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Germany

Human Behaviour in Spaces around Metro Stations in Cairo: An approach towards improving the metro-catchment area to fulfil users' needs

A Thesis submitted in the Partial Fulfillment for the Requirement of the Degree of Master of Science in Integrated Urbanism and Sustainable Design

by

Mennat-Allah Mohamed Fathy Aref

Supervised by

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Examiners Committee
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Professor of (...)
University of (...)

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07/29/2018

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الحمدلله اولا واخيرا
Thanks God

Abstract

Transit stations and networks have big influences on the built environment and its surroundings, and these influences mostly depend on the location of transit networks and stations. In Cairo, the total number of passengers using public mass transit in 2016/2017 is 2.17 billion passengers (CAPMAS, 2017). The highest number of passengers is in vehicles (bus - minibus) 44.8%, Metro 40.7%, rail 11.2% and other mode of transportation 3.3% (CAPMAS, 2017). So, the second highest and almost half percentage of passengers using public mass transit are by Metro. This gives areas around metro stations the importance to be studied and investigated. Besides, spaces around metro stations are very vital which accommodate different users and mode of transportations and usually they play an important role as a gate way and common platform for several users and as entry spaces to one of the most important public mass transit. Moreover, metro stations are usually located in different areas either in downtowns, in suburbs or in residential neighborhoods where transit provides a convenient means for people to travel to and from work and other destinations. Some stations are located in areas that are experiencing rapid growth and change, while others are in more established, built-out areas.

This research follows a theoretical and qualitative approach in order to create design guidelines to promote walking, cycling and fulfil user's needs. So, the research is divided into three main parts, first part is the building knowledge part which it is a general review of concepts and literature to understand the characteristics of transit catchment areas and their typologies ended with theoretical framework to be applied in the Egyptian Context. The second part is the empirical and the applying knowledge part, in order to classify, explain and identify catchment areas in Cairo, so this part is divided into three levels, the city level, the catchment area and the core catchment area level. The objective of the city level is to classify metro's catchment areas according to their similarities, differences, dominant land use, type of transport connections and street pattern using GIS and matrix to cluster catchment areas and to select three case studies from the dominant catchment area type. Moreover to identify the catchment area and core catchment area level, a 500 m buffer, as it is the optimum walking distance, is identified for the three chosen case studies. Through the 500 m buffer, observations, interviews, mapping activities and mobility patterns have been analysed to investigate the relation between metro and the physical settings, human activities and the different mode of transportation. Finally, the activating knowledge part, this part evaluates the three selected case studies according to the guiding principles that has been identified in part one and concludes with learning the deficiencies and strengths of their catchment areas. At the end, the research concludes with design guidelines and recommendations for metro's catchment areas on three levels.

Key Words: transit Catchment area, Pedestrian Friendly, Transit Oriented Development TOD, Human Behaviour

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Thinking Beyond the Station

(David M. Nelson)

1.Introduction:

Metro transit network has big influences on the built environment and its surroundings, these influences mostly depend on the location of metro transit network and stations. Metro stations are usually located in different areas either in downtowns, in suburbs or in residential neighbourhoods where transit provides a convenient means for people to travel to and from work and other destinations. Some stations are located in areas that are experiencing rapid growth and change, while others are in more established, built-out areas. Also metro stations have big impacts and influences on land use, development, activities and human behaviour. Spaces around metro transits are vital which accommodate different users and mode of transportations and usually play an important role as a gate way and common platform for several users. Different countries deal with these spaces as an essential part in the mobility system and in the transportation agencies, they define these spaces as “Catchment Areas”. So any type of transit has a catchment area, however it is different in sizes and type of modes connection. Accessibility, as an important concern has a long history and it is one of the important processes in the whole urban design process. The better accessibility to metro station, the more people it attracts and the more important land use. Accessibility means enabling all people with diverse abilities and disabilities to reach exact destination without facing any barriers and in an efficient way. UN-Habitat has mentioned that most cities of the developed world, redesigned streets to accommodate various modes of transport i.e. motorists, cyclists and pedestrians. However, in most cities of the developing world, there are not enough streets, and those that exist are either not well designed or well maintained (UN-Habitat, 2013). Also, according to the UN-Habitat, in the developing countries citizens are reclaiming streets as public spaces, pedestrians, cyclists and public transport are sharing the public space with motor vehicles, and similarly in Cairo.
Reflecting on Cairo, the total number of passengers using public mass transit in

2016/2017 was 2.17 billion passengers compared to 2.16 billion passengers in 2015/2016, the number of passengers has increased by 0.4% (CAPMAS, 2017). The highest number of passengers is in vehicles (bus - minibus) 44.8%, Metro 40.7%, rail 11.2% and other mode of transportation 3.3% (CAPMAS, 2017). So, 2/3 of all motorized trips are made by public transport (World Bank, 2006) and the second highest and almost the half percentage of passengers using public mass transit are by Metro. In addition, the number of passengers using metro increases annually and will also face more increases, because Cairo Metro Organization now is preparing to implement the second phase of line 3, 4, 5 and 6 will soon be implemented as shown in Figure (1).

Furthermore, Egypt Vision 2030 promotes the idea of improving the quality of different transport means and to be suitable to fulfil the needs of all citizens especially for the middle and high income class (Urban Development Pillar, Egypt Vision 2030). The vision is not only promoting the quality of public mass transit but also increasing number of passengers using public transportation by 2030. Figure(2) shows the indicator of citizens' dependence on public mass transit services rather than private vehicles for mobility in 2015, 2022 and 2030.

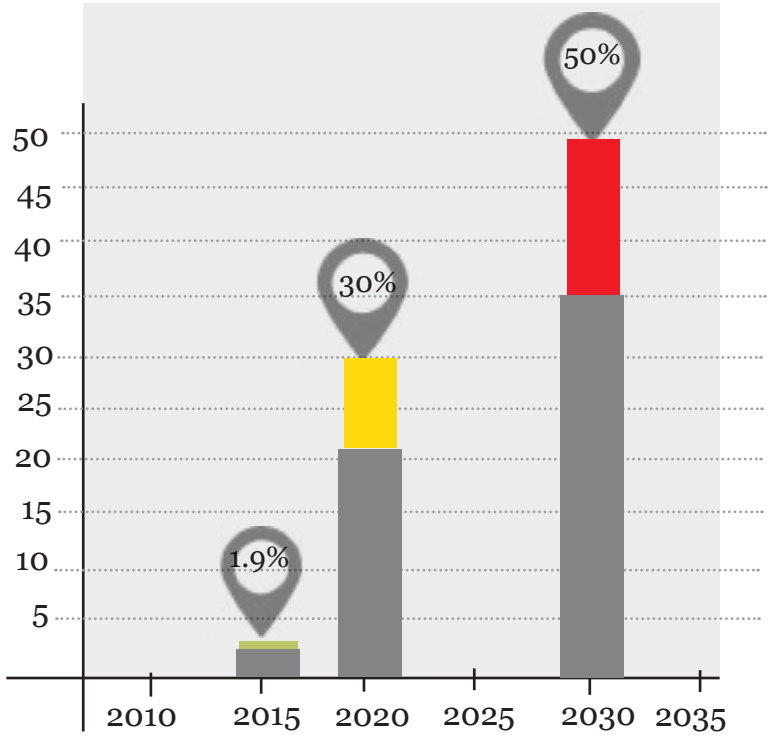


Figure (2):Percentage Indicators dependence of public transit passengers rather than vehicles
Source: Egypt Vision 2030

Figure (1): Existing and planning Cairo's metro lines,
source: Metro's Tunnel Organization

However, Egypt's vision 2030 aims to improve the urban environment quality by increasing citizens habit to use public mass transit in a way that helps to reduce the congestion in addition to the environmental and health positive effects. Generally, the purpose of urban mobility systems is to provide access to essential goods, services and activities and to enable people to participate in civic life [...] [and] to afford public transport including for those belonging to vulnerable and disadvantaged groups (UN-Habitat, 2014). Reflecting this on Cairo, there are a lot of challenges related to achieve good mobility and affordable method of transport. The Cairo Transportation Master Plan of 2002, provided strategy and framework for an integrated urban transport strategy, the main objective was to put people's mobility before that of vehicles (World Bank,2006). However, the Urban Transport Strategy that done by the World Bank has highlighted other critical urban transport issues. These issues are aggravated traffic congestion, poor public passenger transport system, a high accident rate, air and noise pollution, institutional weaknesses and fragmentation and inadequate financial arrangements. All these highlighted issues do not include people's scale and the challenges that people are facing to reach in the end these integrated urban transport strategy.

Meanwhile, there is still the challenge for people who would like to switch between mode and another mode of transport, although over 20 million motorized person trips and 7 million non-motorized trips daily (World Bank,2006). In so doing and from one side, many people do not have either access or transportation means to get the closest metro station. On other, if people managed to get to the metro station, it is still a challenge for some people to walk, set or wait for other mode of transportation in the space around metro station and this is the main focus on the research. So, the places around the transit mode might needs to be easily accessible for different types of users with effective usage during the day. The literatures describe the best practices of public spaces and are always easily accessible on foot, surrounding streets are narrow, crosswalks are well marked, lights are timed for pedestrians rather than vehicles, traffic moves slowly, and transit stops are located nearby. In addition, the American Public Transportation Association (APTA, 2009) mentioned that the places around transit facilities should be attractive, functional and serve as communities destinations. Also, it should support and encourage a vital mix of activities, balances the needs of all modes and users to support and encourage pedestrian, bicycle and transit trips.

Moreover, the content analysis of media explains the issue of people movements around metro station. In October 2017, a video has been made by famous actress

and actors and through Helm organization , about the importance of developing areas around metro stations. It focuses on the essential need of Cairo University and Faisal stations to be designed and adapted for disabled people. These challenges are not only for disabled people in the public space, but also for women and children. Walking in Cairo to reach a destination or in street alone as a woman, or as a woman with children, is not an easy experience; threats of safety can make a simple walk for leisure or shopping out of question. (africanurbanism.net, April 2013). Not just people's movement is the only issue around metro station, in 2015 the head of Shubra Al-Khaymah district announced that a distance of six meters had cut from College of Agriculture station's sidewalk and extended the road which shortened the sidewalk to be 3.5 meters wide, instead of 10 meters to limit and control the presence of street vendors (AlAhram Gate online, 2015). The head described this solution as a non-conventional solution to eliminate the chaos in that area. In addition, Transport for Cairo (TFC) is currently working on mapping all public mass transit in Cairo, formal and informal, in order to create one cumulative map for all transits and to build mobile transit appilication. In order to achieve the way to move from one point to another using mobile transit app figure (3).

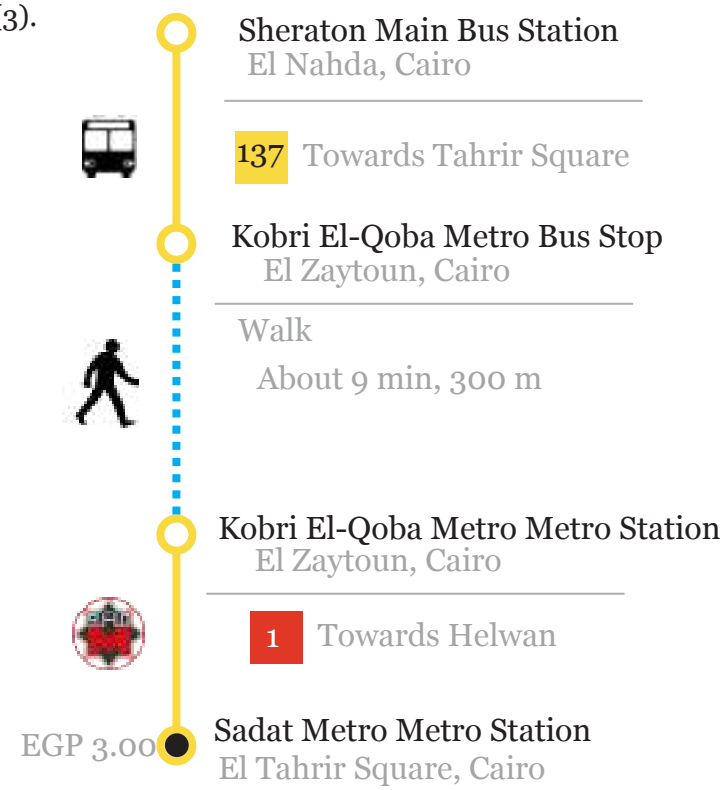


Figure (3):TFC mobile application proposal to reach destination using public transit
Source: Transport For Cairo, 2017

At the end, the motivation of the current research raises from a daily operation by the researcher on the areas surround metro stations. In addition, government strategies to increase number of people using public transportation by promoting infrastructure and built environment. Moreover, NGOs are putting efforts to develop areas around metro stations to be accessible and safe for different users. Also, urban initiative is developing application for easily reaching a place by using public transit. Sittings of the status show the problem of chaos and disorder. So, this makes the behavioural and physical dimension of catchment areas needs to be investigated with reference to facilitate the effectiveness of people's movements to reach metro station.

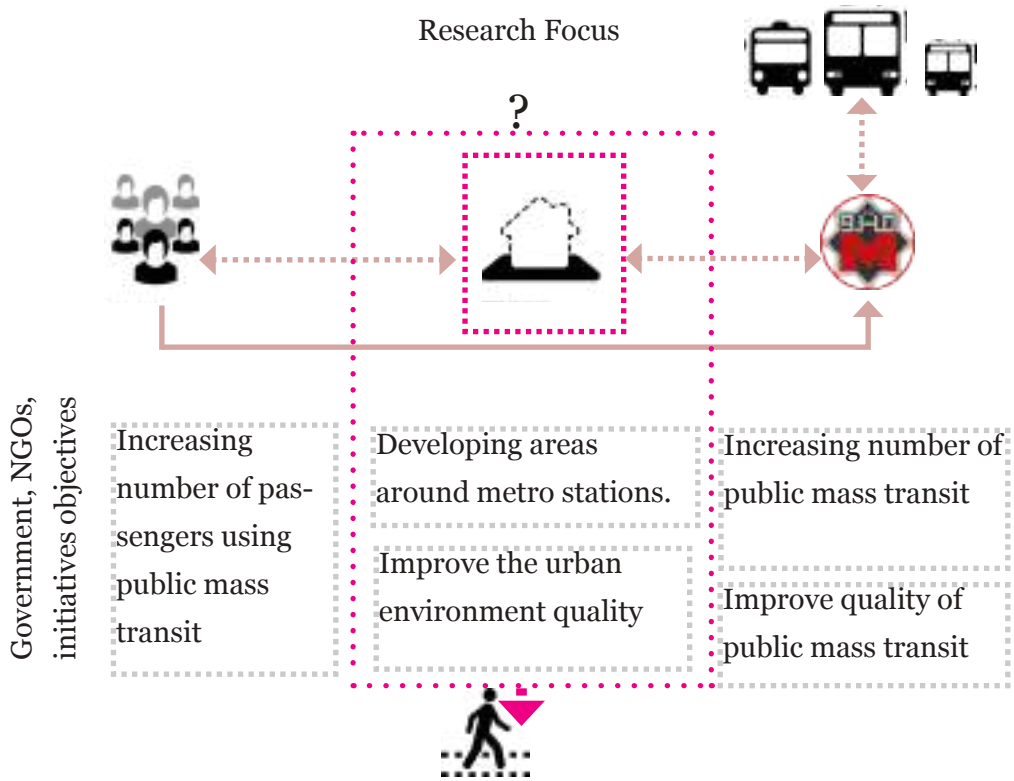


Figure (4):Schematic Diagram for research focus
Source: Author

1.1. Research Questions

The current research investigates the answer of main question which is: w***hat are the guiding principles that should be applied for metro stations' catchment areas to be pedestrian friendly and enhance people's mobility?*** Subsequently, the hypothesis of this research that it is possible to design catchment areas around Metro station that they are pedestrian-friendly and fulfil User's needs. To answer the main question and to prove or deny it, other several

questions have to be answered and to be considered in the research:

- What is the relation between transit stations and catchment areas?
- What are the type of metro's catchment areas in Cairo?
- What are the different typologies of spaces around metro stations?
- Do metro's catchment areas fulfil space users' needs?
- What are the common activities in metro's catchment areas and what are their patterns within the space?
- What are the challenges that users are facing in catchment areas to access and reach the metro station?

1.2. Research Design and Methodology:

In order to answer research questions, the research is divided into three parts; first part is the building knowledge and theoretical part. It is divided into two chapters, they aims at understanding definitions and concepts of human behavior and activities in public spaces. Also, it investigates the relation between transits and public spaces with focusing on the influence of these transits on catchment areas, how it is defined as an area and their scales. Moreover, it explains the concept of Transit Oriented Development (TOD) that has been applied in different countries and metropolitan cities. This part ends with general understanding of TOD catchment areas typologies and the guiding principles that have been applied from different transport agencies and be applied in part two.

Part two is the applying knowledge part; it is divided into four chapters, first chapter gives a quick overview about urban transport system in Cairo and how it is governed with focusing on Metro system. The following three chapters are research's empirical part; it identifies the different catchment areas in Cairo according to TOD typologies and classifies them into categories and that is the city scale level. Sequentially, understanding the catchment area level, it is done on three different metro stations to study human behaviour and activities and the physical settings of catchment area. This part ends with reflections and discussions of the relation between human activities and built environment with highlighting the deficiencies and challenges that people are facing in metro's catchment areas, in order to learn and interpret this behaviour.

Finally, part three is the adapting knowledge and conclusion part. It concludes all the discussions in previous chapters and combines the theoretical an empirical part together by modifying and setting design guidelines and recommendations for Metro's catchment areas in Cairo on the three levels, core and catchment area level and city level.

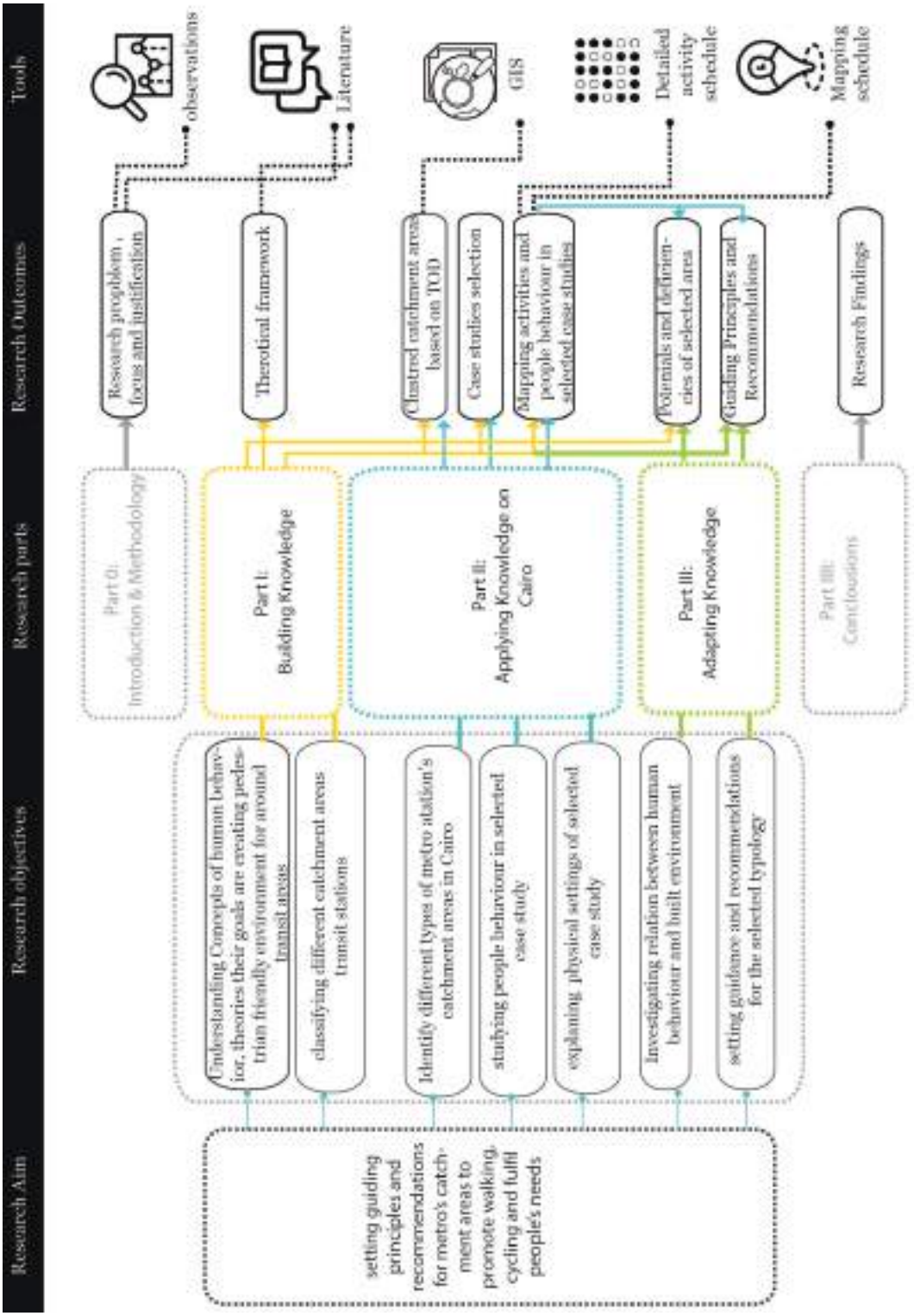


Figure (5):Research Design and Methodology
Source: Author, 2018

To reach research aim and objectives, different methods and tools have been used to collect different types of data. First part of research is a literature review for concepts, definitions and theories, ends with a theoretical framework that will be applied in part two. Part two is research empirical part using a qualitative exploratory approach based on case studies. GIS is used as a tool for collecting data and analysis on the city scale level, following by classification of metro's catchment areas in Cairo to investigate the different types of catchment areas. For the catchment area level, activity setting mapping, behavioural mapping are tools for collecting data for the selected case studies, in order to map activities, people's movements and how they interact with the built environment, also to identify main and dominant activities in metro's catchment area.

1.3. Research limitations

The research has passed through several limitations and challenges which affected the theoretical, empirical and the analysis part and the research outcomes as well.

- *Data Gathering limitations*

First on the institutional level, despite Cairo's huge data base created by GOPP, but all this information are not connected to each other and the quality of the overlays data do not make sense together which affected the accuracy of data collected and analysis. However all the working data were based on the official sources of information which are GOPP and CAPMAS but all this information were inconsistent and irrelevant. Second on the organizational level, an email has sent for Helm Organization to gain knowledge and interview them for the tools and possibilities to develop areas around metro stations, as it was one of their projects nowadays, but without any response. However, this email was a request from the organization's manager after visiting her in the organization location in Maadii. Third on the field work level, all the observations and semi-structured interviews have been done before Ramadan (started 15th May) and after the presidential elections (28th March 2018) because of the elections advertising that took place in all streets and public spaces which would affect the quality of observations. Also, some of the interviews had done after the announcement of raising metro tickets fares, which affected all questions direction and focused on fares topic. Because of the time limitation , observations, mapping activities and tracing people flow should be done in different seasons and in different occasions to recognize the differences in human activities.

- *Locations limitations*

Location of the metro station was also an important limitation, as the case studies done in three completely different areas in the social class, the urban fabric, densities and the type of users. However that was the main comparative factors, but it was hard for the researcher to do same number of interviews in the same time frame for the three areas, which affected the sample size, so the main tools the research depended on in the research, were observations and mapping As Kolet Albnant station is located in a formal area and the residents are considered as mid-high income and the dominant users are girls from Girls College, so it was easier for the researcher to observe and to do interviews with different people and with both genders. Conversely Al Malek Al Saleh Station, as the station is located in an informal area, vendors and residents were easily recognize anyone who is observing them, which affected the quality and timing of observations. In addition, the residents, users were conservative and closed to answer questions and to do interviews.

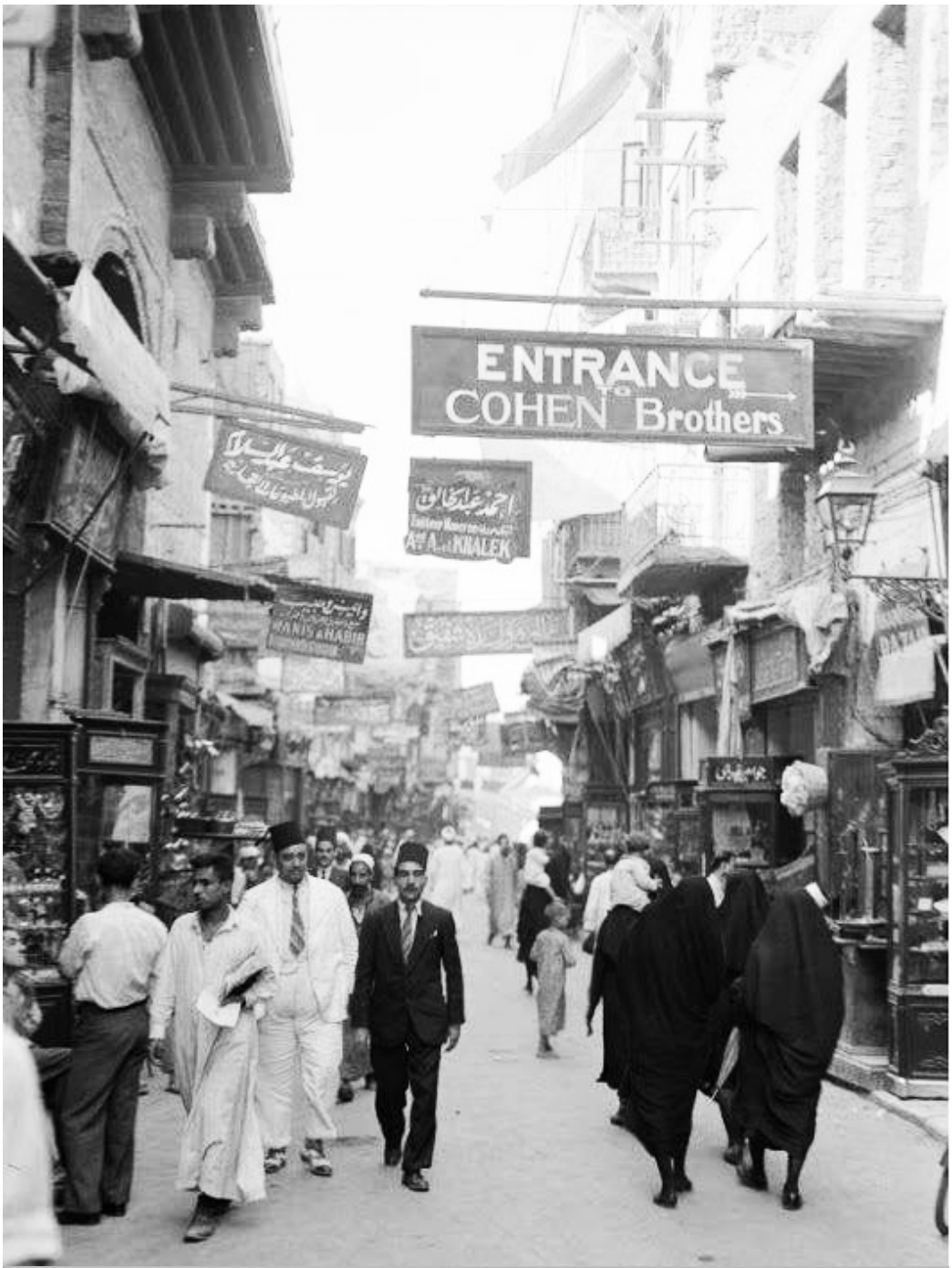
- *Sample size limitations*

As mentioned before, the different locations of station area affected sample size. Another important limitation which also affected the sample size, gender, it was hard to ask males as random sample in Al Malek Al Saleh area. Also, that affected the on-site activities mapping, counting and documenting, so the researcher depended completely on recording videos and photos. In addition to the time limitations affected the sample size in the three case studies.

- *Lack of previous studies*

Another limitation the research has faced is the lack of previous studies in this specific research area. Also most of the studies were not up to date since 20 years ago and they were just focusing on metro line number one and two, so most of these studies have completely changed and developed. In addition, most of the studies and strategies that done form different agencies and organizations such as World Bank and Japan International Cooperation Agency (JICA) were old and most of these strategies are not under working progress, however, these studies have been done with the cooperation with GOPP and government officials.

Part I: Building Knowledge: Theoretical Framework


ENTRANCE
COHEN Brothers
KHALEK
MANSY HABIB

2. Human Behaviour and public spaces

This chapter begins with definitions and concepts of human activities and what is the relation between human behaviour and activities. Besides, it describes the relation between these human activities and public spaces. Public spaces in this context mean streets, squares everything can be considered as part of the built environment (Gehl and Svarre, 2013). The chapter ends with categorizing these activities according to their types.

If you lose the human scale, the City becomes an ugly place Joan Clos, Executive Director of the UN-Habitat.

2.1. Definitions

Human behaviour is a term used in different disciplines such as psychology, social sciences and biology. From psychological perspective, Human Behaviour "refers to the full range of physical and emotional behaviours that humans engage in [...] and are influenced by culture, attitudes, emotions, values, ethics, authority, rapport, persuasion, coercion and/or genetics"(Alleydog.com's online glossary, 2018). However, in architecture and urban design field, human behavior can be defined as" reactions of an individual or groups of individuals with relation to the immediate surrounding area including the animate or inanimate objects within that area" (Reference. ND, 2018). In general, a behaviour is any observable action can be regarded as behaviour such as drinking coffee, talking on the phone, typing on a computer,

cleaning up the apartment, skipping rope (Imotions, 2017), so this behaviour is based on the relation between three components, act, think and feel. This relation is a closed-circle relation; if an individual think he has also to feel and then act, but someone else can feel, act and think and so on, so this closed-circle relation is translated into behaviour as a conclusion of this relation. However, other scholars from computing field clarified human activities from completely different point of view but it could be considered in the built environment field. The human behaviour has been classified into four main tasks which are motion, action, activity and then behaviour (Nguyen et al., 2016). They argue that these four classifications are happening sequentially in increasing time frame to make human behaviour. So, from the previous overview to understand human behaviour concept, that human behaviour is a reaction of different emotions, cultures, activities through a period of time. That will lead us to understand the relation between human behaviour and the surrounding environment more deeply in the next sub-chapter.

2.2. Human Activities and public space

It is not easy to understand people daily, monthly or seasonally behavior in the urban space. Jan Gehl has described human behavior as sort of activities; he mentioned “it is necessary to [...] divide the variety of activities and people into subcategories in order to get specific and useful knowledge about the complex interaction of life and form in public space”. Also in order to learn people’s behavior pattern, consecutive questions should be asked such as who is doing the activity, where exactly this activity is taking place, how many people are doing this kind of activity, how long this activity takes.

Jan Gehl and Birgitte Svarrealso have categorized outdoor activities as optional and necessary activities. The optional activities which are activities take place under good external conditions (Gehl and Svarre, 2013) such as walking, sitting and standing and the necessary activities which are activities take place under all conditions(Gehl and Svarre, 2013) such as walk to shop, to transit, walk to do a job. For optional activities also, stand could be optional such as just to enjoy life, to enjoy sun, to take photos or to eat something, also stand as an activity could be necessary such as stand for waiting a bus or waiting for someone. For sit as an activity, it is also optional if someone is sitting for enjoying sunshine but it becomes a necessary if someone sits for taking a break from a long walk or waiting for a bus.

Gehl also mentioned not only the external conditions such as weather or availability of services, but also the quality of physical environment (Gehl, 2011) is an important factor that affects human activities. When the quality of built environment is good, optional activities occur, however, these activities may vanish in poor built environment. But the necessary activities will occur in both good and poor built environment. This is a leading point to be reflected and taking into consideration in the relation between transits, type of activities and the quality of built environment.

To understand people's behaviour with and within public space, there are several tools to measure human activities. For instance to understand people's movements pattern, Gehl suggested these tools which are counting, mapping, keeping a diary, tracing, tracking, looking for traces, test walks and photographing. Each one of these tools has a role to investigate people's behaviour in public space. Also, Participatory Development Project (PDP), GIZ has created steps to read and understand people's dominant activities especially in informal areas in Cairo. These steps are divided into how to read the built environment, by mapping fixed and non-fixed street elements, and how to read people's behaviour by observing activity settings, mobility and by activity setting mapping. So the steps are mapping ground floor activities, and then mapping fixed street elements such as street walls, fences, sidewalks, stairs and ramps, subsequently, mapping semi-fixed street elements such as bus stop, street light, trees and kiosks. Following the steps, preparing time schedule for observing and mapping and mobility counts and then document these observations in activity setting map.

So, different tools and methods have been identified for reading and understanding human behaviour in the public space, however thus understanding depends on the context and other constrains either political or climate. Also, the importance of reading and investigating human behaviour is to identify people's needs and how they overcome the deficiencies of public space.


UNION VIE

3. Transit stations and public spaces

This chapter discusses the relation between transit and the surrounding area. It begins with definitions and concepts of transit catchment area and discussing arguments about "Catchment Area" as a term used in transportation and the urban field. Also, it discusses the concept of Transit Oriented Development (TOD) and how it has been developed and the relation between TOD concepts and urban design. Besides, the chapter reviews different case studies from several transport agencies that classify transit's catchment areas into categories. Finally, the chapter ends with presenting several guiding principles that aimed to apply TOD concepts and transit friendly communities, following by selecting the most common principles that will be later applied in Part II.

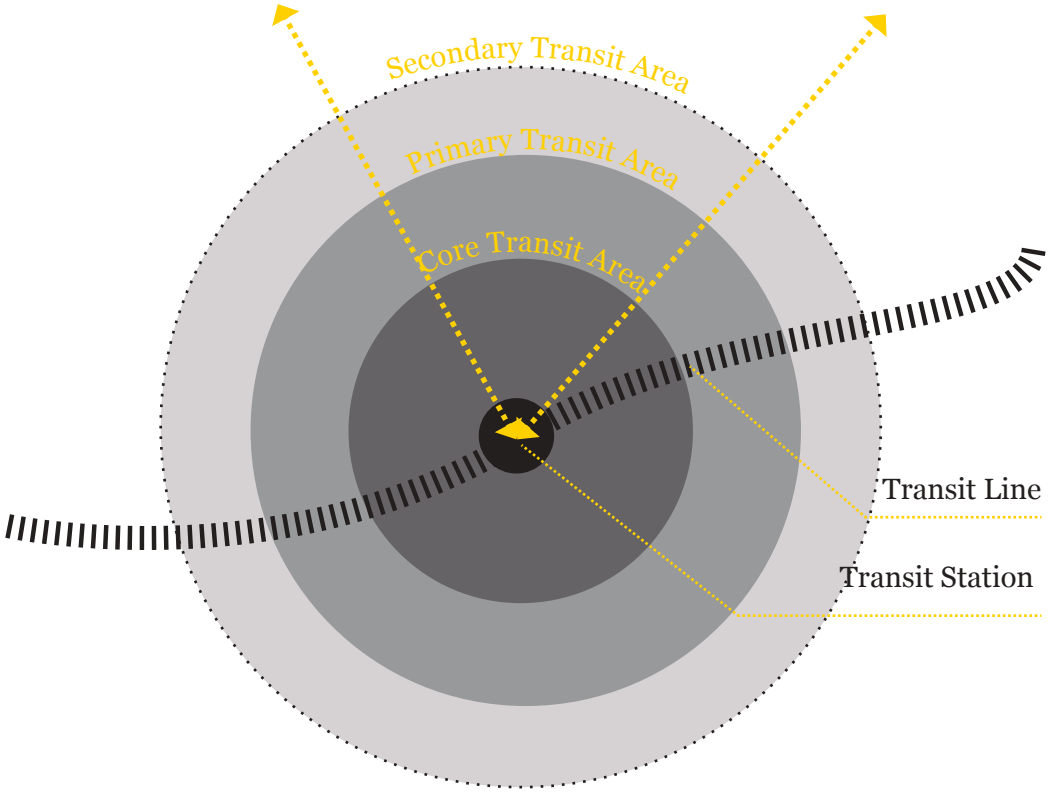
3.1. Transit Catchment areas

In human geography, catchment area is the area from which a city, service or institution attracts a population that uses its services. For example, a school catchment area is the geographic area from which students are eligible to attend a local school. Also, a catchment area is the geographic area for which a facility attracts clients or customers. The size and shape of a catchment area will depend on how accessible a facility is and how far it is from alternative facilities (Caliper Mapping and transportation glossary, 2018). Transit systems have many stops compare to other mean of public transportation in which the importance of these stops locations is high, this means that the stops should be located in areas with high quality of built environment, which gives also the importance to identify and understand the concept of catchment areas.

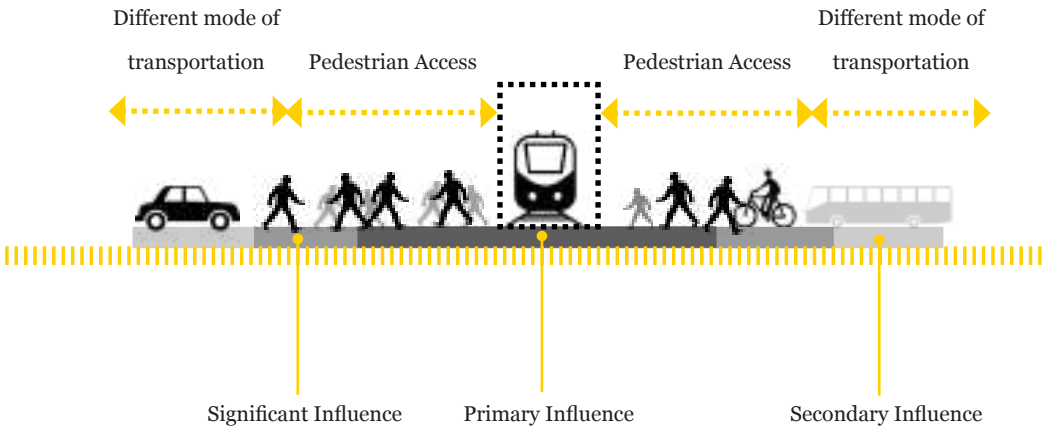
Different transit agencies have defined the area of influence for transit station in literature, but the most common one and the one is directly related to the research "that it is the spatial area in which transit stops and stations typically have the greatest impact on land use and development and from there is high potential

to generate transit ridership" (APTA, 2009). Also, it is the area that has proximity to the transit station area where people can access to their service or to switch to another mode of transportation. In the US, a half-mile-radius circle has become the standard for rail-transit catchment areas (Erick, G., Robert, C., 2013). However, catchment area is defined in Oxford dictionary as "the area from which a hospital's patients or school's pupils are drawn" or "the area from which rainfall flows into a river, lake, or reservoir" and the term is common and well known in hydrology field and many scholars use the term in this way. But, several transit agencies, especially in the US, use the term to describe transit area of influence as mentioned before to predict people behaviour and their space use patterns, asses the impacts of transit investments on land use and recently for designing transit oriented developments (TODs) (Erick, G., Robert, C., 2013).

APTA has divided the transit area of influence into three zones: core catchment area, primary catchment area and secondary catchment area. The dimension of typical area of influence is changing according to the type of transit either local street transit, rapid street transit, semi-rapid transit, regional transit or rapid transit which means it is changing according to type of transport mode, but the research focuses on the rapid transit. So, the definition of core catchment area is the area around station which land use and urban design features have a primary influence on transit ridership and pedestrian access will generate a significant portion of transit trips from and to stations. Primary catchment area is the area which land use and urban design features and directness of access to the station have impact on transit passengers and pedestrian access will generate a significant portion of transit trips to and from the station. Secondary catchment area is the area around transit station and it has big influence on the transit passengers and within this area, bikes, autos and other mode of transportations are the primary access modes to and from the station. So, in different literatures they have just mentioned primary and secondary catchment area, because the core transit area is not very different from primary catchment area. Also the use of network-based catchment areas, which are defined by road-network distances as opposed to radial distances (ERICK, G., ROBERT, C., 2013). However, there is no an optimal definition of a transit catchment area, it depends on several aspects, such as the type of transportation mode, topography, climate and the context in general. Figure (6) shows the area influences on three level core, primary and secondary areas while figure (7) shows the main mode of transportation to access the transit.



Figure(6): Diagram of Typical Areas of Influence
Source: APTA, 2009



Figure(7): Diagram of Different modes of transportation in typical Areas of influence
Source: Author based on APTA, 2009

So, from the previous overview, there is no exact dimension or sizes for catchment area, however, several transport agencies define the core and primary catchment area as (5-10) minutes or 500 meters from mass transit which 500 meters is the optimum walking distance for human. Also, figure (7) shows that the core and primary catchment areas are the areas that pedestrian access and walk from and to transit station, while the secondary catchment area is accessed by other different of modes of transportation. Therefore, secondary catchment area is not the research focus, so it will not be discussed and be analysed in the empirical part.

3.2. Transit Oriented Development (TOD)

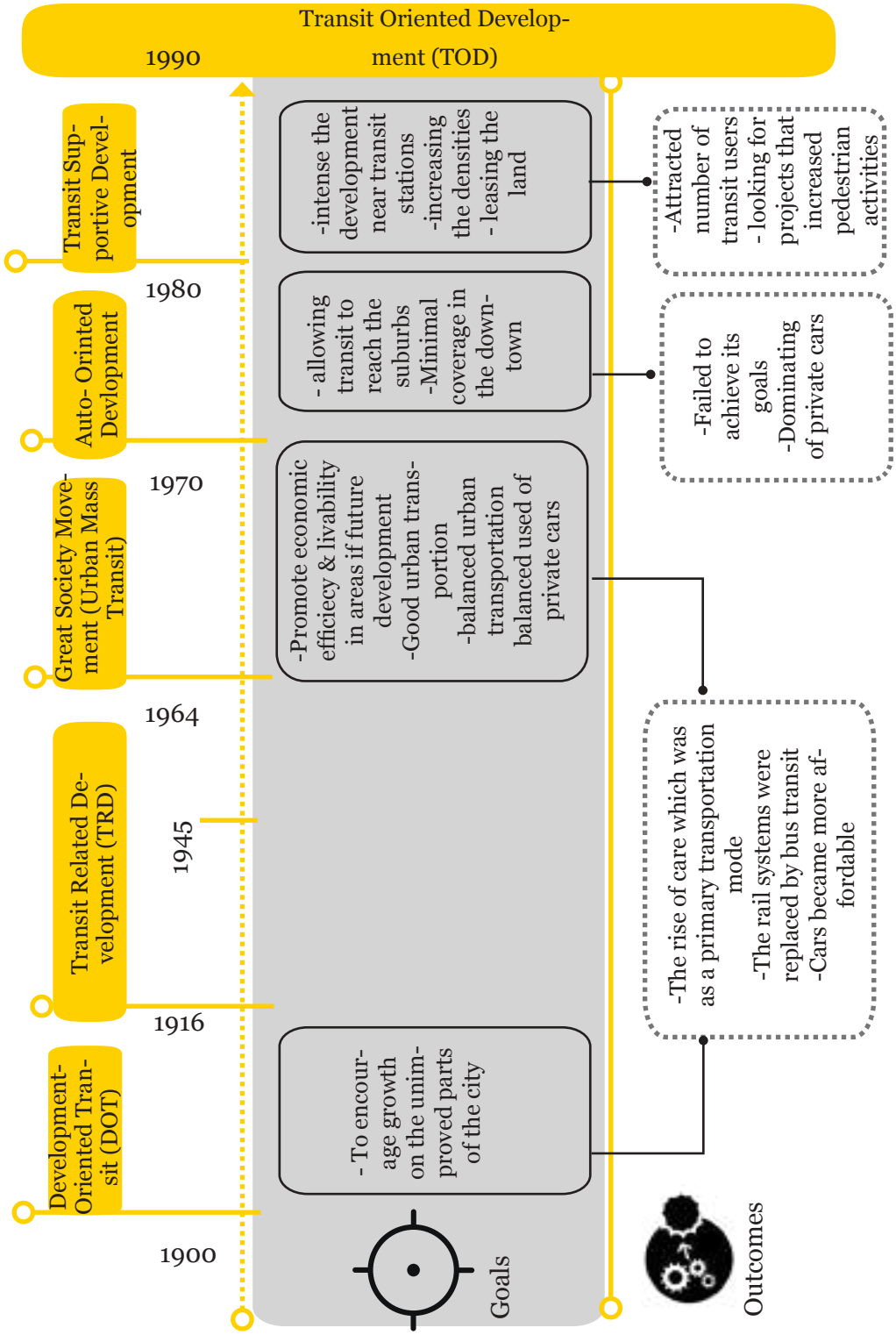
Transit-Oriented Development (TOD) concept depends on good urban design to coordinate transportation types, mix land uses, and create an appealing public space, all in a limited area. In addition, it focuses on creating developments which facilitate the use of public transit, walking and cycling within a 5-10 minutes walking distance from mass transit stations. The concept can be applied on different scales so there is no "one size fits all" approach in transit oriented development, it can be applied on city scale, district scale and transit area scale. Also, TOD concept is intended to promote walking, biking, and transit, in which these types of transformation can increase the walkability and bikeability of communities along transit corridors. The concept can be applied on areas with high density, mixed use residential and commercial developments. Furthermore, TOD concept aims at making established car dominated communities more transit friendly through the physical design features. So, in order to understand the keystone of transit orientation, it is essential to elaborate the physical arrangement of street design, land uses and densities. The concept can be applied on any station serving a premium transit mode such as commuter rail, heavy rail, light rail or bus rapid transit (Florida'sTOD framework and Typology, n.d.)

The next sub-chapters will discuss the development of Transit Oriented Development concept. In addition, TOD typologies, classifications, TOD guiding principle and concepts will be discussed from different cities and transport organisations point of views.

3.2.1. History of Transit Oriented Development (TOD)

Over past 30 years, TOD has played an important role in American cities. The concept is not new but it has been developing along the history. Peter Calthorpe has generally defined the TOD concept as" a mixed-use community that encourage people to live near transit services and to decrease their dependence

on driving". It is known as a strategy and a planning tool to promote sustainable urban development and smart growth by integrating public transportation and land uses. Also, it is a concept that promotes the creation of a network of well-designed, human-scale urban communities focused around transit stations (government of Queenland, 2010) with easy walking and cycling connection between them, diverse neighborhoods and to the rest of the city. The concept has developed in American cities since 1900. The "New Transit Town" or the "Development-Oriented Transit" was a term used to describe the American suburbs at that time and it is occurred on the edges of the city, its goals were to encourage growth in the unimproved parts of the city. This forms of development shaped American cities (Carlton, 2007). Between 1916 and 1945, another term has appeared to describe the American cities in this phase which was "Transit Related Development". The reasons for the emergence of this period were because of the rising of cars number, the disinvestment in transit infrastructure and the replacement of rail systems by bus transits. After 1964 and coinciding with the "Great Society" movement, the concept of conserving and enhancing the existing urban areas and promoting economic efficiency and livability became essential. By 1970s, different transit agencies provided cities with rail transit systems in order to achieve the previous goals and to reduce number of private cars in the city and to allow people in the suburbs to access the transit by cars which leaded to "Auto-Oriented Transit" period. Between 1970s and 1980s, the financial perspective was dominant. Several travel agencies figured out that there is a relation between development, transportation and costs, in which the term "Transit-Supportive Development" had been highlighted. The main goals of this phase were to intense the development near transit stations by increasing the densities and leasing the land, which would have financial benefits. Transit agencies developed the projects around transit stations such as projects that increased pedestrian activities to enhance the development process. At that time, the environmental movements became the city brand; the movement was promoting the neo-traditional neighborhood design (Carlton, I, 2007) which enhanced walkability, reduced car trips and increased community benefits. So, as an outcome of all the pervious goals and as an understanding of all the failure and success that happened along the history in the American cities, the concept of TOD has been developed. Figure (8) shows the development of TOD concept along the history, in addition to the goals and the outcomes of each phase.



Figure(8): Development of the TOD concept
Source: Author based on Institute of Urban and Regional Development (IURD , 2007)

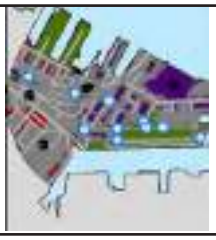
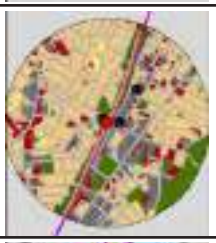
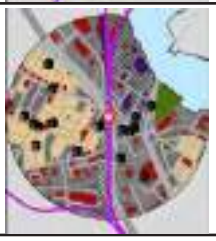
3.2.2. Typologies of TOD

In order to understand type of transit catchment areas, the type of place is one of the important factors that should be investigated and explained. TOD typology is a framework to define the catchment area of any transit station either light, heavy rail transit or bus transit in 500 meters radius. In order to understand and examine the characteristics of each catchment area. It is always applying on national, regional or city scale, so for each catchment area there are some similarities and differences. Therefore, this framework categorizes and clusters station's catchment area based on their similarities. Thus, these similarities are according to land use, density and transit technology which means type of transport connection. Several organizations and municipalities used this framework for their transits. For example the Metropolitan Area Planning Council (MAPC) has classified station area of Metro Boston to different categories based on their existing conditions and the nature of development that each area can accommodate in the future. Table (1) shows these classifications and description of each area. MAPC classified their metro's catchment areas into ten categories which are Metro Core, Seaport / Airport, Neighbourhood Subway, Transformational Subway, Urban Gateway, Town & Village, Commerce Park, Suburban Transformation, Trolley Suburb and Undeveloped areas.

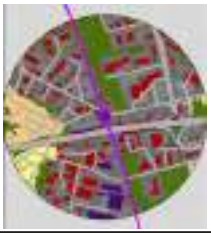
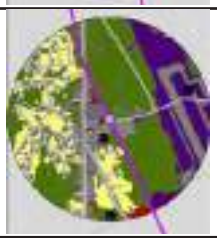
MAPC classified their station areas that already TOD has been applied to large parts of the city and was not a new concept for them, where 25% of housing units and 37% of employment is within a half-mile of a rapid transit or commuter rail station (Reardon and Dutta, 2012). In addition, the city is experiencing a huge rapid growth around transits (Reardon and Dutta, 2012).

Conversely, a non-profit institution in the U.S.A. developed other eight station area typologies according to Transit Oriented Development concepts. Their eight points of classifications are not just based on the densities, land uses and the intensity of activity, but they focus also on street networks, how transits are accommodated and their roles in the city. The difference also between these classifications and MAPC's are the scale of classifications. MAPC classified station areas on whole Boston city, however, this organization classified station area for all American cities. So, table (2) shows how this organization has classified station areas in American cities.

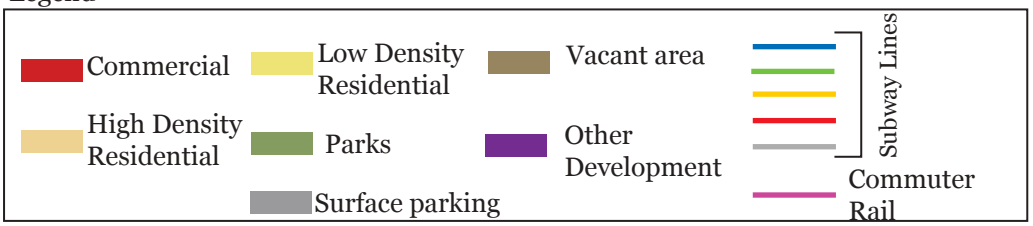
Table (1) MAPC's classifications and description of catchment area, source: Author

Typology	Description	Classification
1-Metro Core:	Areas in or near Downtown and near to high density employment and institutional centres. These stations have the highest number of transport connection and highest existing density.	
2-Seaport / Airport:	Areas in the Seaport District and at Logan Airport, with low- to moderate densities, population number and large amounts of surface parking and underutilized land.	
3-Neighborhood Subway:	Areas in dominant residential land use, moderate-density, transit neighborhoods throughout the core transit area. New development in these station areas can easily happen to be redeveloped.	
4-Transformational Subway:	Areas with potential for transformative change through land development projects involving the redevelopment of city blocks and the creation of new street networks	
5-Urban Gateway:	Areas in or adjacent to the downtown of Regional Urban Centres, with a moderate-density and land use is balanced between residential and commercial development and a large population of low income residents, served by commuter rail or subway and often functioning as a hub for local or regional transit authority bus service.	
6-Town & Village:	Areas in mixed-use town centers, business districts, or villages, ranging from remote Boston neighborhoods to suburban downtowns and small village centers.	

Following Table (1) MAPC's classifications and description of catchment area, source: Author

Typology	Description	Classification
7-Commerce Park	Commuter rail station areas in existing office or industrial parks or adjacent to major institutional employers outside Boston.	
8-Suburban Transformation:	Suburban commuter rail station areas likely to experience transformative TOD through a major planned development or redevelopment.	
9-Trolley Suburb:	Trolley station areas, mostly in Newton that are considerably less dense than other subway station areas, with higher income and lower transit commute mode share than Neighborhood Subway stations.	
10-Undeveloped:	Isolated commuter rail stations in low-intensity, high-income suburban areas with very few nearby destinations, incomplete pedestrian infrastructure, and large areas of vacant undeveloped land.	

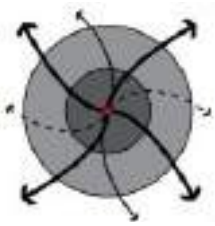
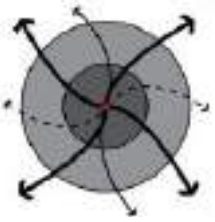
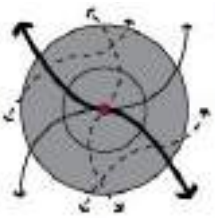
Legend



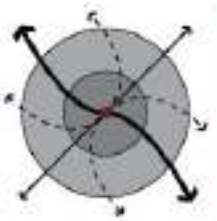
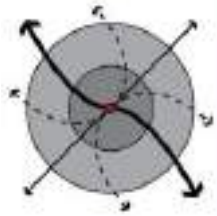
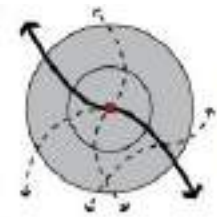
The previous example was a classification of station areas that already TOD has been applied to large parts of the city and was not a new concept for them, where 25% of housing units and 37% of employment is within a half-mile of a rapid transit or commuter rail station (Reardon and Dutta, 2012). In addition, the city is experiencing a huge rapid growth around transits (Reardon and Conversely, a non-profit institution, Reconnecting America, in the U.S.A. developed eight sta-

tion area typologies according to Transit oriented development concepts. Their eight points of classifications are not just based on the densities, land uses and the intensity of activity, but they focus also on street networks, how transits are accommodated and their roles in the city. The difference also between these classifications and MAPC's are the scale of classifications. MAPC classified station areas on whole Boston city, however, this organization classified station area for American cities. So, table (2) shows how this organization has classified station areas in American cities.

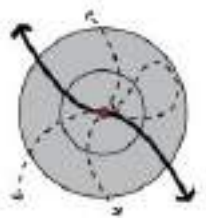
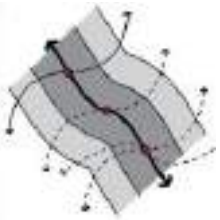
Table (2): Reconnecting America's classifications and description of catchment area, source: Author

Typology	Description	Classification
1-Regional Centre	the primary centers of economic and cultural activity in any city and mostly in downtowns. They are characterized by a dense mix of housing and employment. In addition, they are connected by mix of transit modes that support all these activities, including regional rail and bus, and local-serving bus.	
2-Urban centres:	areas with a mix of residential, employment, retail and entertainment uses usually are lower densities than regional centers but still higher than other areas. They are served by multiple transit potions including regional rail and bus and serve local areas as well with local buses. Mostly of urban centers have historic urban character with the retain of historic buildings and street network.	
3-Urban neighbourhood:	are mainly residential areas that are well-connected to regional centers and urban centers. Densities are moderate to high, and commercial uses are limited to small businesses. . Development is usually along connected street grid that is served by transit network.	

Following Table (2): Reconnecting America's classifications and description of catchment area, source: Author

Typology	Description	Classification
4-Suburban centres:	areas with a mix of residential, employment, retail and entertainment uses, usually densities are similar to urban centers' densities but lower than that in regional centers. They are connected to the regional transit network and include a mix of transit types. In terms of development, these areas are new compare to urban centers and the opportunity to be transit oriented is very high, also the intensity of uses is less than urban centers' intensities.	
5-Transit town centres:	areas that function more as local-serving centers of economic and community activity than urban and suburban centers. Different transit modes serve transit town center but just primary transit is commuter service can be found and the other modes are secondary transit service. Residential densities are usually lower than in the previous place types and a mix of retail, smaller-scale employment.	
6-Transit neighbourhood:	residential areas that are served by rail service or high frequency bus lines that connect at one location. Densities are low to moderate and economic activity is not concentrated around stations. Transit neighborhoods are found within older urbanized areas that were developed as streetcar suburbs and in more recently developed suburban neighborhoods.	

Following Table (2): Reconnecting America's classifications and description of catchment area, source: Author

Typology	Description	Classification
7-Special-use or employment	areas are mostly single use, mainly are focused around a major institution such as a university, or an entertainment spot such as a stadium, opera etc. There can be significant opportunities for mixed-use development if these stations are well-connected to other parts of the region	
8-Mixed-use corridors	are focusing on economic and community activity but they do not have exact center. These corridors are characterized by a mix of moderate density that varied between services, retail, employment, and civic or cultural uses.	

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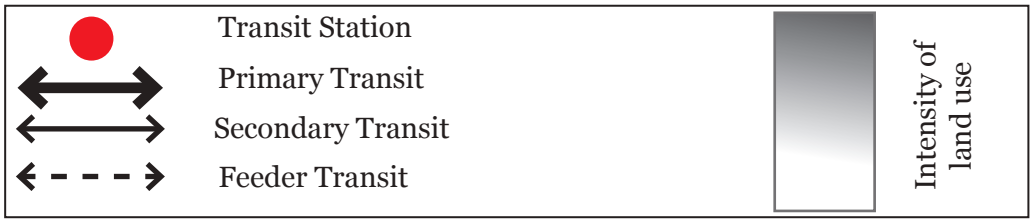


From the previous overview, different cities have applied TOD concepts and framework to understand characteristics, opportunities and challenges of each station area. It also depends on the scale of application, sometimes on region, city or corridor, but the common factors that always taking into considerations are the intensity of land use, varieties of variable modes in the transit area, the type of land use and the role of catchment area with the region, city or the neighborhood. In addition, depends on catchment area scale, other factors are taking into considerations; sometimes the typologies include street pattern and how it connects to other pattern and some other factors have been mentioned such as the amount of development that happened because of the transit or could happen. So, each context is different from another, some other examples have applied TOD typologies but on urban design scale not a city scale. The Centre

for Transit-Oriented Development (CTOD) classifies station areas in Allegheny County, Pennsylvania
into five typologies. So, the factors that have been considered are different, because of the different scales, such as people, places, physical form, population and land availability. This is essential to understand the main factors that are mostly used in different countries so it could be applied on the Egyptian context. So, each country has its own typologies and classifications no specific typologies are applied in all countries, however, there are common factors mostly considered which are land uses, density, physical form and the type of transit connections and these will be studied and applied in the second research part in chapter six.

3.2.3. TOD Guiding principles:

For TOD concepts to be applied, different countries and transport agencies all over the world created manuals and guide lines in order to work on these concepts to create better communities. Many countries and transport agencies have created guiding principles and manuals to apply the concept of TOD in their plans. Some countries create and apply these principles on national level as strategies and policies and others apply these principles on catchment area as mentioned in the previous section. This part is focusing on guiding principles or manuals that have been done on catchment area level. However, some countries can apply these concepts specifically on different sectors such as: Housing, Mobility, Density and Urban Design. So, this part focuses on best practices of applying TOD concept as guiding principles but on catchment area level from urban design perspective. In 2017, Institute for Transportation and Development Policy (ITDP) in New York carried out eight principles called TOD Standard which has been endorsed by UN-Habitat, GIZ and many other organizations. The TOD Standard metrics is used to evaluate the catchment areas of existing transit stations that has applied TOD concepts and enable planners and stakeholders to understand existing land use characteristics and see where opportunities and challenges exist (ITDP, 2017). TOD standard can be applied in any scale of catchment area, however ITDP recommends a 500 meters, around 10 minutes walking distance, which can be evaluated and assessed. Urban designers and developers can use the TOD standard as a scoring system to identify gaps and opportunities for each transit catchment area. Also, it can be used to rate existing conditions or redevelopment proposals and advocate for higher-standard transit-oriented communities in areas where people live and work.

However, the TOD standard is a quantitative method for assessing transit catchment areas and it has three rating scores, Gold, Silver and Bronze Standard, each standard has points and scores. Gold standard is for projects that achieved all aspects of walking, cycling and transit oriented development. While the Silver standard is for projects that achieved most of the objectives and Bronze Standard is for projects that satisfy the majority of the objectives.

As mentioned before, the eight principles of TOD standard are based on quantitative data and they are used for evaluating existing catchment area. Also, American Public Transportation Association (APTA) has created design principles for creating transit friendly communities and achieves TOD concepts. APTA's principles mainly focus on achieveing TOD concepts and goals but from urban design scale. In 1996, Joint Center for Environmental and Urban Problems (CEUP) that affiliated to Florida Atlantic University and Florida International University has created a manual to achieve Transit oriented Developments and to create pedestrian and transit friendly communities through urban design features.

Figure (9) shows comparison between ITDP, APTA and CEUP principles, there are a lot of common objectives to achieve human scale environment in areas around transits. So, in figure (9) these common and redundant principles that have mentioned in the three manuals are shown. Therefore, this will be used in chapter five in order to discuss these principles in the Egyptian context to investigate the deficiency and sufficiency points in areas around metro stations in Cairo. So, this part ends with compiled guiding principles table (3) to determine the similarities and common aspects that should be considered in transits' catchment areas. However these guiding principles have been applied in different contexts all over the world, but they deal with transit catchment areas as from only functional perspective. Certainly, these principles are considering the human scale, but they are not considering other human factors, cultural and social dimensions that change from context to context. Thus, in the empirical part these factors will be identified and considered according to the Egyptian context and people's needs to reach in the end to research main aim.

ITDP's principles of urban development for transport in urban life.

A. walk: developing neighborhoods that promote walking	1.The pedestrian realm is safe, complete, and accessible to all. 2.The pedestrian realm is active and vibrant. 3.The pedestrian realm is temperate and comfortable.
2.cycle: prioritize non-motorized transport networks	1.The cycling network is safe and complete. 2. Cycle parking and storage is ample and secured
3.Connect: create dense networks of streets and paths	1.Walking and cycling routes are short, direct, and varied. 2.Walking and cycling routes are shorter than motor vehicle routes.
4. Transit: locate development near high-quality public transport	High-quality transit is accessible by foot
5. Mix: plan for mixed uses, income, and demographics	1.Opportunities and services are within a short walking distance and the public space is activated over extended hours. 2.Diverse demographics and income ranges
6.densify: optimize density and match transit capacity	High residential and job densities support high-quality transit, local services, and public space activity.
7. Compact: create regions with short transit commutes	1.The development is in, or next to, an existing urban area. 2.Traveling through the city is convenient.
8.shift : increase mobility by regulating parking and road use	The land occupied by motor vehicle is minimized.

Center for Environmental and Urban Problems (CEUP)

Accessibility:	All individuals should be able to easily and Safely access transit services without any significant and unavoidable impediments or barriers.
Walkability:	All pedestrians should be able to comfortably access transit facilities and surrounding communities on foot.
Mix of uses:	Access to a range of uses, services, and amenities are necessary to support transit and community vitality.
Connectivity:	Transit needs to be part of a network of travel
Density:	Riders depend on a concentration of activity and intensity in close proximity to transit facilities
Adaptability:	Transit facilities should include flexibility to respond to changing demand and conditions while still investing in long-lasting materials and infrastructure.
Comfort:	Transit facilities and the surrounding communities should be pleasant, inviting places that encourage use of available services.
Safety:	Transit facilities and the surrounding communities should provide for users' physical safety by addressing points of conflict and safety for riders using all access modes.
Security:	Transit facilities and surrounding communities should utilize crime prevention through environmental design (CPTED) techniques to address the security of all users.
Legibility:	Transit facilities and communities should be understandable to users and should help users orient themselves.
Quality:	Transit facilities and surrounding communities should be built with lasting materials and craft that reflect the scale of investment and design context.
Economy:	Transit facilities and surrounding communities should be built and maintained with consideration of economic sustainability
Partnerships:	Multiple stakeholders should be engaged

APTA creates transit friendly communities and achieves TOD concepts.

Density	Areas should be Medium-to-High Densities (80-40 people/acres) with short –medium blocks
Mix of Land Uses	Areas should be Places where we people can work, shop, learn, and play within walking distance
Street network	Short-to-Medium Length Blocks .Transit routes every 500m
Sidewalks	Continuous Sidewalks Wide Enough for Couples, secured from cars included (arterial and collectors streets, local streets)
Crosswalks	marked and lighted
Buffering from Traffic	Through curbing, planting (also can be shaded areas)
Street-Oriented Buildings	To achieve sense of enclosure and intensely experienced three-dimensional space visual enclosure
Shelter	Comfortable and Safe Places to Wait
Supportive Commercial Uses	Classify the Supportive commercial uses in the areas around transit stops and stations to uses support transit and others
Traffic Calming Along Access Routes	Speed humps, traffic circles, sharp bends and chicanes (S-curves)
Closely Spaced Shade Trees	right" trees are planted in the "right" patterns at the "right" locations
Not Much Dead Space	minimizing "dead" street frontag and parking lots
Plazas as Extensions of Main Streets	Public spaces contribute more to the street environment
Streetwalls	Visual enclosure
Functional Street Furniture	Achieve good urban design and pleasant environment
Signs	Coherent sign patternsment to users

Figure(9): compiled comparison between ITDP, APTA and CEUP principles, Source: Author based on ITDP, APTA and CEUP

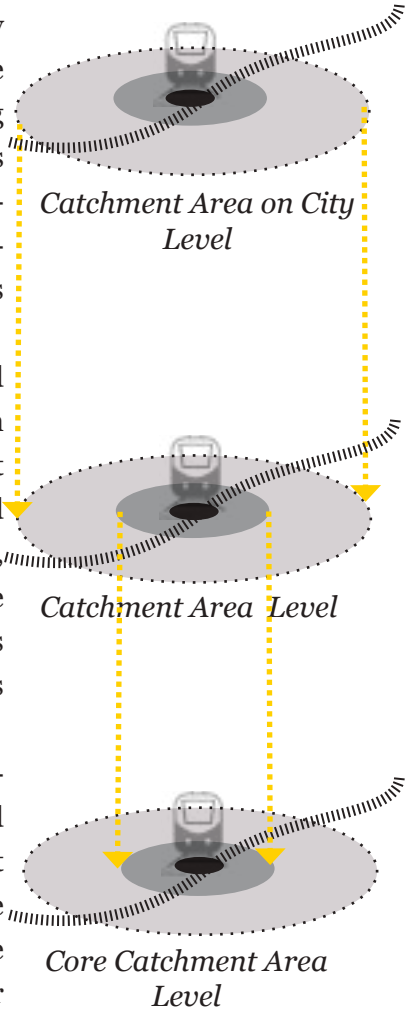
Table (3): Compiled Guiding principles, source: Author

Principles	Objectives	Indicators
Built Environment		
A.Walkways 	A.1.Accessible	Access to public transportation Accessible to older people and people with disabilities and barrier free
	A.2. Safe	Safe crossings (marked and lighted) pedestrians are separated from vehicles
	A.3. Active	Vibrant ground floor activities
	A.4. Comfort	Shaded walkways and temperate
	A.5.Legiblea	Walkways are clear and understandable to users and easy to be oriented
	A.6. Pedestrian connectivity	Size of blocks are short (100-150) to medium (150-190)
B.Street Network 	B.1.Street Connectivity	Size of blocks are short (100-150) to medium (150-190)
	B.2.Traffic Calming	Speed humps Parking lots
C. Land use 	Mixed land use	Range of users and services
D. Cycling Network 	Cycle routes	Cycle routes are separated from vehicles
	Cycle parking	Availability of parking for bikes (motorcycles)
E. Density	Floor area ratio	Medium to high Density
Transit	Access to Public transportation Transit Routes	Access to high quality public transportation Transit routes every 500m

So, this sub-chapter ends with compiled guiding principles to determine the similarities and common aspects that should be considered in transits catchment areas. However these guiding principles have been applied in different contexts all over the world, but they deal with transit catchment areas from only functional perspective. Certainly, these principles are considering the human scale, but it is not considering other human factors, cultural and social dimensions that change from context to context. Thus, in the empirical part these factors will be identified and considered according to the Egyptian context and people's needs.

Moreover, this part discussed human behaviour and activities definitions and how it could be measured in public space. Also it discussed the concept of transit catchment area in urban field. In addition, it ended with conceptual framework for the empirical part, which the TOD classifications and typologies have discussed and from this review, most of the countries apply the typologies on city level and each country has guiding principles also on the catchment area level.

So, according to the research objectives and the previous discussion, the application part will be discussed on three levels, city, catchment and core catchment area levels. From the discussion also, mostly, the catchment area is determined as 500 meters distance from transit station, so this will be the study area for the empirical part. Finally, the TOD typologies concept will be applied on Cairo, city level, while the guiding principles will be applied and guide for just indicators that will be measured from urban design scale on catchment area level.



Part II: Applying Knowledge:


PENSION RIGHI
AFRICA

4. The Spatial Context

This chapter gives an overview about public transportation system in Cairo, how it is governed and which organizations are responsible for providing the public transit service in Cairo. Also, it shows some of the urban transport strategies that have been done in Cairo from different organizations. In addition it focuses on Metro, as it is the main rapid transit in Cairo and its current and future plans.

4.1. Public Transport System and Cairo

It is strange to say transport systems and Cairo, because if anyone think about Cairo and its transport systems, the first idea will raise is it chaotic, un-organized and not functional at all. But David Sims (2012) highlighted that the city's traffic moves and its transport system do function but with "Poor Performance" (World Bank, 2006) as the average speed of traffic movement is 15.8 Km/hour, compared to Bangkok is 12.3 Km/hour and in Mexico city is 12.4 Km/hour (Sims, 2012). Talking about the public transportation system, most of the public transport modes are governed and controlled by the Cairo Authority Agency (CTA), which leaded to poor performance of the public transport system and unpleasant traveling conditions (World Bank, 2006). Also, most of the public buses and minibuses are not maintained, unsafe and inadequate. Cairo's mass transit sources were mainly in Metro, Suburban Rail, Light Rail (tram), public

Figure (10): CTA Minibus park in the middle of street for passenger to ride the minibus, source: Author

Figure (11):Heliopolis Light Rail Tram in the Seventies, source: Amira Ezzat, Abeer Ibrahim, 2016

Figure(12):Heliopolis Light Rail Tram before demolishing , source, Historic grandeur of Korba,October 2016

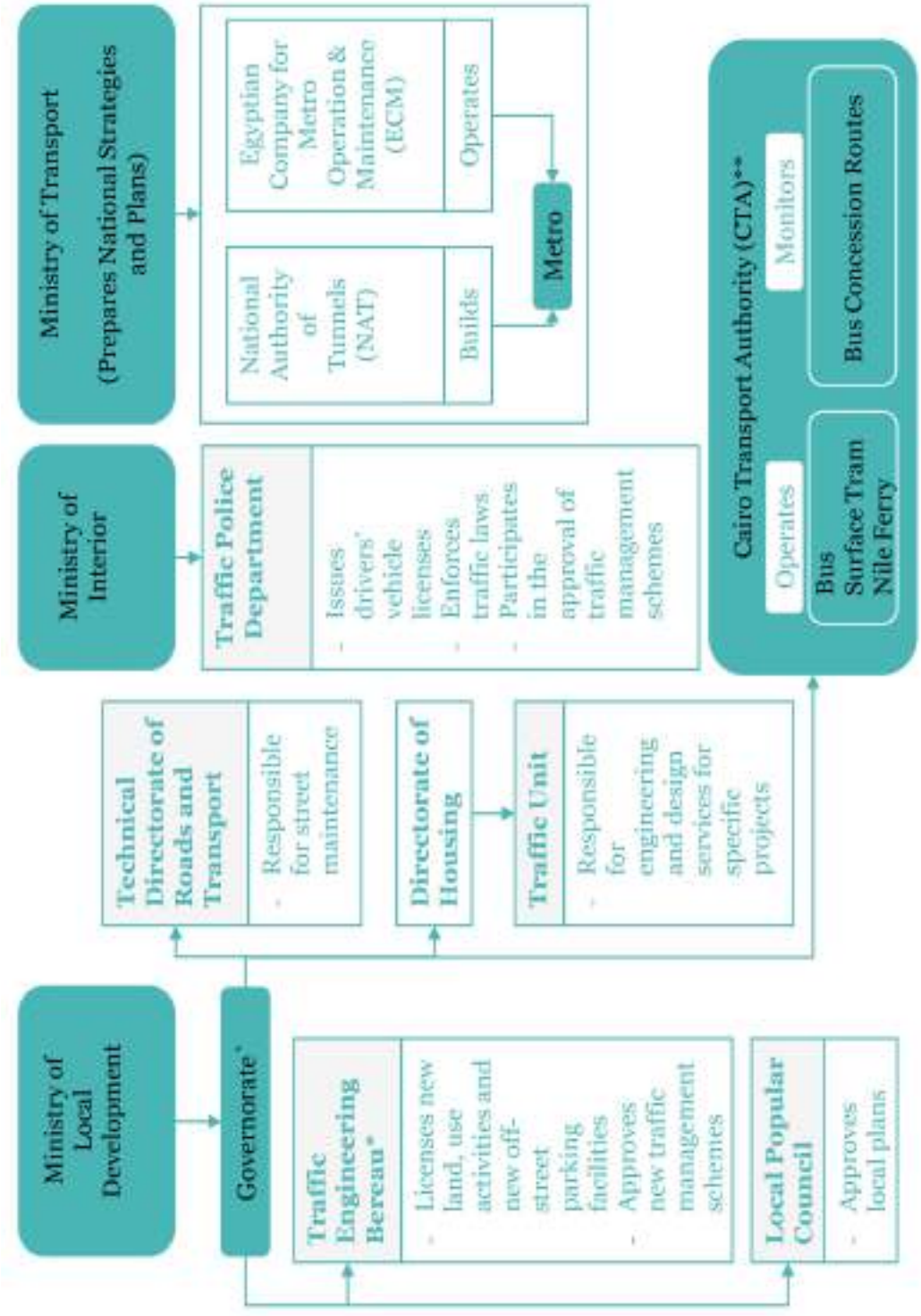
Figure(13):Heliopolis Light Rail Tram after has been demolished, source, Reham Mourad,July 2018

and private Buses, Mini-buses, shared taxis, private transit and other modes of transport. Nowadays, instead of improving quality of these transits and increase their numbers as all other countries do, the government is removing one of the important modes which Tram and build roads instead. Recently, the tram line has been demolished, the Tram was serving Heliopolis and Nasr city and many people was depending on the tram.

Urban transportation governance represents in three ministries, Ministry of Local Development, Ministry of Transport and Ministry of Interior Figure (14). Governorates are ones who responsible for the urban transport regulations in Egypt under the Ministry of Local Development, except the Metro is under the Ministry of Transport. The Egyptian Company of Metro Operation and Maintenance (ECMP) is the one operates Metro system while the National Authority of Tunnels (NAT) is just constructing it, while Cairo Transport Authority (CTA) is under Ministry of Local Development. So, the two main mass transits are governing from two different ministries with different strategies and agendas.

4.2. Metro Network and Cairo

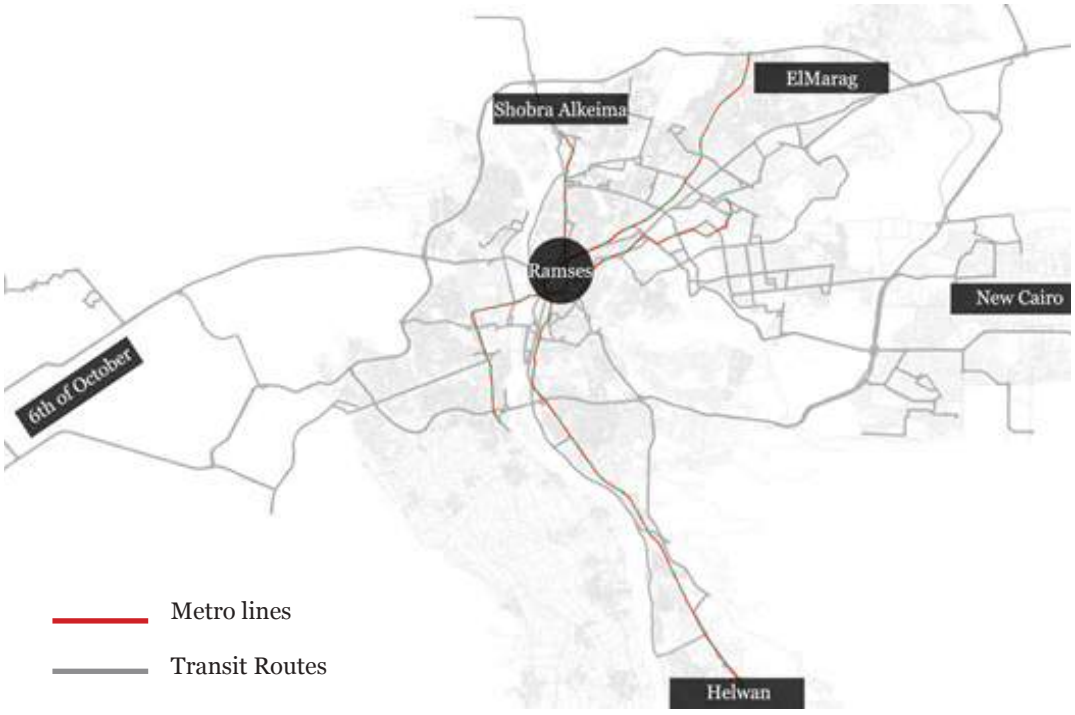
Cairo Metro is the rapid transit system in Greater Cairo, Egypt and it was the first metro system in Africa and in the Middle East. Currently metro system consists of three operating lines. Line one was opened in 1987 from Helwan to Ramsis square, as a first phase, with a length of 29 kilometres. Then the second phase was opened in 1989 to connect South and North Cairo (ElMarag) together with total length of 44.3 kilometers. But because of the overpopulation and the problems of public transportation have once again led to think about creating a second metro line. Line two is 21.6-kilometres serves 20 stations



Figure(14):Urban transportation governance in Greater Cairo
source: Tadamun, February 2017

and connects the northern eastern part of the city from Shobra Alkeima railway station with the western part of the city which connects Cairo, Alkalyobia and Giza Governorate together. Presently, Line three extends from Attba station to Alahram station, which connects central Cairo and eastern part of the city with Cairo International airport passing by different areas. In 2017, Cairo Metro has 63 stations of which 3 are transfer stations, with a total length of 77.9 kilometres. Phase one and phase two have been implemented and currently the National Authority for tunnels is executing phase number three from Line three. Finally, Line four is planned to run from 6th of October city's border to New Cairo district, connecting Greater Cairo from West to East. Line four and one will be connected together in Al Malek Al Saleh station and passing through Giza Railway Station will be connected with line two. Figure (15) shows a map for the Cairo metro network that connects different location in Cairo.

Metro in Cairo is used primarily by the low and middle income but high-income people deal with the Metro as crowded, unsafe and only for the poor.



Figure(15):metro lines and districts in Cairo,
source: Author based on GOPP data base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5. Empirical Part Methodology

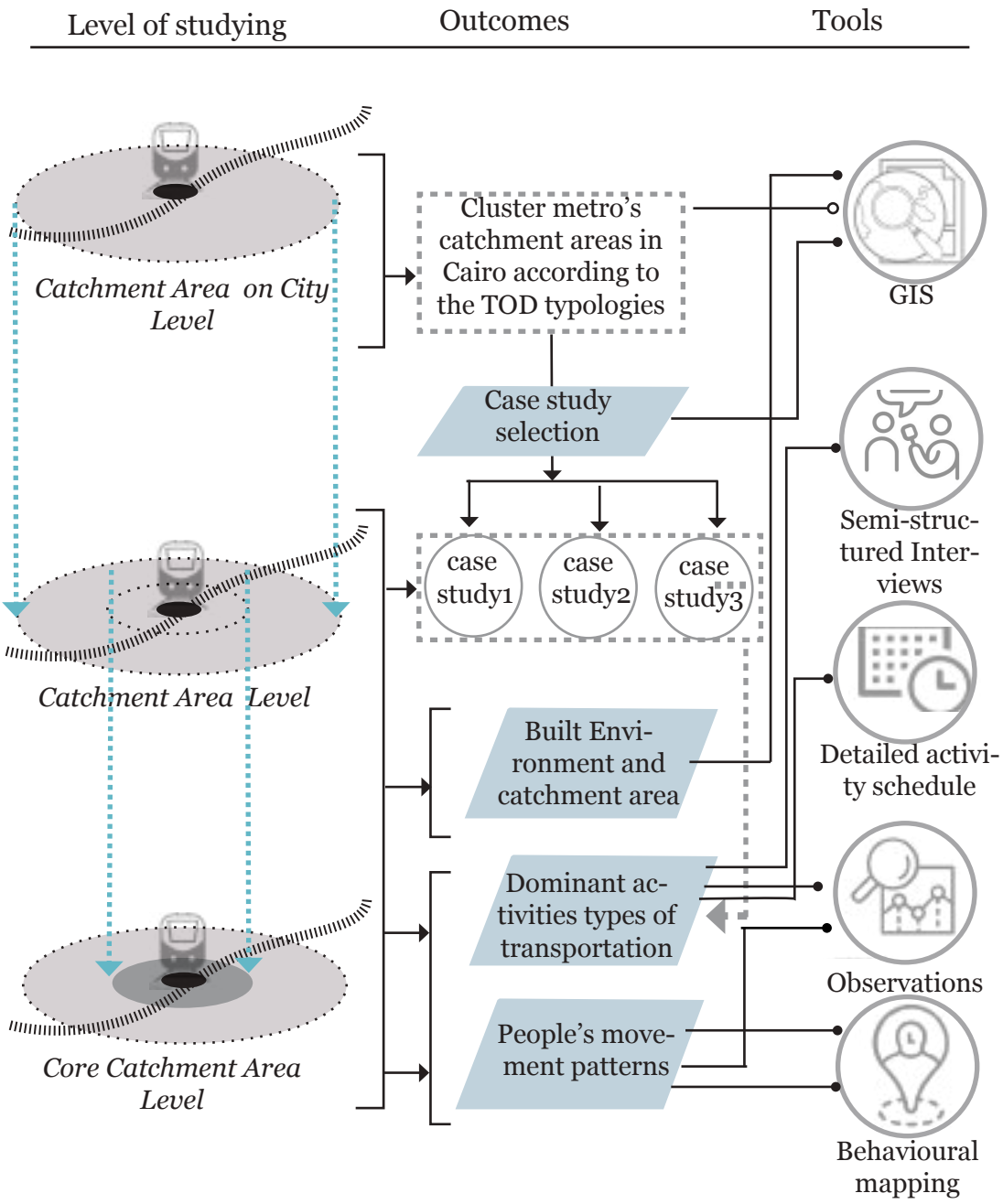
This part is the research empirical part; it is like an open eye for the areas around metro stations in Cairo and to understand the typologies of these areas. The methodologies, tools and limitations will be described. Also to understand the methodologies that will be applied to answer research questions in part II are on three levels. Figure (16) shows the methodology that has been applied and the outcomes of each level. The theoretical framework that discussed in part I will be applied on three levels, first is catchment area on the city level and second and third is on the catchment area level as the catchment area level includes the core and primary catchment areas. City level outcomes are clustering catchment area's metro stations in Cairo according to TOD typologies and concepts and the selection of case studies. Catchment area levels, the main analysis will be done on the two levels for the three selected case studies. In order to understand the deficiencies, challenges in the selected catchment areas, three main aspects will be considered: the built environment, the dominant activities and people's movements' patterns in each catchment area.

5.1. Data Gathering & Methods

In order to answer the research question, the theoretical part was mainly literature review and conceptual framework, but to understand the Egyptian context several methods and tools have been done.

- *Part I Catchment area on City level:*

For the city level part, to cluster Cairo's catchment areas, a cumulative map has been produced by GIS. The data sources are Cairo's data base from GOPP which includes the classification of formal and informal areas in Cairo, land uses, street network and the urban character of each area. In addition to the type of transportation connection in each station. Due to the lack of Cairo's data base in the transportation sector, Transport for Cairo (TFC) was the main source of the transpor-



Figure(16): Empirical Part Methodology outcomes
source: Author based on GOPP data base

tation data; the released data was the public mass transits in a 500 meter buffer around the 61 metro stations in Cairo and then the selected catchment area will be wil be analysed. TFC has divided the different type of transportation based on the providers of public transportation services figure (17), which means the type of different public mass transit that has been documented and considered in the 500 m buffer, the mode that has fixed routes and destinations. The type of public mass transits that has been considered are the CTA buses and minibuses, private sector buses and minibuses and microbuses .

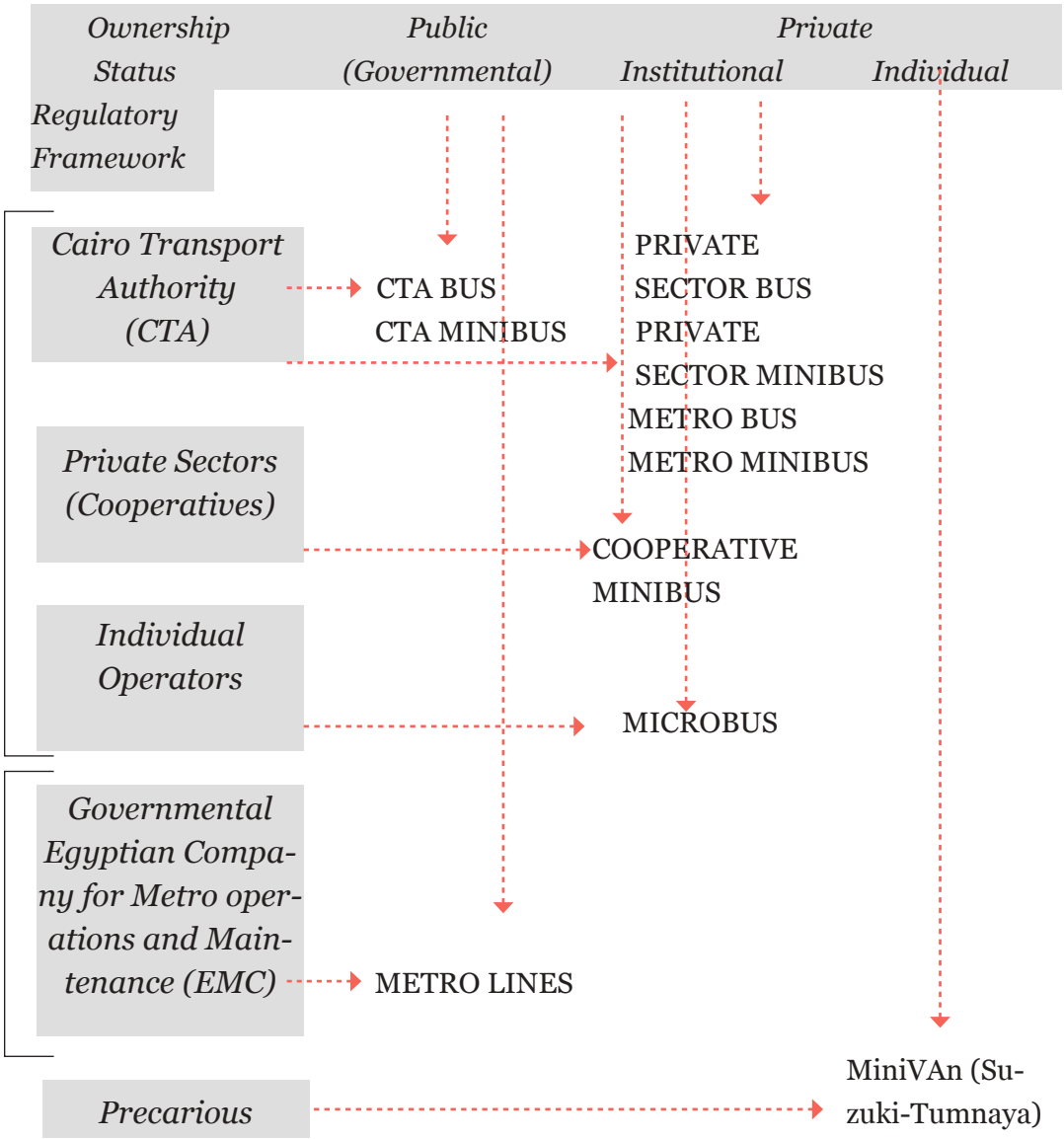


Figure (17): Providers of Public Transportation service in Cairo
source: Author based on TFC Transport Mode Catalog

- *Part II Catchment Area level:*

Part two is the case study level, three stations have been identified to analyse and interpret people's behaviour, dominant activities, types of public transportation and people's movement patterns. In order to discover how people practice different activities in specific environments and specific time.

The case study part is carried out through qualitative data and studies in the three selected catchment areas in order to identify the core catchment area, dominant users and dominant activities. The observations in each station have been done twice, the first one was at the peak time between 13:00 and 16:00 o'clock in a working sunny warm day and the second was at the same time on a day off. The core catchment area was dived into parts to be easily observed, counted and documented based on the study area. There are five methods done to collect all the required data.

1- Preliminary observations: The first method was a preliminary observation throughout the day in each station to identify the core catchment area and the dominant activities and then divide the core catchment area into small cadres to make it easier to be observed, analysed, counts people and investigates the main activities around metro station through counter, videos and photographs.

2- Strolling: The second method was to walk around the catchment area as strolling is one of the strongest tools to feel, see and to observe the hidden stories, increase area's perception and offer deep understanding. Each walk stared from one of metro station exits, probably the opened one and walking with people flow.

3- Behavioural Mapping: The third method is an activity setting mapping and focused observations have been done. In order to investigate these activities, actors, number of people, the different types of mode of transportation and trace people's movements, that has done using two schedules, one for the detailed activity map schedule (Appendix 1) and the second one for the mobility counts schedule (Appendix 2). The counting tool has done by fixing 10 minutes to observe and count so to know how many people are moving, sitting and staying.

4- Mapping physical settings: The fourth method was to map fixed and semi-fixed street elements such as kiosks, sidewalks, curbs, trees, fences, seats and location of bus stops etc. Base maps, counter, videos and photos have been used to document these activities and map people's behaviour. These tools have

been used in order to achieve a deep understanding of catchment area's dynamics and assess its positive and negative aspects.

5- Semi-structure interviews: The fifth method was a semi structured interviews (Appendix 3) to discover people's point of view and perceptions about their journey from or to metro station. The semi-structured interviews were done on a sample of residents, space user and street vendors randomly, however type of questions for each target group was different. The initial questions for space users were closed-ended questions to gain information about if they are using metro as a mode of transportation or not, and then these questions leaded to semi-structured interview questions. The questions for space users were mainly about describing the journey from or to the metro station, what are the challenges they are facing to reach the metro station or to their destination, what are the main threats in spaces around metro station, what is your opinion about street vendors and what is your opinion to develop spaces around metro station. The questions for residents were about how they are satisfied living in a catchment area, their opinion about street vendors, land prices, their perceptions about how the area has been changed before and after metro station implemented, in line two and three case.

5.2. Sampling:

The main objective for the sample criteria after identifying the main actors in each catchment area is the varieties of age, gender and social class, to gain wide range of information and to identify different needs for each actor and to identify the diversity of activities in the catchment area. The semi-structured interviews have done by chosen samples randomly especially in Kolet Al Banat area and Al Malek Al Saleh area, with taking into considerations the previous criteria. However, in Al Dokki area the sample was not random; it depended on researcher's friends and acquaintances especially for employees and residents. Also the random sample was considered different actors which are space users, street vendors and residents. These actors have been identified from the preliminary observations for each station area.

6. Metro Station and Catchment Areas in Cairo

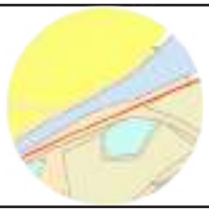
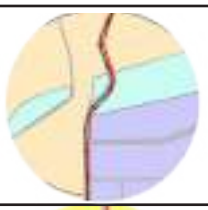
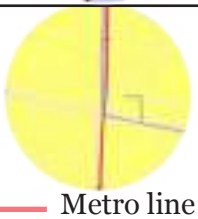
6.1.Catchment area on City Level: Typologies of Metro station's catchment area in Cairo

Some metro stations are located in very vital and authentic areas such as downtown at the heart of the City. In addition, some other stations are located in areas that are experiencing rapid growth and change, while others are in residential districts where metro provides a convenient and adequate means for people to travel to and from work or other destinations. Every station area is unique, faces different challenges and requires deep understanding in order to create high-performing station area. However, some station areas have similar characteristics; these similarities can help urban planners and citizens to understand the character of each station area in Cairo.

It is essential to understand the relation between the station and the built surroundings. As also an application of the typologies and station area classifications that have been discussed in part I, which are the density, type of land uses, type of transits and the characteristics of station area. So to understand this relation in Egypt, these factors were considered and other several factors have been identified in one cumulative table. These factors are: type of stations either final station, sub-station, viaduct station or central station. Also, the dominant land uses either residential, industrial, mixed use or a special use around each station. In addition to the type of public mass transport connections that exist in 500 meters, these connections have been classified into two categories regional and local connections. Firstly, the regional connections, which are heavy rail transit and other modes of transit which connects Greater Cairo to other cities and regions such as Wagh Bahary or Wagh Qebly. Secondly, local connections, which are divided into three types, first one is rapid rail transit (Metro), is a mean of connection within the city i.e. if two or three lines intersect in together which

makes the station as a central station. The second is governmental transits which are buses, minibuses or other modes offered by the government. The third type is private transits such as microbuses. Furthermore, two categories are added to the matrix, how streets are arranged and availability of parking area and bus station with the station. One of the factors that mentioned in the TOD typologies is density. Cairo can be considered as one of the densest cities on Earth and very compact city after Mumbai (Sims, 2012), as the density is 257 persons per built-up hectare which makes Cairo denser than other metropolitan cities as Lagos, Manila, Tehran, Jakarta or Delhi (Sims, 2012). According to the table that has been executed (Appendix 4) and TOD typologies and concepts, metro station areas in Cairo are classified into two categories, areas can be developed and areas cannot be developed (Appendix 5). The area that cannot be developed, due to its dominant use, is industrial or it is a vacant area and do not have mass transit connection. Areas that can be developed are classified into four categories: Residential, Urban Centres, Special Use and Fringes Gateway Figure (18). This classification can be explained in the following Table (4).

Table (4): Classification of catchment areas in Cairo

Special Use:	Areas that have dominant and special use such as educational use universities or colleges, culture and sport use (opera, entrainment venues or stadium), business or employment use.	
Urban Centres:	Areas are located in the centre of Cairo with significant centre of economic and mix of activities, and has a specific urban character, has strong and multiple connections with different mass transit.	
Fringes Gateway:	Areas are located on Cairo's fringes, have a mix of residential, commercial and public srvices areas and have wide varieties of regional connections	
Residential:	Areas are primarily residential district and are connected to urban centres	

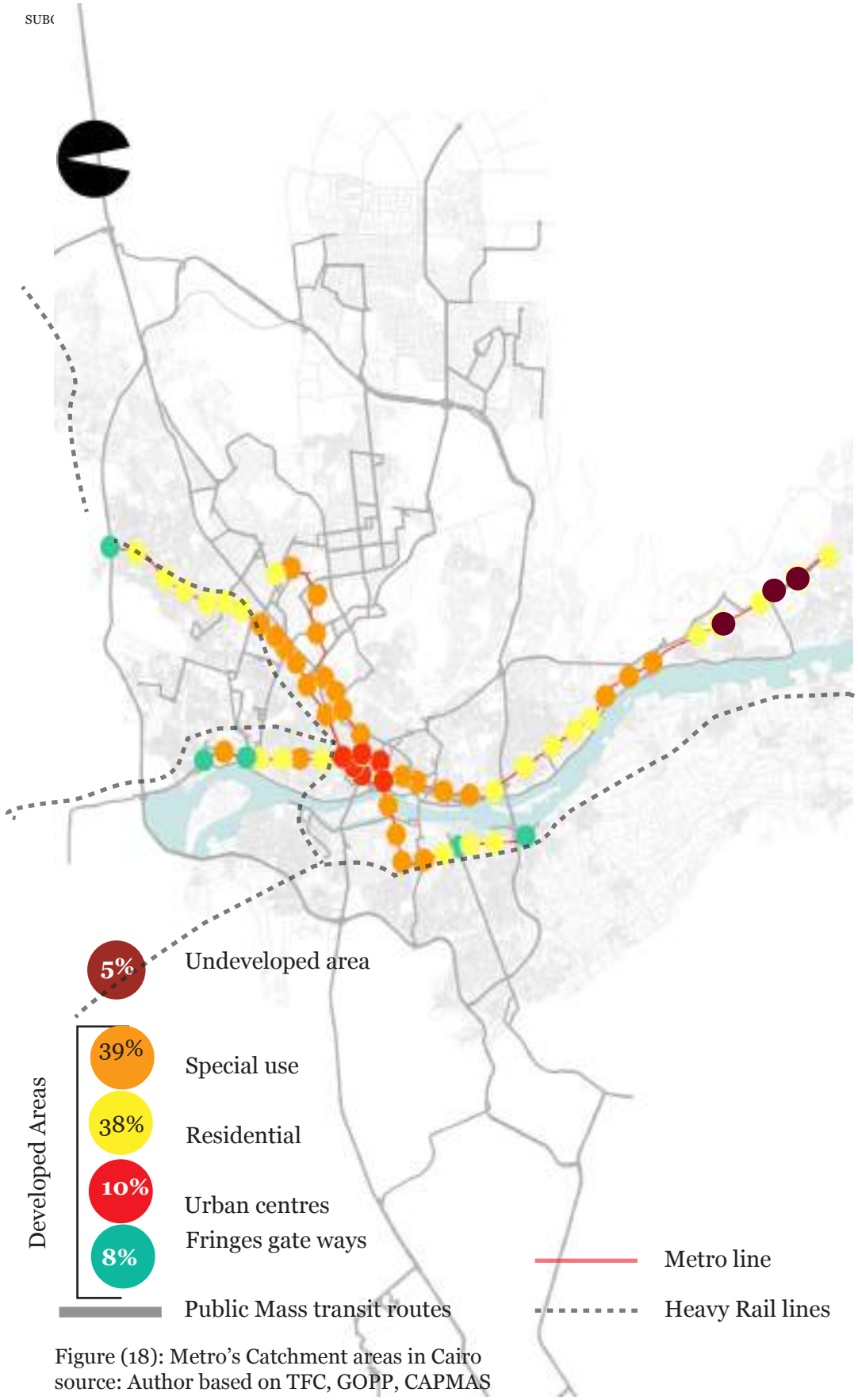


Figure (18): Metro's Catchment areas in Cairo
source: Author based on TFC, GOPP, CAPMAS

From the previous classifications, the special use category is the highest number of catchment areas in Cairo. So, in order to investigate the human behaviour in theses catchment areas, three catchment areas have been selected. To know similarities and differences between three stations in the special use category has done to discover the benefits and deficiencies of the surroundings built environment. The three stations are different in densities, street pattern and social class to point out the differences of people's behavior and perceptions about the area; this will lead to elementary understanding about the nature of catchment area in the Egyptian context.
The previous classifications are done for the catchment areas on city level to gain comprehensive understanding about the different metro's catchment areas in Cairo. The three selected catchment areas from special use category are Kolet AL Banat station, Al Dokki station and Al Malek Al saleh Station. In the next sub-chapter, the level of understanding and the field work will be on the catchment area level. Figure (19) shows the location of the three selected case studies, location of semi-structured interviews and the sample size

6.2. Catchment Area Level: The Case Studies

This part describes the built environment of the three selected case studies Kolet Al Banat Station, Al Dokki Station and AlMalek Al Saleh Station. Also it gives an over view about the different types of metro's catchment areas in details and not similar in their urban characteristics. Each catchment area is different in street patterns, social class and densities, this is in order to understand what are differences or similarities that affect people's activities and behaviour in metro's catchment areas. Total studied area in the 500 meters buffer is 7854 km2, it is a fixed area in the three case studies so can be analysed and discovered.

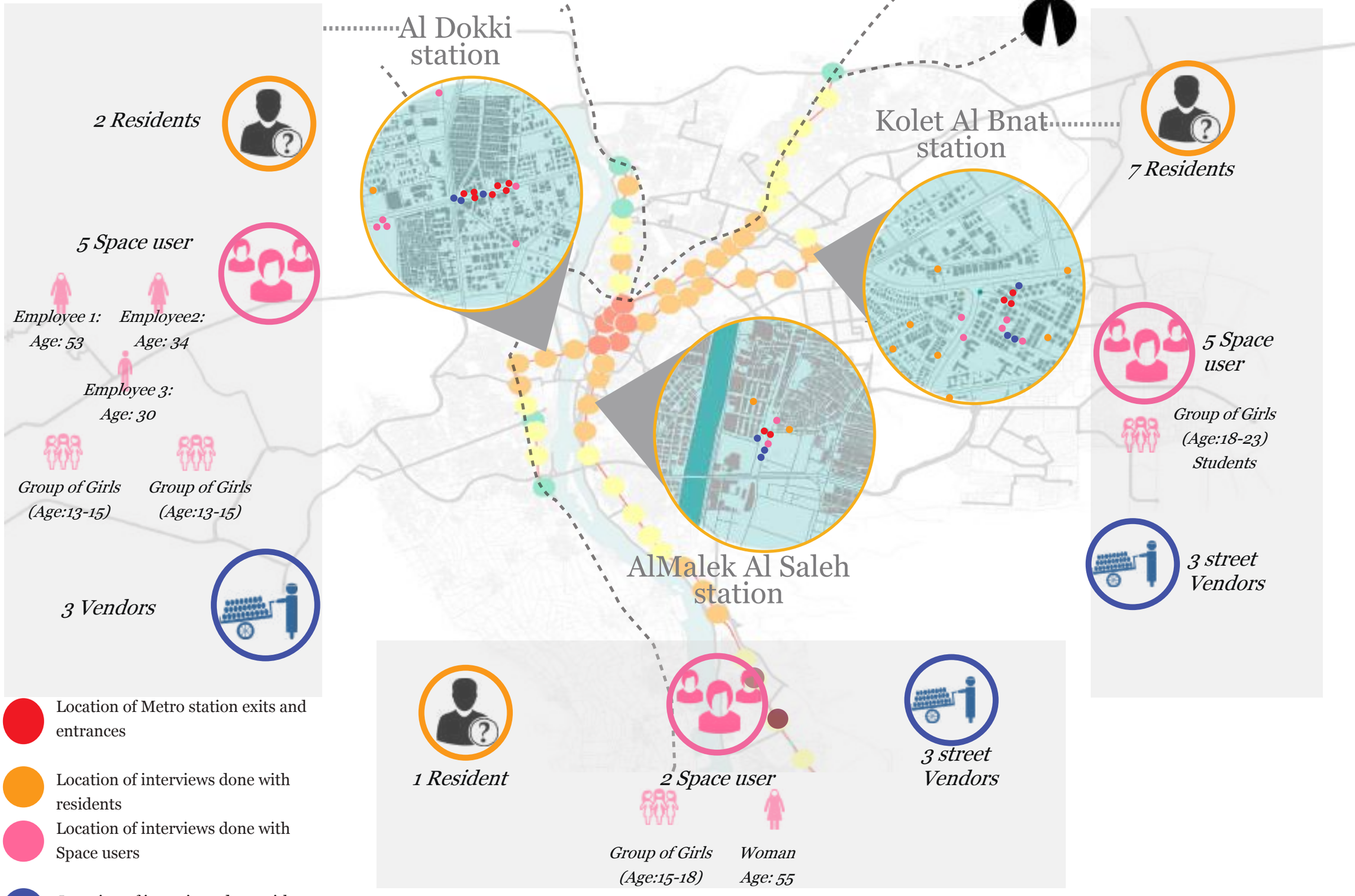


Figure (19): Three selected catchment areas and interviews location source: Author

6.2.1.Kolet l Banat station:

Figure (20): Location of Kolet Al Banat Station within districts
source: Author, based on Google earth 2018

Kolet Al Banat station is located in Nasr city district, it is a mixed use area varies between residential and educational area. Surrounding areas of Kolet Al Banat station within 500meters are two districts Golf District which related to Madinet Nasr zone and AlMontaza district related to Heliopolis zone. The station now attracts different kind of users from different locations across the Eastern part of Cairo which makes the station one of the most important stations in this area. The station is underground station and has three exits, just two of them are working, due to security reasons, in the same street side and the third one on the other side of street. Population number for Golf and Almontaza districts are 40710 and 21761 respectively (CAPMAS,2015), so the residential density in both areas are 55 inhabt/feddan and 62.11 inhabt/feddan . The southern part of the station is medium density residential area and most of the residences are mid-rise buildings (4th -7th floors). The northern part of the station is located in AlMontaza district and separated by AlMaraghany street and most of the residences are high-rise building. There is a significant difference between the two areas in terms of people's socio-economic class, that has been identified through the interviews with residents of each area. The common land use pattern in Almontaza district is residential and also a residential/ commercial.

Built Environment: *Street network:*

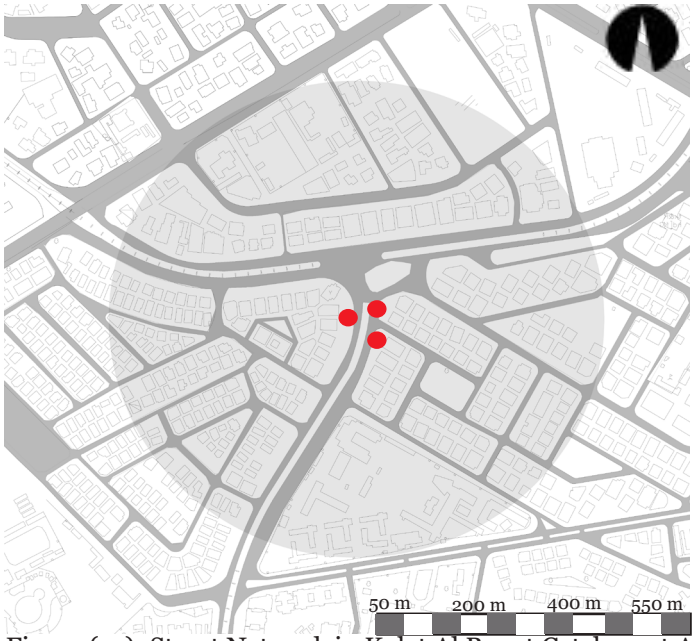


Figure (21): Street Network in Kolet Al Banat Catchment Area
source: Author

Figure (22): Grid street Network

Metro Exits and entrances

It is essential to describe the form and structure of streets that can accommodate or cannot accommodate different modes of transportation and different means of mobility. Also, the type of street is influential to be studied, to understand street's function and the nature of activities overview the street, as well as the nature of the surrounding area. In addition, this besides to understand street and pedestrian connectivity and blocks size, which shorter blocks facilitate more areas within walking distance for the station. In Kolet Al Banat station, there are two types of streets, Main Street which accommodates the highest ground floor activities and where the exits of metro station exist. Also, it accommodates the highest amount of vehicles and different types of transportation. Residential Street is a street that its dominant users accessed are inhabitants and the main activities are for their residents such as people seating outside in the ground floor or walking with their dogs. Another important factor to measures street and pathways connectivity is the Block Size. According to the Egyptian Building Law No. 119 for 2008, the block size is a piece of land surrounded by streets, roads, gardens or waterways based on. So the block sizes in kolet Al Banat are varied between 105-160* 50 meters these are in the residential blocks, . All streets pattern within catchment area are grid pattern and all streets are well connected to each other because of the blocks size and the well-organized street network. The number of street intersections are 39 and the number of blocks are 27 block.

Surroundings Land uses:

Residential
Mixed-use (residential and commercial
Educational
Religion
Hotels
Protected area
Cemeteries
Military area
Health

Figure (23): surrounding land uses in Kolet Al Banat Catchment Area
Source: Author

Current land uses around Kolet Al Banat station are residential and mixed residential/ commercial such as supermarket, stationery services and fast food restaurants and educational (Girls college). The mixed uses, residential and commercial are concentrated around metro station in Al Marghany Street and Ahmed Tayseer Street.

Figure (24): Girls College the educational use in the areas
source: Author

Public transit connections:

Around Kolet ALBanat metro station, there are different means of public transportation and different varieties that access from surrounding areas. These varieties are normal outcomes from the different social class that appears in the same area which means also that they meet different people's needs. These transits are classified into two types, according to TFC, from observations and interviews. These two types are public and private transit service providers.

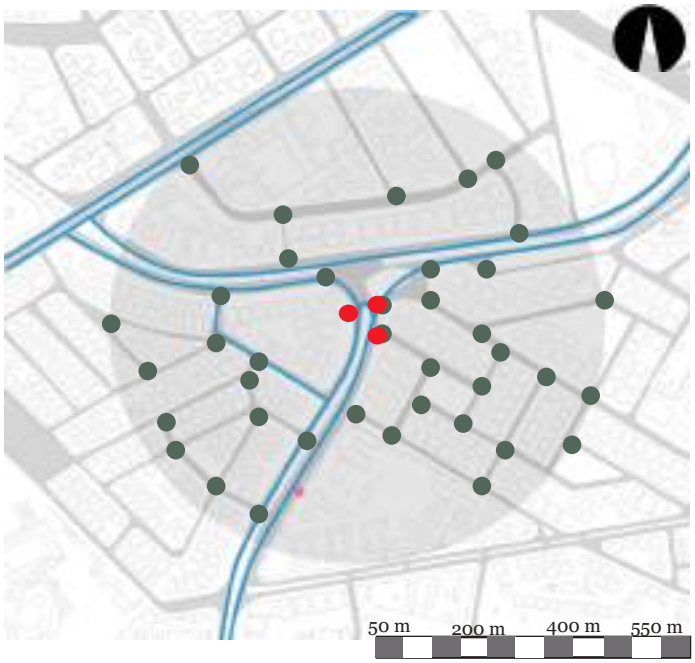


Figure (25): Transit routes and intersections in Kolet Al banat Catchment Area
source: Author

CTA mini bus are passing by Kolet Al banat station and they have fixed routes. They have several lines, First Settlement (New Cairo)-Mataria, First Settlement- Shubra, First Settlement-AbouAlresh. Another provider is private sectors, Mwaslat Masr, it is a private company that has offered new mini buses Smart Mini-Buses" with WIFI service and air conditions to serve users of Metro Heliopolis (Sada AlBalad news, 2014). These minibuses are operated by CTA which offers 26 Smart Mini-Buses to connect the eastern part of the city with metro lines in order to encourage citizens to leave their cars and use public transportation. In kolet Al Banat Station, two lines of smart mini-buses are passing by the station as girls of Girl's College said "M1" and "M2". In fact, "M1" which means M: Metro and 1:mini-bus number 1, it connects New Cairo and Nasr City with Kolet Al bnant station and M3 connects Heliopolis and Alhegaz square with

Figure (26): people rides Al rehab Bus in front of the metro station
source: Author

Figure (27): Smart Minibus
source: Egypt business Directory

Figure (28): Different modes of transportation in front of Girls College
source: Author

Kolet Al Banat station. However, these two lines are not serving the Metro station only, but Girls college also. Also, it is very common in Kolet Al Banat station to find “Al Rehab Bus and Minibus”, Al Rehab is one of the gated compounds in New Cairo that offers private buses for the residents live there and connects AlRehab to certain locations in Cairo.

This besides number of microbuses, minibuses and Tumnaya that are provided by individuals, they can be found in front of metro station and especially in front of Girls College.

Figure (29): Microbuses and Tumnays in front of metro station source: Author

Parking Lots

The area is almost dominated by cars, especially after the metro station has been implemented. According to some residents and Bwabs (doormen), the number of cars in the area has increased the triple and many people currently park their cars in any place near to the station and then take the metro. Many of these people are coming from New Cairo or Nasr city. According to a New Cairo resident, he mentioned that “when I go to the Downtown, I prefer to park my car here instead of other metro stations because I can find several places to park, so I can easily reach my destination and save time, effort and fuel”. Furthermore, plenty of habitants leave their cars and prefer to take the metro, a lot of them mentioned the same idea” Metro saved my life, why I should use my car”. As observed also, there is a paid parking area which used to be a tram line rented by Grümarket from Cairo Governorate.

Figure (30): Cars and Microbuses and Tumnays in front of metro station source: Author

Figure (31): parking lot legalised by Cairo Governorate in the location of old tram
source: Author

Walkways

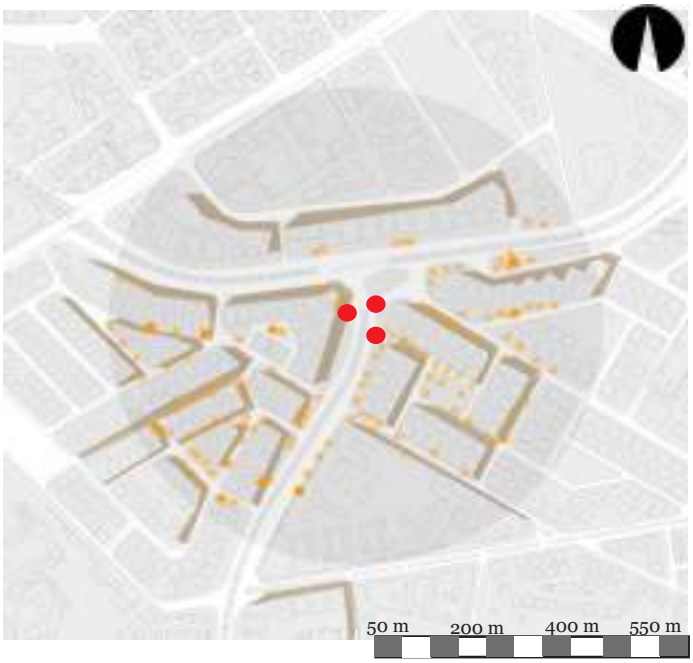


Figure (32): Shaded and not shaded walkways in Kole Al Banat Catchment Area
source: Author

The dedicated walkways are mostly separated from the vehicular traffic in both main and residential streets. Walkways' width in main streets is varied between 5-8 meters and heights are between 15-17 cm, however these heights are not fixed and applied on all the walkways. Many shops and restaurants are controlling these heights based on their type of uses or because of the deficiency in walkways application, so they are most probably do not have exact heights and definitely are not efficient for people even if they have disabilities or not. In addition, walkways are mostly occupied by the support activities of ground floor uses, such as workers' motorcycles are parking on the pedestrian pathways and supermarkets' trucks for loading goods and products. Also, some of the Kiosks are occupying walkways, so all of these activities are blocking pedestrian movements which force them in some parts of the walkways to walk with vehicles

Figure (33): Metro Transit Facility and park motorcycle are blocking pedestrian movement source: Author

Figure (34): Heights of sidewalks are not adequate source: Author

In addition, some residents park their cars on the walkways neglecting people's right in the pathways, which also these cars blocks the walkways. In residential streets, walkways' width are varied between 1.5-3 meters, walkways' quality are almost good but also cars are always park in front of Houses entrances which are cause barriers for pedestrians to walk and to use the walkways continuously. For disabled people including wheelchair, in the station area, a sloped curb exists in front of metro's elevator and also it is connected to the street. However, it is easy and possible for wheelchair users to get out from metro station and to use walkways, but as mentioned before, that exists only in the station area, but if any of wheelchair users want to access metro station or any other transit within the station area won't be easy

Figure (35): shaded sidewalks in residential streets
Source: Author

Talking about shading walkways, the walkways in main streets are not completely shaded especially in the core catchment area, also tress are not homogenously distributed along the main streets. Trees are mainly concentrated among residential streets and because of the proportion between buildings height and street width is very good, makes these streets and walkways are shaded and comfortable for walking. Also through interviews with group of girls, they mentioned "each resident is planting trees in front of his house which is something good and gives shading to walkways but these trees are not well-distributed among the walkways, so some parts are shaded and comfort and others are very sunny and hot". So most of the walkways in the residential streets are shaded and comfort compare to the main streets.

Figure (36): no shaded area in main streets
source: Author

Figure (37): people standing in shaded area waiting for transportation
source: Author

Human Activities and Core Catchment Area

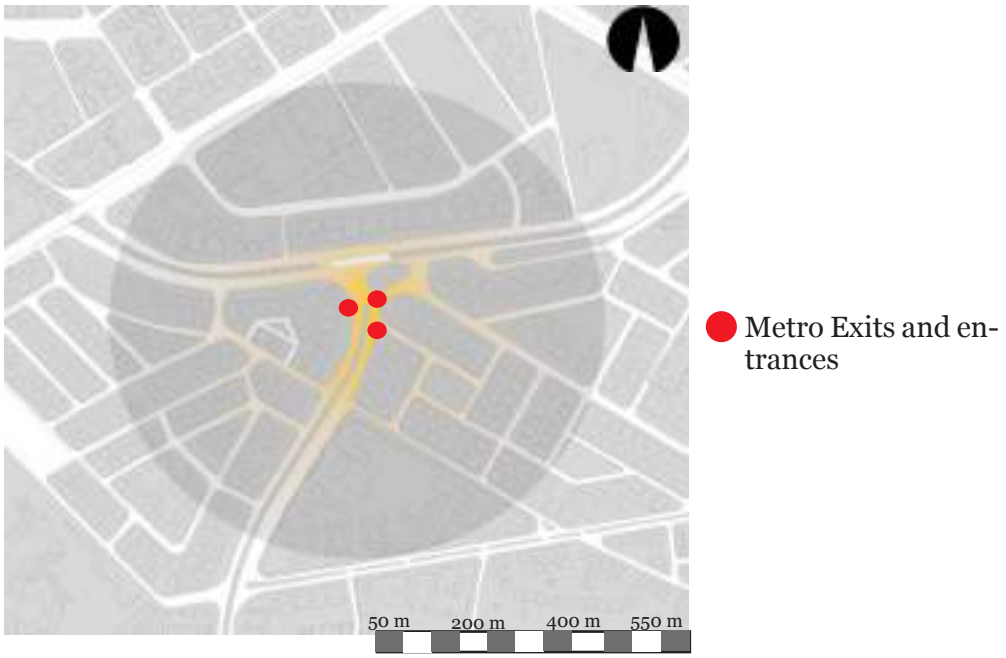


Figure (38): core catchment area in Kolet Al Banat
source: Author

Within the studied area two zones have been identified and analysed, core catchment area that will be analysed in this part and primary catchment area that has been analysed in the previous section. In order to define the core catchment area, which is the area that attached to metro stations' exits and entrances and surrounded with different means of transportation that support metro station and dominant activities that are located around the station. In the research random sample, the dominant space users were girls from girls' college with average age between 18 and 22 years old. The area was dived into four parts to be easily observed, counted and documented. A behavioural mapping has been developed to demonstrate the core catchment area. Figure (39) shows pattern of pedestrian movements to access metro station, main activities and people's assembly places. Also it elaborates the activities of ground floor and the car parking spots. In addition, it shows some of the fixed street elements that have been observed and documented such as places and distribution of trees, kiosks, lightings spots, shade and shelters, cycling parking, seats and how people functioned with them.

Park and ride activity

From the previous section, different transits have been identified passing by the station. So, all of these transits create a new activity in front of the metro station or nearby. One of these transits AlRehab bus, there is a fixed line AlRehab- Kasr Al Kobba line, figure (40) was always passing by Al Marghany street, but after the metro has been implemented in this area, a presumptive bus stop has been done by the people two minutes away from metro station and on AlMarghany street as well. People, medium-high social class, are almost standing or seating on the stairs or some rocks waiting for AL Rehab Bus around 8-10 minutes in any shaded area. They created an accumulation hypothetically bus stop in the shade of metro station support facilities. There is another accumulation for different modes of transportation grouping directly in front of one of metro's entrances. In this grouping, there are informal microbuses, Tumanyas and Taxis. Each mode of transportation created a queue with themselves to wait for Zebon (The customer). In addition each mode is targeting different user with different social class. Through observations group of customers went out from the metro and asked microbus driver about a location they want to reach, the microbus driver said " you just have to walk around five minutes to reach your destination", but the guys ignored his suggestions and rode a taxi while they were saying to the microbus driver " no of course we will not walking, it is very sunny and the weather is hot". Availability of different mode of transportation in Kolet Al Banat is very high and easily accessible from metro exists especially for disabled people, however Metro Company achieved accessibility and provided support facilities for disabled people but only to exit the metro station not more than that

Figure (40): people stand in shaded area waiting for Al Rehab Bus in shaded area
source: Author

Figure (41): Ramp in front of metro station elevator exit for disabled people
source: Author

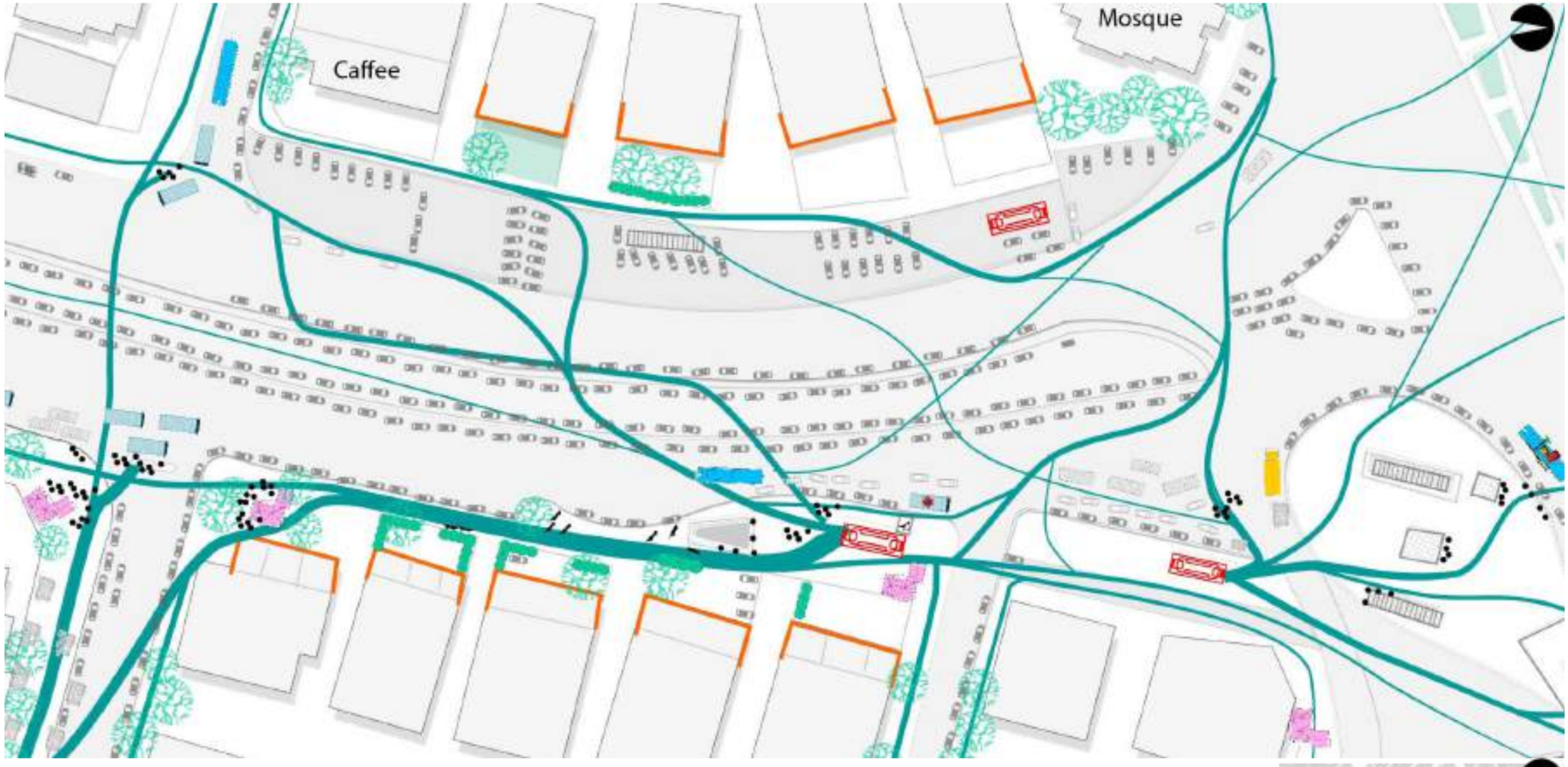
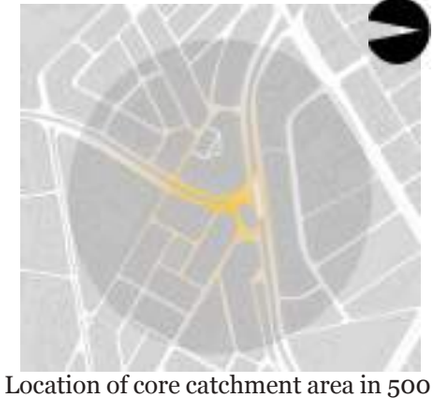


Figure (39): behavioural mapping of pedestrian movements and assembly points of activities in Kolet AL Banat core catchment area
source: Author

Legend

Pedestrian movement (20-200)	Governmental sales outlets	Park Car	Kiosk
Metro exit and entrance	Al-Rehab Bus (Private)	Park Taxi	Tree
CTA bus (Public)	Microbus (private)	Metro support facility	Ground floor activities
Metro Bus	Mini bus (Private)	Assembly point of people	Street Vendors



Location of core catchment area in 500 meters buffer

and it does not responsible for the surrounding environment.

Around 100 meters away from metro station, there is another accumulative spot for different modes of transportation, where the Girl's College located. This informal activity came spontaneously as a need for girls, these different modes are individuals varying between microbuses, minibuses and CTA's buses and minibuses. So from the observations, interviews and behavioural mapping, four main spots for park and ride activities in the catchment area zone have been identified. There is only bus stop with shelter 200 meters away from metro station, it is usually not used as bus stop but it is used a sheltered space for any other purpose.

Figure (42): The only shelter provided by Cairo Governorate for the bus stop (200m away from metro station)
source: Author

Economic activity

Ground floor activities

Most of the activities in ground floor are big supermarkets, pharmacies, cafés and fast food restaurants such as Shabrawy, Gad, KFC, Macdonald's etc. They are intense in the main streets especially Almarghany street and Ahmed Tayseer street. The ground floor activities in front of the Girl's College are different; the activities support the college, so there are different bookshops, stationeries and university support facilities. Apart from that the main streets have strong ground floor activities, but these vital activities are not found in residential streets.

Street vendors:

Street vendors appear wherever an opportunity presents itself, which is basically in locations where large numbers of pedestrians pass by (Shehayeb, D, 2016). Thus, vendors select the type of goods that attracts the type of customer frequenting a certain route or a place. In kolet Al Banat station, street vendors do not frequent the place periodically; however, in front of

Figure (43): Street vendors sell products on front of th metro station
Source: Author

Girl's college and especially the college boundary wall, different vendors are occupying the side walk there. Surely the types of vendors around Girls College are selling accessories, makeup, clothes, women bags, etc, and other vendors do not sell products but use their talents in drawing Henna. These vendors are always searching for economic opportunities, they are coming from different destinations such as Ain shams and they are mostly staying in the morning till the girls leave the college. Girls do not mind street vendors along their route as they satisfy their needs for shopping and for entrainment and to pass time while reaching the metro (Interview with group of girls). However, vendors are source of nosiness, chaos, and uncivilized people to many of residents. According to one of the residents "we are calling the police to come and remove them". Many of the residents are not accepting this kind of activity in their area

Figure (44): Street vendors sell products on the walkways
Source: Author

Kiosks

Kiosks play an important role as economic and social activity, they are usually can be found in main, active streets and paths with high frequency of pedestrian movement. Around Girls college, the kiosk here is playing a very important role, it is not just a place for selling beverages, cigarettes and phone cards, but also is a gathering place for girls to wait for transport. One of the girls mentioned" sometimes I have to wait for three hours for the minibus that reach directly my home in this kiosk, at least I can sit, drink, eat, wait and listen to songs that Am Mohamed always turn it on for us." Two kiosks are located in the intersection of Girls College street and Ahmed tayseer street, also the existence of private

minibuses and microbuses in this location, makes this spot a vital and another hypothetically bus stop in this area. However, this importance is reflecting on the kiosk size and the amount of occupation on the sidewalk which force other people to walk off the sidewalk and on street. There is also another type of movable kiosk, it is a small truck owned by the government that sells led lamps.

Figure (45): Kiosks are occupying the walkways in local streets
Source: Author

Figure (46): Kiosks as social and economic activity and occupying the walkways in main streets Source: Author

Social Activities

As mentioned before that the kiosk does not have only an important role as an economic activity but also as a social activity. It considers as a gathering place, seating area and a transition point before reaching the metro or any other mass transit especially it is also a shaded area. Another vital spot is the public space in front of the metro station and has metro station support facilities, this public space used to have a pergola before the existing of metro station. So, some teenagers use this public space to play football after finishing their school. Also as mentioned before, it is a waiting area for people using AlRehab buses. However, these support facilities that used for ventilation, people use these facilities to sit, eat and waiting for some other people as the height is around 70cm.

Figure (47): people sitting on Metro support facility (ventilation facility) in front of the metro exit, Source: Author

Figure (48): people are standing in front of the metro station, Source: Author

6.2.2. Al Dokki station:

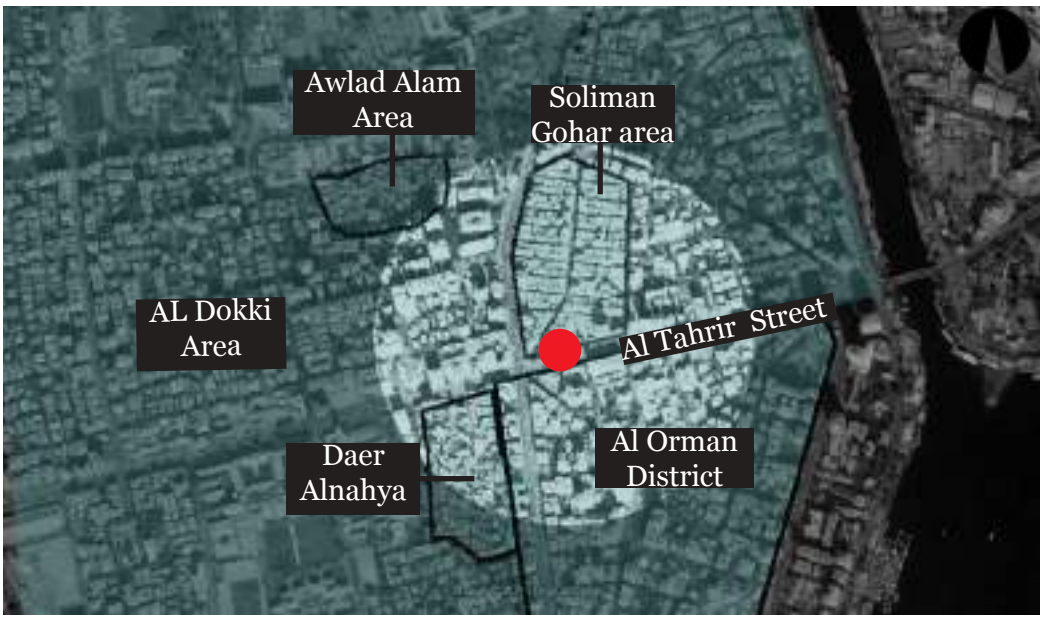


Figure (49): Location of Al Dokki Station within districts
Source: Author, based on Google earth 2018

Al Dokki station is located in Al Dokki area, it is a mixed use area varied between residential, governmental and non-governmental organizations and commercial. The surrounding area is classified as special use, based on metro's catchment areas classifications, because the dominant use is governmental institutions. The surrounding areas are five zones, Daer Alnahya, Soliman Gohar, Al Orman, Awlad Alam and Al Dokki. Awlad Alam and Daer Alnahya are classified as informal areas according to GOPP, so the catchment area includes mix of formal and informal area. The station attracts huge amount and diverse of users from all over the City, especially employees that travel daily to reach the station. The station is underground station and has four exits, three out four are working. Population number of Al Dokki district is 111854 habitants (CAPMAS,2015), so the residential area is 98 inhabt/feddan. The surrounding areas are varied in density, building heights and uses. Alnahya and Awlad Alam areas are medium density and building heights are var. Daer Alnahya ied between (4th – 7th floor), however, the formal part is varied between (5th-12th). There are major differences between each zone especially in land uses and social classes. The dominant users are employees access the metro station from different parts of Cairo, however it was not easy to identify the real dominant users in Al Dokki metro station.

Built Environment: *Street network:*

Figure (50): Street Network in Al Dokki Catchment Area
Source: Author

Because of metro station's location, as it is located in four different zones, so there are different street networks and patterns. The common street patterns are divided according to district. Street patterns vary between parallel grid which are in Al Dokki area and Soliman Gohar Area, and organic in Awlad Alam and Daer Alnahya. So, The block sizes in Al Dokki area are very diverse depends on the zone, in Soliman Gohar zone the block sizes varied between 110 *30 m and in Al Orman and Al Dokki zone varied between 70-85* 100-200 m. It is very hard to know size blocks in Daer Alnahya area, because of its very dense. Number of intersections are 92 and number of blocks are 62 block. There are four types of streets in the surrounding area of Al Dokki station, main Street which accommodates the highest ground and first floor activities and where the seven exits of metro station exist. Also, it accommodates the highest amount of vehicles and main lines of different types of transportation.
Market street, where It is a street for daily shopping

Metro Exits and entrances

Figure (51): parallel Grid street Network in Al Dokki Station

Figure (52): organic street Network in Al Dokki Station

Figure (53): Main streets
Source: Author

Figure (54): local streets
Source: Author

and it is mixed with residential and mixed uses. It functions as a main pedestrian street and it is accessible from different residential streets without crossing main streets with high vehicular movement or mass transit. Residential Street is a street that its dominant users are inhabitants and it does not accommodate too many vehicles and does not accommodate mass transit. Local street is a street that accommodates vibrant ground floor activities such as restaurants and supermarkets, etc, but does not accommodate mass transit.

Figure (55): market streets
Source: Author

Surroundings Land uses:

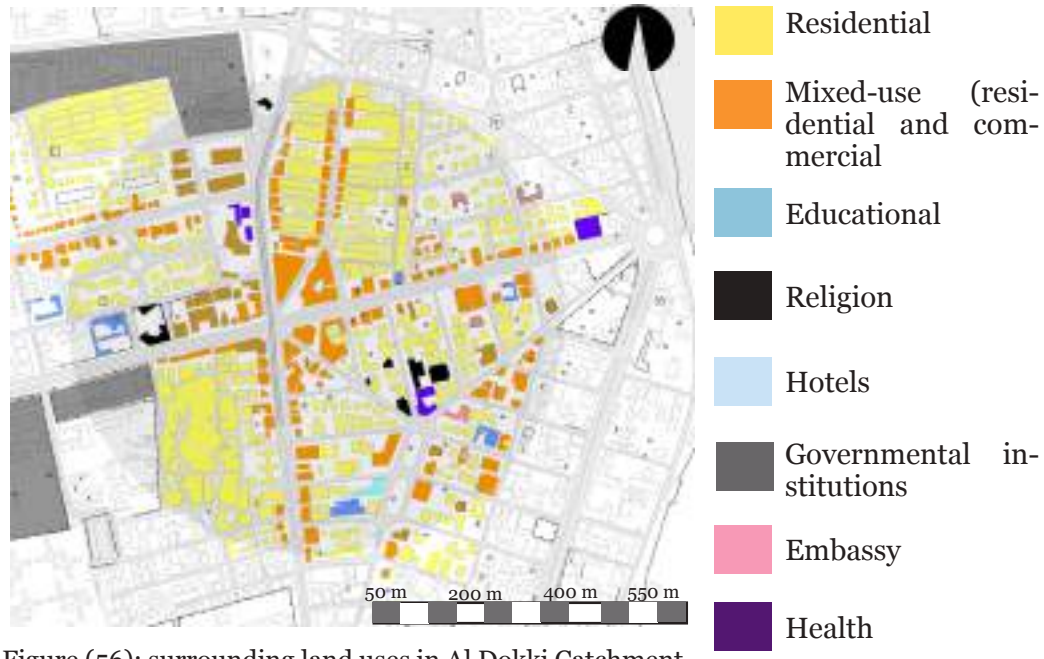


Figure (56): surrounding land uses in Al Dokki Catchment Area source: Author

Land uses around Al Dokki station are mainly public services such as hospitals and schools, governmental institutions and organizations such as, Ministry of Agriculture and National researches centers, this besides embassies such as Palestinian, Syrian, Korean, Libyan and Kuwait embassies. Furthermore, in the area, land uses pattern are residential and mixed residential/ commercial such as grocery shops, pharmacies, butcher shops, coffee shops, bakeries and car repair shops. The mixed uses are concentrated in the main street Al Tahrir street and Al Dokki street and around metro station.

Public transit connections:

Figure (57): transit routes and intersections in Al Dokki Catchment Area
Source: Author

Transit Routes

Roads Intersections

Official Bus Stop

Metro Exits and entrances

Figure (58): people riding microbus in-front of metro station Source: Author

Figure (59): CTA bus and microbuse passing by metro station Source: Author

Around Al Dokki metro station, there are different means of public transportation and different varieties that access from surrounding areas. Types of public transportation that occurs around Al Dokki metro station are different from the ones in Kolet Al Banat station. Because the type of users and social class are in both areas different from each other's, so, types of public transportation are also different. In Al Dokki station area, private buses for specific gated community in 6Th of October city are not found comparing to Al Rehab bus. But, CTA buses and CTA minibuses with fixed lines can be found in the area, also microbuses exist in station's catchment area especially under Al Dokki bridge.

Walkways:

Figure (60): Shaded and not shaded walkway in Al Dokki Catchment Area
Source: Author

Figure (61): occupied sidewalks in local streets
Source: Author

Because the catchment area of Al Dokki area is located within four zones, so each zone has different street networks and walkways. Walkways width are different from street to street, in order to recognize the walkways in Al Dokki's catchment area, that should happen in the late night, so no shops, street vendors and Ahwa are opened. It was not easy to realize walkways' heights and width at the peak time. The only thing that can be easily recognized is a massive of people walking in the same direction with movement's flow between numerous of street vendors. Walkways in Al Tahrir Street are wide enough, only at night, to accommodate these numbers of people. Walkways width varies between 3-5 m and in front of metro's exits is 5-7m.

Figure (62): sidewalks in Al Tahrir street taken in day off
Source: Author

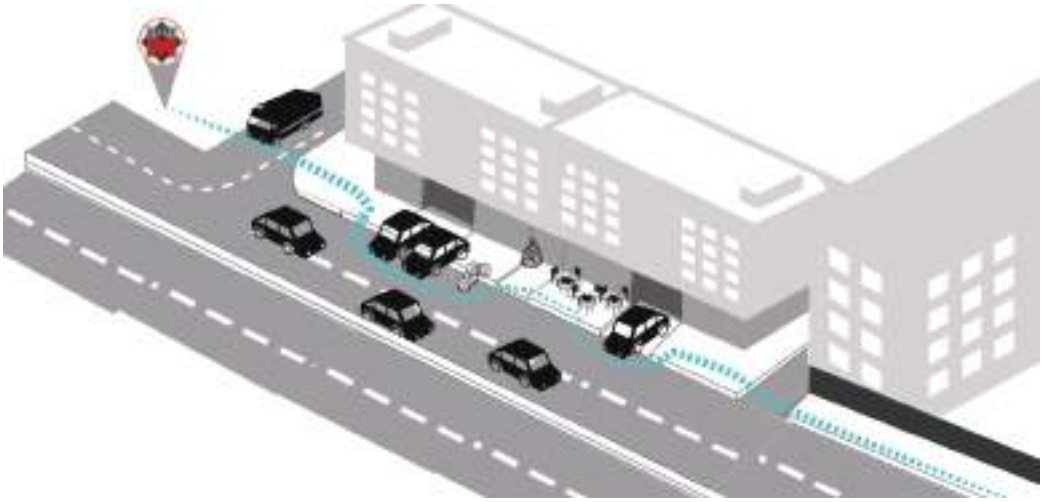


Figure (63): Schematic diagram for an interviewee (1) described her walking journey to metro station
Source: Author

An interview done with one of the employees and lives in Al Marag area, she is an elder woman her main mode of transportation is the Metro. She described her daily walking experience from the metro station to the research Center, where she works, she explained her walking experience as serpentine movement. She mentioned that she walks in the empty spots and in the low walkways heights, which is the reason that she ended to walk in the middle of the street with vehicles, microbuses and buses. She highlighted and complained about the shops and workshops that are occupying the walkway such as the butcher she said" he and his meat are forcing us, users, to walk away from his shop because of the smell". Also she highlighted the same issues " not only the butcher who does not want people to walk but also the car workshops, cars are everywhere on streets and on the walkways, where should we walk?

Figure (64): ground floor activities occupy sidewalks besides their the quality are not adequate
Source: Author

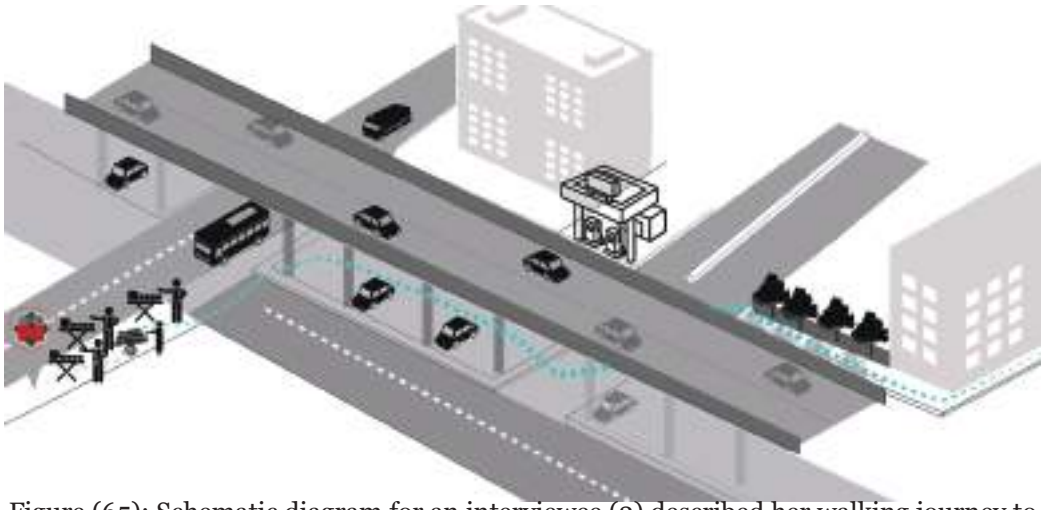


Figure (65): Schematic diagram for an interviewee (2) described her walking journey to metro station
Source: Author

Another middle aged employee is working in Agricultural ministry described her journey to the metro station, she mentioned other concerns and priorities while she walks, she said" I always walk in the short distance walkway, I always walk with the shaded area to avoid the heat as much as possible so I walk often under the bridge to avoid cars and sun. However, the crosswalk in front of the metro station (Al Dokki Square) is horrible because many cars and microbuses cross at the same time". In addition she mentioned that a lot of car accidents happened in this place especially with children. Other group of teenager's girls mentioned their journey to reach their school; they mentioned the same challenge as the previous lady mentioned, which the one related to crosswalks.

Figure (66): unsafe crossing in AlDokki square and in front of metro station and under Al Dokki Bridge
Source: Author

Not only these interviewees had mentioned safety and comfort as their main concerns, a middle aged employee mentioned" Metro of course is better than the normal modes of transportation, the main problem for me is the heat, it is very hot to walk from metro to here (work) and vice versa. Another issue is I do not use the walkways, I always walk with the cars because cars workshops always have Cars Park on the

Figure (67): unshaded and narrow sidewalks leading to metro station
Source: Author

walkways which I cannot walk on the walkway.

The main big challenge when I have my children with me, it is not safe at all to walk with two children to reach metro station, I prefer to take tutuk if I have my children rather than to walk. This besides the garbage that are everywhere on the walkways a resident described her daily journey as she works and lives in the same place" There are not walkways anywhere compared to the past, so I always walk with cars this besides the garbage everywhere. We complained a lot to AL Hay (Dokki District office) but without any actions and responses. Near to my house, one minister lives there, it is the only street that is always clean, paved, and walkways are clear".

Another employee highlighted another issues, she is an architect and do not use metro frequently, she highlighted issues not from metro user point of view but from a stroller point of view always pass by Dokki metro station and from design point of view, she mentioned "I do not use metro very often, because it is very crowded and I always get disoriented I do not know where the entrances and exits are because metro signs are not clear and a lot of advertisements cover metro signs, this besides the disorientation inside the station itself" . Also she mentioned "the problem also is metro support facilities (ventilations), their heights are (1m-1,5m) which are blocking the walkways like in Dokki metro station and almost they are in the main street or in street's island which also obstructing people's while crossing streets. Also the quality of walkways are very important not just the existence of walkways. I think metro exits and entrances need clear and safe streets to create safe accessibility from and to the station especially in the main streets". In addition, from observations these ventilations facilities in street's island are not safe at all for people while crossing Al Tahrir street.

Figure (68): Advertisements disturb and cover metro sign
Source: Author

Figure (69): Ventilation facilities on the sidewalks which decreased sidewalks' width
Source: Author

Human Activities and Core Catchment Area:

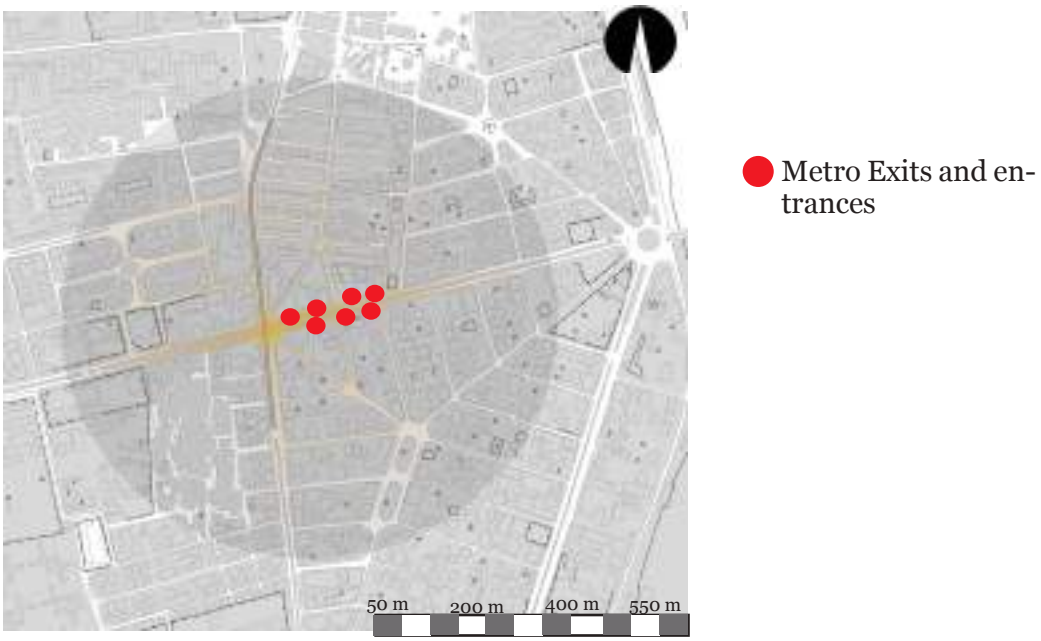


Figure (70): Shaded and not shaded walkway in Al Dokki Catchment Area. Source: Author

The core catchment area in Al Dokki metro station is mainly in Al Tahrir street and to Al Dokki square, underneath Al Dokki bridge, where different means of transportation are accumulating in Al Dokki square and in front of the metro station's exits. But from the observations that have been done twice along the day, the highest people movement volume is in the morning before 8:30 o'clock, which the employees have to sign in and at 14:00 o'clock. So, as the previous station, the same methodology has done, however it was much more complicated to be observed. The core catchment area was divided into six parts to be easily observed, counted and documented. The first part was in front of the first metro station's exits and entrances that faced Al Dokki square, where a bus stop is located and the highest amount of different transit stop. The second part was in front of the second metro's exits on the same side of the first exit. Figure (71) shows pattern of pedestrian movements to access metro station, main space activities and people's assembly places. Also it elaborates the activities of ground floor and the car parking spots. In addition, it shows some of the fixed street elements that have been observed and documented such as places and distribution of trees, kiosks, lightings spots, shade and shelters, seats. So from observations, as in Kolet Al banant station, the following activities have been identified, Park and Ride activities, Economic Activities and Social Activities.

Park and ride activity

As in Kolet Al Banat station, presumptive bus stop has been done by the people directly under Al Dokki Bridge on both sides of ALTahrir street, this is due to the shaded area that the bridge does. However, there is a bus stop with shelter on the same side of metro exits, but people use it as a waiting area, place to eat and to relax. So, there is accumulation of microbuses in the corner of main streets which means the intersection of Al Tahrir street and Al Dokki street under Dokki bridge. In Al Dokki station, the accumulation of taxis or microbuses in front of metro stations exits are not commonly found, because of the control of Giza's traffic administration over the taxis, microbuses and cars to park in front of the station.

Figure (72): Bus shelter near to metro exit and people using it as public space source: Author

Figure (73): Bus stop in the main street without shelter and people sitting on the sidewalk. Source: Author

Parking Lots

Al Dokki station plays an important role for the people lives in the western part of the city especially for car drivers. So, it plays the role of gate way station and an entry to the city, because of the existence of parking lots underneath Al Dokki Bridge, however the parking ticket is expensive comparing to other places and comparing to Kolet Al Banat station. The same scenario repeats again in Al Dokki station, according to someone who lives in 6th of October city and works in Downtown he said" I come to Dokki to park my car and take the Metro, I prefer Al Dokki metro station because the availability of parking spaces around the metro, and Dokki area is the first metro station area that I can park my car". So, this parking lot is essential in this area and it could be a suitable

Figure (71): behavioural mapping of pedestrian movements and assembly points of activities in Al Dokki core catchment area
Source: Author

Legend

Pedestrian movement (20-200)	Governmental sales outlets	Park Car	Kiosk
Metro exit and entrance	Microbus (private)	Park Taxi	Tree
CTA bus (Public)	Mini bus (Private)	Metro support facility	Ground floor activities
Street Vendors	Motorcycle	Assembly point of people	

Location of core catchment area in 500 meters buffer

Economic activity

Ground floor activities

Ground and first floor activities are very vital, most of the main streets activities in ground floor are coffee shops, computer shops, butchers, pharmacies, bakeries, confectionery shops, juice shop, phone shops and all kind of vehicles services. All kind of "on-going services" can be found in AL Dokki station area that serves pedestrians or vehicles. Besides, ground floor activities in residential areas, especially in Al Orman zone, another kind of activities that support the embassies, private school and hotels there such as coffee shop and restaurants (cilantro, costa cafee, Macdonald's) or hyper super markets such as Metro, Awlad Ragab. These kind of ground floor activities do not appear in this area because of the existing of metro station, unlike the ground floor activities in Al Tahrir street. Many of these shops are occupying the walkways and expand their activity to the walkways such as the local coffee shop, juices shop and car repair shops. According to interviewee (2), (3) and (4) they mentioned the same type of ground floor activity that is blocking the walkways which is the butcher shop, Ahwa (local cafe) and car repair shop, they mentioned that these kind of ground floor activities should not be in the main streets.

These situations are not only in the main streets but also in the market street, however, in the market street there is not walkways for pedestrians ,so expanding the ground floor activities are always taking part of the street.

Figure (74): ground floor activities occupy the sidewalk because of the type of activity
Source: Author

Street vendors:

In Al Dokki station, street vendors are occupied and settled the walkways in front of metro stations exits which means in Al Tahrir street. There is a frequent control from the traffic management for cars and taxis that are parking in front of the station that cause vehicles congestions but there is not that much control on street vendors. According to the interviews that done with different metro users and employees, they do not have problems with the existing of street vendors, however, some of them mentioned they are blocking the pedestrian traffic which cause chaos and mislead their directions to the metro station especially in the peak hours interview 3 mentioned "I cannot use the walkways because of the chaos and obstructions that street vendors create. Street vendors are also blocking the walkways and the movements", however interviewee (2) mentioned" street vendors are "Morzaeen and they need to be here to gain money, they do not have place to sell their products and people also need them".

The types of vendors are completely different from Kolet Al Bnabt Station, here different and numerous products can be found. The type of products varies between clothes, fruits, slippers etc. However, one of the street vendors said" where should we sell our products, the government should give us a place or a small shop to sell our products, we will stand wherever there is a high frequent movement of people". Also when the topic of the new law of occupying the public roads has raised, all of the of street vendors that have been asked agreed on the same thing which is" if the government will force us to pay a fine, the government should think about us". There are different arguments and reactions about the existence of street vendors around metro stations without considering their real legal status.

Figure (75): street vendors occupy the sidewalk on the both sides
Source: Author

Kiosks:

As kolet Al Banat station, on the way to metro station there are several kiosks near to each exit and in main streets. The types of users in Al Dokki area are different from Kolet Al Banat station, so the kiosk here does not play the role of social activity as in Kolet Al Banat station and area, but play more the economic activity role, as the area is dominated by high speed frequent users. Kiosks around Al Dokki Metro station also can be found in the intersections of main street and residential street. No one from the interviewees mentioned the kiosk as a blocking element for people's movement or as an element for social interaction.

Figure (76): people depend on kiosks for waiting, economic and social activity
Source: Author

Social Activities:

In Al Dokki station, because of the big diversity of users and the amount of people using the station, the station is like a pendulum always swings all over the day without stopping. So, there were not social activities observed or documented, except the bus shelter that is used as social place for eating, sitting and relaxing from the sunny weather rather than a bus shelter for people to wait for their bus.

6.2.3.AlMalek Al Saleh Station

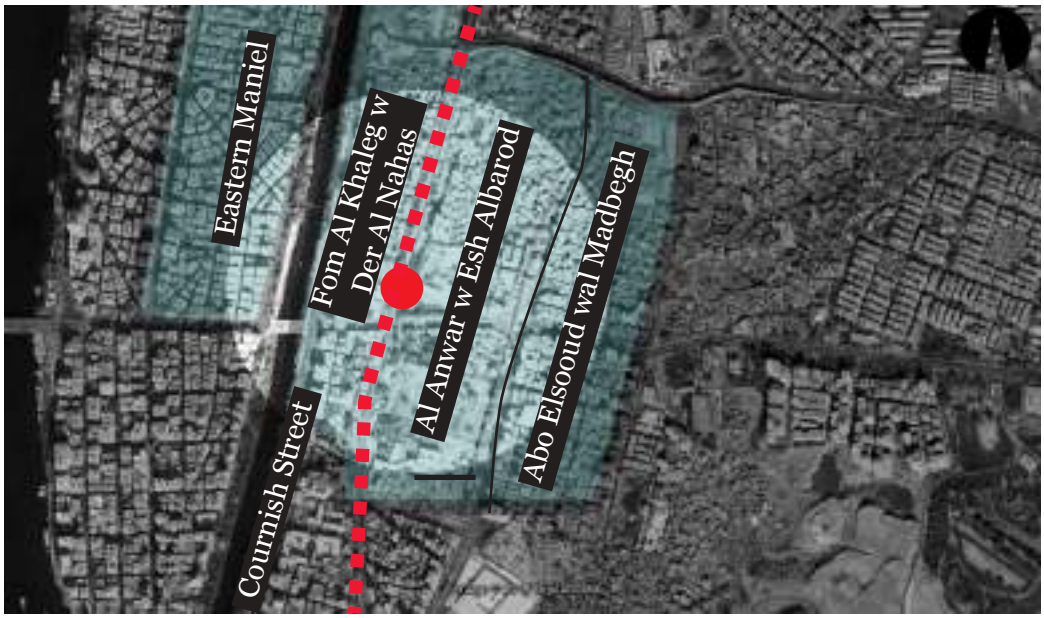


Figure (77): Location of AL Malek Al Saleh Station within districts
Source: Author, based on Google earth 2018

Al Malek Al saleh station is located in old Cairo district, it is a mixed use area varies between residential and health use and it is categorized as informal area based on GOPP. Within 500m, the station is located in four districts, Abo Elsooud w al Madbegh, Al Anwar w Esh Albarod, Fom Al Khaleg w Der Al Nahas and the Eastern Maniel. Sequentially the population number of each district is 23975, 14879, 6417, 21673 (CAPMAS, 2015). So, the residential density in each area is 373 habitant/feddan, 185 habitant/feddan, 114 habitant/feddan and 196 habitant/feddan. The station in on ground station, it has two exits which are separated by the metro rail network and divide the four districts, Fom Al Khaleg w Der Al Nahas and the Eastern Maniel are on the western part of the metro rail network and Abo Elsooud wal Badbegh and Al Anwar w Esh Albarod on the eastern part. The station attracts users from different destinations as the other two stations, because of the existence of Al

Figure (78): metro rail divides the two areas. Source: Author

Built Environment: *Street network:*

Figure (79): Street Network in Al Malek Al Saleh Catchment Area. Source: Author

Streets in this area are very narrow and small alleys and rarely can accommodate different vehicles. There are cumulative streets which accommodate cars, Tutuks, pedestrians and Suzukis. However, the size of this accumulative street is narrow and is not paved, so it is dominated by pedestrians, tuktuks and suzukis and rarely microbuses.

The other types of streets are local streets and also are not paved and their sizes are varied between 3-8 m. As any informal area, street patterns are organic, not connected and some of them are dead ended, however the western part of the station street pattern is grid and well connected. In contrast with the previous catchment areas, to investigate number of blocks and number of intersections is hopeless case.

Metro Exits and entrances

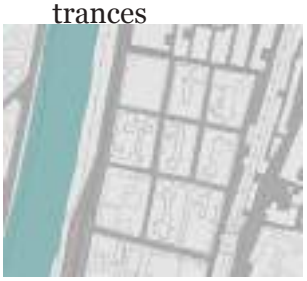


Figure (80): parallel Grid street Network in Malek Al Saleh Station

Figure (81): organic street Network in Malek Al Saleh-Station

Figure (82): Main street in the western part Source: Author

Figure (83): main street in the eastern part Source: Author

Surrounded land use:

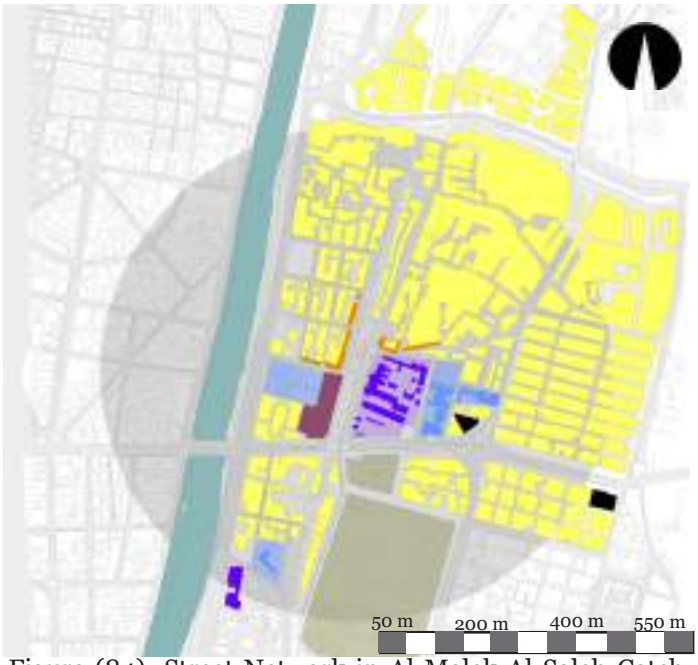


Figure (84): Street Network in Al Malek Al Saleh Catchment Area. Source: Author

Dominant land uses in catchment area of Al Malek Al Saleh Station is residential, health, mixed land use and car repair workshops. The quality of residential units in the eastern part are low and poor quality, while the quality in the western part is better.

Figure (85): quality of houses in the eastern part Source: Author

Figure (86): the western part of catchment area Source: Author

Public transportation connection:

Figure (87): Street Network in Al Malek Al Saleh Catchment Area. Source: Author

The scene of cumulating microbuses, buses and taxis in front of the metro station exits and entrances in Kolet AL Banat and Al Dokki, does not exist here. The only cumulating public transportations that exist are Tutuks, especially in the Eastern part of the metro rail in Al Anwar w Esh Albarod area. In Al Anwar w Esh Albarod area, which it is informal area, the only connection with public transportation is also informal. There are two microbus and Suzuki stops, the Suzuki stop is 50 meters away from the metro station in the direction of the main street and the other microbuses stop is located in the intersection of the main street and the local street. As mentioned before, these microbuses connect Al Malek AL saleh area to Sayda Zainab area and the surroundings.

Figure (88): the only route for CTA bus (Cournish street). Source: Author

Figure (89): Cumulative microbuses in the intersection of main streets
Source: Author

Walkways:

Figure (90): Shaded and not shaded walkway in Al Malek Al Saleh Catchment Area. Source: Author

The are no sidewalks in Al Malek Al Saleh Catchment area, however all pedestrians, vehicles and vendors are sharing the street together. So, street in this area plays different roles as connector from different user to reach metro station, switch between other transit or to any other destinations.

Figure (91): pedestrians, vehicles and street vendors share the street. Source: Author

Human Activities and Core Catchment area:

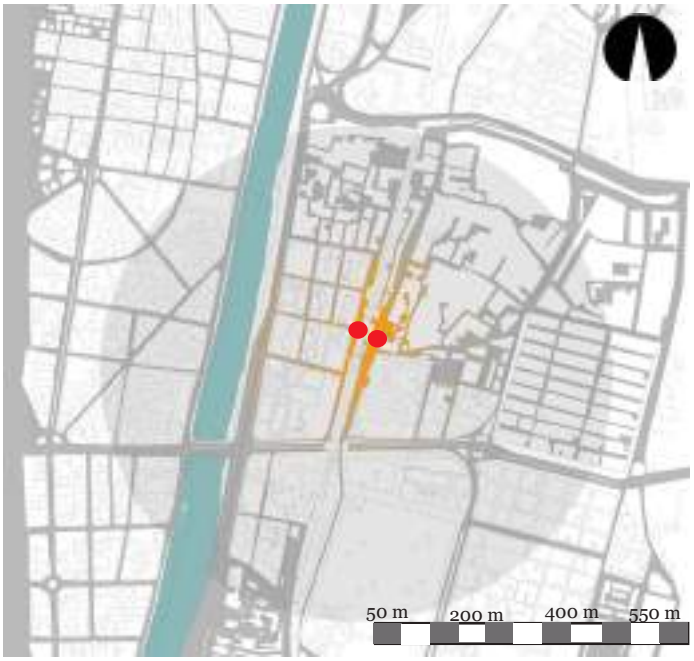
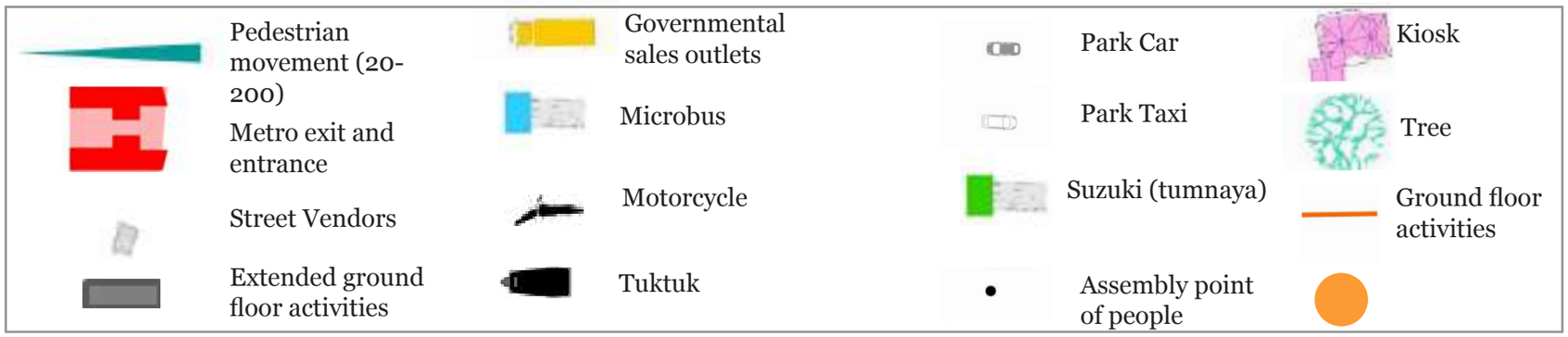


Figure (92): Core catchment area in Al Malek Al Saleh.
Source: Author

Although the 500m buffer of the metro station, the theoretical catchment area, includes four areas, but the Nile is a barrier which reduces Metro Station's catchment area, so The Easstern Maniel is not included in the study area. Therefore, the building heights in the other three areas are different, in Fom Al Khaleg w Der Al Nahas zone, building heights vary between 2-4 floors and 12 floors, while in Al Anwar w Esh Albarod and Abo Elsooud w al Madbegh area buildings heights vary between 1-3 floors. The core transit area is divided into two separated areas because of the metro rail and the only connection is by a bridge six meters high. This type of station is different from the previous two because it is on ground station and its entrances and exits are controlled by fences and has borders.
In order to define core catchment area, the core catchment area in ALmalek AL Saleh station is divided in two parts, part in the eastern part of the metro rail and the second part in the western part of the metro rail. The western part connects the area with Giza Governorate while the eastern part connects the area with Cairo Governorate.

Figure (93): behavioural mapping of pedestrian movements and assembly points of activities in Al Al Malek AL Saleh core catchment area
Source: Author

Legend



Location of core catchment area in 500 meters buffer

Park and ride activity

Park and ride activity it is also appears here but with different volume and types of transportation. Because the only space available is shared narrow street, so the activity is taking place with vehicles, vendors and people movements, which the street turned to a complete chaotic and un-organized space. Park and ride activity is just concentrated in Metro's exits and entrances and the main transit is Tutktuks and taxis. This elaborates the existing of microbuses stop and Tumnayas 200 meters away from the station.
In addition, street width does not appropriate for this kind activity to take place in front of the station.

Figure (94): Tuktuks waiting for people outside metro station. Source: Author

Parking lots:

There is only parking lot in the catchment area, although, it is private and cars are parking since a long time, so it is not used as a park and ride activity or is used as one day parking. So, the area is not dominated by cars but dominant by tuktuks, microbuses and people. Also, because the quality of street network and pavements are poor, so many cars are not passing in main and local streets. However, in the western part, cars are found just in front of houses.

Figure (95): park cars in the western park
Source: Author

Economic Activities
Ground floor Activities

Around the station and in the main streets, Ahwa balady (local coffee shops) can be found a lot, also these coffee shops can be found in the main and local street and act as a social activity and waiting activity as well. The most common activities in this area are retail and daily products such as watch repair shop, baker, juices, etc, and most of these products are informal business related to area's residents.

Figure (96): ground floor activities, especially food, and local cafés in front of the station
Source: Author

Street Vendors & Kiosks:

The amounts of street vendors are very high especially fruits vendors and fool and food vendors. Also in the other side of metro rail street vendors, juices, car repair workshops exist in the other area as well. Most of these vendors are living in the same area, so that is the reason why exactly they are standing and selling products in this specific area. According to one of the interviewees" I live here and I sell fruits since more than ten years." Also they mentioned sometimes Baladya (Police) come to the area and take all our products, but that happens very rarely".

Figure (97): numerous street vendors are standing outside metro station and along metro station's wall .
Source: Author

"If you plan city for cars and traffic, you will get cars and traffic, but if you plan for people and places you will get people and places"

Fred kent, founder of Project for Public Spaces

7.Discussion of selected Catchment areas

This part discusses the general learning and understanding from previous analysis, interviews and observations. Also, it investigates the relation between built environment and human behaviour in catchment areas through the selected case studies. First part explains the relation between people's opinions, suggestions and concerns and the principles of good catchment area that has been discussed in part I through the selected case studies. Second part summarizes the relation between built environment and catchment area but through the three differences in selected case studies which are street pattern, residential density and resident's social class.

7.1. Reflections on selected case studies

Kolet Al banat catchment area, Al Dokki catchment area and Al Malek Al saleh were the three selected case studies from the special use category according to the classification that has been done in chapter six. The three catchment areas of selected case studies are only similar in their unique special use, however they are different in the type of special use and they are supposed to attract different type of users. Kolet Al Banat station is mixed between residential and educational land use. Al Dokki station is also mixed between residential and governmental organizations land use. Al Malek Al saleh is mixed between residential and health care land use. But the three selected catchment areas are different in street pattern, residential density and resident's social class. The reason behind that was to investigate if there are any similarities and differences in people's behaviour in metro's catchment areas or not in order to reach solid understanding that can help to set design guidelines for catchment areas. From observations, interviews and previous analysis, there were common human behavior and activities have been identified in the three catchment areas. Existing of metro station in areas

already built is very challenging from different levels and metro has different influences on these areas. Some areas their land uses, land prices, floor area ratio or residential density have been completely changed. But the research focuses on how metro station influences human activities within catchment area. According to interviews done with users and residents in three catchment areas, figure (98), figure (99), figure(100) and figure (101) show residents and group of girls opinions about the different principles that have been discussed in chapter six. In adition, these figures show the most important, lackness and strenght of catchment areas according to the principles that discuused with them.

7.1.1.Reflection on Built Environment and catchment areas

Street patters have been explained in three case studies to interpret how the formations of these patterns affect human behaviour and to understand how people move from place to place, their feelings, their opinions and deficiencies they face in their journeys. In kolet Al Banat station, most of the girls mentioned safety as important factor in their walk; the area is safe to walk during the day at night however, some girls mentioned that the area lack good lighting, but some residents highlighted lack of safety while crossing the street in front of the station. Most of the residents and users mentioned the sidewalks are good environment for walking especially in Local Streets because they are shaded, quiet and calm unlike the main streets, they are not shaded and lack well distributed trees. That's confirming what has been discovered from previous analysis, as the configuration of buildings and streets do offer pleasant and comfort walking environment. In addition, girls were mentioning the area as active area, only in Main Street, because of the existence of street vendors and ground floor activities, however, most of the residents reject the existence of street vendors in the area and any other of informal mode of transportation because it gives a bad image for the area in terms of Ashwa'i behaviour. Also, according to residents, they provide crowdedness, noises and occupying the streets and walkways. So, residents are not accepting this kind of varieties of users, activities and informal transits.

However in Al Dokki station, other deficiencies have been highlighted from users and residents. All of them mentioned stated the same "No Walkways", however, there are walkways and they are quite wide especially in main streets, but because the quality of these walkways either very poor so no one can use them to walk, or the heights are very different and hard to reach which force people, especially elder people or disabled people to walk with vehicles in the middle of street. The second main issue that has been highlighted from different users

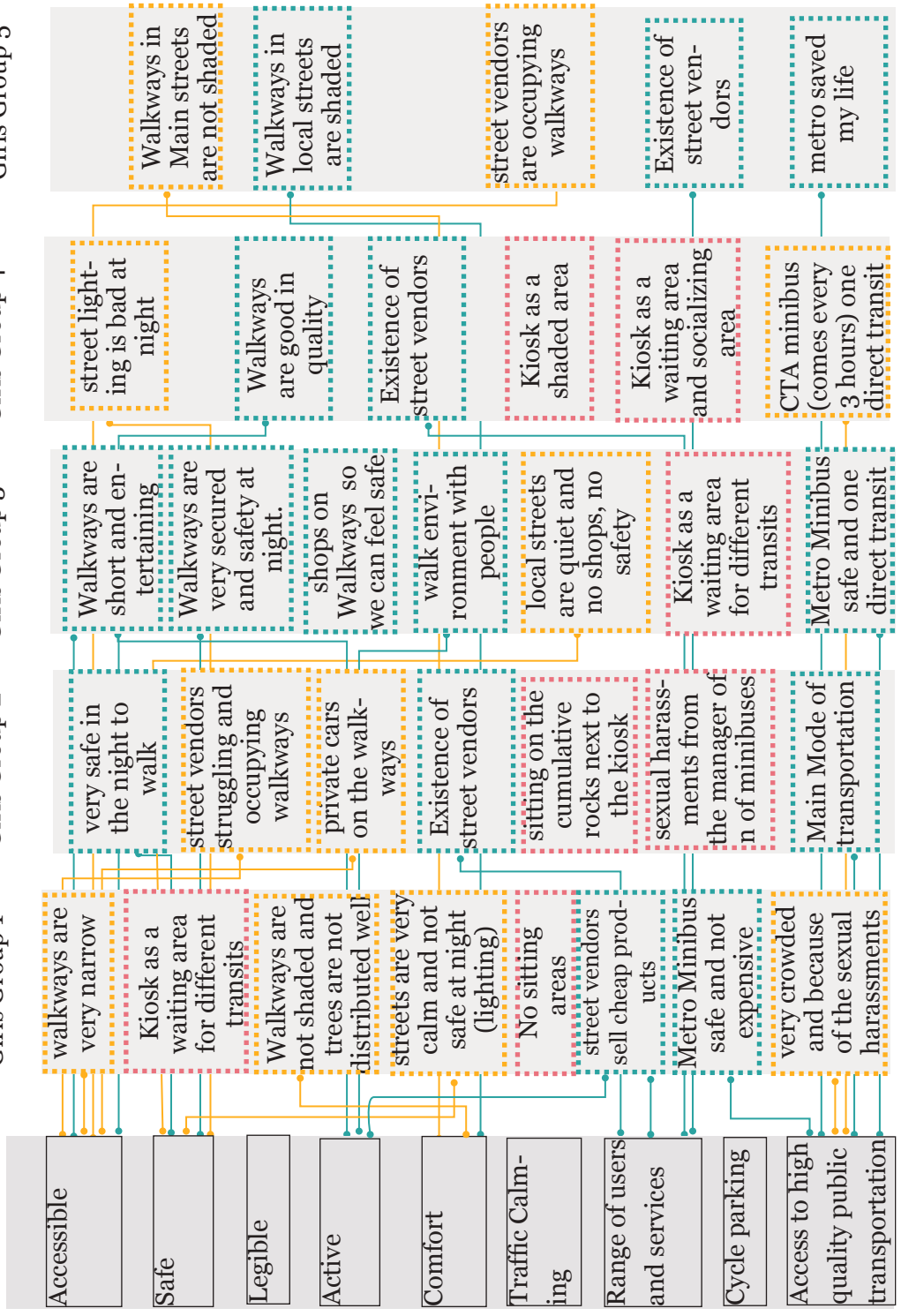


Figure (98): Kolet Al Banat Station-users
Source: Author

is the unsafe crossing either in front of the station, because it is a square, or in the big main street, different accident stories from users and from observations. Although in kolet Al Banat station residents were annoyed from street vendors and the diverse of ground floor activities, in Al dokki station the annoyed part were not from just the type of ground floor activities across the walkways but also the occupation of these activities to the walkways which also force users to avoid these blocking activities and walk with vehicles at the end.
In Al Malek Al saleh catchment area, from observations there were not any walkways, so people, motorcycles, transits, cars, tutkutks were sharing the street. However, this shared street is not only shared by people or vehicles but also with street vendors and kiosks and it is the main street in area. Residents and users highlighted other issues are different from the previous two catchment area, as any other informal area, the quality of streets are very poor, this besides the garbage everywhere especially in front of metro station's exits and entrances. Poor street pattern, garbage and the high dense area concluded with misleading streets and not oriented. Also, because of the mixed mode of transportation, people scared to walk and they prefer to take tutkuks instead of walking for scary five minutes. However, most of the streets are well shaded because of building and street orientation and trees, but that did not encourage people to walk. Moreover, users highlighted another aspect which is sexual harassments especially in front of the metro station in both sides.

7.1.2. Reflection on Activities and Core Catchment Areas

So from the three case studies, three main activities are related to metro station have been identified, indeed some of these activities can be found in other areas not just in core catchment areas but volume of these activities are related to the metro station. The three activities are economic activity, park and ride activity and social activity. These activities have been identified through activity sitting mapping, observations and interviews. Also, there are three type of moving users found in case studies, the Crossing User going from a place to place passing by metro station area, the Blocking User, street vendors that occupy the sidewalks and Transit User that is coming from or to metro station. These users created three types of movements, the Normal walk which people use walkways to reach their destinations, the Partially Mixing walk which people use walkways and streets with vehicles to reach their destination and finally the Mixing Walk which is people who walk with all type of vehicles because of the lack of walkways exist-

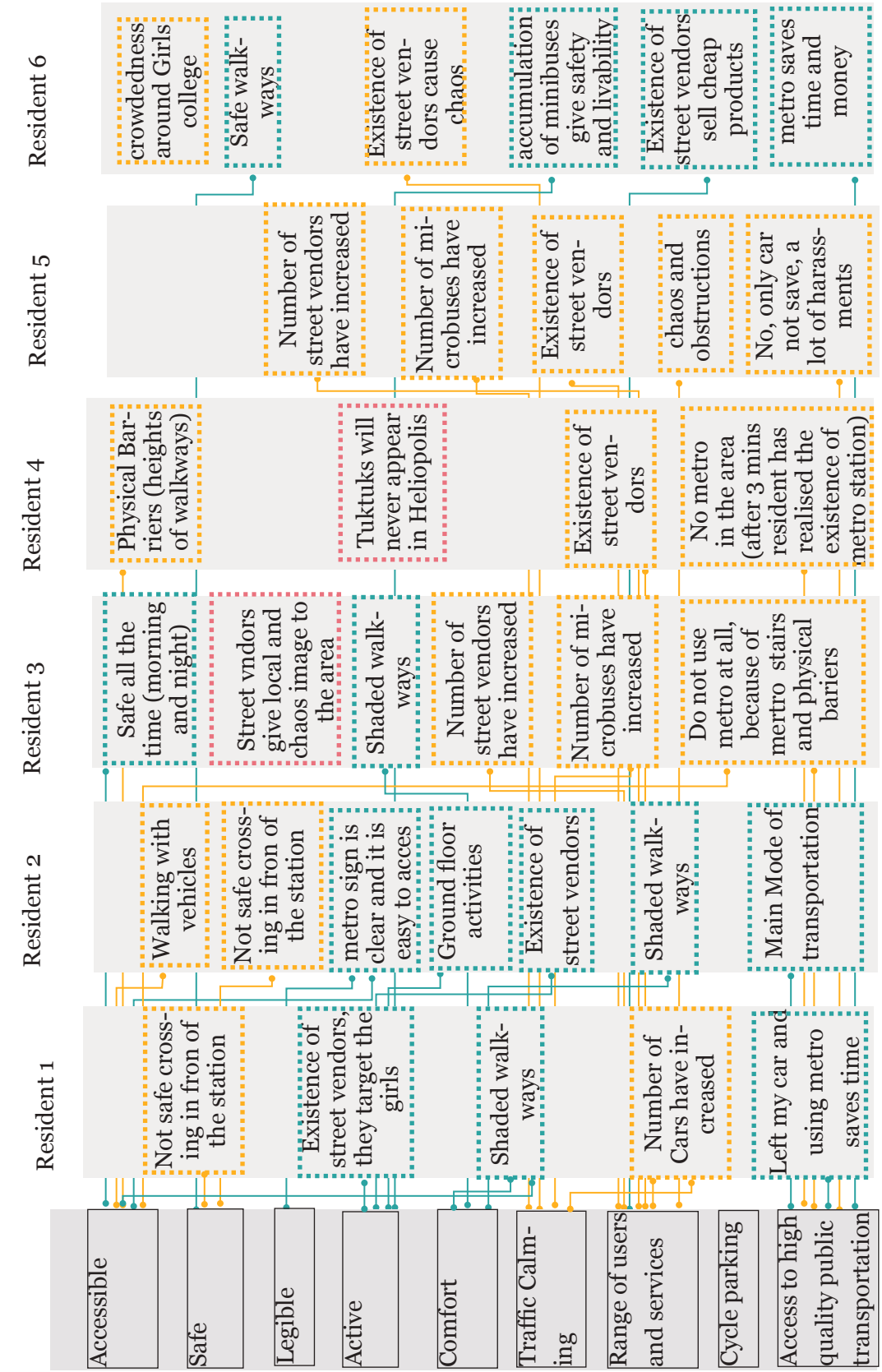


Figure (99): Kolet Al Banat Station-Residents. Source: Author

ence. The first type of movements have been found in Kolet Al Banat catchment area while the third type have been found in Al Al malek Al saleh and Al Dokki catchment area, the second type have been found in Al Malek Al Saleh catchment area.

Volume of activities is different in the three catchment areas; in kolet Al banat station number of street vendors are completely different from Al dokki catchment area or Al Malek Al saleh. The highest volume of activities is in Al Dokki station and then Al Al Malek Al saleh and finally Kolet Al Banat Station. Different users prefer to walk with vibrant ground floor activities especially women and girls because they feel safe and secured, however, in the three catchment areas most of users were criticizing the existence of street vendors because they are blocking their walks but the majorities were supporting them for being in the area either because they are buying from them or because they are “Morza’en” and they do not have economic source.

7.1.3.Transits and catchment areas:

According to metro stations classification in chapter six, the three selected catchment areas are connected already to different transits within 500 meters, however some of catchment areas are not well connected to public transit i.e. in Kolet Al Banat Station and Al Dokki station different types of transits are passing by the station and they are well connected, however, in AL Malek Al Saleh station, because the quality of street network and pavements are poor this leaded to lack of formal public transit access the area. Also, this leaded to the dependence on Tuktuks more than walking because streets are not safe to walk, based on interviews, and streets quality and connectivity is poor.

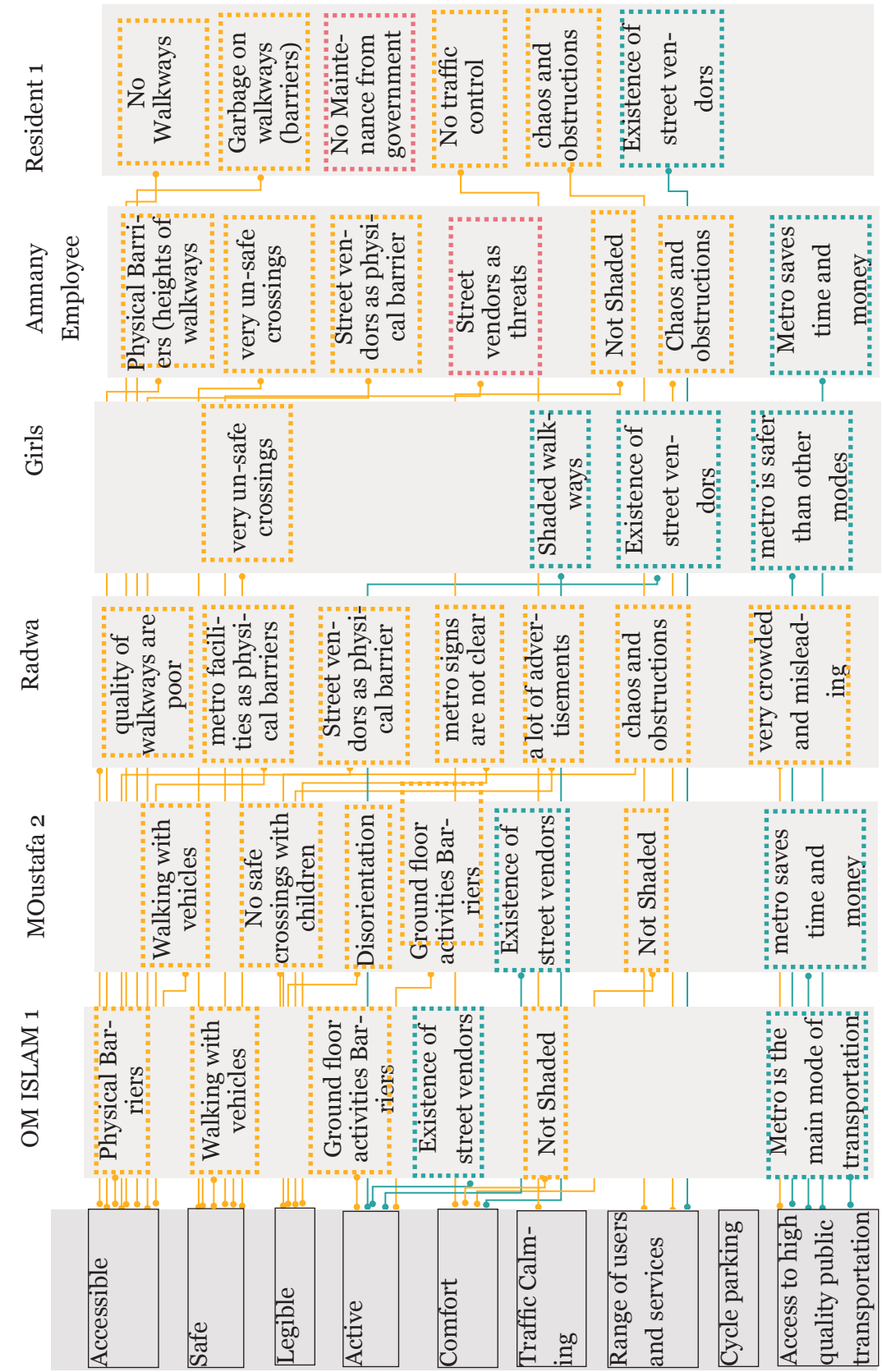


Figure (100): Al Dokki Station-users and residents. Source: Author

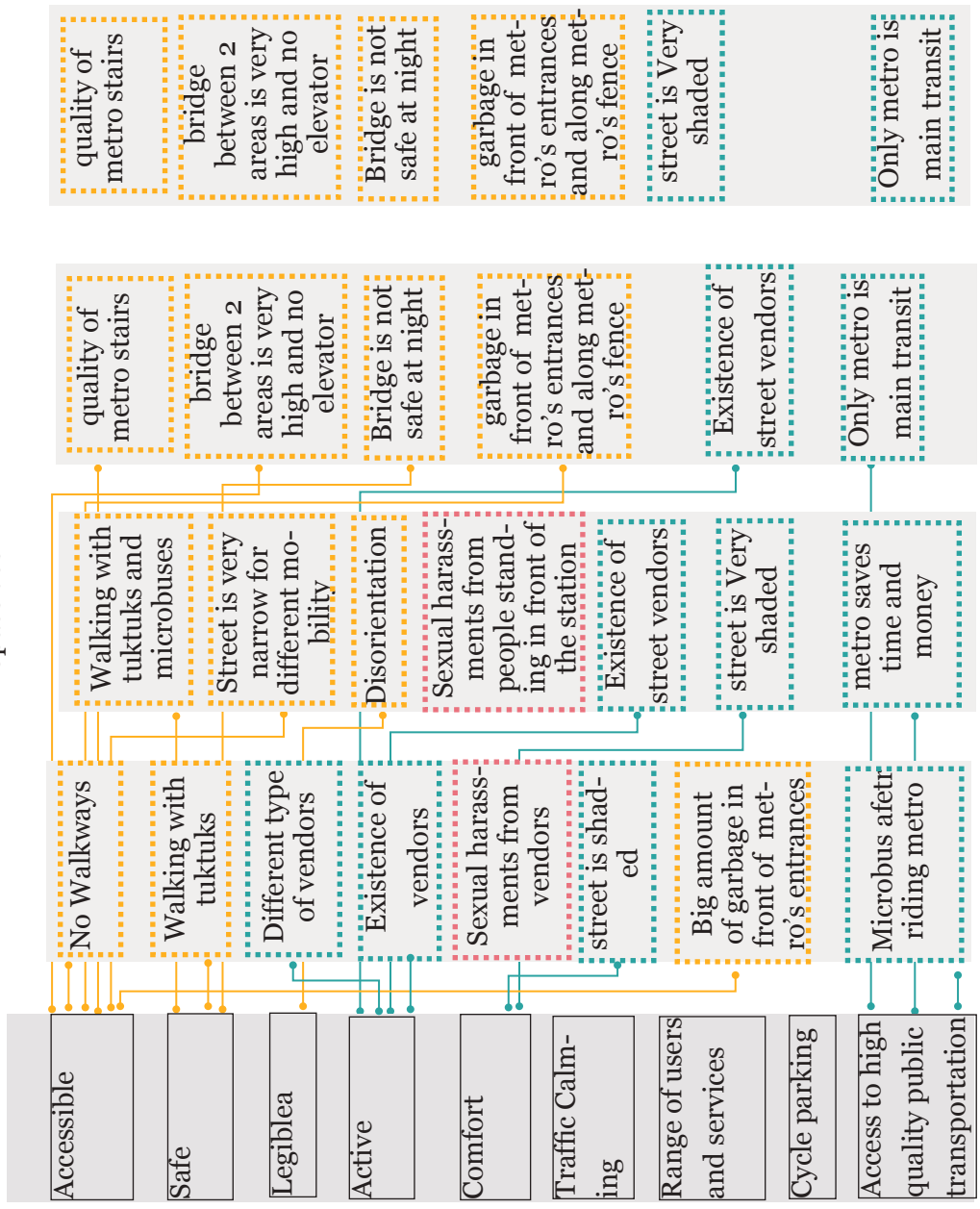


Figure (101): AL Malek Al Saleh Station-users and residents. Source: Author

7.2.Relation between Built Environment and Human Behaviour:

The objective of selecting three different catchment areas were not to compare between the three case studies, however, was to learn and understand the interaction of people in metro's catchment area in Cairo. So, from the previous understanding and reflection, this part highlights if their relation between different built environment elements and human behaviour or not. In addition to understand the other factors that affected this behaviour within the catchment area. Figure (102) illustrates the relation between street pattern, residential density and residents' social class, human behaviour and other factors.

7.2.1.Street Pattern and Human Behaviour

From the previous understanding two types of street pattern have been identified either grid, and the size of blocks are small and medium, which achieve good street connectivity and pedestrian connectivity, or organic and size of blocks cannot be determined, which achieve poor street and pedestrian connectivity. Street pattern has very big influence on people's movements pattern; as mentioned before three movement patterns have been identified, so good street pattern ended with Normal Walking but that depends also on other factors such the quality of walkways as in Kolet Al Banat Station. That does not mean that good street pattern can end with a Normal walk only, but it can end with Partially Mixed Walk as In Main streets In Al Dokki station, that is because of the poor quality of the walkways or the lack of law enforcement on street vendors that occupy the sidewalks and ground floor activities that also transgress the sidewalks. The third movement type which is Mixed Walk, this type of movements are connected to the organic street pattern that ended with poor street connectivity, poor and inadequate design quality.

7.2.2.Residential Density, Land use and Human Behaviour

The three stations represent three different residential densities, however each catchment area is located within two or four districts, but still the residential are approximately the same. Al Malek Al Saleh represents the highest residential density in the three case studies, while Al Dokki catchment area is the second highest and the lowest is Kolet Al Banat catchment area. So, from observations and interviews, when the density was low, the volume of people's movements was medium. However, when the residential density was medium, people's movements was high and when residential density was high, people's move-

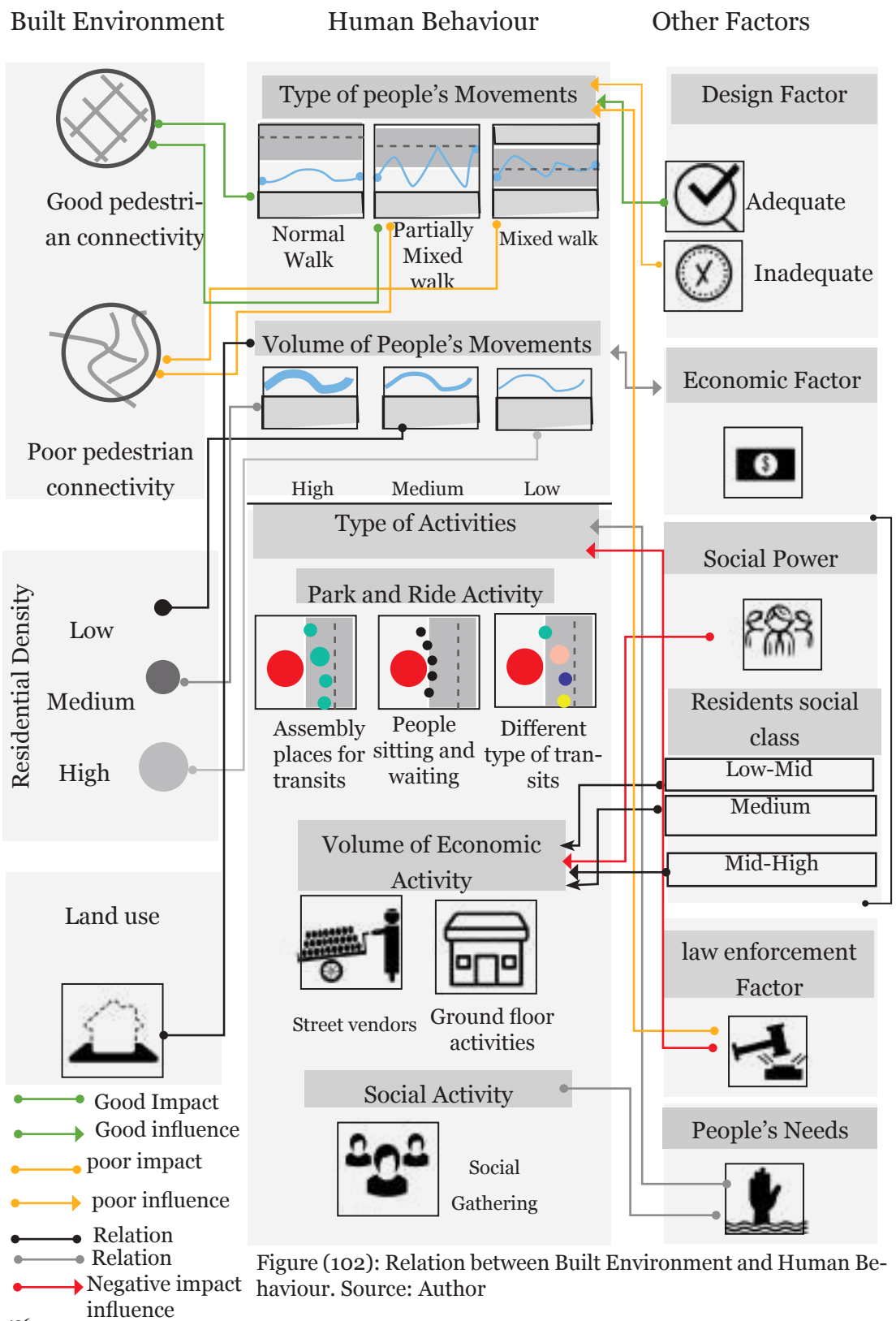


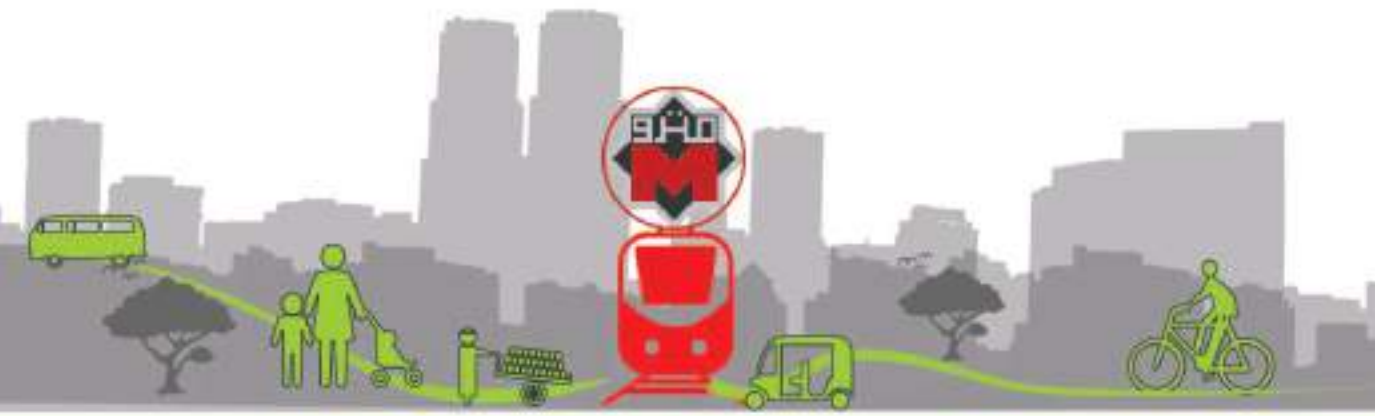
Figure (102): Relation between Built Environment and Human Behaviour. Source: Author

ments was low. This gives a hint that the density is not only the main factor that affects people's movements, land use is very important factor also economic factor is mutual effect factor.

7.2.3.Other factors and Human behaviour:

Social Factor is also a factor that affected type and volume of activities in catchment areas and should be considered also it came up strongly from the three case studies. Social factor is considered through social power and residents' social class; social power has very strong influence on type of activities. In other words, in Kolet Al Banat catchment area residents' power is very strong and still rejecting the existence of street vendors in the area, also residents' sense of belonging is very high. Otherwise, because of the high mixed use in Al Dokki area, residents do not have sense of belonging to the area, however they tried to contact AlHay different times for controlling street vendors but with any action.
Another factor is lack of law enforcement, if there is a real law enforcement for ground floor activities that are occupying sidewalks and even streets in some parts, there will be a control for the type and volume of activities, also it will affect people's movements.
Moreover, people's needs are driving factors that affect human behaviour such as the park and ride activity with the diversity of transits and social activities that appeared in three catchment areas and also social factor is a driving factor one more time.

Part III: Adapting Knowledge



8.Conclusions

This chapter attempts to develop design guidelines for the governmental institutions, developers, private initiatives and researchers, in order to increase and to integrate people who walk and cycle so they can depend on public transportation especially metro transit. These guide lines and recommendations are for special use catchment area that has been identified in Part II. So, compiling the theoretical part, previous analysis, people's needs and priorities, the guidelines include them together. This part is divided into two classifications, firstly design guidelines for the core catchment area level and the catchment area level. Secondly, recommendations for the catchment area on city level, which means from urban planning perspective, with taking social factors in consideration. In addition it ends with research conclusion and main findings.

8.1.Design Guidelines and Recommendation for metro's catchment areas in Cairo

8.1.1. Design Guidelines for catchment area level

The core catchment area mainly occurs in main streets which high transits, highest volume of movements and activities appear. So, from previous analysis and interviews, some elements are commonly should exist in any station area, however from the selected case studies, some of these elements have been done by people unconsciously to fulfil their needs. Also, the objectives of each element came as compiling between theoretical part and people's opinion about the priority of each principle that should be exist. So, the core catchment area should contain different elements to fulfil people's needs and achieve proper design as following:
•**Shelters:** each station area should has different lightened and comfort shelter spots in the intersection points of multi transits, so people can sit and wait to other transits. Number of shelters in each area could be calculated based on volume

of people's movements and number of mass transit.
•**Economic Activities:** control the type of economic activities around station by law enforcement. In addition, these types of economic activities should be suitable for travel behaviour without blocking sidewalks and people flow.

•**Crosswalks:** create safe crossings for pedestrian especially elder people, children, family and disabled people. Also these crosswalks should be in main streets, in front of metro's exits and in front of handicapped curbs which means continuity between pedestrians, curbs and crosswalks.
•**Park and Ride:** Create space for park and ride lots which multi-modal can park and take place with taking into considerations passenger pick-up and drop-off to avoid congestions and offer safety for passengers. This park and ride facilities should be accessible and connected to metro's exits and different public transit.
•**Bikes and motorcycles** parking: create safe and secured space for bikes and motorcycles separated from vehicles and pedestrian movements
•**Parking lots:** Surface parking should be located away from main streets and metro's exits and designed separately, which means each station has to have adequate parking lots suitable for number of each area users.

Catchment area level:
On the catchment area level, as also the core catchment area is included, from the analysis in chapter six, six elements are playing crucial role in pedestrian movements and access to metro station. Each element has objectives as they are part and complete each other. So, the main objectives of these elements to create connected, complete and accessible built environment.
Walkways:
Walkways should be divided into passenger and pedestrian zone and furnishing zone to be clearly accessible, active and safe. All the walkways within catchment area especially in main streets should be promoting vibrant ground floor activities, barrier free either physical such as parking cars on sidewalks, heights of walkways or temporal barriers such as street vendors, fenced areas especially for embassies or governmental institutions. Heights of walkways should be all in the same height (12-15cm) to be accessible to elder people and children. In addition to the surface materials of walkways, there should be a control and law enforcement of selecting sidewalks material not each shop or coffee shop select the desirable material.

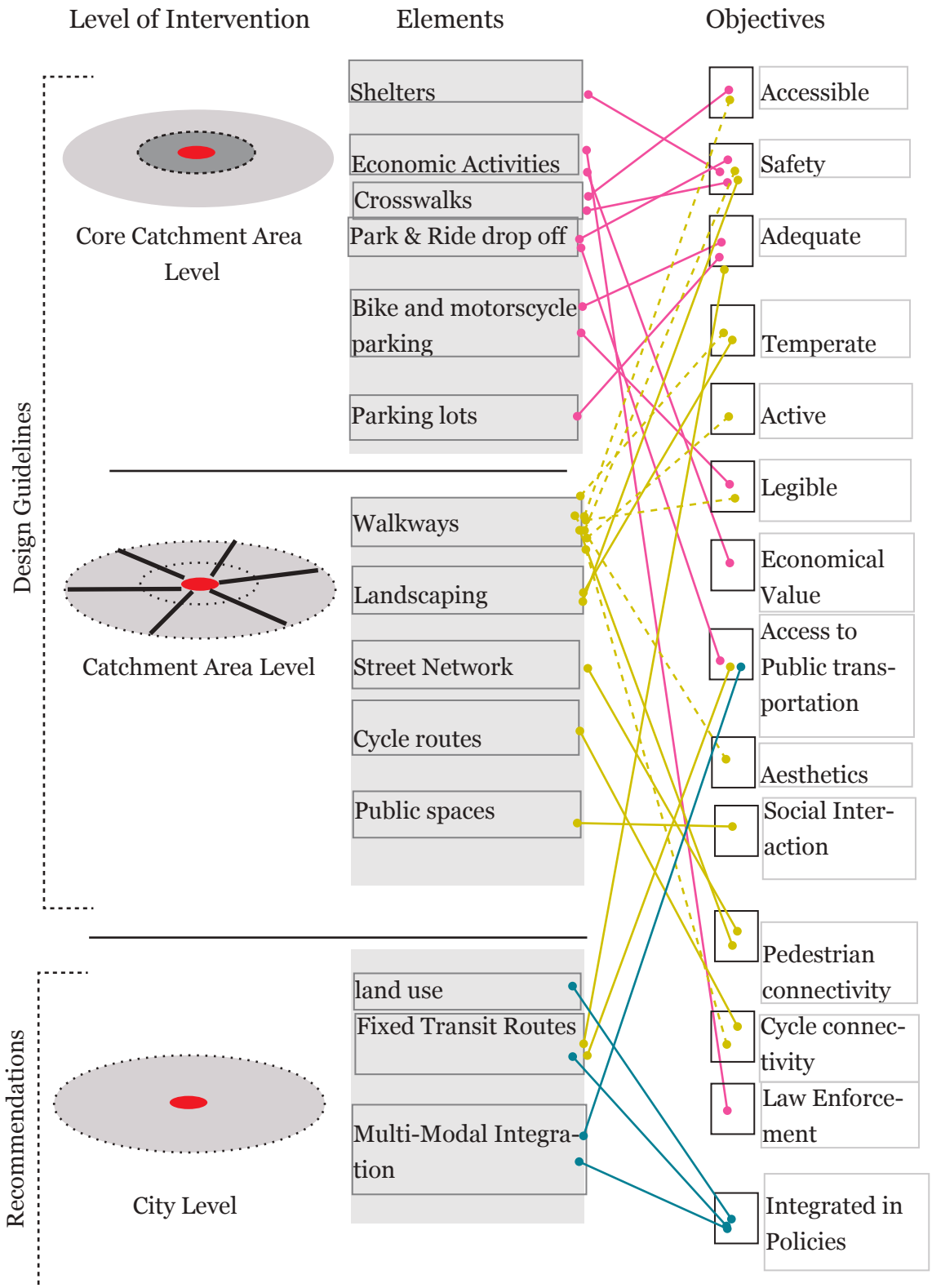


Figure (103): Guidelines and recommendations for Cairo's Metro catchment areas . Source: Author

Moreover, walkways should be legible and easily oriented from and to the station, in addition to the importance to create aesthetically sidewalks in terms of clear understanding and easily oriented to the station. That should be applied especially in areas that have special urban character such as downtown and historical areas. Walkways should be connected with street curb ramps and cross walks to achieve pedestrian connectivity and safe pedestrian realm.

Landscaping:

As mentioned before that the walkways should be divided into pedestrian zone and furnishing zone. Landscaping as an element in catchment areas is defined through the furnishing zone. The furnishing zone should contain lighting elements with certain distribution based on the area and sidewalk's width. Also it should contain the shaded elements for the walkways, so these elements could be well-distributed trees or shaded elements within the building.

Street Network:

To create connected and complete pedestrian, street network should be also connected, block sizes should be also small to medium as the Egyptian law stated and suitable number of intersections, so it could increase the chances of pedestrians and cyclists to be safe and to add human scale dimension to street.

Cycle routes:

Also to increase the chances of depending on other mode of transportation and encourage the park and ride concept is to take into considerations bike routes. It should be safe, visible and well-known to users either by coloring the street or by physical barrier. It could start in main streets in catchment areas as first step and then in local streets.

Public spaces:

Catchment areas could have public areas for gathering, entertaining and social interactions especially in the mixed use areas that attract huge number of people

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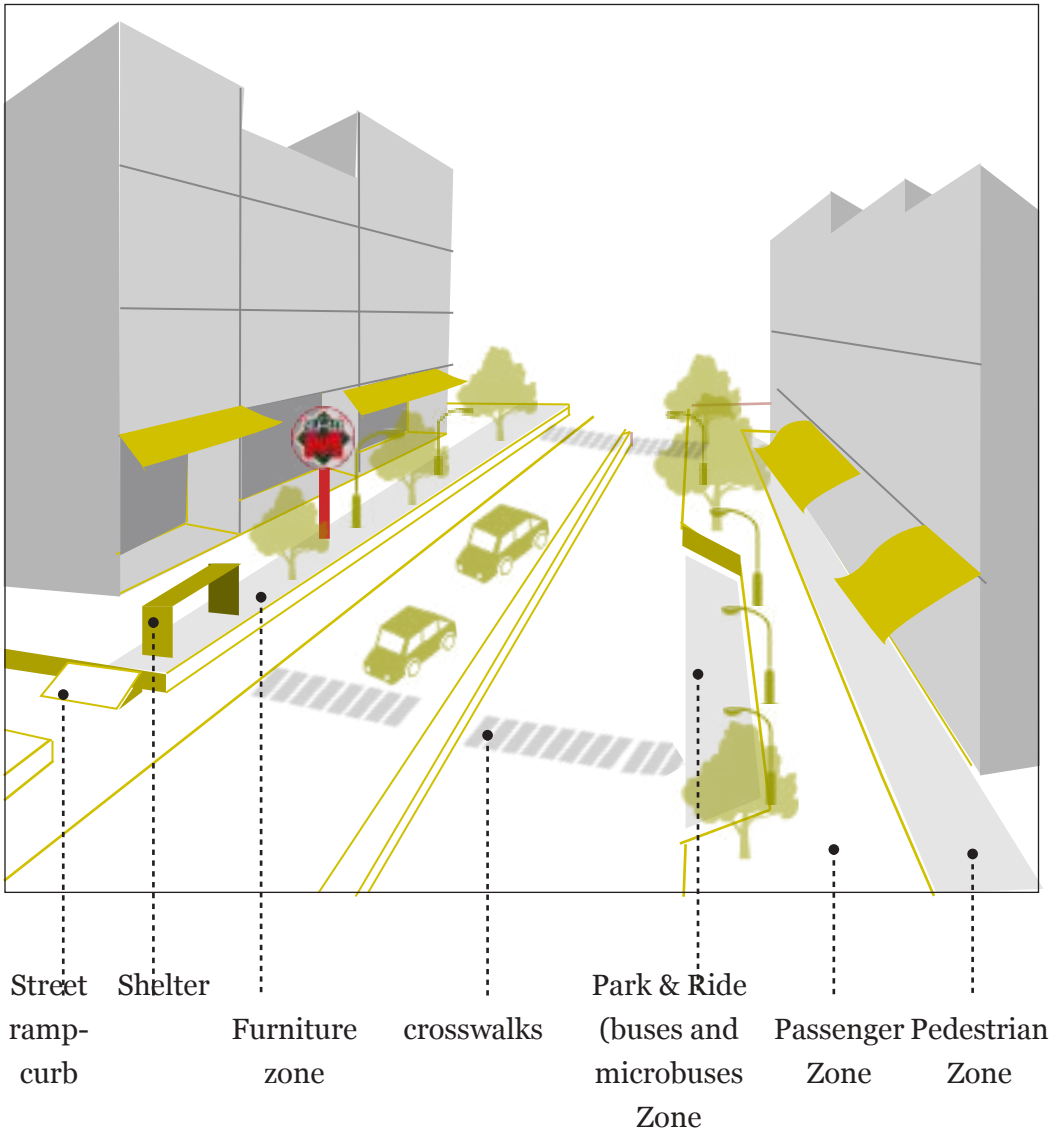

Figure (104):schematic diagram for typical catchment areas. Source: Author

8.1.2. Recommendations for catchment area on city level

This part is recommendations for catchment area on city level which includes land use, fixed transit routes and multi modal integration. It is recommended to include TOD concepts in national policies and strategies.

Land use:

land uses should be integrated with type of transits and to be included in strategies and policies under vision of urban development but with including public transit with land uses and infrastructure elements.

Because there is not integration between ministry of local development and ministry of transport, so it is recommended to generate a new organization for managing and creating national polices and plans which includes policies for all public transit and urban development.

Fixed transit Routes:

It is essential to have a fixed well known transit routes that are defined to all people, decision makers and practitioners.

Multi modal Integration:

Because there is no integration between CTA and Metro, so this organization that has been mentioned before, should be responsible for the integration of different transit modes and to offer easily, accessible information, maps and mobile applications to all people with offering the walkbale and shortest sidewalks to switch between different modes or to access specific public transit. In addition, integration with private sector that is already working on mobile application such Transport For Cairo (TFC).

Finally, for linking actors with the guiding principles figure (105) shows the link of different actors and who is responsible for applying the guiding principles for catchment areas on the three levels.

8.2. Summarized findings

The part concludes and summarises the main research findings from the theoretical and empirical work that have been done in the three selected case studies; also it highlights the importance of improving metro's catchment areas to fulfill people's needs. In addition it ends with recommendations for further research.

As the government's vision is to increase number of people who use public transportation, and as mentioned before that the metro is the second highest mass transit used by people in Cairo, so how through designing metro's catchment areas is to increase number of people depend on mass transit and to fulfill user's needs. So the research was divided into three parts, the first part was the theo-

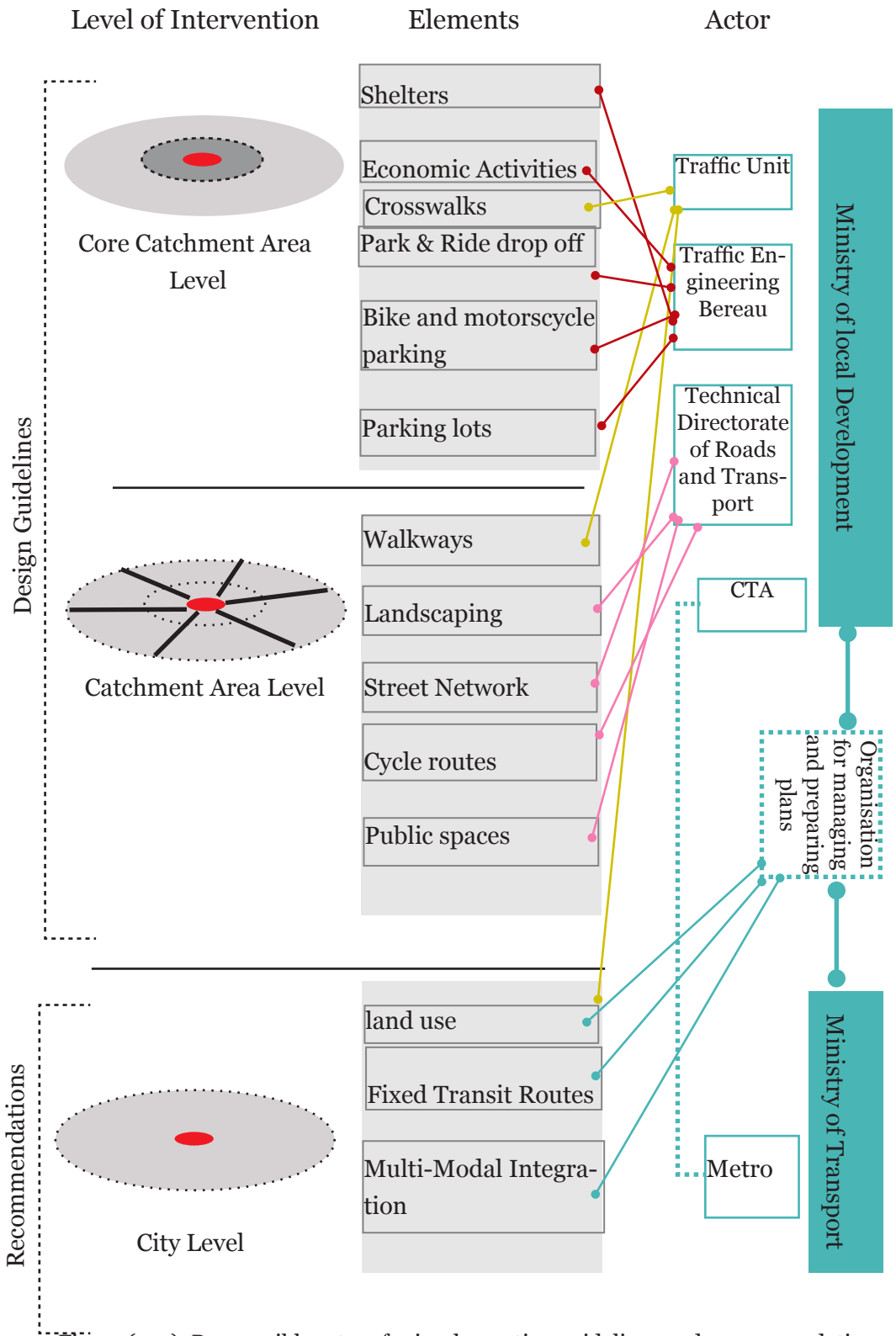

Figure (105): Responsible actors for implementing guidelines and recommendations.
Source: Author

retical part which discussed the concepts and definitions of human behavior and activities with reviewing literature reviews. Also, first part discussed definitions of transit catchment areas and how the term is used in transport and urban development field. Moreover, it reviewed the TOD typologies, concepts and guiding principles that done from different transport agencies to learn and understand how it could be applied in the Egyptian context. This part ended with the conceptual framework that have been applied in part two the empirical part. In the empirical part, the methodology that has been used in order to reach research objectives and answer research question is an inductive approach. Observations, behavioral mapping, semi-structured interviews and mapping physical settings are tools used for collecting data. The conceptual framework applied in part two on three levels, catchment area on city, primary catchment and core catchment area levels. Catchment area on city level ended with classification of metro's catchment area in Cairo. Four classifications of catchment areas have been determined, special use, urban center, fringes gate way and residential. It is found that most of metro's catchment areas in Cairo are categorizing as special use and the second highest category is residential then urban centers and then fringes gate ways. Since the highest percentage of catchment areas is special use category, therefore three case studies have been selected to study the human behavior and activities in metro's catchment areas. The three case studies have been analyzed through analyzing built environment and human activities and behavior in catchment area. The three catchment areas were different in street pattern, residential density and social class in order to understand the relation between human behavior and built environment in catchment area. The main findings of the three catchment areas for Kolet Al Banat Station, Al Dokki station and Al Al Malek Al Saleh are not only the built environment influence people's behavior and attitude but also there are other factors that have found. These factors are design factor, social class factor, people needs factor and law enforcement factor. So there are a lot of factors affect human behaviour in metro's catchment area and affected people movements. Thus, last chapter ended with design guidelines and recommendations to improve metro- catchment area and fulfill people's needs with taking into considerations who is responsible for managing and applying these guidelines on catchment areas.

In the end, every country has guidelines and design principles for each type of catchment areas, also these guidelines are integrated in their national policies. Not only developed countries or high transits system that applied TOD concepts and promote walking and cycling in their plans, but also developing and same

climate countries applied the same concepts and it worked in their contexts. So TOD concepts are recommended as a tool to be added in the national policy including pedestrians and cyclists in the national policy. However, the concept of TOD can be applied in some areas in Cairo, some catchment areas have potentials to be transit oriented and integrate pedestrian and cyclists with public transit, but for catchment areas located in dense and organic urban fabric, it is not fair to apply these guiding principles on those areas, because of the lack of infrastructure, the organic urban fabric and the poor quality of built environment so those areas need to be redeveloped to improve the quality of built environment with integrating TOD concepts. Also, there should be awareness about the right of walking, cycling and the right of use sidewalks and deal with the sidewalks as an important key role in the mobility system at all. Also, it is very important to re-distribute the role of each organization, follow-up and the supervision of catchment area to fulfill people and users' needs especially the local departments under each governorate. In addition, these guidelines are recommended to be added in the Egyptian design codes as the two codes, which are Smart Cities code and Quality of Life code do not include these design guidelines from the importance of catchment areas perspective.

For further research, it is very essential to translate these qualitative data into quantitative data for each guiding principles in order to be included in the Egyptian codes and Standards. Moreover the research just analyzed the catchment area for special use category, it is recommended to analyze catchment areas in each category in order to achieve solid understanding of the dynamics of catchment area on the three levels.

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Appendix (1) :Detailed Activity schedule

Date: .....
Zone: .....
Timing: .....

Activity	Actors		Description	Notes
	Gender	Age		

Appendix (2): Mobility Counts Schedule

Name: .....
Date: .....
Zone: .....
Timing: .....

Type of modes	Passerby	Number	Notes
Pedestrians	Men		
	Women		
	Children		
	Elders (women and men)		
	Handicapped		
Bicycle	Wheelchair		
	Bicycle		
	Motorcycle		

Appendix (3): Questions for interviews

General questions	What is your educational background?
	Do you live in this area? / Where do you live?
	Do you use metro/ public transit?
	What is the main reason that you are coming to this area?
	How did you come to this area? metro/Car / taxi/ microbus/ tuktuk?
Space User	
Accessibility and Transit connection	Describe your journey from/to metro station?
	What are the main challenges do you face while reaching the station?
	Is there any obstacles facing your walk to reach your destination?
	How long you take to reach metro station?
	How long you walk to reach nearest transit from metro station?
	What is the nearest stop for you that you are usually use?
Safety, active, comfort	Is the space adequate for number of people using it?
	Is the pathway to reach your transit mode clear to walk? Why?
	Is the pathway to reach your transit mode safe to walk? Why?
	Are you satisfied with the current activities in the space? Why?
	What are the elements that offer shade in the space?
	Are you come here at night? Why if not
Residents	
Diversity, vibrant	Does the space have diversified uses?
	What are the types of Activities that you are do not agree (events, markets, ground floor activities etc.)
	Are you satisfied with activities? (Normal, vibrant, too much)
	What is your opinion about street vendors?
	Does the government should remove them?
	Are you satisfied with the activity ground floor uses?
Existence of metro station in the area	Are you satisfied with the existing of metro station in the area?
	How the area has changed? (rent prices, number of people, number of vendors, number of vehicles)
	Did the metro station transfer the area to be more vital?
Street vendors	
	Why you are selling here?
	What are the main challenges do you face while selling?
	Government gives organized kiosks to street vendors, why you do not get one of these kiosks?

	Exist
	Doesn't exist
U.D.	Undefined

Appendix (4): Table of Cairo's metro stations

Station	Type of station	Station location	Dominant land use	Activities	Type of Connection (public mass transit)					Car parking	Stops or stations	Area's status	Availability of public spaces
					Regional		Local						
					Heavy trail transit	Other modes of transit	Metro (rapid mass transit)	Governemental (mini bus, bus,..)	Private (Microbuses)				
1.Helwan	End station	On Surface station	Residential, commercial, mixed use	Kiosks, street vendors						Y		Formal area	
2.Ain Helwan	Substation	On Surface station	Industrial	Kiosks						Y		Formal area	
3.Helwan university	Substation	On Surface station	Special use	U.D.						N		Formal area	
4.Wadi houf	Substation	On Surface station	Residential, industrial	U.D.						Y		Formal area	
5.Hadiyek helwan	Substation	On Surface station	Residential, industrial	Street vendors, kiosks						Y		Formal area	
6.Al masra	Substation	On Surface station	Residential	Street vendors, kiosks						Y		Informal area	
7.Tora al asmant	Substation	On Surface station	industrial	U.D.						Y		Informal area	
8.kozzika	Substation	On Surface station	Residential, industrial	Street vendors						N		Informal area	
9.Tora el balad	Substation	On Surface station	Special use	Street vendors, kiosks						Y		Specific features	
10.Thanknat el maddi	Substation	On Surface station	Residential, industrial	U.D.						Y		Formal area	
11.Al maddi	Substation	On Surface station	Residential	Street vendors						N		Formal area	
12.Hadek maddi	Substation	On Surface station	Residential, industrial	Street vendors						N		Formal and informal area	
13.Dar el slalam	Substation	Viaduct station	Residential, mixed used	Street vendors, organized markets						N		Informal area	
14.Al zhara	Substation	On Surface station	Residential	Street vendors, kiosks						Y		Informal area	
15.Mar gerges	Substation	On Surface station	Residential, special use	Street vendors, kiosks						Y		Informal area	
16.Al malek l saleh	Substation	On Surface station	Residential, special use	Street vendors						N		Formal and informal area	
17.Al syda zainab	Substation	Viaduct station	Residential, special use	Street vendors, kiosks, organized market						Y		Informal area	
18.Saad zaghlol	Substation	Underground station	Governmental, downtown	street vendors, organized market						Y		Formal area	
19.Sadat	Central station	Underground station	Mixed uses, downtown	Street vendors						N		Formal area	
20.Gamal Abdl nasser	Central station	Underground station	Commercial and mixed uses, downtown	Street vendors and kiosks, organized market						Y		Formal area	
21.Ahmed oraby	Substation	Underground station	Mixed uses, downtown	U.D.						N		Formal area	
22.Alshohdaa	Central station	Underground station	Mixed uses, downtown	Kiosks and markets						N		Formal area	
23.Ghamra	Substation	Viaduct station	Industrial, mixed uses	Street vendors						Y		Formal area	
24.Al demerdash	Substation	On Surface station	Educational special use	Street vendors						N		Formal area	
25.Manshyet Al sadr	Substation	On Surface station	Residential, special use	Street vendors, kiosks						Y		Informal area	
26.Kobri Al kobba	Substation	On Surface station	Residential, special use	Street vendors						Y		Formal area	
27.Hammat l kobba	Substation	On Surface station	Residential, special use	Organized market (souq Algoba)						Y		Formal area	
28.Sarraya Al kobba	Substation	On Surface station	Special use	U.D.						Y		Formal area	
29.Hadek al zayton	Substation	On Surface station	Residential	Street vendors, organized markets						Y		Informal area	
30.Hlmet Al zayton	Substation	On Surface station	Residential	Street vendors						Y		Informal area	
31.Al matrya	Substation	On Surface station	Residential	Street vendors						N		Informal area	
32.Ain shams	Substation	Viaduct station	Residential	Street vendors						N		Informal area	
33.Ezbet l nakh	Substation	On Surface station	Residential	Street vendors						Y		Informal area	
34.Al marg l kadema	Substation	Viaduct station	Residential	Street vendors, organized markets						Y		Informal area	
35.Al marg l gdeda	End station	On Surface station	Residential	Street vendors						N		Informal area	

Appendix (4): Following Table of Cairo's metro stations

Station	Type of station	Station location	Dominant land use	Activities	Type of Connection (public mass transit)					Car parking	Stops or stations	Area's status	Availability of public spaces
					Regional		Local						
					Heavy trail transit	Other modes of transit	Metro (rapid mass transit)	Governemental (mini bus, bus,..)	Private (Microbuses)				
1.Shobra Al khema	End station	Viaduct station	Residential, industrial	Street vendors, kiosks, organized markets						U.D.		Informal area	
2.Kolet Al zeraa	Substation	Viaduct station	Educational special use	Street vendors, kiosks						Y		Informal area	
3.Al mazlat	Substation	Underground station	Mixed uses, corridor	Street vendors, kiosks						Y		Informal area	
4.Al khalafawy	Substation	Underground station	Residential, mixed uses	Street vendors, kiosks						N		Formal area	
5.Saint Treza	Substation	Underground station	Residential	Street vendors, kiosks						N		Formal area	
6.Rod Al farag	Substation	Underground station	Residential mixed uses, Faculty of engineering	U.D.						N		Formal area	
7.Masrra	Substation	Underground station	Residential, Mixed uses	U.D.						Y		Formal area	
9.Al Attba	Central station	Underground station	Commercial mixed uses, downtown	Kiosks						Y		Formal area	
10.Mohamed naguib	Substation	Underground station	Mixed uses, downtown	U.D.						Y		Formal area	
12.Opera	Substation	Underground station	Cultural (opera)	U.D.						N		Formal area	
13.Al dokki	Substation	Underground station	Mixed uses, governmental	Street vendors, kiosks						Y		Formal area	
14.Behos	Substation	Underground station	Mixed uses, governmental	Street vendors						N		Formal area	
15.Cairo university	Substation	Viaduct station	Landmark (cairo university)	U.D.						N		Informal area	
16.Faysal	Substation	Viaduct station	Residential, mixed uses (faculty of agriculture)	U.D.						Y		Informal area	
17.Giza	Substation	Viaduct station	Residential, mixed use, corridor	U.D.						Y		Unplanned area	
18.Giza suburbs (om l masreen)	Substation	Viaduct station	Residential, mixed uses, industrial	Street vendors, kiosks, organized market						Y		Unplanned area	
19.Sakkert mekky	Substation	On Surface station	Residential	U.D.						Y		Informal area	
20.El moneb	End station	On Surface station	Residential, corridor	U.D.						Y		Informal area	
13.Al Ahram	Substation	Underground station	Residential	U.D.						N		Formal area	
14.Kolet al banat	Substation	Underground station	Residential, Kolet l bnat	Street vendors						N		Formal area	
15.Staduium	Substation	Underground station	Residential, stadium, mix of use	U.D.						N		Formal area	
16.Cairo fair	Substation	Underground station	Cairo fair	U.D.						N		Formal area	
17.Abbasseya	Substation	Underground station	Ain shams university (educational) mixed use	U.D.						N		Specific features	
18.Abdo pasha	Substation	Underground station	Residential , faculty of engineering	No street vendors						N		Specific features	
19.El geisha	Substation	Underground station	Residential mixed use	U.D.						N		Specific features	
20.Bab Elsheriaa	Substation	Underground station	Residential	U.D.						N		Specific features	

Appendix (5): Table of classifications of Cairo's metro stations

Un -Developed Areas	Developed Areas			
	Residentaial Area	Urban centers	Special Use	Fringes Gateway
8. Kozzika	1. Helwan	19. Sadat	3. Helwan university	20. El moneb
7. Tora al asmant	4. Wadi houf	20. Gamal Abdl nasser	15. Mar gerges	1. Shobra Al khema
9. Tora el balad	6. Al masra	21. Ahmed oraby	16. Al malek l saleh	17. Giza
	11. Al maddi	22. Alshohdaa	17. Al syda zainab	35. Al marg l gdeda
	12. Hadek maddi	9. Al Attba	24. Al demerdash	3. Al mazlat
	13. Dar el slalam	10. Mohamed naguib	25. Manshyet Al sadr	
	14. Al zhara		26. Kobri Al kobba	
	29. Hadek al zayton		27. Hammat l kobba	
	30. Hlmet Al zayton		28. Sarraya Al kobba	
	31. Al matrya		2. Kolet Al zeraa	
	32. Ain shams		6. Rod Al farag	
	33. Ezbet l nakhl		12. Opera	
	34. Al marg l kadema		15. Cairo university	
	4. Al khalafawy		14. Kolet al banat	
	5. Saint Treza		15. Staduium	
	7. Masrra		16. Cairo fair	
	18. Giza suburbs (om l masreen)		17. Abbasseya	
	19. Sakkert mekky		18. Abdo pasha	
	13. Al Ahram		19. El geish	
	16. Faysal		20. Bab Elsheriaa	
	2. Ain Helwan		18. Saad zaghlol	
	5. Hadyek helwan		13. Al dokki	
	10. Thanknat el maddi		14. Behos	
			23. Ghamra	
3	23	6	24	5

الملخص

تقع محطات المترو عادة في مناطق مختلفة سواء في وسط المدينة، في الضواحي أو في الأحياء السكنية حيث يوفر التنقل بوسيلة مريحة للركاب من وإلى أماكن العمل وغيرها من الوجهات. تتاوجد بعض المحطات في المناطق التي تشهد نموا وتغيرا سريعا، في حين توجد مناطق أخرى في أحياء أكثر رسوخا. إنعكاس ذلك على محطات المترو في القاهرة، فيمكن العثور على وسائل نقل مختلفة عادة في مكان واحد، ولا يتم تصميم المنطقة المحيطة لإستيعاب كل منها معا. أيضا، ليس كل الناس، ذوي الاحتياجات الخاصة والإعاقات وجميع مستخدمي وسائل النقل المختلفة (سائقي السيارات وراكبي الدراجات والمشاة) يستطيعون الوصول إلى محطة المترو. كل هذه التحديات أدت إلى ان المناطق المحيطة بمحطات المترو مليئة بالفوضى، والاضطراب، مضللة وغير آمنة.

يركز هذا البحث على المناطق المحيطة لمحطات النقل العابر وخاصة المترو والتي لها تأثيرات كبيرة على استعمال الأراضي، والتنمية، والأنشطة والسلوك البشري. كما أنه يتناول وصف المنطقة الواقعة بين وسائط النقل ومناطق محطات المترو، مع وضع في الاعتبار ان لكل منطقة أنماط استخدام مختلفة. تلعب هذه المناطق دورا هاما كمناطق دخول رئيسية إلى محطات المترو، ومن المهم أيضا فهم كيفية تفاعل هذه المناطق مع الأرصفة والمباني و وأماكن الجلوس والأنشطة التجارية من حولها.

وفي النهاية، الدافع الرئيسي من هذا البحث ترتفع من العملية اليومية من قبل الباحث على المناطق حول محطات المترو. البعد البصري للهذه المناطق يحتاج إلى التحقيق مع الإشارة إلى تسهيل فعالية نظام التنقل. لذا، فإن البحث الحالي يجادل إعدادات المناطق حول محطة المترو كجزء أساسي في نظام التنقل التي قد لا تصمم لتلبية احتياجات الناس ولأغراض مختلفة. وأخيرا، فإن الهدف من هذا البحث هو تحليل هذه المناطق والتحديات التي في تصميمها والتي ادت لهذا السلوك البشري وأنشطتها في هذه الأماكن. النتائج المتوقعة من هذا البحث هو وضع مبادئ توجيهية للمناطق حول المترو حتي تلبي احتياجات جميع المستخدمين بكل سهولة ويسر.

الكلمات الدالة: ***transit Catchment area, Pedestrian Friendly, Transit Oriented Development TOD, Human Behaviour***

إقرار

هذه الرسالة مقدمة في جامعة عين شمس وجامعة شوتجارت للحصول على درجة العمران المتكامل والتصميم المستدام. إن العمل الذي تحويه هذه الرسالة قد تم إنجازه بمعرفة الباحث سنة ...

هذا ويقر الباحث أن العمل المقدم هو خلاصة بحثه الشخصي وأنه قد اتبع الإسلوب العلمي السليم في الإشارة إلى المواد المؤخوذه من المراجع العلمية كلٌ في مكانه في مختلف أجزاء الرسالة..

وهذا إقرار مني بذلك،،،

التوقيع: منة الله عارف

الباحث: منة الله محمد فتحي محمد عارف

التاريخ:07/29/2018

السلوك البشري في المناطق حول محطات المترو في القاهرة:نهج نحو تحسين المنطقة حول محطات المترو لتلبية احتياجات المستخدمين

مقدمة للحصول على درجة الماجستير في العمران المتكامل والتصميم المستدام

أعداد: منة الله محمد فتحي محمد عارف

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أ.د.....
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جامعة .....

أ.د.....
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جامعة .....

تاريخ المناقشة:.....

الدراسات العليا

ختم الإجازة

أجيزت الرسالة بتاريخ:.....

موافقة مجلس الكلية .../.../...

موافقة مجلس الجامعة .../.../...

جامعة عين شـــــمس

جامعة شتوتجارت

07/29/2018

جامعة عين شـــــمس

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رسالة مقدمة للحصول على درجة الماجستير في العمران المتكامل والتصميم المستدام

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يوليو 2018