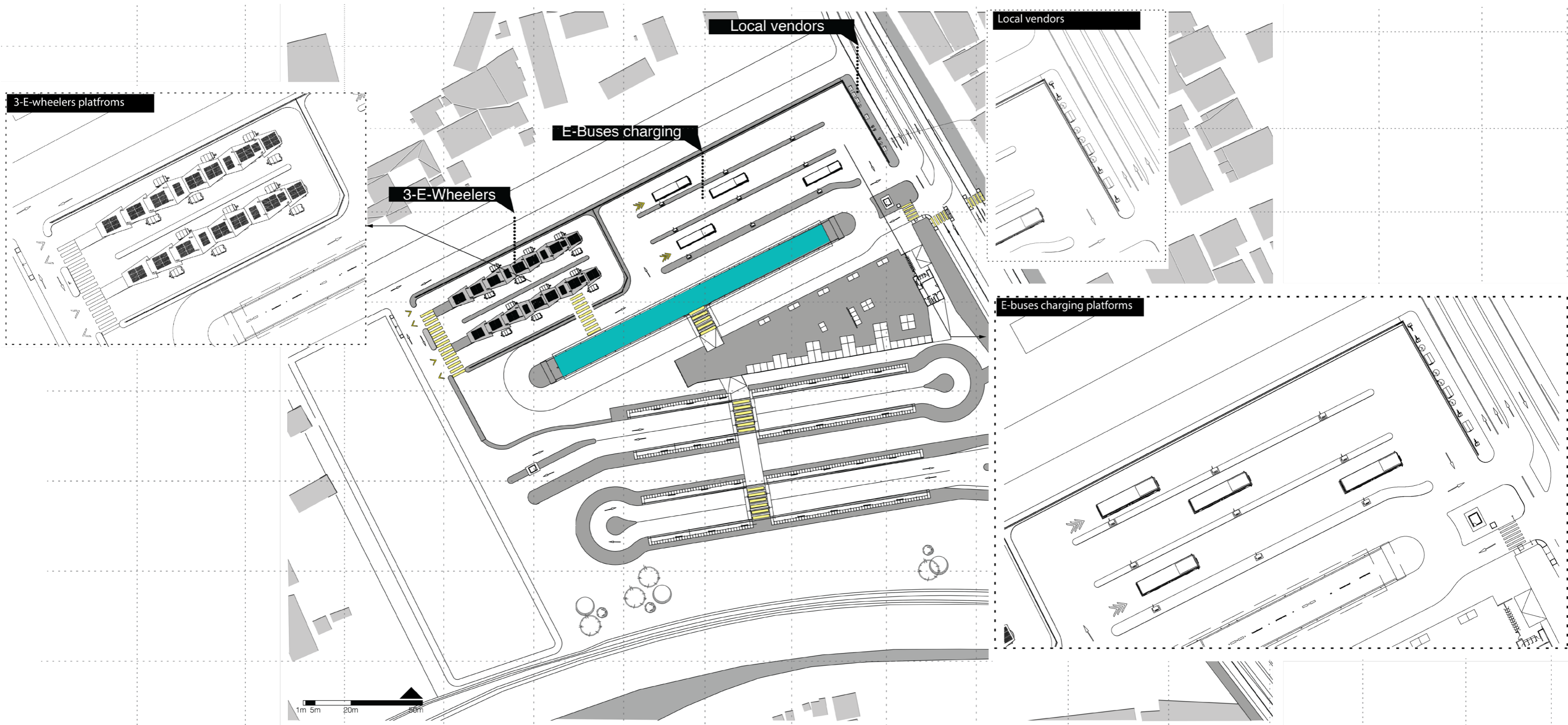
This is our developed master plan that shows our design intervention zone which is originally planned as parking lot for cars by Dar's planners.

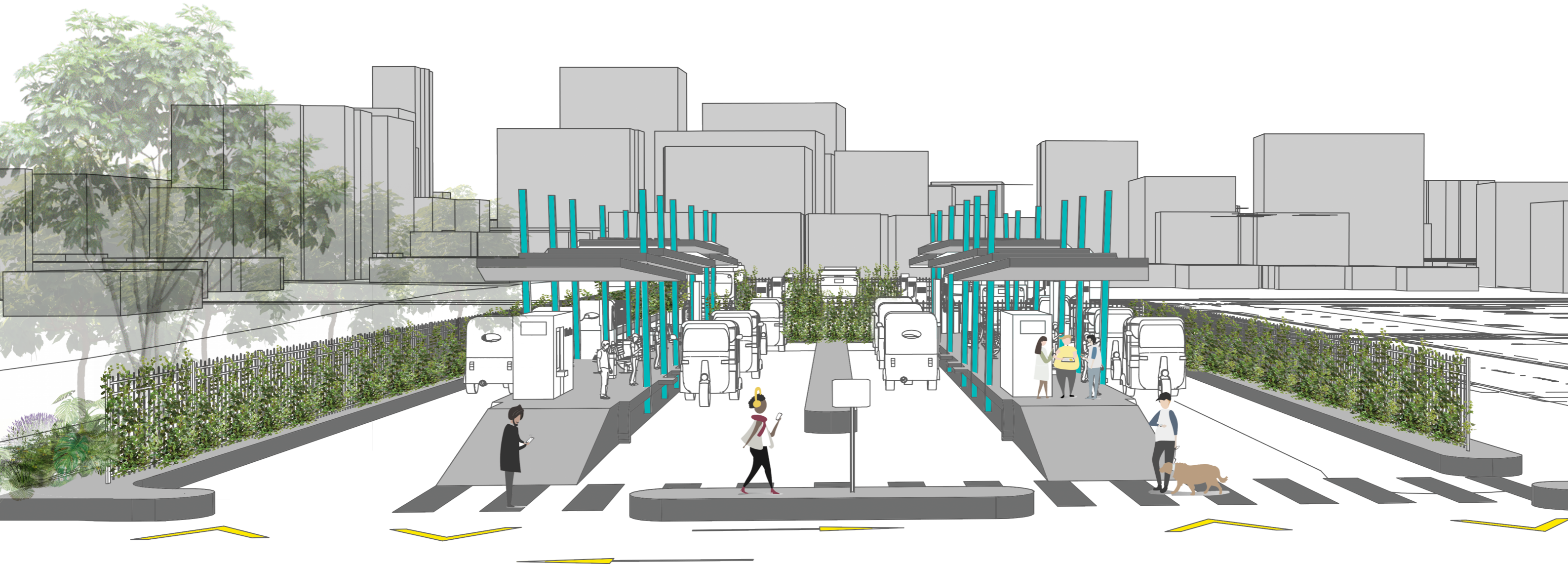
In Gerezani minor changes were made to the pre-developed master plan so we intervened in the parking lot to design a proper charging platform for the E-buses as DART intends to electrify its vehicles, so charging machines we provided in three platforms that are planned in a way to insure continual efficiency of BRT buses.

We designed two 3-e-wheelers platforms in this station that feed 2 different neighborhoods, using the feeder routes because Gerezani is a terminal station that is daily accessed by thousands of passengers.

We also redesigned the station frontage to host the local vendors and also intervened to propose a design solutions of the main sidewalks to host different alternative mobility solutions and activities.

# Developed Master Plan





This 3D shot shows the designed 3-E-wheelers platform in Gerezani terminal, where we designed 2 platforms to answer the last-mile mobility connectivity with high efficiency. These 2 platforms feed two different neighborhoods and navigate them through the feeder routes and not the main streets as prohibited according to the planning and mobility regulations of the city. The platforms are provided with proper waiting ar-

reas that are serviced with urban furniture solutions from shaded seats, ticketing machines, fans that provide urban comfort, and most importantly the battery swapping machines that insure the continuous efficiency of 3-E-wheelers fleet through totally cutting the charging time to zero.

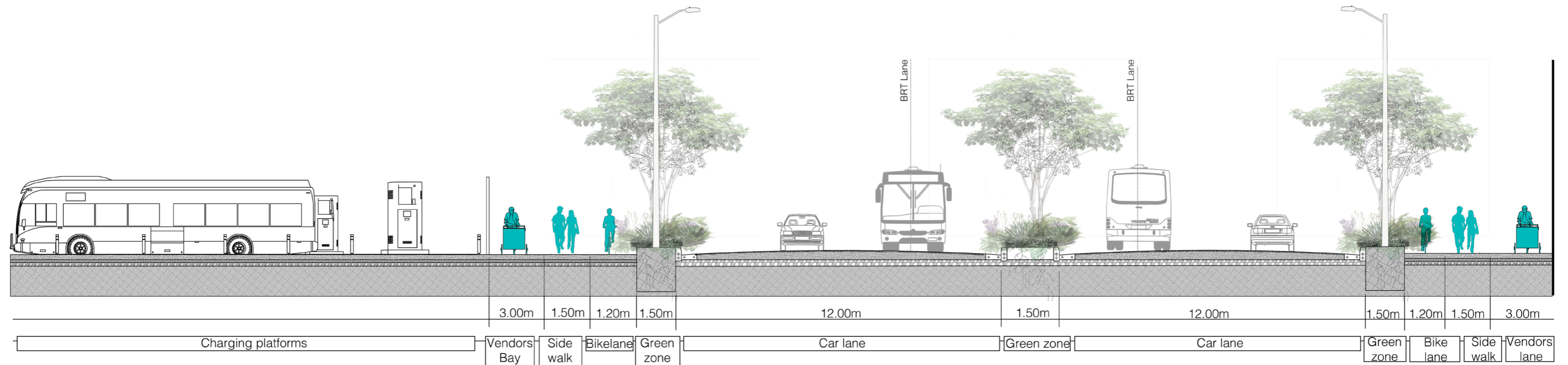
Green infrastructures solutions are followed in the design through the use of the station roof to host

P.V.C that generate electricity to operate the platforms and also charge the empty batteries inside the battery swapping machines. Also the greening the station is another vital aspect that is implemented around the platform to provide safety measures that are wrapped with urban comfort.

The methodological thinking consists of 6 stages of research: data collection; data evaluation and

filtering; urban holistic thinking, planning and design system; planning policies and strategies; to finally position and spatially apply all the design interventions in the existing BRT terminals with adoption of 3-E-Wheelers as low carbon effective last-mile connectivity solutions.

**Applied Typological section  
- Gerezani**

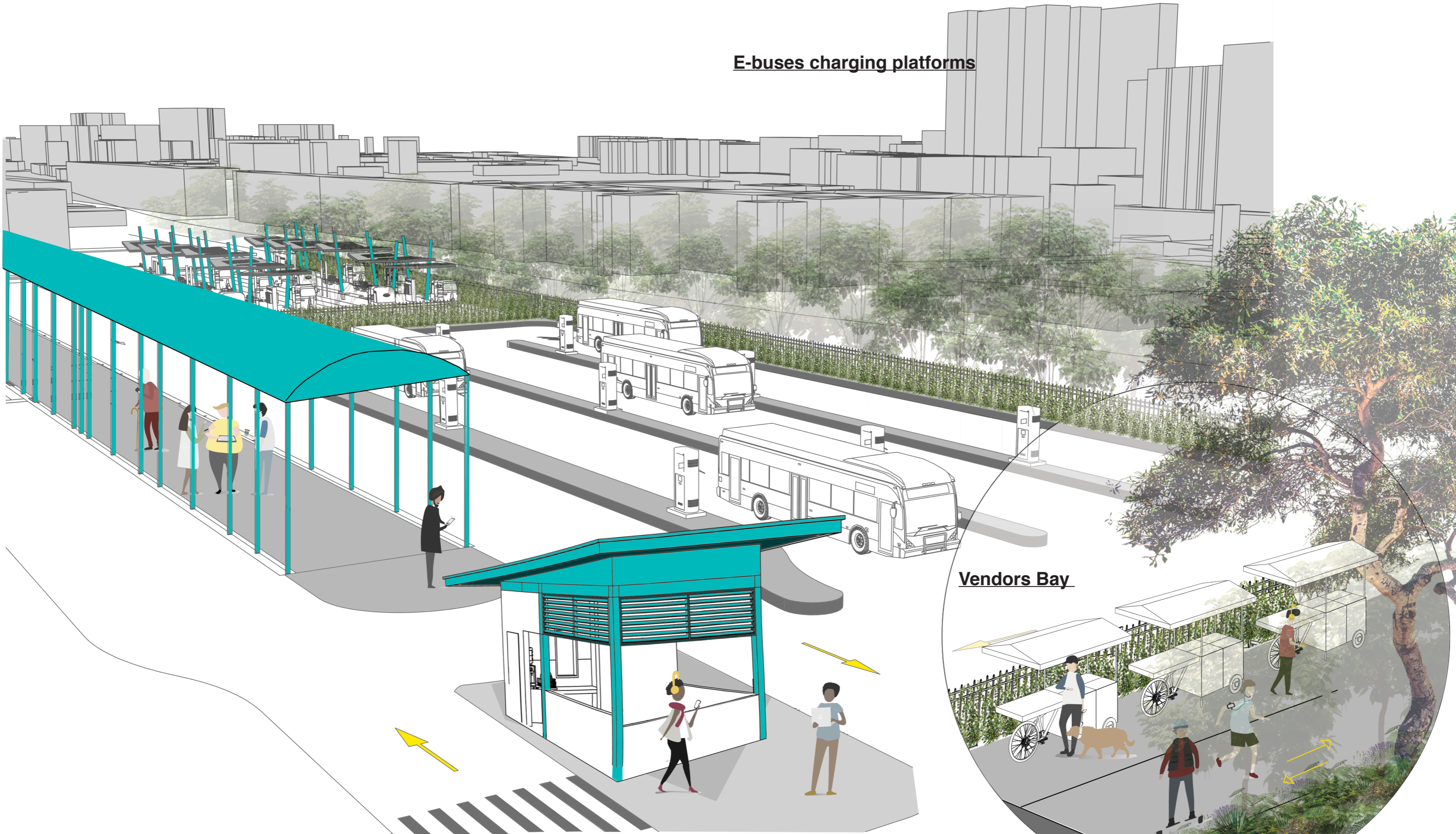


Our planning and design interventions include also the development of the street section in the city, where the current street section lacks a defined cars and 3-wheelers lanes, shaded and designed sidewalks to host walkability, cycling, safety, and commercial models. So our developed street section typology is focusing to incorporate all these activities on the same platform where every mobility and human factor is taken into consideration.

Also local vendors are incorporated in the design of the sidewalks to act as an active business frontages to the stations.

The methodological thinking consists of 6 stages of research: data collection; data evaluation and filtering; urban holistic thinking, planning and design system; planning policies and strategies; to finally position and spatially apply all the design interventions in the existing BRT terminals with adoption of 3-E-Wheelers as low carbon effective last-mile connectivity solutions. The methodological thinking consists of 6 stages of research: data collection; data evaluation and filtering; urban holistic thinking, planning and design system; planning policies and strategies; to finally position and spatially apply all the design interventions in the existing BRT terminals with adoption of 3-E-Wheelers as low carbon effective last-mile connectivity solutions.

**E-buses charging platforms**



**Vendors Bay**

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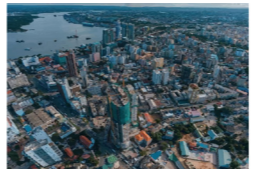



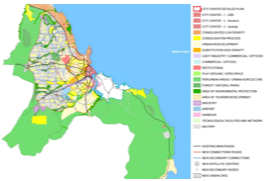
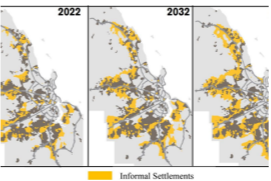



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# 7 Image index

Picture	Description	Link
	Cover Picture	Source: AFP pic,2016.
	Brt system	<a href="https://www.google.com/url?sa=i&amp;url=https%3A%2F%2Fwww.strabag-international.com%2Fdatabases%2Finternet%2F_public%2Fcontent30.nsf%2Fweb30%3FOpenagent%26id%3D78E714EA7732617AC125811B006BACF4&amp;psig=AOvVaw11uKzMXAGascFrkYlhEO6c&amp;ust=1614849509213000&amp;source=images&amp;cd=vfe&amp;ved=0CAIQjRqFwoTCMiy5q_lk-8CFQAAAAAdAAAAABAJ">https://www.google.com/url?sa=i&amp;url=https%3A%2F%2Fwww.strabag-international.com%2Fdatabases%2Finternet%2F_public%2Fcontent30.nsf%2Fweb30%3FOpenagent%26id%3D78E714EA7732617AC125811B006BACF4&amp;psig=AOvVaw11uKzMXAGascFrkYlhEO6c&amp;ust=1614849509213000&amp;source=images&amp;cd=vfe&amp;ved=0CAIQjRqFwoTCMiy5q_lk-8CFQAAAAAdAAAAABAJ</a>
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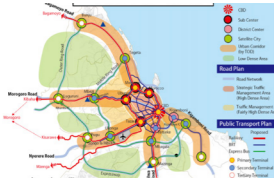




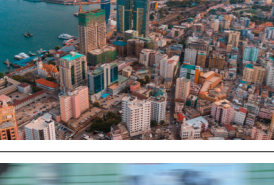


Picture	Description	Link
	Undeveloped land	Source: Google maps
	Informal Vendors	Source: Google maps
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	Spatial Growth	SDP - Dar es Salaam city council

Picture	Description	Link
	Dar es Salaam	<a href="https://www.google.com/url?sa=i&amp;url=https%3A%2F%2Fwww.pinterest.com%2Fpin%2F579908889497083024%2F&amp;psig=AOvVaw355ErrBOaTfjx8l-8MRhaV&amp;ust=1615558381739000&amp;source=images&amp;cd=vfe&amp;ved=0CAIQjRxqFwoTCKioqZG2qO8CFQAAAAdAAAAABAJ">https://www.google.com/url?sa=i&amp;url=https%3A%2F%2Fwww.pinterest.com%2Fpin%2F579908889497083024%2F&amp;psig=AOvVaw355ErrBOaTfjx8l-8MRhaV&amp;ust=1615558381739000&amp;source=images&amp;cd=vfe&amp;ved=0CAIQjRxqFwoTCKioqZG2qO8CFQAAAAdAAAAABAJ</a>
	1949 Master Plan	Peter, Yang. 2019. Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania.pdf
	1968 Master Plan	Yang. 2019. Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania.pdf
	1979 Master Plan	Yang. 2019. Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania.pdf
	2012-2032 Plan	Yang. 2019. Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania.pdf
	Informal settlements	Yang. 2019. Urban planning historical review of master plans and the way towards a sustainable city: Dar es Salaam, Tanzania.pdf
	Dar Es Salaam mobility in pictures	<a href="https://www.theguardian.com/cities/2019/jan/08/how-an-emerging-african-megacity-cut-commutes-by-two-hours-a-day-dar-es-salaam">https://www.theguardian.com/cities/2019/jan/08/how-an-emerging-african-megacity-cut-commutes-by-two-hours-a-day-dar-es-salaam</a>
	Gerezani terminal	<a href="https://www.google.com/maps/@-6.8254569,39.2728343,779m/data=!3m1!1e3">https://www.google.com/maps/@-6.8254569,39.2728343,779m/data=!3m1!1e3</a>
	Kivukoni terminal	<a href="https://www.google.com/maps/@-6.819171,39.2986058,527m/data=!3m1!1e3">https://www.google.com/maps/@-6.819171,39.2986058,527m/data=!3m1!1e3</a>




Picture	Description	Link
	Morocco terminal	<a href="https://www.google.com/maps/@-6.7786357,39.2632544,577m/data=!3m1!1e3">https://www.google.com/maps/@-6.7786357,39.2632544,577m/data=!3m1!1e3</a>
	Ubungo terminal	<a href="https://www.google.com/maps/@-6.7932567,39.2104744,811m/data=!3m1!1e3">https://www.google.com/maps/@-6.7932567,39.2104744,811m/data=!3m1!1e3</a>
	Underdeveloped land (parking lot) next to Gerezani BRT terminal	<a href="https://www.google.com/maps/place/Gerezani+Bus+Stop/@-6.8263477,39.2738984,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipOFj4GzTPxpMG6Lir9VHHGdPDQr989A_p8y-hvu!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipOFj4GzTPxpMG6Lir9VHHGdPDQr989A_p8y-hvu%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x185c4bac878969b1:0x72378131d7c770a3!8m2!3d-6.8263538!4d39.2738995">https://www.google.com/maps/place/Gerezani+Bus+Stop/@-6.8263477,39.2738984,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipOFj4GzTPxpMG6Lir9VHHGdPDQr989A_p8y-hvu!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipOFj4GzTPxpMG6Lir9VHHGdPDQr989A_p8y-hvu%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x185c4bac878969b1:0x72378131d7c770a3!8m2!3d-6.8263538!4d39.2738995</a>
	3-wheelers waiting at a station	<a href="https://cambridgedevdevelopment.wordpress.com/tag/vingunguti/">https://cambridgedevdevelopment.wordpress.com/tag/vingunguti/</a>
	People crossing the busy road in order to access the BRT terminal at Ubungo	<a href="https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231">https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231</a>
	Kimara terminal	<a href="https://www.google.com/maps/@-6.7869791,39.1668177,690m/data=!3m1!1e3">https://www.google.com/maps/@-6.7869791,39.1668177,690m/data=!3m1!1e3</a>
	Monocentric structure of the city	<a href="http://www.planning4adaptation.org/Docs/newsInfoMaterial/05-2013/08/FONTANARI_22_APRIL_2013.pdf">http://www.planning4adaptation.org/Docs/newsInfoMaterial/05-2013/08/FONTANARI_22_APRIL_2013.pdf</a>
	Chaotic road structure	<a href="https://www.strabag-international.com/databases/internet/_public/content30.nsf/web30?Openagent&amp;id=78E714EA7732617AC125811B006BACF4">https://www.strabag-international.com/databases/internet/_public/content30.nsf/web30?Openagent&amp;id=78E714EA7732617AC125811B006BACF4</a>
	No connection between Gerezani BRT terminal and elevated railway	<a href="https://www.google.com/maps/place/Train+Station+Kamata/@-6.8268019,39.2737412,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P%3Dw86-h86-k-no!7i3024!8i3024!4m5!3m4!1s0x185c4baca10222b7:0x5f476b0e9aef51a1!8m2!3d-6.8268019!4d39.2737412">https://www.google.com/maps/place/Train+Station+Kamata/@-6.8268019,39.2737412,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P%3Dw86-h86-k-no!7i3024!8i3024!4m5!3m4!1s0x185c4baca10222b7:0x5f476b0e9aef51a1!8m2!3d-6.8268019!4d39.2737412</a>

Picture	Description	Link
	Chaotic situation on a sidewalk at Ubungo terminal	<a href="https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231">https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231</a>
	Ubungo terminal from inside	<a href="https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231">https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shttps://www.googleusercontent.com/2Fp%2FAF1QipNopr1V8trvfuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7i3120!8i4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231</a>
	Rising CO2 emissions in Tanzania	<a href="https://ourworldindata.org/co2/country/tanzania?country=~TZA">https://ourworldindata.org/co2/country/tanzania?country=~TZA</a>
	Air pollution in Dar es Salaam	<a href="https://www.who.int/news-room/events/detail/2018/10/30/default-calendar/who-s-first-global-conference-on-air-pollution-and-health">https://www.who.int/news-room/events/detail/2018/10/30/default-calendar/who-s-first-global-conference-on-air-pollution-and-health</a>
	Green infrastructure of Dar es Salaam	<a href="https://www.sciencedirect.com/science/article/pii/S2095263519300093">https://www.sciencedirect.com/science/article/pii/S2095263519300093</a>
	Floodings affecting the BRT system	<a href="https://www.ubuntu-times.com/ubuntu-photonews-infrastructure-deficit-pose-flood-concerns-in-dar-es-salaam/">https://www.ubuntu-times.com/ubuntu-photonews-infrastructure-deficit-pose-flood-concerns-in-dar-es-salaam/</a>
	BRT and Dala dala networks	<a href="https://www.trackyourcity.org">https://www.trackyourcity.org</a>
	Plan for densification around BRT corridors 1	<a href="https://drive.google.com/file/d/1ULp8hJRM2XkYmq5gwg1vku7SWaMw_u/view">https://drive.google.com/file/d/1ULp8hJRM2XkYmq5gwg1vku7SWaMw_u/view</a>
	Plan for densification around BRT corridors 2	<a href="https://drive.google.com/file/d/1ULp8hJRM2XkYmq5gwg1vku7SWaMw_u/view">https://drive.google.com/file/d/1ULp8hJRM2XkYmq5gwg1vku7SWaMw_u/view</a>

Picture	Description	Link
	Development plan for the transit oriented mega city	<a href="https://openjicareport.jica.go.jp/pdf/12319349.pdf">https://openjicareport.jica.go.jp/pdf/12319349.pdf</a>
	Inside Kimara terminal	<a href="https://www.flickr.com/photos/unhabitat/48641613303/in/photostream/">https://www.flickr.com/photos/unhabitat/48641613303/in/photostream/</a>
	Bad infrastructure for non-motorized transport	<a href="https://www.taylorfrancis.com/books/transport-planning-mobility-urban-east-africa-nadine-appelkans-wolfgang-scholz-sabine-baumgart/e/10.4324/9781003011149">https://www.taylorfrancis.com/books/transport-planning-mobility-urban-east-africa-nadine-appelkans-wolfgang-scholz-sabine-baumgart/e/10.4324/9781003011149</a>
	Urban railway	<a href="https://www.skyscrapercity.com/threads/dar-es-salaam-commuter-rail-network.1675127/">https://www.skyscrapercity.com/threads/dar-es-salaam-commuter-rail-network.1675127/</a>
	Daladala buses at a station	<a href="https://www.google.com/maps/place/Simu+2000+Bus+Terminal/@-6.7882812,39.2168589,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNAH9BLAgqBxpw9bTvBQbfyDzARfrhmgds-Uz2c!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipNAH9BLAgqBxpw9bTvBQbfyDzARfrhmgds-Uz2c%3Dw218-h100-k-no!7!2619!8!1200!4m8!1m2!2m1!1sdala+dala!3m4!1s0x0:0x60b597969a9c7850!8m2!3d-6.7877579!4d39.2164385?hl=de">https://www.google.com/maps/place/Simu+2000+Bus+Terminal/@-6.7882812,39.2168589,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNAH9BLAgqBxpw9bTvBQbfyDzARfrhmgds-Uz2c!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipNAH9BLAgqBxpw9bTvBQbfyDzARfrhmgds-Uz2c%3Dw218-h100-k-no!7!2619!8!1200!4m8!1m2!2m1!1sdala+dala!3m4!1s0x0:0x60b597969a9c7850!8m2!3d-6.7877579!4d39.2164385?hl=de</a>
	Developed city center (CBD) of Dar es Salaam	<a href="https://images.ntmlc.com/v4/destination/Tanzania/Dar-es-Salaam/219623_SCN_dar-es-salaam_iStock-943545526_Z4C4E9.jpg">https://images.ntmlc.com/v4/destination/Tanzania/Dar-es-Salaam/219623_SCN_dar-es-salaam_iStock-943545526_Z4C4E9.jpg</a>
	Daladala bus in service	<a href="https://africasacountry.com/2019/01/the-only-way-to-eliminate-exploitation-from-the-transport-sector">https://africasacountry.com/2019/01/the-only-way-to-eliminate-exploitation-from-the-transport-sector</a>
	Inconveniently accessible BRT terminal Kimara	<a href="https://photos.fareast.mobi/photo?id=14446">https://photos.fareast.mobi/photo?id=14446</a>
	BRT buses stopping at a station	<a href="https://www.transportphoto.net/">https://www.transportphoto.net/</a>

Picture	Description	Link
	No connection between Gerezani BRT terminal and elevated railway	<a href="https://www.google.com/maps/place/Train+Station+Kamata/@-6.8268019,39.2737412,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P%3Dw86-h86-k-no!7!3024!8!3024!4m5!3m4!1s0x185c4baca10222b7:0x5f476b0e9aef51a1!8m2!3d-6.8268019!4d39.2737412">https://www.google.com/maps/place/Train+Station+Kamata/@-6.8268019,39.2737412,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipPr7SLguSJW0W224dakSI5_s1_xJ700go_AO-P%3Dw86-h86-k-no!7!3024!8!3024!4m5!3m4!1s0x185c4baca10222b7:0x5f476b0e9aef51a1!8m2!3d-6.8268019!4d39.2737412</a>
	Passengers waiting at Kimara terminal	<a href="https://photos.fareast.mobi/photo?id=14447">https://photos.fareast.mobi/photo?id=14447</a>
	Street vendors at Ubongo terminal	<a href="https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipNopr1V8trvuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7!3120!8!4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231">https://www.google.com/maps/place/Ubungo+Terminal/@-6.7937609,39.2118231,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipNopr1V8trvuodQZZMArbIO9nL-vCRa-a3-AEX!2e10!3e12!6shhttps:%2F%2Fh5.googleusercontent.com%2Fp%2FAF1QipNopr1V8trvuodQZZMArbIO9nL-vCRa-a3-AEX%3Dw203-h270-k-no!7!3120!8!4160!4m5!3m4!1s0x0:0x257b62022c35694a!8m2!3d-6.7937609!4d39.2118231</a>
	Concentration of street vendors at Kimara terminal	<a href="https://www.mdpi.com/2071-1050/13/3/1058">https://www.mdpi.com/2071-1050/13/3/1058</a>
	BRT bus in the city center	<a href="https://mobilizesummit.org/past-summits/dar-es-salaam-tanzania/">https://mobilizesummit.org/past-summits/dar-es-salaam-tanzania/</a>
	Informal settlement in Dar es Salaam	<a href="https://www.ucl.ac.uk/bartlett/development/news/2017/jun/imaging-opportunities-just-development-dar-es-salaam">https://www.ucl.ac.uk/bartlett/development/news/2017/jun/imaging-opportunities-just-development-dar-es-salaam</a>
	Traffic congestion	<a href="http://klhnews.com/2014/02/why-traffic-jams-are-here-to-stay/">klhnews.com/2014/02/why-traffic-jams-are-here-to-stay/</a>
	Dangerous traffic conditions	<a href="https://www.pikist.com/free-photo-ibora">https://www.pikist.com/free-photo-ibora</a>
	Bad road infrastructure	<a href="https://www.wantedonline.co.za/travel/everywhere-else/2016-10-06-dar-es-salaam--a-heady-concoction/">https://www.wantedonline.co.za/travel/everywhere-else/2016-10-06-dar-es-salaam--a-heady-concoction/</a>

Picture	Description	Link
	SOLUTIONSplus Partner cities	<a href="http://www.solutionsplus.eu/partners.html">http://www.solutionsplus.eu/partners.html</a>