APPLICATIONS OF GIS AND REMOTE SENSING TECHNIQUES FOR STUDYING THE HOUSING PATTERNS IN CAIRO GOVERNORATE A STUDY IN URBAN GEOGRAPHY

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Hanan Mosad Abdraboh Mosad
Geboren in Kairo, Ägypten

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Erklärung:

Ich versichere hiermit, die vorliegende Arbeit selbständig und nur unter Verwendung der angegebenen Quellen und Hilfsmittel verfaßt zu haben.

Assertion:

All views and results presented in this thesis are those of the author unless stated otherwise.

Dedicated to my dearest husband and sons
with love and gratitude

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1 INTRODUCTION

1.1 Background

As in many developing countries, Egypt has been overwhelmed with the challenges that accompany rapid urbanization and population growth and change. Formal sector activity has failed to keep pace with the momentum created by the needs of the city's inhabitants.

In this situation, the majority of the poor have been housed in one of two ways. The first way is through the subdivision and filtering down of existing housing. This has produced overcrowded, unhealthy and dangerous housing in older neighbourhoods that observers have labelled slums. The second way in which the poor have found shelter is by erecting their accommodation. They have resorted to informal land development and alternative housing options in what has come to be known as informal settlements or *ashwayat*.

Informal areas refer to a wide range of dense residential areas formed of communities housed in self-constructed shelters that are perceived as informal on the basis of their legal status, their physical conditions or both (Abdelhalim 2010, p. 2).

From a formal perspective, these areas are unplanned, illegal entities that suffer from a lack of adequate services and infrastructure. They are considered illegal because they do not conform to statutory rules and formal regulations.

Cairo, the capital of Egypt (*Al-Qahirah*, the victorious), faces a tremendous shortcoming of available (formal) housing especially for the poor population. Informal settlements on the periphery of Cairo are the most visible manifestations of the challenges posed by rapid urbanization. They have developed mostly on private agricultural land and, less frequently on publicly owned desert land (El-Batran & Arandel 1998, p. 217).

According to the results of the last census 2006, Cairo's informal settlements are home to 39.3 % of the city's residents. It was estimated that the slum population is growing at over six times than the speed of formal Cairo (Sabry 2009a).

Considering the residents of formal and informal settlements represent a wide socio-economic spectrum, the relevance of socio-economic disparities to the existing housing patterns is investigated.

Using four case study areas reviews how urban morphology and land uses interact with socio-economic characteristics of the residents in each housing pattern case.

1.2 Administrative Setting of Cairo Governorate

Cairo Governorate or the city of Cairo (the capital of Egypt) is the main sector in the built-up conurbation of the Greater Cairo Metropolitan Area. Geographically, Cairo Governorate extends over the east bank of the Nile from El-Marg and El-Salam in the north and El-Nozha and Nasr City in the east to Dar el-Salam in the south. Administratively, Cairo is divided into 275 shiakhat, the plural of shiakha (Fig. 1), a word that literally means places controlled by a sheikh, but in modern times they represent areas controlled by a police station and, more importantly for our purposes, are the bounded areas for which census data are collected by the Central Agency for Public Mobilization and Statistics. Demographically, and according to the 2006 census, Cairo Governorate houses 7.8 million of the 18.29 million population of Greater Cairo (CAPMAS 2008a). The population is distributed on a total area of 378 sq. km. The built-up area represents 94 sq. km. and accordingly the actual population density reached to 83,000 person/sq. km.

It is worth mentioning that, in April 2008, the presidential decree no. 114 was issued herewith Helwan Governorate was split from Cairo Governorate. In 2011, the Armed Forced Supreme Council issued decision no. 63 to abolish the presidential decree no. 114 of the year 2008 and reincorporated its territory into Cairo Governorate.

Considering that the research was going on during this period and that the data were officially collected and published based on 2008 boundaries, the thesis employs the administrative boundary of the year 2008 by which the territory of Helwan was separated from Cairo Governorate (Fig. 1).

1.3 Statistical and Spatial Data Sources

- Statistical Data

The Central Agency for Public Mobilization and Statistics (CAPMAS) is the official organization responsible for censuses, surveys, public statistics and formal data and information. Furthermore, it is the main source of the digital administrative boundaries of the shiakhat of Cairo Governorate. Through the empirical investigation of the case study areas, two groups of maps are used. The first group is usually referred to as “Linear Objects” maps that include the layer of street network. The second group is usually referred to as the “Surface Objects” layers (version 1993 and 2006) and includes:

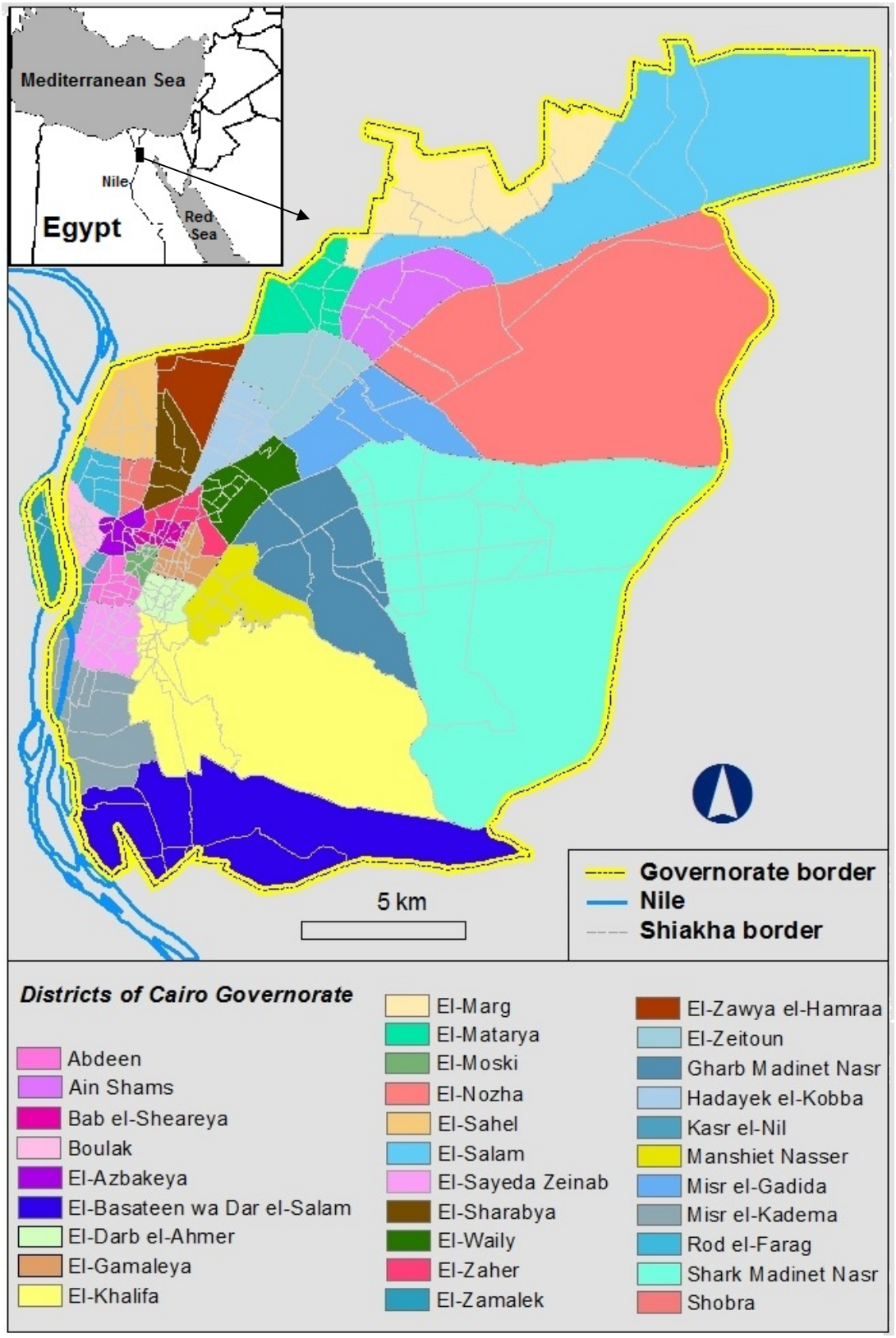


Fig. 1: Location and administrative subdivisions of Cairo Governorate

Source: Designed by the author.

(1) Residential buildings layer that shows the area and position of the main residential buildings within the administrative boundaries for each case.
(2) Landmark layer that shows the area and position of the main landmarks within the administrative boundaries for each case.

Moreover, studying the socio-economic characteristics of the population of Cairo Governorate depends to a large extent on statistics available in the Human Development Report for Cairo Governorate 2008 carried out by the Institute of National Planning, Cairo.

- Satellite images

To identify the extent of the built up area in Cairo Governorate, two available satellite images were used.
Landsat ETM+ image (acquired in 24 August 2006) was obtained from the United States Geological Survey (USGS) databases online resources. An IKONOS multispectral image, acquired in 2000, is used to help in image analysis.
To identify the existing street layout, high resolution Google Earth satellite image was used (acquired in 23 August 2010).

- Field study

In order to investigate and explore the potential spatial variations of the housing patterns in terms of morphological and structural composition, a fieldwork activity was carried out in January 2012. Observations were recorded using photographs and field notes.

1.4 Literature Review

This part presents a literature review of the attempts to classify housing patterns, in order to identify the most appropriate classification for developing spatial patterns of housing in Cairo.
Previous efforts to classify the housing patterns were mostly concerned with low-income housing. Such attempts can be summarized from a numbers of aspects. Firstly, in the developing world generally. Secondly, in Egypt. Thirdly, in Cairo.

1.4.1 Classification of Housing Patterns in the Developing World

The first attempt was made by Drakakis-Smith 1981. He referred to the types of housing provision only for low-income class in developing countries. His typology consists of public housing, commercially built dwellings and slum and squatter settlements (Drakakis-

Smith 1981). This typology, however, does not emphasize the process by which housing is made available to the poor.

Similar to the typology identified by Drakakis-Smith 1981, two other attempts were developed. Firstly, a conceptual model of the main modes of housing provision in the developing countries was designed by subdividing the two main structures – conventional (formal mode) and unconventional (informal mode) – into several other secondary substructures or sub modes (Keivani & Werna 2001, p. 72). Therefore, the conventional or formal mode can be divided into public, private and co-operative substructures, while the unconventional or informal structure can be divided into squatter settlements, illegal subdivisions and low-income rental housing. This conceptual model is shown graphically in Fig. 2.

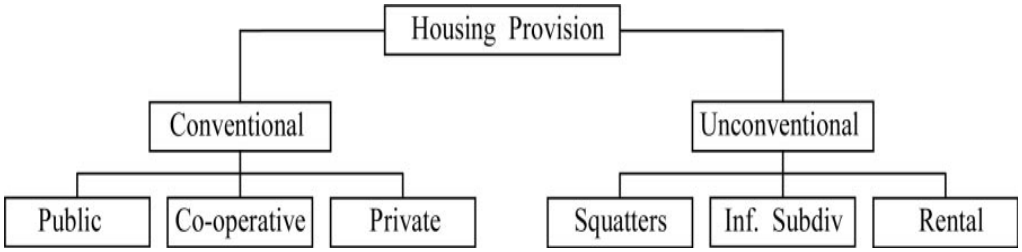


Fig. 2: A conceptual model of housing provision in developing countries

Source: Kleivani & Werna 2001, p. 72

Secondly, Pacione 2009 adapted the two previous models as shown in Fig. 3. According to the previous three attempts, housing is classified as conventional, if it is constructed through the medium of recognised formal institutions (e.g. banks and planning authorities) and in accordance with established legal practices and standards. Unconventional housing, which does not comply with established procedures, is usually constructed outside the institutions of the formal building industry, it is frequently in contravention of existing legislations, and it is almost always unacceptable to prevailing middle-class standards (Pacione 2009, p. 517).

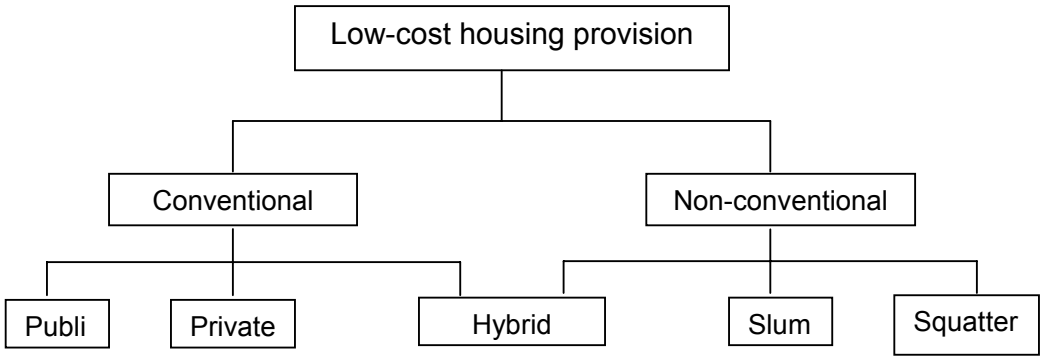


Fig. 3: Major sources of housing for the Third World urban poor

Source: Pacione 2009, p. 517

1.4.2 Classification of Housing Patterns in Egypt

Some researchers were concerned with classification of housing patterns mainly in Egypt. According to Soliman 1989, housing provision in Egypt has occurred in the form of a dual system, formal and informal housing (Soliman 1989). The differences between formal and informal housing relate specifically to the legality of tenure.
In his work in 2004, he divided the informal housing into three subgroups, namely semi-informal settlements, informal settlements and ex-formal (hybrid) settlements (Soliman 2004).

Informal housing involves the illegal occupation of mostly publicly-owned land, and is often constructed using self-help techniques. Semi-informal housing is not developed through established, regulated procedures, and does not utilize the recognized institutions of housing; but it has legality of tenure with formal occupation permits. Ex-formal housing generally describes homes that have built additional rooms onto the initial structure without the proper building permits or in violation of the city's building codes. These types of housing are no longer formal, by definition, but they do not violated as many laws as squatter settlements, so they are viewed as more socially and politically acceptable (Soliman 2004, p. 11).

Formal housing has three subgroups: private, public and slum housing. Each is formal in that it is built by affluent groups and organized institutions, in the form of individual or mass production, and uses a capitalist form of production. Accordingly, local building codes and regulated styles of construction and controls are drawn up by professionals. It is constructed with the labor of people who are different from those who consume the final housing product. The final product is usually consumed by higher- or middle-income groups and, to a certain extent, is dominated by the private sector. Relatively little formal

public housing is obtained by the mass of the Egyptian population, as in other Third World countries.

Abdelhalim 2010 referred to informal settlements as a wide range of residential areas formed of communities housed in self-constructed shelters that are perceived as informal on the basis of their legal status, their physical conditions or both. Categorizing informal areas based on these two criteria helps to identify different typologies. The criterion legal status differentiates between legal and illegal housing, where illegal housing designates all constructions that are either not following building and planning laws and regulations or are built on illegally acquired land. The criterion physical condition allows distinguishing between acceptable and deteriorated physical structures. The four categories that emerge designate different typologies of housing structures (Fig. 4), three of which are considered informal. There are legal, but deteriorated structures, such as old inner-city dilapidated houses that are usually subdivided and rented out to lower-income groups. There are also structures that are illegally built but are in acceptable physical conditions, however, somewhat lack access to water, electricity, sanitation and other basic services and infrastructure. On the other hand, there are illegal and deteriorated structures, such as simple shacks of impermanent building material that form pockets of shanty towns and are considered unsafe (Abdelhalim 2010, p. 3).

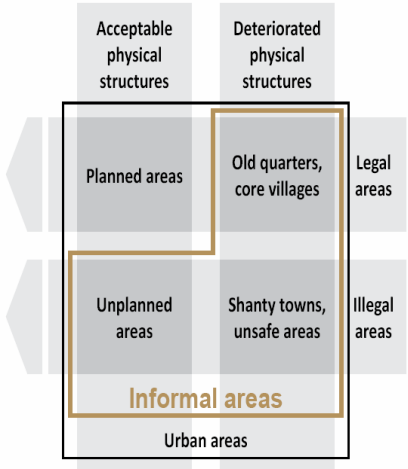


Fig. 4: Classification of urban areas according to legal status and physical condition

Source: Abdelhalim 2010, p. 3

A temporal classification of informal areas in Egypt was made by the World Bank 2008. Two categories were identified: old village style informal areas and classic informal areas. The former were prominent in the 1960s and 1970s. This type is often found in what

had been villages on the fringes of towns which have either (1) expanded into large informal areas or (2) were engulfed by horizontal urban expansion. These settlements are relatively small, rarely exceeding 20,000 inhabitants. Classic informal areas have dominated since 1970s up to today (World Bank 2008, p. 83).

Recently, El Kafrawy 2012 distinguished four forms of affordable housing in Egypt, namely, state-led housing, co-operative housing, private sector housing, and self-help housing.
State-led housing provision is managed by the central government. Co-operative housing has developed in the modern history of Egypt as a reflection of the nationalist sentiment in 1908, to built and modernize the society and to achieve a decent standard of living for the whole Egyptian population. The co-operative began to be active in the housing market in the 1940s. The first Egyptian housing co-operative society was established on 17 November 1952 and it was named the Co-op Association for Housing Construction in Maadi. However, the co-operative housing sector role has dramatically declined during the economic transition in recent years (El Kafrawy 2012, pp. 36 - 38).

1.4.3 Classification of Housing Patterns in Cairo

Several attempts were made to classify the housing patterns in Cairo. Most of which are concerned with the classification of informal settlements. Others are concerned with public housing projects.

An attempt was made by Rageb 1985. He referred to different patterns of public housing in Cairo during the second part of the 20th century, namely, low-cost housing, workers' housing and public housing program for the middle class. The study found that these projects tried mainly to provide shelter, while utilities, access to job, health, education, recreation and other social facilities are all important and vital factors in a complete housing project (Rageb 1985, p. 135).

Fekade 2000 was concerned with informal settlements as a response to deficits of formal urban land management together with rapid urban growth. He classified informal housing into three categories depending on many parameters which are: population densities, proportion of apartments in the dwelling stock, crowding rate and housing conditions. These categories are (Fekade 2000, p. 141):

- Affluent settlements which have the highest housing quality and best housing conditions.

- Moderate settlements which have less housing quality.
- Disadvantaged settlements which have the most inferior quality of housing and worst housing conditions.

Another study interested in the phenomenon of informality was carried out by Sims and Sejourné 2000. They distinguished two main aspects of informality: residential areas which started and developed informally, and residential units in formally-developed areas which acquired aspects of informality over time.

Within each of the two aforementioned categories, they identified sub-typology classifications. The main typologies of residential areas which started and developed informally are shown in Table 1.

The main types of residential units in formal areas of informal potential are (Sims & Sejourné 2000, p. 8):

- Public housing.
- Dwelling units under rent control.
- Dwelling units in ex-permit buildings.
- Old dwelling units in the historic city.

Table 1: Extent of informal residential areas in Greater Cairo in 1998

Main typology	Sub-typology		Net Surface Area km^2	Percent of the total %
A On agricultural land	A1	On private agricultural land	105.5	81.7
	A2	On core village land	3.5	2.7
	A3	On government agricultural land	4.2	3.3
B On desert land	B1	On local administration (desert) land	4.3	3.3
	B2	On reclaimed (desert) land	3.9	3.0
	B3	On decree (desert) land	7.8	6.0
Total			129.2	100.0

Source: Sims & Sejourné 2000, p. 8

Previous attempts to study the patterns of housing emphasized the characteristics and the dynamics of urban development of informal settlements. However, little attention has been paid in comprehending the socio-economic context within which such a dual sys-

tem has evolved. Moreover, no attempt has been made to produce a comparative in-depth study of formal and informal patterns in the context of their socio-economic framework. No simulation attempt has been made to compare morphological configuration and the spatial distribution and accessibility to urban services of such patterns. This is what this research is attempting to cover.

1.5 Research Objectives

The major objective of this work is to clarify the differentiation among the housing patterns in Cairo Governorate. As interpretation references of such differentiation, population density, socio-economic characteristics, structural and functional composition and spatial accessibility to services were used.

The specific research objectives are:

1- To review the housing policy transition in Egypt in general and in Cairo in particular and to illustrate the major factors that may be contributing to the evolution and development of the existing housing patterns.
2- To assess the probability of using remote sensing and Geographic Information Systems (GIS) in the field of urban geography.
3- To explore population density patterns as an outcome of the existing housing problem in Cairo Governorate.
4- To give an overview of the socio-economic characteristics of the population of Cairo Governorate and to develop an index that allow ranking of the population according to their socio-economic status.
5- To study the urban landscape in the case study areas with reference to land use structure, building characteristics and street layout.
6- To highlight changes and gaps in public services provision and to determine whether service provision and the location of service points are adequate to meet the needs of the population in the case study areas in terms of accessibility.

1.6 Thesis Structure

The thesis has been organized into four main parts and nine chapters. The first part comprises chapter one that reviews an introduction to the thesis. The second part consists of four chapters (2, 3, 4, 5). Chapter two introduces a historical background of the housing problem in Egypt in general and in Cairo in particular during the 20th century and up till 2013. Chapter three characterizes influential factors of the housing problem including demographic factors, poverty, access to urban land and the increase of the price of the building materials. Chapter four analyzes population density in Cairo Governorate. Chapter five provides the analysis and classification of the shiakhat according to their socio-economic characteristics. The third part comprises three chapters of empirical investigations from the four case study settlements represented by El-Marg el-Qibliya, El-Nozha, El-Ma'desa and Ain el-Sira. This part includes three chapters (6, 7, and 8). Chapter six presents a historical perspective of the case study areas. Chapter seven analyzes the built-up area, its urban growth and structural and functional composition. Chapter eight highlights the provision of public services and evaluates spatial accessibility to such services. Finally, the fourth part comprises chapter nine that presents the general conclusion, potential limitations and further recommendation of the thesis.

2 HOUSING PROBLEM IN CAIRO: ITS HISTORICAL DEVELOPMENT, INFLUENTIAL FACTORS AND OUTCOMES

2.1 HOUSING POLICY IN CAIRO: HISTORICAL BACKGROUND

Although many volumes have been written about housing in the Third World, it is only during the 1980s that rigorous analysis of housing markets in developing cities has become more common. Unfortunately, there are few strong and consistent findings regarding the demand for particular attributes in the developing world, partially because of the lack of agreement by researchers over the best way to measure willingness-to-pay for housing attributes and the susceptibility of such estimates to statistical problems (Daniere 1994, pp. 577 - 578).

Like many other developing countries, Egypt encountered great challenges in urban planning during the second half of the 20th century owing to the economic and population explosion. As Egypt enters the 21st century, access to housing for many Egyptian low- and moderate-income households remains a major challenge. Despite the rapid development of housing policy and institutions in the recent period to address the problem, there are still a small number of Egyptian households who are able to access housing (El Kafrawy 2012, p. 23).
Egyptian cities have undergone massive urbanization mainly because of the immigration of rural population accompanied by increasing fertility rates. These changes resulted in a great strain on public service provision and deterioration of quality of life. Cairo, as Egypt's largest city and the economic capital, has been the primary victim of the problems arising from such rapid population growth (Duquennois & Newman 2009, p. 3).

In other words, the housing problem is one of the most important problems in the Egyptian society in general and in Cairo specifically due to such rapid population growth. Hence, there is an insistent need to meet the problem through various stages of housing production, associated with political, economic and social developments.

The main purpose of this chapter is to review the housing policy transition in Egypt in relation to the political development during the 20th century and until 2013 and the impact of this transition on the evolution and development of the existing housing problems in Egypt as a whole and in Cairo in particular (Fig. 5).

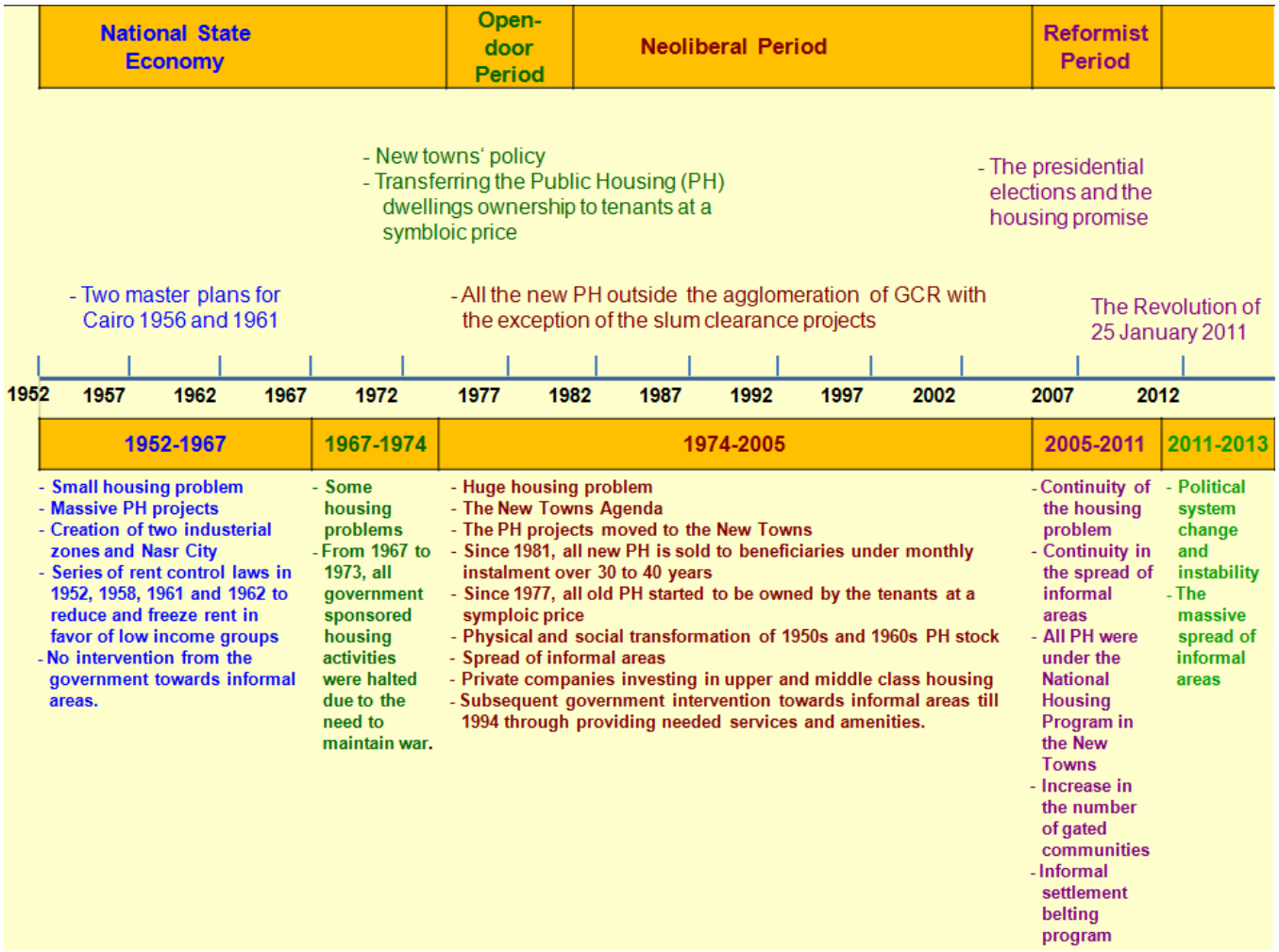


Fig. 5: Timeline of the development of housing policies in Egypt from 1952 until 2013

Source: Adapted from: Abouelmagd 2011a, p. 3 & El Shahat & El Khateeb 2013, p. 7, and modified to relate to the context of the study

It also highlights the role of the housing laws in shaping the housing policy through the different historical stages. One can identify six stages of housing policy in Egypt as follows.

2.1.1 The First Half of the 20th Century

Till the beginning of 1950s, housing units supply was mainly the responsibility of the private sector including wealthy and middle-income people, where the supply was much greater than the demand (Aref 2004, p. 8). The private sector was awarded concessions in the form of large plots of land on which they could develop neighborhoods and become the sole provider of utilities and services in those areas, such as Heliopolis. The main objective of the private sector was to capitalize on the growing demand in the middle to upper income housing market (El Kafrawy 2012, p. 25). Wealthy people were able to build palaces and luxury villas, or some small buildings for their own use. Middle-income groups were able to construct multi-storey buildings on their own land in order to use part of them for their own needs and the rest for rent to gain high profit margins. Poor and low-income groups resided in the popular areas in big cities neighborhoods such as El-Sayeda Zeinab and Bab el-Sheareya Districts, in Cairo Governorate, where housing units of low-rent value were prevailing. The Egyptian housing market was largely dominated by foreign capital up to 1947 when the first rent control legislation was enacted which blocked rents at their 1941 level and prevented house owners to evict their tenants. Rent control has been prescribed as a way to protect low-income households from the high cost of housing. It has also been viewed as a redistributive mechanism and a tax on housing capital, which allocates income from wealthy landlords to relatively poor tenants. The first implementation of rent control was applied to housing units built before 1944 to avoid discouraging new house building (Fahmi & Sutton 2008, p 280).

As Cairo did not have the status of a municipality until 1944, public authorities were ill-equipped to effectively control land development at the city's periphery. This contributed, from an early stage, to the growth and proliferation of uncontrolled urban settlements (Arandel & El-Batran 1997, p.1).
The outbreak of the July Revolution 1952 was a monumental turning point in the history of Egypt. Major social and economic changes occurred in the Egyptian society that affected housing greatly. One of the six prime goals of the revolution was the establishment of social justice by taking care for low income families as will be clarified in the next section (Aref 2004, p. 5).

2.1.2 The National State Economy Period 1954 – 1974

The involvement of the Government of Egypt (GOE) in the process of public housing provision started after the 1952 Revolution and the rise to power of Gamal Abdel Nasser in 1954. The Nasser era was marked by an attempt to reform the society while strengthening the political and economic independence of Egypt (El Batran & Arandel 1997, p. 4). In 1958, the regime decided to initiate new policies as part of the ideology of the 'Arab Socialism'. Under Nasser, government intervention occurred in the form of measures such as rent control and modest efforts in promoting public housing (Feiler 1992, p. 298). During this period, a wide participation of the state in the national affairs accompanied by a planned economy took place. Consequently, the public sector grew fast, whereas private enterprises were controlled and the major private companies were nationalized. The state showed a genuine interest in the welfare of the low income groups. Therefore, low-cost housing was built on a large scale (Rageb 1985, p. 135).

Moreover, the government participated in all aspects of the society i.e. price controls, minimum wages, rent controls, land reform, public education, and basic goods subsidies. This transformation led to more authoritarian, corporatist institutions, a restructured economy and a presumably more equitable society (Zetter & Hamza 1998, p. 188).

During this period, two industrial zones in the north and the south of Cairo were created. A substantial number of large factories were constructed on the periphery, specifically Shobra el-Khaima in the north and Helwan in the south. This industrialization process attracted more migrants to the city (Abu-Lughod 1971, p. 163).
In order to strengthen his relationship with the working class, Colonel Nasser carried out a program of economic and social reform similar to the program that emerged in the Soviet Union following the World War II. Nasser's land reform policies aimed to redistribute the arable land in small parcels to the peasants. This policy, however, caused many peasants to be landless and triggered rapid proletarization of the rural layers. Subsequently, many peasants moved to the major urban cities in search of work, leading to an increase in informal housing developments, which contravened the building and land use regulations (El Kafrawy 2012, pp. 24 - 25).

The housing problem started in the early fifties when industrialization resulted in a growing flow of rural migrants into cities in search for better job opportunities in the developing urban economy. The increasing demand for housing urged the Egyptian government to commit itself to provide low-cost housing for medium and low income families through

ambitious programs which consisted of completely finished walk-up apartments (Salama 1995, p. 10). In 1954, the Development and Popular Housing Company was established and directly built low-cost housing of an average rent of 5 LE monthly.

Simultaneously, the phenomenon of squatting on state-owned land was established, mostly in the eastern part of the capital, in places such as Manshiet Nasser and Kum Ghurab in Cairo Governorate (Séjourné 2009, p. 17).

Table 2 illustrates economic housing constructed in Egypt during 1952 – 2007. From the table it is clear that the total number of housing units constructed by the government during the national state economy period reached 390,000 which are known as *El-massaken el-shaabiya*. In Cairo, the low-cost houses were built outside the city in the outskirts represented in El-Zeitoun in the north, Embaba in the west, Helwan in the south, the 1000 houses on Ismailia Road, Hadayek Zeinhom and Shobra. The layout of these projects was much the same consisting of apartment blocks constructed parallel to one another. No attempt was made to provide open green yards. Moreover, the lack of the essential social and physical services was experienced. These projects tried mainly to provide shelter, while utilities, access to job, health, education, recreation and other social facilities are all important and vital factors in a complete housing project (Rageb 1985, p. 135).

Meanwhile, the government constructed another type of housing for industry workers, which was known as “workers’ housing”. This type was built mainly for workers and employees attached to major industrial centers such as the residential town for the Iron and Steel Mill Company in Helwan. A similar town was built in Abu Zaabal in the north of the railway for employees and workers. Such houses were supplied with infrastructure and some other social services. Population density was generally low (30 persons per ha).

Afterwards, the government expanded the public housing program for the middle income groups. Consequently, another 1,020 units were built in El-Zeitoun, 1,200 units in Helwan and somewhat fewer in Abbasya and Manial. The population density was about 60 persons per ha and the open spaces constituted 44 % of the total area. Separate small villas were built in addition to the apartments and the building cost was only 10 LE per m^2.

Table 2: Economic housing constructed in Egypt 1952 – 2007

Period of time	Number of housing units			%
	Urban	Rural	Total	
1952 – 1960	32,000	-	32,000	1.1
1960/61 – 1966/67	131,341	80,963	212,304	7.2
1967/68 – 1971/72	104,507	38,619	143,126	4.9
1972/73 – 1976/77	62,222	10,553	72,775	2.5
1977/78 – 1981/82	381,598	-	381,598	13.0
1982/83 – 1986/87	464,286	-	464,286	15.8
1987/88 – 1991/92	324,887	-	324,887	11.1
1992/93 – 1996/97	98,940	-	98,940	3.4
1997/98 – 2001/02	253,674	-	253,674	8.7
2002/03 – 2006/07	585,700	360,000	945,700	32.3
Total	2,439,15	490,135	2,929,290	100.0

Sources: CAPMAS 2008b & Ministry of Economic Development, Five Year Plan for Economic and Social Development (2007/08-2011/12) p. 47.

One of the main successful projects during this period was Nasser Emergency Housing, which offered 10,000 public housing units by the price of 500 LE/unit. Of which 3,000 units were built in Cairo. Thus appropriate housing with subsidized rents was accessible for low-income groups (Aref 2004, p. 9), but the plans did not provide any social and physical services since the program was hastily completed using substandard materials to save time and money. This resulted in poor finishing and fast deterioration of the buildings in Helwan and on the main thoroughfare of the Engineers City (Rageb 1985, p. 137).

These projects were financed by governmental loans, which were given to the public sector company for this purpose.

The socialist government developed two master plans in 1956 and 1960. The 1956 master plan assumed that the maximum population of GC will be 3.5 million. Basic studies were made in depth. Although the broad outlines of the master plan were established, they remained at the blueprint stage and were never totally implemented (Rageb 1985, p. 137). The population of the city already reached 3.5 at the time the plan was rolled out (Soliman & De Soto 2004, p. 4). One of the main results of the master plan of 1956 was

an attempt to construct a large town-extension scheme northeast of Cairo's center located in the desert fringe. It was called Madinet Nasr (Nasr City).
Concerning the master plan of 1960, the average target was 14,500 units to be funded from the nationalization policy (El Araby 2003, p. 438). The essential legal machinery for the implementation of the plan was never created. Different agencies dealt with urban problems, but without sufficient collaboration among them.

In the early sixties, Heliopolis Housing Company and El-Maadi Housing Company, in Cairo, were nationalized. The mentioned companies together with Nasr City Housing Company became the leading establishments in land development and housing construction in Cairo. They grew very fast and offered Cairo the possibility for expansion and growth. Hence, sites were prepared with roads and infrastructure at first and then became available to individuals and/or real estate companies. These sites represent the residential quarters for the middle income groups (Rageb 1985, pp. 136 - 137).

Yet, the picture of middle-class housing was brighter. Nasr City and Maadi expanded eastwards into the eastern desert, and Heliopolis and Helwan expanded northwards and southwards respectively (Rageb 1985, p. 137).

Housing programs gradually declined between the mid-1960s and the mid-1970s, particularly in low-cost and workers housing. The construction of public housing dropped to less than one-third of the previous decades. There was obvious shortage in the supply of housing units (Table 2). Due to a quasi-permanent state of war, most of the national income was directed to military purposes (Fahmi & Sutton 2008, p. 280). However, the middle income housing continued to expand but at a lower rate.

During the Attrition War 1967 – 1973, the public funds of the entire nation were reserved for the war effort, consequently plans of urban infrastructure were shelved, and Cairo's formal expansion was more or less stopped. However, the demographic growth of Cairo continued because of migration and the natural increase that reached its highest levels. Moreover, Cairo had to accommodate a significant number of one million people evacuated from the Suez Canal Zone.

Fortunately, the informal sector played an important role in overcoming part of the housing gap. Although it is constantly being criticized by scholars and government officials for creating "slum-like housing areas" which offer poor living conditions not acceptable by

normal standards. It nevertheless succeeded where the public sector had failed (Salama 1995, p.12).
Unfortunately, there is a great lack of the detailed historical data concerns about the informality's debut as it was on a small-scale that did not draw attention of the researchers. One can only surmise from maps and questionnaire a number of informal areas, which began their incipient growth in the mid-1960s including i.e. El-Basatin, Dar el-Salam, El-Zawya el-Hamraa and Manshiet Nasser in Cairo Governorate; and Boulak el-Dakrour, Waraq el-Hadar, Omrania and Embaba in Giza Governorate (Sims et al. 2003, p. 11). Most of these areas are descendants of rural cores. The lack of official reaction to the rural unregulated housing played an influential role in such extensions (building permits were unnecessary outside the city limits). So local administrations had a plausible excuse for overlooking what was already becoming quite evident (Sims et al. 2003, p. 12).

From that period on, the state reinforced legislation forbidding informal construction on agricultural land (Law 59-1966, subsequently amended many times). Nevertheless, these laws and decrees were ineffective, and housing demand was still growing because of migration and high demographic growth in the capital (Séjourné 2009, p. 17).

2.1.2.1 Laws of Housing Rent Control during the Period 1954 – 1974

Rent control laws are the cornerstone for understanding the housing policy in Egypt. In the framework of achieving social equality during the Nasser era, the state legislated a series of laws to define the rental value instead of supply and demand law.

Law no. 168 in 1961 reduced the rents to 20 % for all the units almost without exemption and without challenge. The only exemptions to the law were luxury and furnished units, which were limited in supply and usually rented out to foreigners.

Law no. 46 in 1962 determined the rent value as 3 % of the land value and 5 % of the construction costs.

The most important law was Law no. 52 of 1969, herewith the inheritance of tenure from the tenant to their heir was permitted. Moreover, side payments like advance rent or key money were prohibited.

This law represents a unique feature of the Egyptian rental system and it is usually called the Old Rental Law. However, a landlord would be able to evict a tenant legally under four specific cases: if the tenant converts the unit to non-residential use without the land-

lord's permission; if the tenant sublets the unit without the landlord's consent; a failure by the tenant to pay the rent 15 days after it is due, and if the building collapses (Fahmi & Sutton 2008, p. 280).

It is worth mentioning that rent control policy caused another investment recession in housing sector, especially for the private investments. In 1959, private investments were 50 % below the level of 1956. In 1962, private investments had declined by 42 % compared to 1959 (Aref 2004, p. 10). The practice of selling began gradually to spread. The 20 % reduction of the rental value of housing units constructed after 1944 led to the deterioration of the rental housing stock as maintenance costs exceeded rents collected by owners (Fahmi & Sutton 2008, p. 280). Nowadays, the law only controls rents and the real estate prices are determined by market forces (Rageb 1985, p. 137).

Rent control was conceived as means of lowering the cost of housing for low-income people. However, the consequence was a reduction in the amount of rental housing built and the rapid deterioration of the existing housing stock. Due to the restrictions presented by rent control laws, the majority of newly built units were owner-occupied with the majority of public sector buildings being for the private rather than the rental market (Arandel & El-Batran 1997, p. 4). In conclusion, while public housing flourished, private housing was severely hurt due to the drastic rent control measures during this period (Rageb 1985, p. 137).

2.1.3 The Open Door Era 1974 – 1981

Nasser was succeeded by President Anwar el-Sadat in 1970. Anwar el-Sadat attempted to move Egypt away from the predecessor's socialist, centrally planned and public sector-dominated policies. In 1974, law number 43 was introduced by President Sadat to open the Egyptian economy to foreign capital investment, although the Egyptian economy had been closed to outside foreign investment for almost 20 years. A stream of legislations followed, facilitating an open door policy identified as *Infitah*. The *Infitah* marked a reversal of Nasserist economics through an unrestricted opening of the economy to foreign imports and investment and a downgrading of the public sector involvement in the economy and other areas (Zetter & Hamza 1998, p. 189).

Sadat's open door policy also brought about an intensification of investments in infrastructure and services, resulted in massive inflows of capital, mainly in the form of grants and loans.

In 1971, the General Organization for Housing Co-operatives was established to promote and supervise the development of housing co-operatives. The organization gradually expanded and became the most effective device for providing housing for lower-middle and middle classes. Individual members were encouraged to form housing co-operatives. Major sources of financing housing co-operatives were through members' savings and governmental allocations. Financing was provided at 5 % for 15 years to co-operative groups and at 6 % for individuals. Planning and design of the units were left to the co-operative societies. The organizations also supervised construction and keep a reasonable control over the societies. Increasing co-operative housing during these years channeled large investment into the housing sector (Rageb 1985, p. 137).

Sadat established as well the Ministry of Reconstruction, which became the instrument for implementing a major part of Egypt's human settlement policy (Meikle 1988, p. 127).

All internationally funded projects were required to work in association with an Egyptian firm under the auspices of the new ministry. The governmental agency was responsible for the construction of low-income housing which started at a rate of about 30,900 units annually. The policy towards squatter settlements on state-owned land focused officially on the demolition of houses and the relocation of the inhabitants. Yet, such urban renewal rarely occurred especially in the areas located on potential investment property, as in the cases of Eshash el-Torgoman and Arab el-Mohamady. They were on small-scales and located in the central business district of Cairo (Sedky 2000, p. 39).

Considering that the government was only responsible for the construction of low-income housing, the private sector had the responsibility for the provision of other housing units (Fahmi & Sutton 2008, p. 280). The government was oriented to mass production and opened the markets for European and American companies as suppliers of machines and equipments for building and construction. Importing basic building materials like cement and reinforcing steel was also adopted in order to minimize the gap between supply and demand in the field of housing. In the framework of the open door policy, large size contracting companies reappeared again. Most of them had the trend of invest in moderate and luxury housing with the aim to gain a quick high profit (Aref 2004, p. 10).

The *Infitah* and the influx of Arab and foreign investment caused a sudden rapid rise in land prices within the city followed by enormous demand on the peripheral agricultural land. During the period 1977 – 1982, the expansion of the built up area including villages

around the Greater Cairo agglomeration was consuming 600 ha of agricultural land each year (Becard 1985, p. 184).

Due to the absence of an effective master plan and the inadequate support of low-income housing associated with rapid increase of immigration from rural areas to the city, informal housing spread over Cairo (Fig. 6 and 7). It was estimated that 84 % of the new units built in Greater Cairo Region during this period were considered illegal (Séjourné 2009, p. 18). This informal housing type operates outside the formal process of land acquisition, building permits, formal planning and zoning since it was not related to official housing production. It was estimated that the lost of the agricultural land by urbanization just on the peripheries of Cairo was about 13.7 km^2 between 1976 and 1996 (GARPAD, undated).

With the capital being invested in real estate speculation, land became a basic commodity as investors tightened their grip on land (El-Batran & Arandel 1998, p. 221). The real estate speculation played a major role in exacerbation of another facet of the housing problem represented in a massive increase in the production of moderate and luxury units versus an enormous lack of the economic affordable units.

In 1974, a Master Plan for the CMR (Cairo Metropolitan Region) was approved to face the existing and the future problems. The two main concepts of the 1974 Master Plan were:

- Controlling the growth of the existing agglomeration to end urban encroachment on agricultural land and keeping the agglomeration within manageable size; and constructing a ring road to contain the CMR.
- Establishing self-sufficient new communities acting as relief poles to accommodate the new migrants to the CMR.

Based on the second concept, the state was oriented towards constructing New Towns in order to tackle the housing problem in metropolitan Cairo. Large new cities such as 10^{th} of Ramadan, 15^{th} of May (1978), Sadat (1979), New Ameriah (1980) and 6^{th} of October were just few examples of new planned towns. The New Towns policy explains how the number of economic housing constructed increased by five times during the period 1978 – 1982 compared to the period 1972 – 1977 (Table 2).

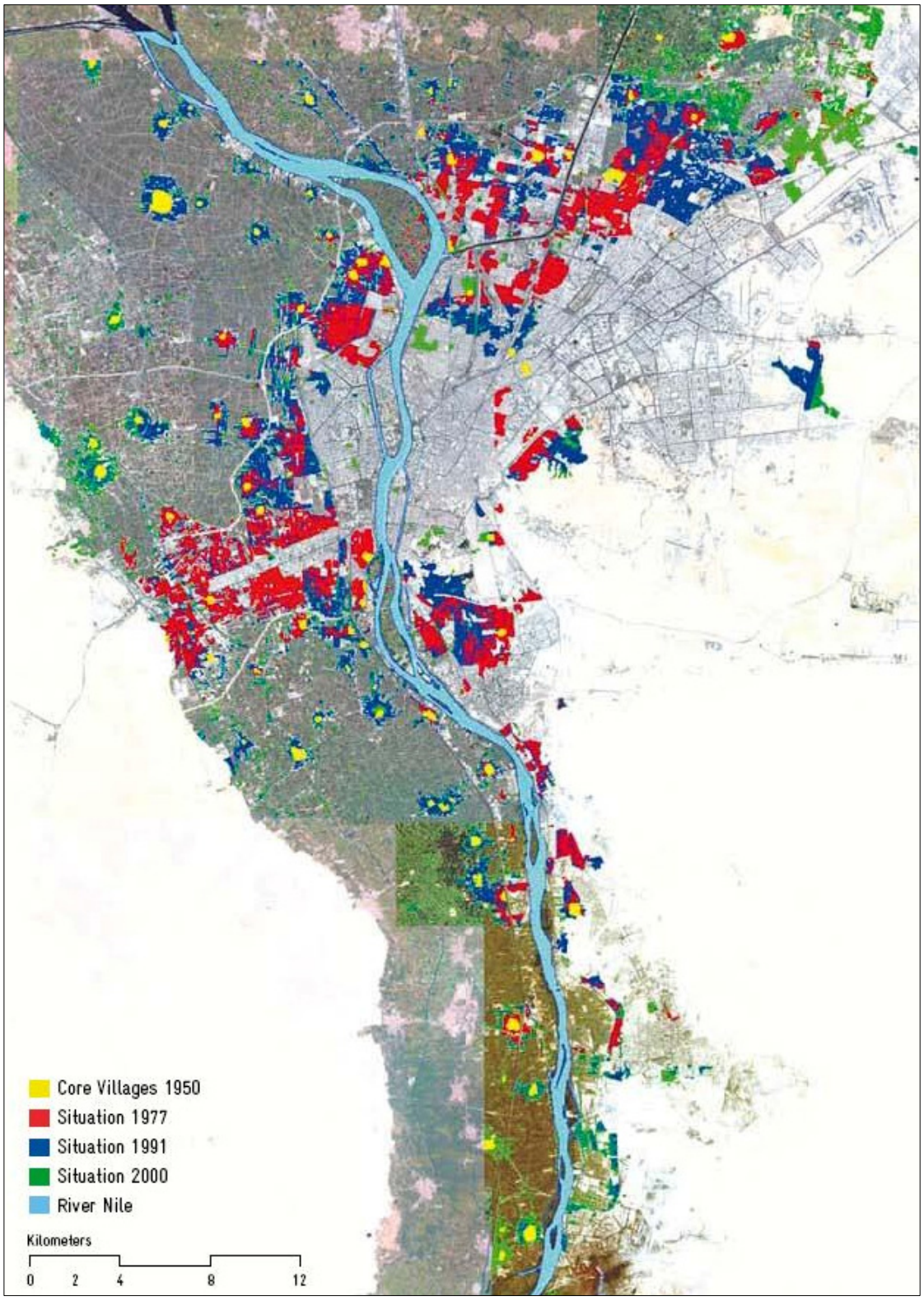


Fig. 6: Historical development of informal areas in the Greater Cairo Region since 1950

Source: Séjourné 2009, p.16.

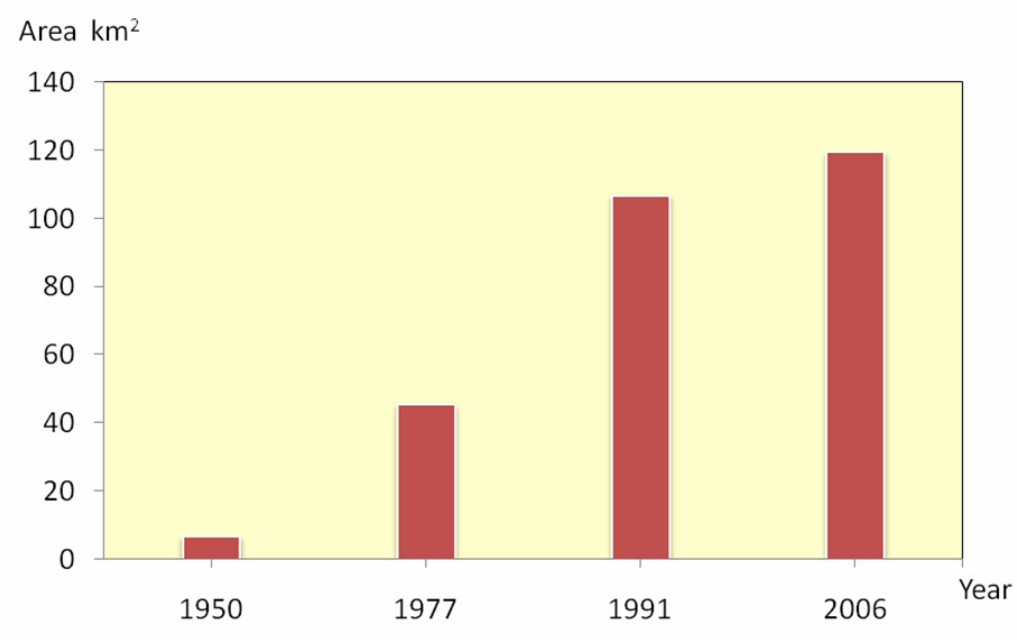


Fig. 7: Development of the total area of informal settlements in GCR 1950 – 2006

Source: Designed by the author based on data from the Ministry of Local Development 2007

As a matter of fact, public housing units in the New Towns located in the desert areas surrounding Cairo were built for the upper middle class and not for low income and poor families (Séjourné 2009, p. 18).

Generally the open-door economic policy had negative results which resulted in a great increase of housing unit prices due to the following reasons:

- Shortage of qualified labor because of the unplanned emigration to Arab countries. It was estimated that the number of Egyptian workers abroad reached three million during this period. Their remittances constituted a significant share of the economy (Rageb 1985, p. 138).
- The great demand on labor for reconstruction of the Suez Canal Region resulted in the increase of labor wages to levels which were not matched with both income levels and market requirements.
- Increase of prices for building materials and construction costs.
- Rise of housing units' prices resulted from the increase of buildable land prices, labor wages and building materials after the 1973 War.

Egyptians working abroad, mostly in construction, directed part of their savings to housing and thus created a big demand on middle-income housing. Their remittances began to create an unprecedented cash-based economic boom. This boom provided the main

financial source for and the acceleration of the development of informal areas in Cairo. It was particularly important as it put serious investment money in the hands of blue-collar families who were attracted to live in informal areas (Sims et al. 2003, p. 12).

The influx of foreign investments, which came as a result of a new open door policy, added to the demand for both middle- and upper-income housing.

The demand created by these two groups has contributed to the rise in land prices and building costs. Furthermore, the continuous drain of the labor force in the construction sector upset the traditional wage balance. Workers` wages increased to new heights, and for the first time they surpassed the wages and salaries of other groups, particularly those of professionals and civil employees (Rageb 1985, p. 138).

Land prices in Cairo increased at compound annual rates ranging from 25 % to 40 %. Cost of building materials and labor increased less rapidly at 15 % to 20 %, but it exceeded the general inflation rate.

To meet the growing need for dwelling units with the great increase in land prices, vertical extension on existing buildings became easier for investors than building new apartments. Additional floors accounting for as much as half of the units added to the existing stock. Luxurious apartment buildings are located in three major areas; Zamalek, Garden City and along the Nile, particularly between the bridges of Kasr el-Nil and Giza on the west bank and in Maadi on the east bank.

In these areas, old private villas and chateaux were destroyed and replaced with new tall apartment buildings. Because of the lack of tight municipal control, owners were able to add more floors than the building regulations generally permit.

Middle-class housing continued to expand largely in traditional locations as Zamalek and Garden City. Intermix between business and residential areas have recently become a common feature of these two neighborhoods. However, Heliopolis, Nasr City, Maadi and Helwan continued to grow but the residential character still dominated these areas. These areas were developed both by the public sector and the private sector. Under the new investment law, many development companies were established and interesting housing projects have been adopted (Rageb 1985, p. 139). Other extensions of formal city included El-Nozha, El-Salam and Ain Shams.

Starting from the mid-1970s, the government finally took notice of informal areas. Series of decrees emerged which made it illegal to build on agricultural land and more efforts to preserve state lands. Decrees had little real impact as it promoted business activities via bribes (Hamilton et al. 2012, p. 51). As the agricultural land was cheaper than building plots, many agricultural fields were transformed to informal areas without planning or services (Aref 2004, p. 10). If people invested in the informal sector, it was because the

supply proposed by the public sector was neither sufficient nor affordable especially for the poor (Séjourné 2009, p. 18).

2.1.3.1 Laws of Housing Rents Control during the Period 1974 – 1981

The state maintained the policy of rent control with minor modifications to make the construction of rental housing more profitable. Consequently, there was a considerable increase of approximately 76,320 public housing units per annum (Table 2). All these units were in the New Towns. The state issued several laws that produced some kind of balance between owner and tenant. Law no. 49 in 1977 aimed to define the investment profit on the base of 7 % revenue of land value and 3 % revenue of building value in return for capital consumption, maintenance and management (instead of 5 %, 3 % respectively). This law allowed also foreigners to purchase units and allowed units to be sold as condominiums (Fahmi & Sutton 2008, pp. 280-281). The new law aimed also to reduce the responsibilities of the state toward the public housing initiatives. It includes the transfer of tenure from monthly rent and public ownership to private ownership in a symbolic price ship. This later resulted in the physical and social transformation of the public housing projects such as the Ain el-Sira Project as will be illustrated in the chapters seven and eight.

It is noticeable that these laws did not achieve a balanced relation between owner and tenant, but it was oriented to promote tenant benefit against owner profit. This caused some owners to adopt illegal ways to obtain a compensation for their losses. Other owners stopped to invest their money in the housing sector to avoid problems and troubles. Therefore, the supply of housing units decreased and the housing problem was aggravated (Aref 2004, p. 11).

2.1.4 The Neoliberal Period 1981 – 2005

Sadat was succeeded by President Mubarak in 1981. Mubarak's administration was devoted to continuing Sadat's economic agenda and implementing policies which favor the private sector and foreign direct investments.

President Mubarak encouraged the liberalization of the economy. Over the years, these economic reforms affected the Egyptian society, which suffered from high prices and the spread of poverty. Mubarak gradually eliminated government monopolies, reduced subsidies for almost all economic activities, abolished price controls, cut corporate taxes and

expanded the role of the private sector. All these reforms triggered a number of economic shocks caused by a high inflation rate, with a negative impact on the housing market in terms of an increase in housing prices to unaffordable levels for many Egyptian households, especially those at the lower- and moderate-income end of the market (El Kafrawy 2012, p. 31).

Since 1982, the Government of Egypt (GOE) has considered the right to shelter as an explicit part of an Egyptian's social contract with the state. In the meantime, major achievements in providing housing units, developing infrastructure facilities and supporting construction policy were taking place. These acts aimed to minimize the problems facing the housing sector since the seventies (Soliman 1995, p. 311). As a result, Egypt had managed to increase the housing production from 1.33 units per 1000 inhabitants in 1976 to 11 units per 1000 inhabitants in 1990 (El Kafrawy 2012, p.31).

However, many projects failed to meet the needs of the urban poor due to a number of reasons such as:

- The lengthy negotiation procedures.
- Lack of political will and inadequate cost recovery.
- Unsuitability of site location in terms of job opportunities and social services.
- The incorrect implementation process (Soliman 1995, p. 311).
- More than half of all public housing units built by Cairo Governorate during the 1980s and 1990s have ended up for resettlement, not for newlyweds and others just starting families as originally intended (Hamilton et al. 2012, p. 52).

Sites and service schemes were seen to be time consuming and the results appeared unfinished and unattractive. They were consequently seen as creating slum areas with governmental consent (Arandel & El-Batran 1997, p. 218). Upgrading was also seen as condoning illegal activities that encourage the development of more informal areas. The housing problem in Egypt was latent in the increasing gap between supply and demand, due to the shortage of the supply both quantitatively and qualitatively. In the beginning of the eighties, the supply rose by 1 – 3 % per annum, while the demand was increasing by 8 – 10 % per annum, resulting in a high population density and decline in the level of houses and services (Aref 2004, p. 11).

2.1.4.1 State Plans during the Neoliberal Period 1981 – 2005

Updating the plan of 1974 was then indispensable to take into account:

- The CMR related recommendations of the National Urban Policy Study carried out in the early 1980s,
- The important socio-economic changes that occurred after 1974 because of the open-door economic policy which drastically changed public and private investment patterns (El-Batran 2004, p. 4).

Within the first two decades of Mubarak presidency, four five-year plans for restructuring the economy were introduced. Some of their aims have been fulfilled (Ibrahim & Ibrahim 2003, p. 95).

The First Five-Year Plan 1982 – 1987 aimed to construct about 800,000 housing units in urban areas. 55 % of these units are economy, 37 % are moderate and 8 % are luxury units. Since the private sector constructed about 76 % of the total implemented units in this plan, the proportion of luxury housing in the plan was not considered because the plan target was 8 % but 15.25 % were implemented. Subsequently, big cities, especially Cairo, get stacked of luxury housing units (that were empty due to their high prices or to be kept for future investment). Hence, the abundance of luxury empty housing and the shortage in economy and moderate housing units was common (Aref 2004, p. 11).
For Cairo, the main targets of the 1983 Master Plan were to increase the productivity of the economy and to improve the living environment. To achieve these targets, the government followed several ways, such as decentralization of the CMR agglomeration by establishing new communities in the desert to provide alternatives for informal housing areas, organizing the urban structure to improve access to public services, rehabilitating old neighborhoods, protecting water resources, and controlling air pollution (El-Batran 2004, p. 4).

The Second Five-Year Plan was implemented during 1987 – 1992 and was oriented to serve more low-income groups as follows:

- Constructing of a million housing units of which 900,000 units were located in urban districts.
- Providing a great amount of housing units for low-income groups. Therefore, housing proportion was as follows: 73 % economy, 24 % moderate and 3 % luxury housing.

- The government intended to reduce the cost of housing units for low-income groups. The Ministry of Housing and Reconstruction implemented the policy of providing non-finished houses in 1987.

The average area of a housing unit was 70 m^2 and its average price was about 10,000 LE (El-Batran 2004, p. 4).

The decree of the Housing and Reconstruction Minister stated that the public sector would be restricted in the second five-year plan to construct low-cost units. Another decree was issued to state that the loans of cooperative associations for building and housing should be directed to units with a size of not more than 90 m^2 and loans for large scale units were not allowed.
The government implemented the Third Five-Year Plan during 1992 – 1997. The targets of both the Third Five-Year Plan 1992 – 1997 and the Fourth Five-Year Plan 1997 – 2002 focused mainly on the development of informal settlements and supporting the role of the private sector. It is worth mentioning that the construction of new housing units by the public sector was limited to the New Towns. Based on the available capacity at that time, the government estimated that about 40 % of the required 300,000 units per annum, that is approximately 120,000 units per annum, could be built by the public sector in the local government areas and new communities to provide access to housing for low- and moderate-income households. The remainder, that is approximately 180,000 units per annum, could be developed by the private sector. Based on these estimates, the government started to reduce its production of new housing from the mid-1990s (El Kafrawy 2012, p. 34).

Since 1996, the governmental efforts concerning shelter for all can be illustrated by using two cases of projects, namely the “Mubarak Youth Housing Project” and the “Future Housing Project”. Each project aimed to construct 70,000 dwelling units. The efforts of the government included the task to improve the living environment, services, and standards to be healthy and productive.

The government integrated rights of low-income/disadvantaged groups to appropriate shelter and affordable housing in its economic reform program which started in the early 1990s. This integration was made on the basis of the indigenous cultural value of “*Eltakaful El-Egtemaie*”. This value means the responsibility of capable/wealthy groups towards disadvantaged/poor ones which results in social solidarity. The value can be

achieved either through direct donations or cross-subsidy mechanisms. This integration can be illustrated here by presenting the Mubarak Youth Housing Project.

The Mubarak Youth Housing Project started in 1996. Its major target was to provide 70,000 affordable dwelling units, in a healthy and productive residential environment. The beneficiaries were the youths who belong to the disadvantaged/low-income groups. The project was completed in December 2000, and its units were distributed in 15 new towns.

Unfortunately, the project lost its primary goal, which was providing housing units for low-income people as it was re-orientated to a profitable deal between the Ministry of Housing and the private real estate companies. As a result, the proportion of ownership of the housing units in the National Housing Project did not exceed 30 % in 2009. The problem has many dimensions as the area of the housing unit designed for low-income people was limited to 63 m^2, the price of which would normally not have exceeded 70,000 LE. However, most of the developers insisted on achieving profit margins as high as 70 %. Therefore, the price of the unit exceeded 150,000 LE.

Due to the limited area and the very high price, the housing units of this project were neither commensurate with low-income people, nor middle-income people. The middle-income housing units had a size ranging from 130 to 300 m^2. For the experts it was obvious that the price of the housing units in this project were unaffordable and not suitable for monthly incomes of the youths and their financial ability. The conditions for obtaining a housing unit did not match the financial ability of the majority of the people who were interested in buying, especially a large sector of the Egyptians who work in informal sector and have a low or even unstable income (Shabab Misr Magazine 2009).

Table 3 illustrates how the role of the public sector decreased in favor of the private sector during the period 1995 – 2009. It is obvious that the role of the private sector increased gradually to represent 84 % of the production of the dwelling units constructed in urban areas during these 15 years. Therefore, the share of the public sector did not exceeded 16 % at the end of this period.

Concerning informal settlements, their extent began to decrease from the beginning of the eighties. Evidently, the New Towns policy had no effect at all on slowing down the growth of the informal settlements.

The main reason can be found in the declining temporary emigration of Egyptian workers to oil-rich countries due to oil prices tumbling in 1983 – 1986, the end of the Iran-Iraq War of 1988 and the Iraqi invasion in Kuwait (Sims & Séjourné 2000, p. 16).

Table 3: Number of dwelling units in urban areas by sector (1995/96 – 2008/09)

Item	1995 – 2000	2000 – 2005	2005 – 2009
Levels of public dwelling units			
Economic	254,407	55,401	48,233
Middle	73,744	15,466	4,293
Upper-middle	14,420	5,640	1,468
Luxury	635	88	153
Low-cost	153,826	70,701	20,297
Total Public Sector	**497,032**	**147,296**	**73,814**
%	67.4	20.5	15.8
Total Private Sector	**240,827**	**572,011**	**391,994**
%	32.6	79.5	84.2
Total	**737,859**	**719,307**	**465,808**
%	100.0	100.0	100.0

Source: CAPMAS 2007 & Ministry of Housing, Utilities and Communication Development 2001.

On the other hand, starting from the mid-1980s, the national demographic growth rates and those of big cities began to decline: The annual demographic growth rate of Cairo went down from 2.8 % per annum between 1976 and 1986, to 1.9 % per annum between 1986 and 1996. At same time rural-urban migration almost stopped (Bayat & Denis 2000, p. 187). This had a significant impact on the demographic pressure in urban informal districts.

Starting from the nineties, urban policies mainly treated with informal and squatter areas as specified phenomena, either focusing on particular informal pockets or simply redressing the shortfall in urban services in large informal agglomerations. The government initiated a National Program for Urban Upgrading in 1992, which started to operate in several phases to provide basic infrastructure and municipal services for over 1221 informal areas. This program provided for the first time de facto tenure security to all residents and recognition of informal settlements (Cities Alliance 2008, pp. 12 - 13).

The massive program for upgrading informal settlements initiated in 1993 was seen as a social response to the spread of the fundamentalist religious ideology in informal settlements and accompanied the intensification in the repression of terrorism.
Cairo Governorate issued a decree allowing access to water and sanitation for informal settlements but settlements located on public land were not included in the infrastructure layout (El-Batran & Arandel 1998, p. 230).
The structural adjustment policies and economic reforms at national level during the nineties have aggravated the housing problem for low- and middle-income groups, as most of the public housing investment was directed towards provision of housing units, which were unaffordable for the majority. Consequently, high rates of vacancies were notable within low-income flats in New Towns such as Badr and Sheikh Zayed New Towns. Such towns do not offer accommodation within easy reach of jobs, which is frequently the most important consideration for low-income households (Pacione 2009, p. 518). In other words, governmental low-cost housing programs are located in distant new towns or in remote desert areas, making the livelihood struggle for inhabitants much more difficult, if not impossible (Cities Alliance 2008, p. 10).

On the other hand, subsidized cooperative loans and building permits were mainly acquired by middle- and higher-income groups, as private capital led to a substantial increase in land prices.
Furthermore, the continuous increase in land speculation activities within and around urban centers contributed to escalating prices leaving low- and middle-income urban dwellers with no affordable alternative but to enter the informal housing market (Fahmi & Sutton 2008, p. 282). The real estate speculation led to rising prices of condominiums by 300 % between 1990 and 1993 providing a high profit margin for private investors (Meyer, 1996, p. 97).
Upscale gated communities around Greater Cairo Metropolitan Area represent a fascinating case study in the politics of elite land speculation (Dorman 2013). In the early 2000s, 320 real estate companies planned the construction of 600,000 villas and luxury apartments in private cities bearing names such as Dream Land, Utopia, Beverly Hills, and Belle-Ville (Rogers 2008, pp. 5 - 6).
This phenomenon has reshaped the face of urban life and has a tremendous impact on the evolution of the metropolitan area in terms of its form and structure, causing harmful social, economic, cultural, and urban effects which exist in both the micro and the macro level. It has also a negative effect on urban sustainability and livability (Ghonimi et al. 2010, p. 45).

The available space for future physical expansion of informal settlements on Cairo's periphery shrank significantly with the sale of available desert land for gated communities. The gated communities and the informal settlements, each in their own way, played an active role in the privatization of urban development sustained by a lack of public housing, the sharp increase in land prices over the span of three decades, and the opening of a rental market (Rogers 2008, pp. 5 - 6).

An attempt was made to resolve the housing situation and to revive the housing market through recently introduced mortgage law in 2001. The real estate finance law no. 148 in 2001, known as mortgage law, was approved after years of debate. According to the General Authority for Real Estate Finance (GAREF), this law was designed to provide cheap long-term funds for buying, building and renovating real estate at up to 90 % of the value of the housing unit. It challenges the prevailing pro-tenant culture, allowing banks to repossess properties and evict owners who are in default on the loan. In the event of a default, a judge will appoint an agent to sell the property in a public auction to pay off the mortgage. Mortgage laws cover up to 90 % of the value of the property, with monthly payments being fixed at around 40 % of the borrower's net monthly income and with a repayment period from 25 to 30 years (Fahmi & Sutton 2008, p. 282).

The housing market transition has little effect on mortgage financing intermediation in Egypt. Mortgage financing has been considered by many financial intermediaries as an objective in itself rather than a means to an end. Thus, mortgage products are offered at very high prices. As a result, access to housing continues to be a major expense to many low- and moderate-income households (El Kafrawy 2012, p. 51).

2.1.4.2 Laws of Housing Rents Control during the Period 1981 – 2005

According to the housing law of 1981 one third of all housing units within each residential building would be put up for sale. This law declared that all housing investors could have access to low interest loans. Furthermore, luxury units are exempted from rent control (Hamilton et al. 2012, p. 51). Later on, housing regulations decree no. 2 of 1986 gave tenants the right to obtain a new separate lease from the owner.

The building boom in the 1980s played an important role in the subsequent stagnation of Cairo's housing market. High returns on investment from upper-income units during the 1980s had stimulated an oversupply of top-end buildings, resulting in the lack of interest in the demand of low-income groups on behalf of the real estate developers. The reluc-

tance of property owners to let their empty dwelling unit, due to rigid rental control laws and speculative tendencies, left 50,000 units vacant in Cairo alone. The number of buildings increased at an annual growth rate of more than 4 %, which was twice as much as the population growth rate which reached 1.8 %. Therefore, the proportion of vacant dwellings in the Greater Cairo Region was almost 15 % in 1986 (Meyer 1996, p. 97).

Finally, it is clear that rent control laws in Cairo failed to achieve their legislative purposes, as the housing market was turned into an ownership-oriented system. For the new housing units, the failure can be explained by the difficulty to enter the housing market without an up-front lump sum payment or key money, which was usually beyond the ability of most Egyptian middle- and low-income groups. For the old housing units, rigid under-priced rents have led to the neglect of property maintenance by the owners (Fahmi & Sutton 2008, p. 281).

Wheaton (1981) assumed that housing policies in Egypt are generally ineffective, so they appear to be inherently unenforceable. Traditional enforcement mechanisms, such as financial auditing are poor in many less developing countries (LDCs) since most transactions are carried out in cash. He argued that any centrally planned system of price and quantity allocations, which runs contrary to individual interests, requires some form of enforcement. Individuals will exchange commodities and achieve arbitrage on their own accord unless the expected gains from this activity are less than the costs of some imposed sanctions.

Since such policies seem to be largely unenforceable. Subsequently, a system of underground or black markets developed with various forms of pricing. It is argued that the resource allocation which resulted in these markets ran quite contrary to the objectives intended by the policies. The outcome in many respects has discouraged housing investment, and has been both regressive and inflationary (Wheaton 1981, pp. 242 - 243).

Due to the earlier restrictions imposed by rental control laws, the majority of units built by the private sector for middle- and high-income groups were owner-occupied, with less public housing contributions to the rental market. However, the 1996 law (New Rental Law) introduced two major changes to the Egyptian real estate market. First, it ended the indefinite passing down of tenure from the tenant to his or her heirs. Second, it stipulated that rent contracts should be limited to a definite time period, without setting any constraints on price, rather than the fact that it has to be previously agreed upon. Article 14 of the bill stipulated immediate rent increases on the basis of the year of construction

with 10 % annual increase for five consecutive years, after which the landlord is supposed to take it over.
Legislators argued that adjusting these rents would result in increasing the availability of apartments for rent. It is assumed that inhabitants within upper-class neighborhoods were able to pay higher rents, unlike the majority of residents within low-income housing (Fahmi & Sutton 2008, p. 282).
In order to avoid the pre-1996 rent control laws and to secure a return on rental units, the practice of key money appeared as an amount paid by the tenant to the owner that is equivalent to the difference between regulated rents and actual costs (El Araby 2003, p. 439). The practice of paying key money outside contract payments enabled the private sector to earn enough return on rental housing units to continue supplying it.
A housing demand survey in Cairo revealed that 81 % of all the new units accessed between 2001 and 2006 were through rental contracts signed under the new law, only 19 % were for ownership. It is indicated that 42 % of the total urban housing units in Greater Cairo in 2008 were still locked under the old rent control regime which is not necessarily benefiting the poor. This situation puts great constraints on the residential mobility, locks up a large proportion of units out of the market, causes lack of stock maintenance, and distorts the overall housing market (Cities Alliance 2008, p. 10).

The application of rental law no. 4 of 1996 increased the rental values significantly and reduced the supply of rental properties. The law offered no protection to the tenants who are threatened with losing their dwellings and security of tenure. Most landlords preferred fixing the contract period at one year, or else evict the tenant without prior notice.

Consequently, rental units gradually disappeared and were replaced by condominiums. The formal private market dealt almost exclusively with high middle- and upper-income groups who form less than 15 % of the urban households (El-Batran & Arandel 1998, p. 222).

2.1.5 The Reformist Period from 2005 to the Revolution of 25 January 2011

In 2005, within many political and economic reforms, a presidential election took place. In his program, President Mubarak promised to build 500,000 units over six years. The result of such a promise was the creation of a National Housing Program (NHP) (Abouelmagd 2011a, p. 7).

2.1.5.1 The National Housing Program or '*Ebni Bietk'*

Within the context of the National Housing Program, the government launched a new housing program called 'Build your house program' which is referred to as ''*Ebni Bietk*'' or core housing. The project aimed to construct 500,000 subsidized housing units over six years throughout the country, with a significant component of subsidization from the governmental budget. Ebni Bietk was introduced to cater for individuals belonging to additional middle and lower income groups that would qualify for the program.

The program stipulated that Egyptians qualifying for subsidization of housing are individuals with a monthly income of a maximum of LE 1,000. For these individuals and for a unit of estimated cost of around LE 55,000, the program stipulates that the individual ought to put LE 5,000 as down payment. The government subsidized the unit with LE 15,000 and the individual took a loan of LE 35,000 to be paid over a period of 20 years. Around the end October 2007, over 137,000 Egyptians applied for the benefit from this program in 23 governorates and 16 New Towns. Some 56,000 units were delivered and 200,000 were under various stages of construction.

The idea of Ebni Bietk originated from financing mechanisms implemented in unplanned areas, where an individual would buy a plot of land, then would approach a contractor from the neighborhood to be partner with. The landowner contributes the value of land, while the contractor contributes the cost of construction. The split of units between the two partners is negotiated in terms of a number of units for each depending on the relative cost of land versus cost of construction. The project initiative utilized this mechanism of financing for units to be built on planned plots in new communities. The financing model applies for plots of 150 m^2, where the built-up area is limited to only 63 m^2 for ground floor and two additional floors. Infrastructure is supposed to be fully provided for these plots and designs and licenses are standardized without extra cost to the individual. Each plot benefits from the 15,000 LE grant from the government. The land price is to be paid on installments over a 10 year period, with a grace period applying to the first three years.

This program specified a detailed profile of financing for units available for low-income population. Although Mubarak's program provided a solution for only one-third of the expected housing demand in the same period, it leaved the rest for the private sector and local communities to develop. The participation of the private sector in construction and building increased, and its share of GDP rose from 51 % in 1981/82 to 88 % in

2006/07 (Ministry of Local Development 2007, p. 16). The majority of the development projects served mainly to meet the needs of the low-income groups and were suitable to the limited formal financial mechanisms available for the poor. It seemed that the majority of those housing units would continue to be developed informally unless innovative and flexible financial mechanisms would be initiated by CSOs and other non-governmental stakeholders.

The number of the beneficiaries of this project exceeded 120,000 persons. They were facing a lot of problems such as the unavailability of infrastructure, which was the responsibility of the government, rather than the role of the Unified Construction Law enacted 2008. This law aimed at streamlining the issuance of construction licenses, and the establishment of a one-step-shop for property registration, with the aim of reducing the time needed for property registration to one week. Nonetheless, many beneficiaries were still facing the same problems to move between different authorities and spending a long time in registration procedures. The law also identified the area of the building, which must not exceed 63 m^2 out of 150 m^2 representing the total area of the land devoted for each person. The beneficiaries tried to expand the devoted area for building to be 90 m^2 instead of 63 m^2, but the Ministry of Housing refused. The law also provided the demolition of unsafe buildings or of houses which do not follow the planning rules. So it presented a risk for the beneficiaries to start building without finishing the time consuming procedures. The progressive increase of the prices of building materials added another obstacle to the success of this project (EHDR 2008, p. 234).

Eventually, it can be summarized that the housing problem in Egypt is latent in the majority of the housing stock which is constrained by high vacancy rates, rent control and informality as follows:

- The Egyptian Center for Housing Rights confirmed that empty urban housing units stock increased from 3 million units in 1996 to 4.58 million units in 2006. This increase underlines the failure of the real estate laws issued by the government to address the stagnation in the real estate market.
- An estimation of 42 % of the housing stock in GCR is frozen under old rent controls.
- The recently growing housing stock consisted of luxury and upper-luxury units which were extensively constructed by both governmental and private sectors which could not dispose of them. As a result, a crisis arose among housing companies and the banks which provided loans to these companies. To face this problem, the govern-

ment issued a legal regulation of the relationship between landlords and the tenants (Al-Ahram Magazine, 25th July 2010).

- As shown in Table 4, the annual growth rate of the urban housing stock during the period 1986 – 2006 outpaced the annual urban population growth rate in the same period. The table reveals that among the housing units built during the last census period 1996 – 2006, Cairo Governorate accounted for over one quarter of Egypt's total urban housing stock.
- During the last inter-censuses period 1996 – 2006, the urban housing stock grew at a conservatively estimated rate of 4.1 % per annum (Table 4), of which 55.6 % were formal and 45.4 % were informal. Whereas the formal sector was constrained by high building and zoning standards, as well as a bureaucratic and costly registration process and because it was restricted to the New Towns, many families and small developers operated within the informal sector to meet the growing needs of lower-income households.

Table 4: Total number and annual growth rate of housing units in Cairo Governorate compared with total urban Egypt (1986, 1996 and 2006)

Item		Cairo	Urban Egypt
1986	No.	1,692,96000	5,737,967
	%	29.5	100.0
1996	No.	2,287,615	8,157,135
	%	28.0	100.0
2006	No.	3,138,913	12,287,319
	%	25.5	100.0
Annual growth rate in %	1986 – 1996	3.0	3.5
	1996 – 2006	3.2	4.1

Source: Calculated by the author based on CAPMAS 1988, CAPMAS1998 & CAPMAS 2008a.

The comparison between the supply and the demand of the housing stock, as shown in Table (5), reveals that the housing situation at the beginning of the 21st century became more a qualitative than quantitative problem. This can be deduced from the mismatch between supply and demand in different sectors of the housing market, which emphasizes the need to reform the housing policies. The imbalance embodied in a huge surplus of luxury housing does not find abundant demand, which helps to discharge the idle stock of apartments put up for rent or ownership.

On the national level, there is a huge number of vacancies exceeding 7.8 million housing units which equals about one third of the occupied housing units in Egypt. The same rate of the unused housing units in Cairo Governorate is retained out of the housing market for several reasons:

Table 5: Number of families, housing units and proportion of surplus and demand for housing units in Cairo compared with Egypt in 2006

Item		Egypt	Cairo	
		Nr.	Nr.	% of Egypt
Nr. of families		17,265,567	2,049,779	11.9
Nr. of housing units		24,815,312	3,133,626	12.6
Surplus of housing units	**Closed**	2,133,019	351,618	16.5
	Vacant	5,766,065	656,619	11.4
	Total	7,899,084	1,008,237	12.8
Demand for housing units	**Marginal residential places**	316,995	32,955	10.4
	New families	6,997,174	924,283	13.2
	Replacement and renewal	172,656	20,498	11.9
	Reserve	1,327,939	167,395	12.6
	Total	8,814,764	1,145,131	13.0
Housing gap		-915,680	-136,894	14.9

Source: Calculated by the author based on: CAPMAS 2008a & Ministry of Local Development 2007.

- A large proportion of tenants who moved from the old rented units to new housing units, retain their rental units closed instead of giving it back to the owners due to the low value of the rent.
- The desire of owners to maintain the housing units for their offspring.
- Others leave the housing units vacant because they have not yet found a buyer who can pay the higher price they want in terms of speculation.

These units can be plugged additional demand for housing, and bridge a large proportion of the gap between supply and demand if they are re-launched in the market (Al Ahram Journal, 15th December 2007). Cairo Governorate, specifically, suffers from an extreme housing gap which represents about 15 % of the housing gap in Egypt (Table 5).

Existing informal settlements provide a wide potential for solving the housing problem, as it was estimated in 1998 that they contain more than 580,000 empty dwelling units. Within Greater Cairo Region, 44 % of the housing stock are empty units. This means, theoretically, that the population growth of the GCR could be totally accommodated in informal settlements without any additional new housing. If the family growth rate is stable, the existing housing stock can shelter the future population for the next 130 years and even longer, if the population in these areas is decreasing (Denis & Sejourne 2002, p. 6).

2.1.6 Housing Policy after the Revolution of 2011 until 2013

After the Revolution of January 25th 2011, the political changes which happened and continue to take place, intended to build an effective democratic system, decentralize the political decision making and build trust and reliability of the others (El-Shahat & El Khateeb 2013, p. 5).

The most fundamental miscalculation which led to the recent revolution in Egypt is that the government has failed to address the issue of inequality in the distribution of the benefits of economic growth (El Kafrawy 2012, p. 174). Therefore, inhabitants of informal neighborhoods played an important role in the 2011 uprisings, revealing the deficiencies of governmental policy in these areas. The Revolution of 2011 was a turning point not only from a historical, political and social perspective, but also for urbanism. Therefore, the enjoyment of the right to adequate housing was a main demand of the Revolution of 2011, especially for the poor and marginalized population residing in inadequate housing conditions. Yet these citizens remain affected by housing violations including development based evictions and displacement (Housing and Land Rights Network & Habitat International Coalition 2011, p. 1).

Since the uprising in Egypt, informal area residents pursue new means of action, putting pressure on the government to recognize their rights. Taking advantage of the dwindling state of affairs in the months following the uprising, city dwellers seem to have developed new capacities for construction and self-organization. The phenomenon of unlicensed building construction has grown and was motivated by the lax security stability in the country after the revolution, emboldening many to encroach and build on both state and agricultural land (Mahmoud 2013).

The development of informal settlements is motivated also by the unreliability of the government and the private sector by many low- and moderate-income households. Data collected by the urban planners Sims and Shehayeb suggest that informal areas have been growing at two to four times higher than the rate before the revolution (Viney 2013). According to the General Authority for Rehabilitation Projects and Agricultural Develop-

ment (GARPAD), the total encroachment on state land along the desert roads was estimated to exceed 55,000 ha. The investors transferred the reclaimed areas along the freeways roadside to touristic retreats to gain high profits (Sakr 2013). In May 2013, GARPAD announced that the total encroachment on agricultural land by urbanization reached 752,000 cases covering about 13,500 ha of the most valuable agricultural land. 8,800 ha were in Delta governorates corresponding to 65 % of the total encroached agricultural land after the Revolution of 2011 (Table 6).

2.1.7 Summary

The above chapter related the current housing patterns in Egypt in general and specifically in Cairo Governorate to the development of political systems and the housing control laws issued during the 20th century and up until the end of 2013.

Contextually, it reviewed the evolution and development of the current housing problem resulted from the housing policy transition. It is clear that the housing problem emerged due to the imbalance between the demand of affordable housing units for low-income families on one hand, and the huge supply of upper-income housing on the other hand. Growth of uncontrolled urban settlement had evolved, on a limited scale, in Cairo before the July Revolution 1952. The 1952 Revolution had introduced a radical economic challenge. The economy was brought under the control of the state during the period 1954 – 1974. Rent controls were issued to reduce the cost of housing for low-income people. Although massive public housing projects provided affordable formal housing units for low-income families, the extension of the two industrial zones in Greater Cairo led to a massive flow of rural migrants. As a result, the phenomenon of informal settlements on state-owned land evolved in a dramatic way. Starting in 1974, Egyptian economic policy shifted to open door policy or *Infitah*. This policy resulted in rising prices for buildable land and building materials. Such increases together with high remittances of Egyptians working abroad resulted in a vast expansion of the informal built-up area on agricultural land. The formal housing during this period was limited to New Towns and had no effect at all on the slowing down of informal growth. As a result, the housing problem was aggravated.

Table 6: Total area of encroachment on agricultural land in the Egyptian governorates from 25th January 2011 to 7th May 2013

Governorate	Violation cases		Removed cases		Non-removed cases	
	Number of violations	Area (ha)	Number of violations	Area (ha)	Number of violations	Area (ha)
Aswan	1,561	44	253	7	1,308	37
Kafr el-Shiekh	31,595	662	1,269	36	30,326	626
Giza	16,360	258	3,651	59	12,709	199
Behira	93,911	1,483	5,260	163	88,651	1,320
Menoufia	98,022	1,110	1,175	57	96,847	1,053
Ismailiya	2,107	57	791	20	1,316	37
El-Minya	40,339	798	13,311	265	27,028	533
Sharkiya	71,368	1,320	15,499	290	55,869	1,030
Dakahliya	67,893	1,372	4,571	154	63,322	1,218
Beni Suief	25,824	420	722	13	25,102	407
Luxor	10,339	425	4,286	186	6,053	239
Fayoum	20,301	410	1,166	29	19,135	381
Cairo	2,945	53	138	2	2,807	51
Alexandria	12,318	210	889	34	11,429	176
Gharbeiya	73,401	1,441	4,204	128	69,197	1,313
Suez	216	31	21	26	195	5
Damitta	15,184	358	428	23	14,756	335
Asyout	44,193	694	7,534	130	36,659	564
Sohag	34,222	623	3,776	77	30,446	546
Qena	24,540	135	3,785	87	20,755	48
Qalyubiya	63,779	994	4,599	86	59,180	908
New Valley	24	1	2	-	22	0
Port Said	103	13	9	-	94	13
North Sinai	3	-	-	-	3	0
Nubariya	1,355	40	107	2	1,248	38
Marsa Matrouh	57	1	13	-	44	1
Total	751,960	13,388	77,459	1,873	674,501	11,078

Source: GARPAD, unpublished data, information and decision support center.

During the period 1981 – 2010, the state controlled Egyptian economy turned into a capitalist system. The state encouraged the private sector to take an active role. Although the goal was to solve the housing problems, public lands surrounding Cairo were sold cheaply for private development. These lands were supplied with infrastructure and transport links including express ways and bridges. As an outcome, the gated communities started to be constructed outside Cairo. Such communities raised the inequality between the poor in the city and the rich in the peripheries. The housing problem during this period is represented by the huge number of vacant housing units both within formal and informal settlements.

After the Revolution of January 25th 2011, the instability of the political system together with lax security resulted in a massive extension of informal settlements over both state and agricultural land at unprecedented rates.

2.2 FACTORS INFLUENCING THE HOUSING PROBLEM

Understanding the housing problem in Egypt requires the comprehension of the underlying factors for its evolution and subsequent development.

Like many developing countries, Egypt encountered population growth accompanied by massive urbanization trends which resulted in an upward shift in the demand for housing. These demographic changes have been taking place under the dictates of poverty.

Since the supply of housing is a function of the cost of materials, labor costs, government regulations, land values and housing prices (Aurand 2010, p. 1017), access to urban land and the price of building materials were cited as contributing factors to the existing housing problem. Therefore, an attempt is being made in the following chapter to identify and illustrate the major factors influencing the evolution and development of the housing problem.

2.2.1 Demographic Factors

2.2.1.1 High Population Growth Rate and Urbanization

One of the main factors affecting the housing problem in Egypt is the aggregated population growth and urbanization. Egypt is the most populated Arab country (about 83 million in 2013) and ranks on 15th position of the states with the highest number of inhabitants. Its population was about 10 million in 1897. The population grew slowly at an average rate of 1.3 % per annum from 1897 to 1947. The average rate grew significantly to reach around 2.4 % from 1947 to 1966. Afterwards, it declined again to 1.9 % due, in part, to the postponement of marriage, reductions in fertility after the 1973 War, and because of some changes in the age structure echoing the effects of World War II. From 1975 to 1985 the annual rate of population growth climbed to 2.8 % (Table 7). Ever since, the population growth rate has begun to fall while the decline in birth rates exceeded the continuing decrease in death rates (Awad & Zohry 2005, p. 1).

Though, Egypt's population still grows by approximately 1.5 million people per annum. The United Nations projections indicated that population will grow from 60 million in 1996 to 95.6 million by 2026 and it will reach 114.8 million before it stabilizes in the year 2065. This means an increase of approximately 84.4 % over the current total. This increase is esti-

mated mainly based on two reasons. First, fertility rates are still high in many parts of Egypt. Secondly, momentum will cause the population to continue to increase even after fertility rates reach a replacement level (Awad & Zohry 2005, p. 4).

Table 7: Number of inhabitants and annual growth rate of the population in Cairo Governorate compared to GCR and Egypt 1947 – 2006

Year	Cairo Gov.		GCR		Egypt	
	Population in thousands	Growth rate in %	Population in thousands	Growth rate in %	Population in thousands	Growth rate in %
1947	2,062	-	3,031	-	18,967	-
1960	3,358	3.75	4,910	1.82	26,085	2.34
1966	4,232	3.85	6,211	4.50	30,076	2.52
1976	5,074	1.81	8,090	2.68	36,626	1.92
1986	6,069	1.80	10,860	2.99	48,254	2.75
1996	6,789	1.12	13,144	1.93	59,313	2.08
2006	7,787	1.37	18,296	3.30	72,579	2.05

Source: CAPMAS 2008b and Duquennois & Newman 2009, p. 37.

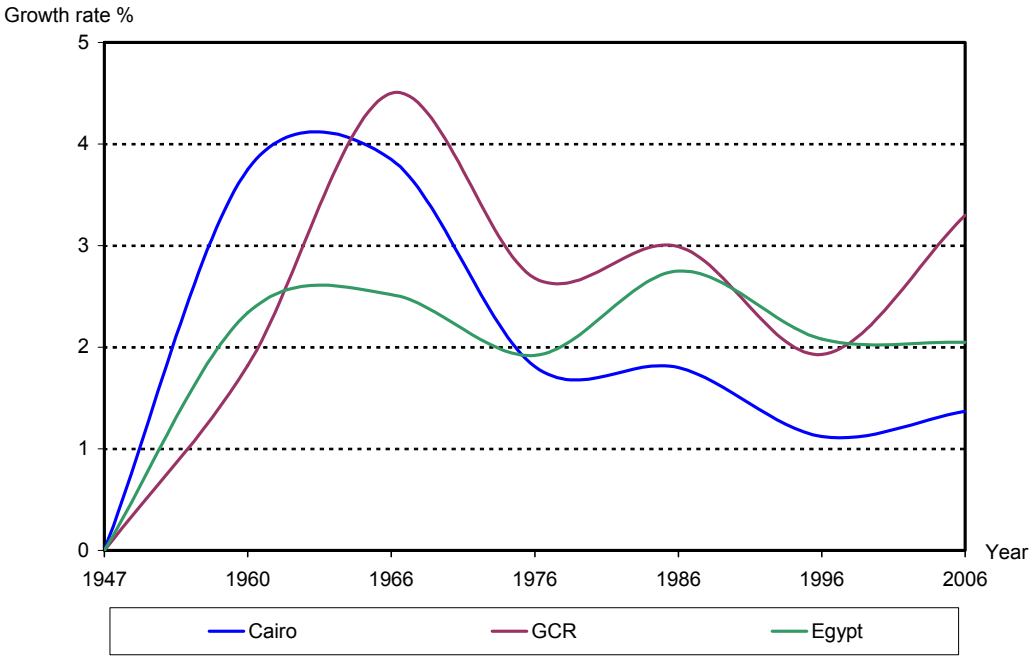


Fig. 8: Population growth in Cairo Governorate, GCR, and Egypt 1947 – 2006

Source: Designed by the author based on Table 7.

In addition to the high annual population growth rate for Egypt as a whole, there is a distorted population distribution in Egypt resulting from urbanization. The Greater Cairo Region only houses 25.2 % of the total population of Egypt, of which Cairo Governorate represented 10.7 % (Table 7). Cairo experienced tremendous urbanization in the form of informal settlements. Although the population of the whole country has grown ten-fold and a half during the last century, the population of Cairo has grown more than thirty-fold (El-Batran & Arandel 1998, p. 218). As shown in Fig. 8 and Table 7, over the second half of the 20th century, Cairo has grown alarmingly from a city of two million inhabitants to today's Greater Cairo Region agglomeration with a population of more than 18 million inhabitants. Rapid urbanization caused by massive migration of both men and women from the rural countryside to the capital contributed to this explosive growth more than natural increase.

Cities continue to act as magnets attracting rural educated and uneducated in steady but inexorable growing numbers. Therefore, the population problem in the major cities of Egypt tends to be more visible (Todaro 1980).

One of the most negative consequences of rapid population growth, associated with urbanization, is the progressive demand for additional housing units. The formal housing market has not been the source of housing provision for the growing population. Alternatively, the informal housing market was the only source for affordable housing to low- and middle-incomes urban dwellers.

In other words, due to the growing and rapid urbanization, the major cities in Egypt especially Cairo and Alexandria, have been forced to absorb large numbers of rural migrants. They experienced a doubling of the urbanized areas in form of a relatively uncontrolled sprawl. Urban expansion has far outpaced the capacity of the governments to adequately integrate and serve these new areas. The overpopulation, in the Egyptian cities generally and in Cairo specifically, resulted in a chronic shortage of housing and subsequently unaffordable priced housing. The mismatch between demand and supply of housing resulted in the rapid expansion of informal settlements.

According to a study carried out by the Egyptian Cabinet, the total number of inhabitants of informal settlements in Egypt reached 15 million people in 2007. Greater Cairo Region only has more than 6 million inhabitants living in informal settlements, accounting for 41.4 % of the inhabitants of the total number of the population living in informal settlements in the

country (Nawwar & Al Kotkat 2008a, p. 17). Cairo Governorate only has 3 million inhabitants living in informal settlements, representing 20.3 % of the total informal inhabitants in Egypt (Nawwar & Al Kotkat 2008a, p. 27). Fig. 9 shows the expansion of informal areas on the periphery of Cairo Governorate in 2009.

The study also concluded that population density of the built-up area of Cairo Governorate was 41.800 persons/km^2. This number is almost twice as high in informal areas and amounts to 79.600 persons/km^2.

According to a report issued by the Ministry of Local Development, the estimated number of informal areas' dwellers in 2007 was 15 million, of which 20 % lived in Cairo Governorate, 13 % in Giza, and 8 % in Qalyubia Governorate (Ministry of Local Development 2008).

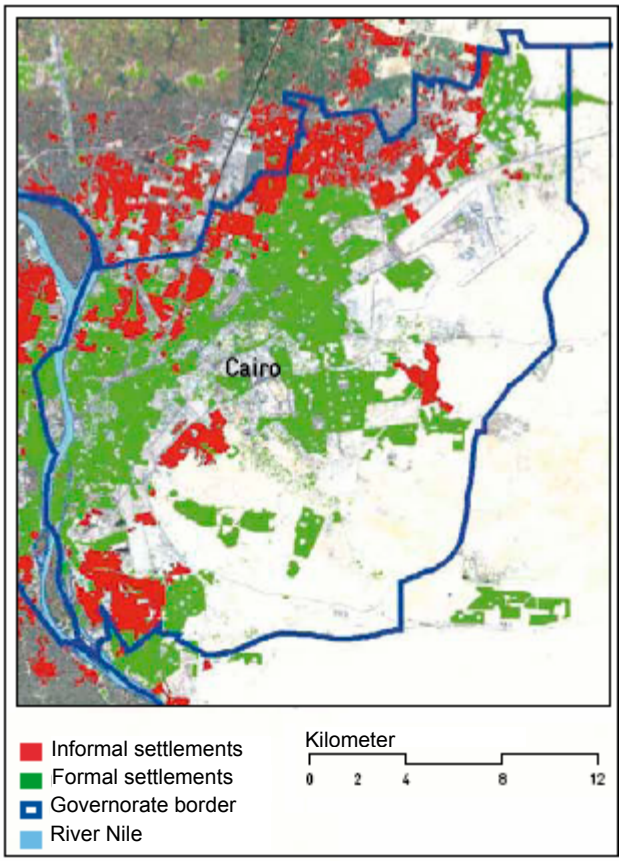


Fig. 9: Formal and informal areas in Cairo Governorate 2009

Source: Sabry 2009b, p. 28

The role of the population growth in aggravating the housing problem can be clarified by examining the components of urban growth in details in terms of natural increase and migration.

2.2.1.1.1 Natural Increase

The demographic growth of Egypt occurred during the course of its ongoing transition from a regime of high fertility and high mortality to one of low fertility and low mortality. As in many developing countries, this transition has taken place since the end of the World War II with a rapid decline of mortality, unaccompanied at first by any noticeable decrease in fertility. Prior to World War II, more than 250 out of every 1,000 Egyptian infants died before reaching their first birthday, but since the late 1940s the infant mortality rate has dropped quite steadily down to the current level in which about 40 ‰ die before age one (Weeks et al. 2004, p. 77). Table 8 and Fig. 10 show that crude death halved from 16.9 ‰ in 1960 to 8.4 ‰ in 1988 due to improvements in nutrition, medicine and public health, as well as in other socio-economic arenas such as education. For at least 20 years, the decline in mortality was not matched by an equal drop in birth rates, as the total fertility rate decreased during the same period from 1960 until 1988 only from 43 ‰ to 37.8 ‰. In other words, Egypt's fertility remained high through this period with a total fertility rate of 6 children per woman.

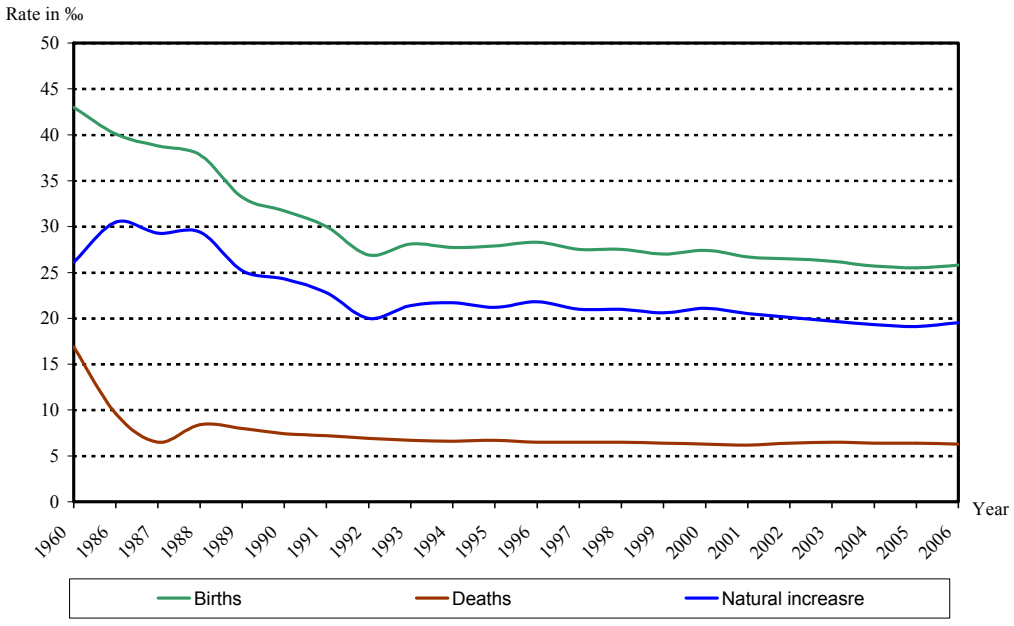


Fig. 10: Development of the rates of births, deaths and natural increase during the period 1960 – 2006

Source: Designed by the author based on Table 8.

Over the subsequent three decades, the birth rate has declined by 50 % to reach a current total fertility rate of around 3 children per woman (Table 9). Fertility rates were high especially in the poor rural areas of Upper Egypt, which were less able to support low population growth. Although family planning policy has been implemented since the 1960s, satisfactory results were not achieved due to religious misinterpretation of the issue (El Sioufi 1981, p. 8). Even after the country reached the replacement fertility level – i.e. 2.1 children per woman – the population of Egypt is going to grow for some more years. Momentum is a powerful demographic force as it is predicted to account for about half of Egypt's population growth over the next 100 years. The sooner the fertility rates are reduced, the smaller will be the number of people added to the population through this momentum (Awad & Zohry 2005, pp. 6 - 7).

Table 8: Development of the number and rates of births, deaths and natural increase in Cairo Governorate 1960 – 2006

Years	Births		Deaths		Natural increase	
	No. (000)	Rate ‰	No. (000)	Rate ‰	No. (000)	Rate ‰
1960	1,114	43.0	438	16.9	676	26.1
1986	1,908	40.1	456	9.6	1,452	30.5
1987	1,903	38.8	466	9.5	1,437	29.3
1988	1,913	37.8	427	8.4	1,486	29.4
1989	1,723	33.2	414	8.0	1,309	25.2
1990	1,687	31.7	393	7.4	1,294	24.3
1991	1,637	30.0	392	7.2	1,245	22.8
1992	1,497	26.9	383	6.9	1,114	20.0
1993	1,601	28.1	380	6.7	1,221	21.4
1994	1,611	27.7	385	6.6	1,226	21.7
1995	1,605	27.9	385	6.7	1,220	21.2
1996	1,662	28.3	380	6.5	1,282	21.8
1997	1,655	27.5	389	6.5	1,266	21.0
1998	1,687	27.5	400	6.5	1,287	21.0
1999	1,693	27.0	401	6.4	1,292	20.6
2000	1,752	27.4	405	6.3	1,347	21.1
2001	1,741	26.7	405	6.2	1,336	20.5
2002	1,767	26.5	424	6.4	1,343	20.1
2003	1,777	26.2	440	6.5	1,337	19.7
2004	1,780	25.7	441	6.4	1,339	19.3
2005	1,801	25.5	451	6.4	1,350	19.1
2006	1,858	25.8	452	6.3	1,406	19.5

Source: CAPMAS 2008b.

During the 1960s, fertility was slightly lower in Cairo than elsewhere in the nation due, in part, to the effect of delayed marriage resulting from rising levels of education among women in Cairo (Weeks et al. 2004, p. 78). Table 8 shows also that the decline in both crude birth and death rates during the second half of the 1980s was extremely strong compared to the subsequent period. Accordingly, the annual rate of natural increase in Cairo reached its maximum in the second half of the 1980s to range between 30.5 ‰ to 29.4 ‰ during 1986 – 1988.

In 2008, Cairo Governorate recorded the highest number of births on the national level – 199,000 births – representing 9.7 % of the total births in Egypt. In other words, a high birth rate of 28.59 ‰ in Cairo Governorate compared to 27.4 ‰ on the national level. The high birth rate can be mainly explained by the higher levels of fertility in the new suburbs, which were heavily characterized by informal settlements.

Table 9: Total fertility rate in Cairo Governorate 1950 – 2050

Period	**Total fertility rate** (children per woman)
1950 – 1955	6.37
1955 – 1960	6.65
1960 – 1965	6.55
1965 – 1970	6.20
1970 – 1975	5.70
1975 – 1980	5.66
1980 – 1985	5.52
1985 – 1990	5.20
1990 – 1995	3.91
1995 – 2000	3.50
2000 – 2005	3.16
2005 – 2010	2.89
2010 – 2015	2.68
2015 – 2020	2.51
2020 – 2025	2.37
2025 – 2030	2.25
2030 – 2035	2.15
2035 – 2040	2.07
2040 – 2045	1.99
2045 – 2050	1.92

Source: United Nations 2013.

Similarly, the highest crude death rate among the Egyptian governorates of 8.14 ‰ in 2008 was attained by Cairo Governorate, compared to 5.93 ‰ on the national level. This pattern was noticeable in the peripheries of the city in particular where informal settlements were expanding. Although the rate of the natural increase reached 20.45 ‰ in Cairo Governorate, it was lower than the national level of 21.47 ‰ and higher than the rate of some other rural and urban governorates such as Alexandria, Port Said, Dakahlia, Behira, Aswan and Luxor.

2.2.1.1.2 Migration and Urbanization

Generally, internal migration is responsible for the redistribution of about 25 % of the population of Egypt. Most of the internal migration streams in Egypt are directed from south to north and from south and north to Cairo.

Rural-urban migration in Egypt is very much driven by, or at least related to, the uneven spatial distribution of employment, income opportunities or just plain economic survival. Rapid population growth, especially in rural areas, provides an important demographic backdrop to these rural-urban migration shifts (Zohry 2002, p. 3). In fact, migration in Egypt is strongly influenced by poverty, economic difficulties, and improper socio-economic policies.

Egypt as a whole has experienced a substantial urban explosion characterized by heavy migration out of rural areas to one or more urban centers. The process of urbanization itself is an outcome of rural-urban migration. Moreover, in Egypt, high rates of natural increase partly account for rapid urban growth rates. Although urban inhabitants were only 19 % of the total Egyptian population in 1976, they exceeded 43 % in 2006 (CAPMAS 2008b).

As the population continued to increase and urbanization followed, the gap between demand and supply, both in the private and public housing sectors, greatly widened (El-Batran & Arandel 1998, p. 219).

With the growing number of migrants moving from the countryside to urban areas along with their inability to afford adequate housing units, small patches of housing started to extend gradually forming unplanned communities. Such communities suffer from the lack of utilities and access to basic services.

The repercussions of rapid urbanization in Egypt appeared primarily in Cairo. Since its establishment more than 1000 years ago, Cairo has continued to represent the main historic, economic, and urban hub of Egypt. Being the seat of the government and the center of the main services and facilities, it encountered an excessive population growth and became the largest metropolis on the African continent. Today, the GCR is the prime engine of economic growth in Egypt, dominating the economy even though it contains only about 25 % of the nation's population. The GCR contains 55 % of Egypt's universities, 46 % of its hospital beds, 40 % of its pharmacies, 40 % of the private sector employment, 60 % of cars, 50 % of buses, and 33 % of trucks. It is a place of unique political and cultural significance in the Arab World (Cities Alliance 2008, p. 8).

Since the 1960s Cairo has experienced a massive inflow of new inhabitants. Cairo has been deeply transformed by the global dynamics of urbanization, which resulted in an increase of the city's population by more than six times in the past 60 years (Piffero 2009a, p. 21). This inflow originated mostly from the Delta Region especially Menoufia Governorate, and districts of Upper and Middle Egypt. Table 10 reveals that the net lifetime migration rate reached 283.7 ‰ in 1960. The period from the late 1950s to the early 1960s can be called the "golden era of migration in Egypt" as a profound change in the social and economic geography took place after the independence from British colonial influence in 1956.

Nasser's industrial revolution moved Egypt from an agricultural society to a partially modern industrial society. Heavy industrial zones were established, mainly in and around the capital, notably at Helwan in the southern part of Cairo and Shobra el-Kheima in the northern part of the city. Tens of thousands of unskilled laborers migrated from all parts of Egypt to work in the new factories, enjoying both a secure job and a housing unit (Ibrahim & Ibrahim 2003, p. 95). The net lifetime migration rate gradually declined over time to reach 88 ‰ in 2004 (UN & Institute of National Planning 2008, p. 318). Such movements are either temporarily or permanent in nature. Unfortunately, temporary migration is hard to be recorded. However, the Greater Cairo Regions still has the highest population growth rate within Egypt (3.3 % in 2006) owing to the continuing movements. These movements resulted at first in a densification in the old town and later in the uncontrolled sprawl of settlements, especially in the periphery of Cairo along the Ring Road, which was built during the 1980s and 1990s.

As a result, the population of the old town is now declining; while the informal settlements are still growing. This densification caused various problems concerning the destruction of

arable land to the north and the west, consuming 500 hectares of prime agricultural land every year (El-Batran & Arandel 1998, p. 217). Table 11 clarifies that the average annual loss of agricultural land in the Greater Cairo Region was 19 km^2 which constituted about one third of the total lost agricultural lands by urbanization in Egypt during the period from 1976 to 1996. Furthermore, these informal settlements lack basic infrastructural services. The majority of the inhabitants are working in the agglomeration of Cairo, which is causing serious traffic congestion on the main roads to the inner city parts. Air pollution is only one of the effects of the overloaded metropolis. Actually, the migration from the countryside to Cairo has strained the responsiveness of the authorities for decades.

Table 10: Lifetime in- and out-migrants by governorate of origin and destination and net lifetime streams of migration in Cairo Governorate in 1960

Governorate of origin and destination	Lifetime in-migrants	Lifetime out-migrants	Net lifetime migrants
Alexandria	47,220	31,049	+16,171
Port Said	9,464	5,293	+4,171
Ismailia	9,518	9,813	-295
Qalyubia	90,668	23,837	+66,831
Gharbia	99,179	10,034	+89,145
Menoufia	216,764	7,038	+209,726
Giza	64,584	88,543	-23,959
Asyout	100,305	4,951	+95,354
Sohag	100,100	2,569	+97,531
Other Governorates	1,194,266	58,476	+ 1,135,790
Total	1,790,471	241,603	+ 1,548,868

Source: United Arab Republic 1963, p. 50.

Table 11: Average annual loss of agricultural land in Cairo, GCR and Egypt 1976 – 1996

Area (km^2)	Eroded area	Agricultural land made barren	Agricultural land lost to urbanization	Total loss	% of total Egypt
Cairo	5.9	3.6	13.7	23.1	11.1
GCR	3.0	1.2	19.1	23.2	27.3
Egypt	39.9	68.5	100.5	208.9	100.0

Source: GARPAD, unpublished data, information and decision support center.

Table 12 reviews the distribution of migrants in Cairo by place of last residence in 2006. From the table, it is clear that:

- From the major negative net gain in Cairo Governorate benefitted both Giza and Qalyubia Governorates. These trends were mainly directed to rural areas in the latter two governorates, especially those areas located within GCR. According to Zohry 2005, migration from rural Egypt to rural areas in these two governorates in 1996 census comprised 60 % of the net gain of rural areas. The total number of out-migrants from Cairo Governorate to all other parts of Egypt in the 2006 census was 794,000; 78.4 % of them migrated only to these two governorates.

Migrants prefer to live in the informal areas along the peri-urban and suburban areas of GCR where housing is less expensive than in the old parts of Cairo (Zohry 2005, p. 20). This trend is confirmed by analyzing the in-migration to districts of Cairo Governorate in 2006 as shown in Fig. 11. It can be deduced from the figure that the outskirts of Cairo Governorate have had the priority in attracting migrants especially in the districts of El-Salam, El-Marg, El-Mataria, Ain Shams, and El-Zawya el-Hamraa. These areas together with Shark Madinet Nasr and El-Basateen wa Dar el-Salam show rapid population growth at the expense of the depopulation of central districts as will be clarified in the next chapter.

– Menoufia, El-Minya, Asyout, and Sohag still represent the major areas of origin of migrants to Cairo Governorate. 36.7 % of the total number of in-migrants to Cairo came from these four governorates. In other words, they represented the source of more than one third of the in-migrants to Cairo Governorate. One of the influential factors motivating internal migration in Egypt is poverty. According to the poverty map implemented by EHDR 2010, El-Minya, Asyout, and Sohag contain more than 75 % of the poorest villages at the national level (863 out of 1411 villages). The deteriorating living conditions and high rates of unemployment in Upper Egypt force many people to migrant to Cairo in search for better living conditions. In general, migrants enjoy better services in Cairo than in their rural areas of origin (Zohry 2005, p. 15).

– The most common influencing factor of migration is the lack of job opportunities, especially for the landless population in the villages, combined with the wage differentials between rural and urban areas. Most of the studies on Egyptian migration highlight the tremendous concentration of production, employment opportunities, services, wealth, and political power

in Egypt's major urban centers, especially in Cairo and Alexandria. This concentration has made them unrivalled magnets for the country's internal migrants from both rural and smaller urban settlements (Zohry, 2005, p. 14).

Table 12: Distribution of in-, out-, and net-migration for Cairo Governorate by place of last residence 2006

Governorate	In-migration to Cairo	Out-migration from Cairo	Net-migration	Net-migration rate in ‰
Alexandria	22,605	14,248	8,357	1.1
Port Said	5,864	10,614	-4,750	-0.6
Suez	9,018	37,549	-28,531	-3.6
Damitta	6,810	1,887	4,923	0.6
Dakahlia	52,017	4,168	47,849	6.1
Sharkia	75,373	25,376	49,997	6.3
Qalyubia	47,010	304,279	-257,269	-32.7
Kafr el-Shiekh	11,815	1,225	10,590	1.3
Gharbia	48,635	4,729	43,906	5.6
Menoufia	84,926	9,230	75,696	9.6
Behira	15,043	3,205	11,838	1.5
Ismailiya	7,522	21,767	-14,245	-1.8
Giza	66,348	318,123	-251,775	-32.0
Beni Suief	48,333	3,577	44,756	5.7
El-Fayoum	54,102	1,554	52,548	6.7
El-Minya	71,672	1,767	69,905	8.9
Asyout	78,769	2,693	76,076	9.7
Sohag	76,614	1,820	74,794	9.5
Qena	36,019	3,165	32,854	4.2
Aswan	17,853	2,730	15,123	1.9
Luxor	5,571	872	4,699	0.6
Red Sea	1,125	7,235	-6,110	-0.8
New Valley	3,855	2,022	1,833	0.2
Marsa Matrouh	407	2,132	-1,725	-0.2
North Sinai	1,575	3,477	-1,902	-0.2
South Sinai	250	4,578	-4,328	-0.5
Total	849,131	794,022	55,109	7.0

Source: Calculated by the author based on CAPMAS 2008a.

– Other factors related to the differentiation of migration patterns are the distribution of migrants by gender and the specific reason of migration. Table 13 and Fig. 12 reveal that obtaining urban job is the main reason for male migrants, representing 21.8 % and 11.4 % of the total migrants in Egypt and Cairo respectively. Accompanying family members and marriage are the main reasons for female migration, representing 45.2 % and 74.8 % of the total number of migrants in Egypt and Cairo respectively.

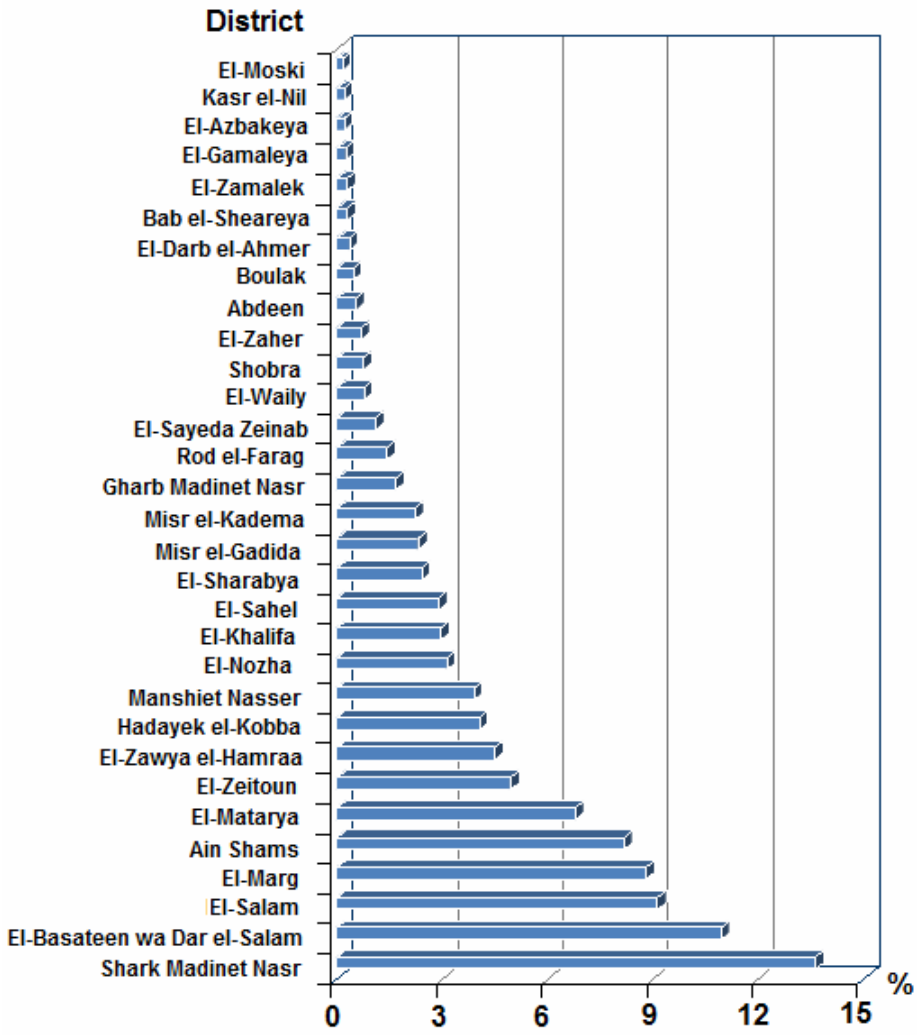


Fig. 11: Percentage of in-migrants in the districts of Cairo Governorate 2006
Source: Designed by the author, based on CAPMAS 2008a.

Table 13: Migration to Cairo Governorate and in Egypt by gender and reason of migration 2006

Reason of migration	Cairo						Egypt					
	Males	% of total migrants	Females	% of total migrants	Total migrants	% of total migrants	Males	% of total migrants	Females	% of total migrants	Total migrants	% of total migrants
Work	205,321	11.4	17,394	1.0	222,715	12.3	1,040,194	21.8	67,687	1.4	1,107,881	23.2
Study	20,220	1.1	8,290	0.5	28,510	1.6	72,089	1.5	33,847	0.7	105,936	2.2
Marriage	61,508	3.4	212,148	11.8	273,656	15.2	285,722	6.0	1,088,408	22.8	1,374,130	28.8
Divorced or widowed	851	0.1	5,201	0.3	6,052	0.3	4,477	0.1	26,509	0.6	30,986	0.6
Accompanying	79,994	4.4	1,137,663	63.0	1,217,657	67.5	640,245	13.4	1,071,518	22.4	1,711,763	35.9
Others	31,128	1.7	24,685	1.4	55,813	3.1	285,188	6.0	157,589	3.3	442,777	9.3
Total	399,022	22.1	1,405,381	77.9	1,804,403	100.0	2,327,915	48.8	2,445,558	51.2	4,773,473	100.0

Source: CAPMAS 2008a.

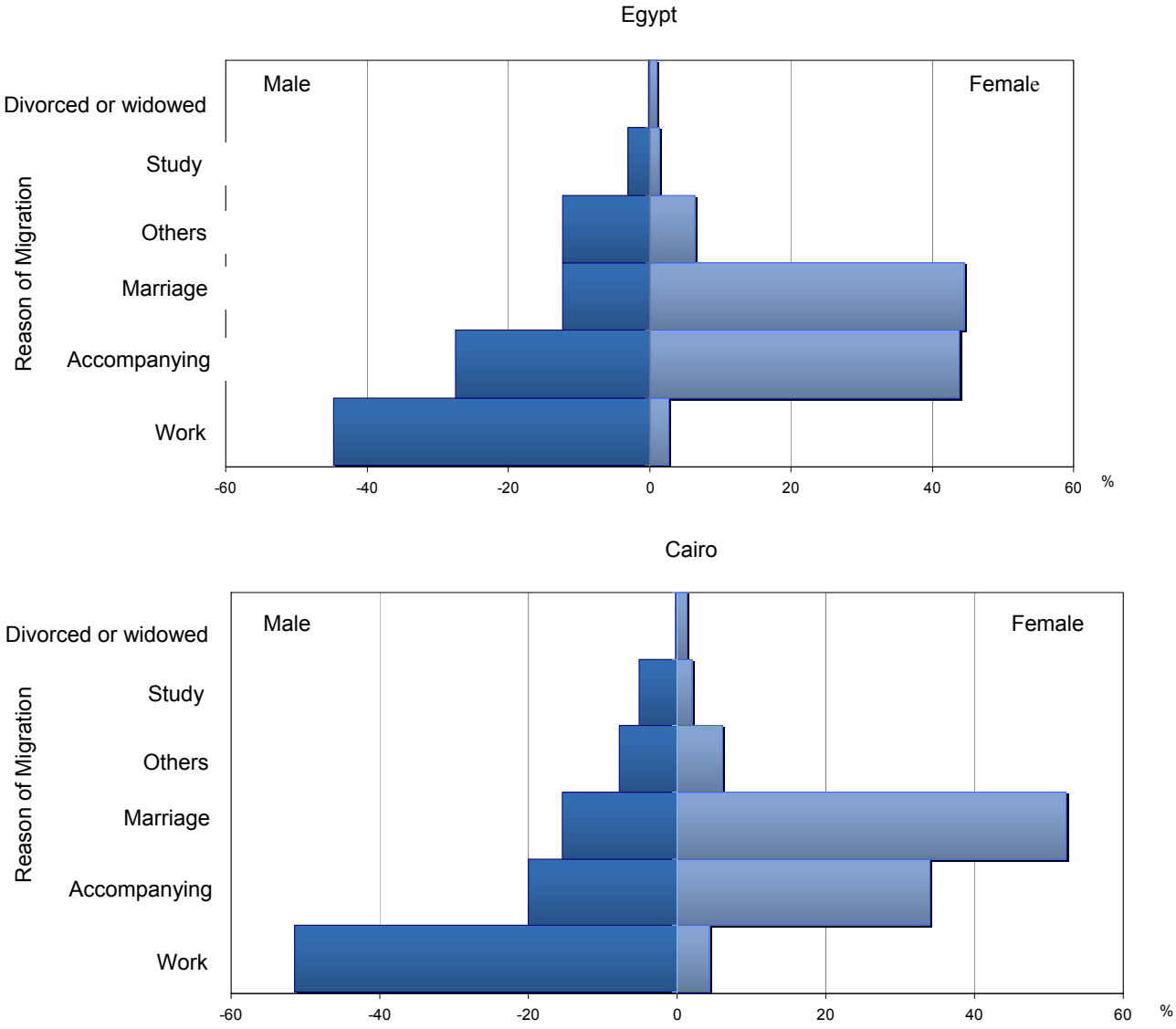


Fig. 12: Percentage of migrants by gender and reason of migration 2006

Source: Designed by the author, based on CAPMAS 2008a.

– As expected, the proportion of females migrating in order to accompany family members and for the reason of marriage was with 74.8 % much higher than among males of whom only 7.8 % migrated mainly to Cairo for the same reason. It is common in Egypt that the wife moves to the place of residence of her husband and not vice versa. Therefore, it is a major migration pattern of families that the husband first moves to the city and

his wife and children will follow him later on. Accordingly, female often migrate either for marriage or for accompanying family members (CAPMAS 2005, p. 19).

Migration of families from Upper Egypt and the Delta resulted in a critical aggravation of the housing pressure.

Finally, while the migration of the rural population represented one of the major factors fuelling the urban expansion of the capital in the past, recent studies show that this is no longer the case. In 1960, an estimated 35 % of Cairo's inhabitants were not born in the city (Piffero 2009a, p. 21). In 2006, only 13 % were born elsewhere. Currently, the growth of the capital is partially explained by rural-urban migration, but increasingly by natural population growth. Although rural migration to Cairo slowed down during the past decades, high birth rates, especially among impoverished people, keep instantly the demand for more affordable housing alive.

2.2.1.2 Age-Sex Structure

Despite the decline in fertility rates in Egypt, the population continues to grow rapidly. Each generation of young people enters the child bearing age in great numbers. Table 14 reveals that the dependent population below the age of 15 years started to decrease during the 1990s after a persistent level of 40 % of the overall population between 1950 and 1990. Nevertheless, Egypt's demographic profile shows a pronounced "youth bulge". The 2006 census data indicate that almost 25 % of the Egyptian population is between the age of 18 and 29 (Fig. 13). This youth bulge resulted from the population increase in the 1980s followed by relative fertility decline. This demographic profile represents both an opportunity and a challenge. Once these young people reach their working age, their ratio to the older and younger non-working population will constitute a demographic gift of low economic dependency (El-Zanaty et al. 2009, p. 14). However, the large size of this group places enormous pressures on the educational system as well as on the labor and housing market. Failures in these institutions may result in social and economic marginalization of a large proportion of youths that will be unable to compete in an increasingly globalized economy. Therefore, the youth bulge will constitute a "demographic burden", rather than a gift (Egypt Human Development Report 2010, p. 35). The increase in this category should be faced by well planning to avoid a high rate of unemployment or a wider housing gap in the future.

At present, children under the age 15 constitute 32 % of the total population of Egypt. The decrease of this age group will give families a disposable income to save or invest, which may help to spur economic growth, create jobs, and in turn reduce unemployment either in urban or rural areas. This may have an indirect impact on reducing the migration rate from poor rural settlements to urban areas and may accordingly affect the housing problem in urban areas, especially in Cairo.

Table 14: Age structure of the population in Egypt 1950 – 2050

Year	Age group 0 – 14		Age group 15 – 59		Age group 60 +	
	Number in 000	%	Number in 000	%	Number in 000	%
1950	8,464	39.3	11,928	55.4	1,123	5.2
1955	10,079	41.3	12,992	53.3	1,306	5.4
1960	12,194	43.9	14,104	50.7	1,501	5.4
1965	13,764	43.6	16,097	51.0	1,712	5.4
1970	15,333	43.1	18,297	51.4	1,945	5.5
1975	16,734	42.3	20,666	52.2	2,199	5.6
1980	18,745	42.2	23,185	52.2	2,503	5.6
1985	21,275	42.0	26,458	52.2	2,922	5.8
1990	24,444	42.3	29,901	51.7	3,440	6.0
1995	25,501	39.9	34,379	53.8	3,977	6.2
2000	25,889	36.9	39,722	56.6	4,563	6.5
2005	25,724	33.3	46,274	60.0	5,156	6.7
2010	27,149	32.1	51,030	60.4	6,295	7.5
2015	28,519	31.1	55,783	60.8	7,477	8.1
2020	29,129	29.5	60,537	61.4	8,972	9.1
2025	28,875	27.5	65,364	62.3	10,731	10.2
2030	28,275	25.5	70,021	63.1	12,611	11.4
2035	27,920	24.0	73,987	63.5	14,596	12.5
2040	27,774	22.8	76,501	62.9	17,343	14.3
2045	27,440	21.8	77,758	61.7	20,806	16.5
2050	26,679	20.6	78,009	60.2	24,846	19.2

Source: United Nations Secretariat 2008.

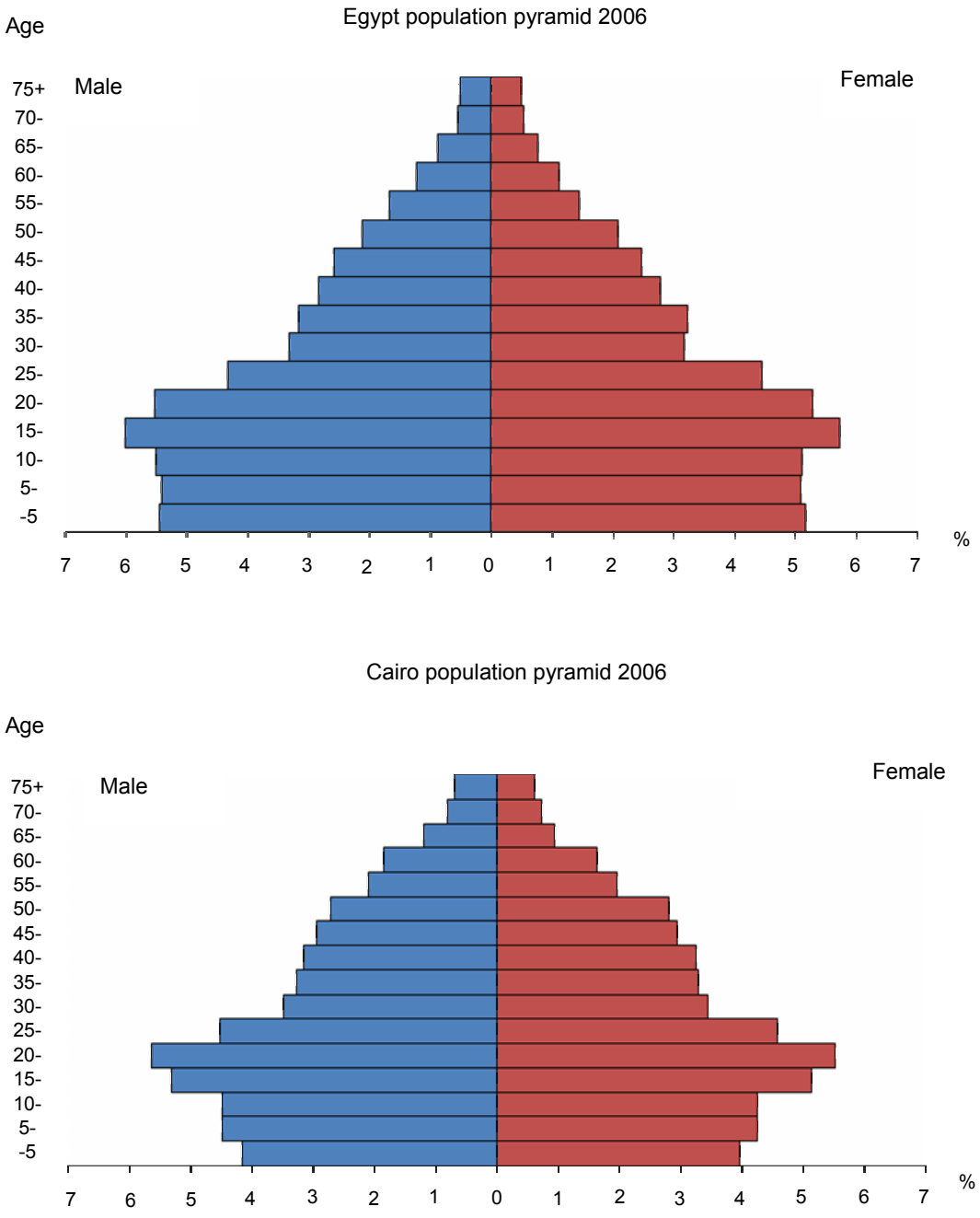


Fig. 13: Age-sex structure of the population in Egypt and Cairo 2006

Source: Designed by the author based on CAPMAS 2008a.

Fig. 13 indicates that the population between the age of 15 and 29 years constituted 30.6 % of the total population of Cairo Governorate in 2006. It can be concluded that this large proportion represents an important element in the housing problem, especially if it is taken into consideration that the median age of the first marriage for the population of urban Egypt is 22 years (EDHS 2010, p. 100). Hence, there is a progressive need for more affordable housing units for newlyweds in informal settlements.

2.2.2 Poverty

Poverty in Egypt plays a direct and an indirect role in the existence and the acceleration of the housing problem in Egypt in general and in Cairo in particular. Its direct role is obvious in the inability of low-income migrants to afford a housing unit in the formal sector, motivating them to reside in informal housing. Poverty prevents people from obtaining a plot of buildable land or, if the land is available, they cannot afford building materials due to the progressive increase of their price. The indirect role of poverty is concealed in the orientation of poor migrants from rural areas to Cairo as most of migrants are looking for both jobs and housing units. In that manner, it plays an indirect role in the aggravation of the housing problem especially in Cairo.

According to CAPMAS 2008b, the proportion of the poor population in Egypt reached 21.6 % in 2006. 11 % of the urban population is classified as poor compared to 28.9 % of the inhabitants of rural settlements. EHDR 2008 revealed that poverty is concentrated in rural areas where 78 % of the poor and 80 % of the extreme poor are living.

Poverty is mainly concentrated in Upper Egypt. Although this region represents only 25 % of the total Egyptian population, its share of the extreme poor is almost 66 %. Subsequently, almost 95 % of the poorest villages are located in the same region. The average poverty rate in the poorest 1000 villages is 52 %, while the corresponding figure in the poorest 100 villages is 77 %. In the poorest 1000 rural settlements, almost 5 million people live under the poverty line, representing about 37 % of the total number of the absolute poor in Egypt (13.6 million persons). Higher rates of poverty are associated with a higher unemployment rate, a higher share of illiteracy, a larger dependency ratio, and the lack of basic services (EHDR 2008, p. 53).

The World Bank (2001) pointed out that almost 35 % of the Egyptian population is considered fairly close to the poverty line. EHDR (2008) stated that the proportion of the poor in Egypt decreased from 24.3 % in 1990 to 19.6 % in 2007. The Egypt Human Development Report (2010) revealed that more than one million poor households, comprising approximately 5 million persons, were living in the poorest 1000 villages in Egypt. They represented almost 46 % of the total residents of these villages and 54 % of the total number of the rural poor in Egypt. The majority of them were living in three governorates in Upper Egypt (i.e. Asyout, El-Minya and Sohag).

According to the last report on the poverty map issued by the Ministry of Local Development, the number of the poorest villages has reached 1141 villages spread over ten governorates, i.e. El-Minya, Sohag, Asyout, Qena, Sharkia, 6th October, Helwan, Beni Suief, Behira and Aswan. The total population of these villages is about 11.8 million people. More than 1.1 million poor household are living in these villages, representing about 45 % of the total population of these villages. The report affirmed that almost three quarters of the poor are concentrated in three governorates Asyout, El-Minya, and Sohag as mentioned above.

Poverty rates in Cairo Governorate and in the Greater Cairo Metropolitan area declined significantly between 1995 and 2000. This means that Cairo has a relatively low poverty rate compared to other governorates. Projections indicate that the poverty rate in Cairo Governorate will increase from 4.6 % in 2005 to 7.6 % by 2015. This is due to the internal migration and greater numbers of people living in vulnerable areas (Sabry 2009a, p. 21).

The informal areas are generally characterized by the following factors:

- High concentrations of the urban poor.
- High illiteracy rates.
- High rates of unemployment or underemployment because of seasonal or daily jobs, a predominance of work in the informal economy, and child labor.
- Prone to environmental hazards and widespread health problems as a result of unhealthy conditions due to garbage, insects and rodents, and the infant mortality rate is high.
- Narrow pathways between buildings, overcrowding in rooms and lack of privacy.

People living under such conditions may have an income of a few pounds above the poverty lines, but it is inconceivable to think about them as ”non poor“. Despite the aforementioned statistics, poverty lines are set far too low in relation to the costs and conditions of living. Undoubtedly, adequate housing is essential as a basic human need. The national poverty line in the World Bank Report (2007) allows for a household of five members to live only in one room with a shared toilet in a Greater Cairo slum. If they lived in anything better, they would have almost no money to spend on any other non-food essentials (Sabry 2009a, p. 21).

2.2.3 Access to Urban Land

A major obstacle to get affordable housing is the rise of land prices resulting in an increase in the relative importance of land costs within the aggregated costs of house or apartment building. After the Revolution of July 1952, the government began to intervene directly in fixing the prices of all goods. One of the main aspects of the state interventions was the specification of the rental values for housing. A series of laws were issued to reduce the rental value as mentioned in the previous chapter, which resulted in a sharp decrease in land prices. From 1960s onwards, the high rate of population growth combined with the absence of new formal subdivisions within which housing could be built, caused a steady increase in the price of land (Dorman 2009, p. 424). It was estimated that the price of land for low-income people rose 23 fold between 1960 and 1993 (El-Batran & Arandel 1998, p. 220).

Another factor with stimulated the increase in land prices was the construction of the High Dam which started in 1962. The demand for building materials increased and was followed by a rise in land prices.

After the end of the 1973 War and the adoption of the Open Door Policy, the price of building land started to explode. The dramatic increase of the costs for building materials and land combined with rising wages due to the shortage of workers who preferred to migrate to the oil-rich countries after 1973 and a massive influx of remittances caused a steep increase in the prices of dwelling units. Most Egyptians could not afford the prices of these units (El-Batran & Arandel 1998, p. 221). In 1975, the price of a square meter in the top locations ranged between 64 and 65 LE. At the beginning of the 21st century, the land prices reached up to 10,000 LE per square meter. Simultaneously, the price of land

in the low-income areas went up from 12 LE in 1975 to 400 LE per square meter in the year 2000.

Consequently, urban growth expanded over agricultural land around the cities because the land prices on the periphery were affordable for people with a relatively low income. Desert sites around the cities were illegally occupied and then developed into informal settlements (El-Batran & Arandel 1998, p. 221).

During the period 2000 to 2007, the price of buildable land rose in some areas of Heliopolis and Nasr City by 150 %, from 10,000 LE to 15,000 LE. In popular areas the situation got even worse: Prices went up by 250 % from 400 to 1,000 LE during these seven years (Al-Ahram Al-Araby Magazine, 25th August 2007).

Speculation of brokers in the real estate market contributed significantly to the explosion of land prices during thirty years by about 350 times. As a result, during the period 2000 – 2007, the annual rate of increase of the price for a housing unit in Egypt rose by 14 % which is at least twice as high as the global average which ranges between 5 – 7 % (Al-Ahram Al-Araby Magazine, 25th August 2007).

Similarly, the situation was not better in the New Towns where the price of the buildable lands dramatically increased, too. In 6th October City, one of the oldest new urban communities in Egypt, the price of a square meter rose between 1980 and 2007 from a range of 17 – 25 LE to 1,000 – 2,500 LE per square meter.

Arab investors bought vast areas of the building lands in the New Towns, such as 6th October City and New Cairo. Since the land was sold by auction, those investors monopolize the process of construction in such towns. Therefore, some New Towns became cities for the elite and lost their main goals for which they had originally been planned. These goals were the redistribution of the Egyptian population and the reduction of the population density in the crowded areas. It was estimated that Arab and foreign investments reached 30 billion LE only in 6th October City (Al-Ahram Al-Araby Magazine, 25th August 2007).

Another example for the increase in the price of building lands was documented in Asyout City. As part of a rural governorate, it was suffering from a high increase in prices for buildable and agricultural land during the last few years which reached up to 45,000 LE

per square meter. The rate of increase was much higher compared to the buildable land in the capital or in the New Towns. Therefore, the prices of some apartments have grown to more than one million LE. Within the rural context, the price of the surrounded farmland has jumped up at an unprecedented rate to reach half 210,000 LE per ha. This amount is three times higher than in Cairo. As a result, many youths preferred to migrate from Asyout to Cairo where it was easier to get a house or an apartment. For this reason, a significant stream of migrants from Asyout invaded Cairo.

2.2.4 Increase of the Price of Building Materials

One of the main factors affecting the housing problem in Egypt is the progressive increase of the prices for building materials which represent a high proportion of the non-land cost for housing. This industry is considered a key obstacle for housing affordability in Egypt.

Considering the high rate of urbanization in the 1960s, the demand for building materials rose substantially. This occurred, however, at a time when the government was committed to a policy of keeping inflation in check (Wheaton 1981, p. 245).

In the context of socialism after the 1952 Revolution, the Egyptian government focused on three basic public policies towards housing. One of these policies was setting prices and allocating supplies of several major building materials. Prices were always fixed below international levels. Behind such policies existed a fairly consistent attitude towards subsidizing the housing sector. The policies were generally ineffective because they appeared to be inherently unenforceable. One of the consequences of the lack of enforcement was the emergence of a system of underground or black markets with various forms of pricing.

It seems possible that the actual effects of the policies may not only be contrary to their intended aims, but they may also be less desirable than would be a simple laisser-faire policy (Wheaton 1981, p. 243)

As shown in Table 15 and Fig. 14, the cost of the main building materials, namely steel and cement, rose by 276 % and 475 % successively during the period from 1973 to 1983 in the wake of the adoption of the Open Door Policy. Moreover, the black market in building materials had a direct effect on housing prices (Soliman 1989, p. 40). In addition, subsidies for building materials tend to go to better-off households and probably

lead to an increase in the price of unsubsidized materials for less well-off households (Soliman 1989, p. 37).

This industrial sector was gradually liberalized under the open door system and fully liberalized during the rule of Mubarak, leading to the consolidation in some sub-sectors, namely steel and cements. The domestic steel industry was dominated by one group which controlled over 70 % of the market. Similarly, the domestic cement industry is dominated by a few enterprises, including multinational companies which managed to seal a joint agreement in order to close the gap between local and international prices without any real increase in the production costs. In the absence of well-established anti-trust regulations, these monopolistic practices have led to significant increases in construction costs and have ultimately reduced housing affordability (El Kafrawy 2012, p. 42). Monopolistic groups continue to dominate the formal housing sector, particularly with regard to buildable land, building materials and capital, and they have excluded the urban poor from participation in this market. Therefore, the urban poor have found a way out through another type of market in the form of informal housing and in particular squatting (Soliman 1989, p. 45).

To estimate the effect of the increase of the building materials prices, one should take into consideration the cost of its manufacturing in relation to their price on one hand and the total cost of construction in relation to the level of income of the builder on the other hand. The main building materials which show unimaginable increase of price were steel and cement. In 2007, the real cost of one ton of steel was about 2000 LE and the real cost of one ton of cement was 125 LE. The minimum cost to construct one floor was estimated to be less than 40,000 LE (Al-Ahram Al-Araby Magazine, 25th August 2007).

Although, Table 15 reviews the annual average price of the building materials, there were seasonal shifts in the prices owing to the market mechanism in terms of demand and supply.

Due to the great demand on steel in construction and the decline of the share of imported steel which was even more expensive, the price of steel in Egypt was much higher than expected. It was estimated that the cost of steel reached 20 % of the total cost of construction. The price of steel attained its highest rate of increase in the year 2008. Although the average price was 6,270, the actual price per ton of steel reached

7,700 LE in May 2008. The price recorded an increase of about 2,850 LE per ton within only two months in 2008 (CAPMAS, Annual Bulletin of Prices of Materials and Industrial Products 2008). During only two months in March and April 2010 the price rose by 25 % from 3,280 to 4,100 LE.

Table 15: Increase in the cost of the main building materials between 1963 and 2013

Year	Steel		Cement	
	Price LE/ton	Change in %	Price LE/ton	Change in %
1963	67	-	5	-
1973	93	38.8	8	60.0
1983	350	276.3	46	475.0
1995	1,273	263.7	320	595.7
2005	2,728	114.3	315	-1.6
2010	3,925	43.9	523	66.0
2013	5,340	36.1	645	23.3

Source:
- (1963 – 1983): Salama 1995, p. 13
- (1995 – 2013): CAPMAS, Annual Bulletin of Prices of Materials and industrial Products, different years.

The phenomenon of building without reinforced concrete pillars is a consequence of the increase in steel prices. It became a common phenomenon and spread throughout all the rural areas and squatter settlements in the Egyptian cities for the sake of avoiding the cost of steel in the total building costs. Despite the seriousness of this phenomenon in a region where earth quakes may occur, it was the only recourse for low-income people to reduce the cost of building.

Simultaneously, the price of cement increased and reached a temporary maximum of 530 LE/ton in 2008 as well. This was caused by the increase of the consumption of cement by 25 % during the second half of 2008.

Due to the rise in the price of building materials, housing construction within some areas of squatter settlements relies upon affordable indigenous or recycled building materials.

For example, some residents used natural stones from the desert areas for building. In other cases they relied on materials which were recycled from other buildings. Some houses were using stone for the footings and base of buildings and the rest was either with brick, stone blocks, recycled materials or a combination of all (Williams 2004, p. 18).

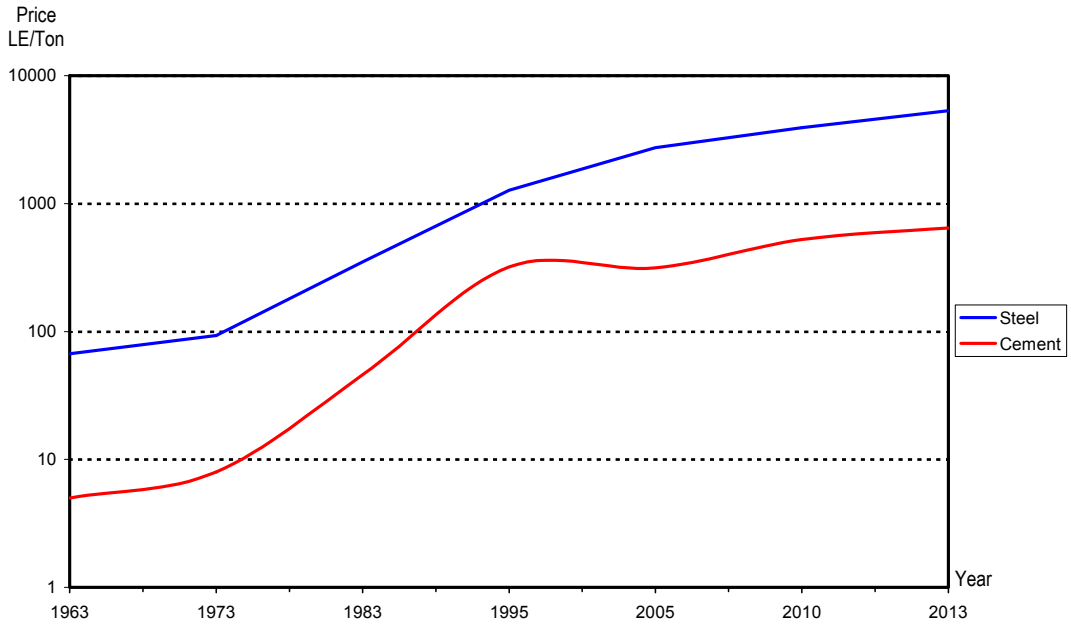


Fig. 14: Development of the price of the main building materials between1963 and 2013

Source: Designed by the author based on Table 15.

Other dwellings were constructed of load bearing limestone walls and shallow reinforced concrete foundations to reduce the construction costs (Soliman 2012, p. 231).

2.2.5 Summary

It has been observed that a combination of different factors played an important role in the current excessive housing problems in Egypt as a whole and in Cairo especially. Demographic factors represented in the rapid growth of the population combined with urbanization had a major impact on the proliferation of informal settlements in Cairo. These factors are in turn linked with the limited capacity of the local authorities to supply buildable land for housing and to facilitate formal provision of housing for the newcomers. Cairo Governorate houses approximately 10.7 % of the Egyptian population of which 3 million are living in informal settlements. Cairo has been affected by the massive

inflow of families from other rural areas since the 1960s. The traditional rural perceptions of the migrants motivated them to attain more births. Therefore, informal areas show much higher fertility rates than the population in formal settlements.

One of the negative long-term consequences of the massive migration to Cairo during the second half of the 20th century is the current youth bulge, where 30.6 % of the population are in the age of 15 to 29 years. Closely related to urbanization, poverty of migrants redirected them to the informal market looking for affordable housing. The encroachment of informal settlements on both agricultural land and desert sites represents another facet of the housing problem and was mainly caused by the increase of the price of buildable land after the 1973 War. Monopolization of the prices of building materials during the neo-liberal period since 1981 together with the rise of land prices resulted in very expensive housing units especially in the formal sector. Having outlined some factors which influence the growth and structure of the housing patterns, the consequences of such housing problems in the Cairo Governorate will be identified and analyzed in the following two chapters. The main variables in this analysis are population density and socio-economic indicators.

2.3 POPULATION DENSITY IN CAIRO GOVERNORATE

In the previous two chapters, the evolution of the existing housing problem, its dimensions and the influential factors have been discussed. In this chapter, an attempt is being made to unveil one of the outcomes of such problems represented in the current pattern of population density in Cairo Governorate.

Population density is a key factor in describing how cities live, operate and develop. Cairo, the capital of Egypt, suffers from the burden of supporting a population which is growing faster than its ability to expand the necessary infrastructure and provide basic services (El Batran & Arandel 1998, p. 217).

In the context of housing patterns, population density can be viewed as a factor and also as an outcome promoting the expansion of informal settlements.

As a factor, the rural areas in many Third World regions have arrived at the limits of their absorptive capacity for their ever growing population due to high population density. An increasing part of the population surplus is absorbed by the cities. The largest city exerts the biggest attractive force and becomes the primate cities (Weiss 1990, p. 97). It may be observed that, as the settlement ages and population density increase, migrants seek other settlements or other areas to reside (Young 2010, p. 89).

As an outcome, population densities in informal settlements on the peripheries of the city are higher where costs of dwelling are more affordable for low income groups than population densities in formal market where land have regulations for planning or building. The unnatural population density in informal areas leads to the deterioration of all their urban environmental components.

To explore more thoroughly the population density patterns as an outcome of the housing problem in Cairo Governorate, an analysis at the shiakha level was desirable to pinpoint more accurately areas of population density change. An additional approach was followed that is to examine population density in relation to the built-up area of the census unit, rather than the census unit as a whole. In other words, population per unit area of built-up surface was calculated for each census unit in the study area in 2006.

Population density of the built-up area of the census units is calculated, giving much deeper insight into the city's growth than previous studies which calculated density based on census units in their entirety.

The analysis of population density of the built-up area could provide a second source for determining the changing extent of the urban area. This metric offers a different measure from the traditional calculation of population density and provides a measure of urban living environment by reflecting the dynamics of both population and urban land use growth (Yin et al. 2005, p. 595).

It's worth mentioning that the total area of Cairo Governorate is 378 km^2, while the inhabited area is 290 km^2 which represents 76.7 % of the total area of the governorate.

2.3.1 Methodology

In order to characterize the built-up area inside Cairo Governorate medium resolution remote sensing data were used.

Since the beginning of the Landsat program in the early 1970s, it has become one of the most widely used and available sources of remote sensing imagery.

The Landsat 7 Enhanced Thematic Mapper (ETM+) images have a higher spatial resolution for the thermal infrared band (60 m as compared to 120 m) and an additional panchromatic band (15 m) resolution.
The Landsat Enhanced Thematic Mapper (ETM+) image of August 24th 2006 was classified. The image depicts two forms of land cover types including built-up area and non built-up area.

Prior to classification, a subset covering about 666.8 km^2 of the 2006 image was used to reduce the time of computation and image interpretation. High spatial resolution image (IKONOS image with 1 m resolution) and maps with the scale 1:5000 were used to assist image analysis. Fig. 15 contains subsets of the images of different spatial resolutions to show the levels and details of the built-up area.

Bands 1 through 5 and 7 of the Landsat ETM+ image were used in a supervised classification. The basic steps followed were:

- Selecting training samples which are representative and typical for that information class;
- Performing classification after specifying the set of the training samples and the classification algorithms.

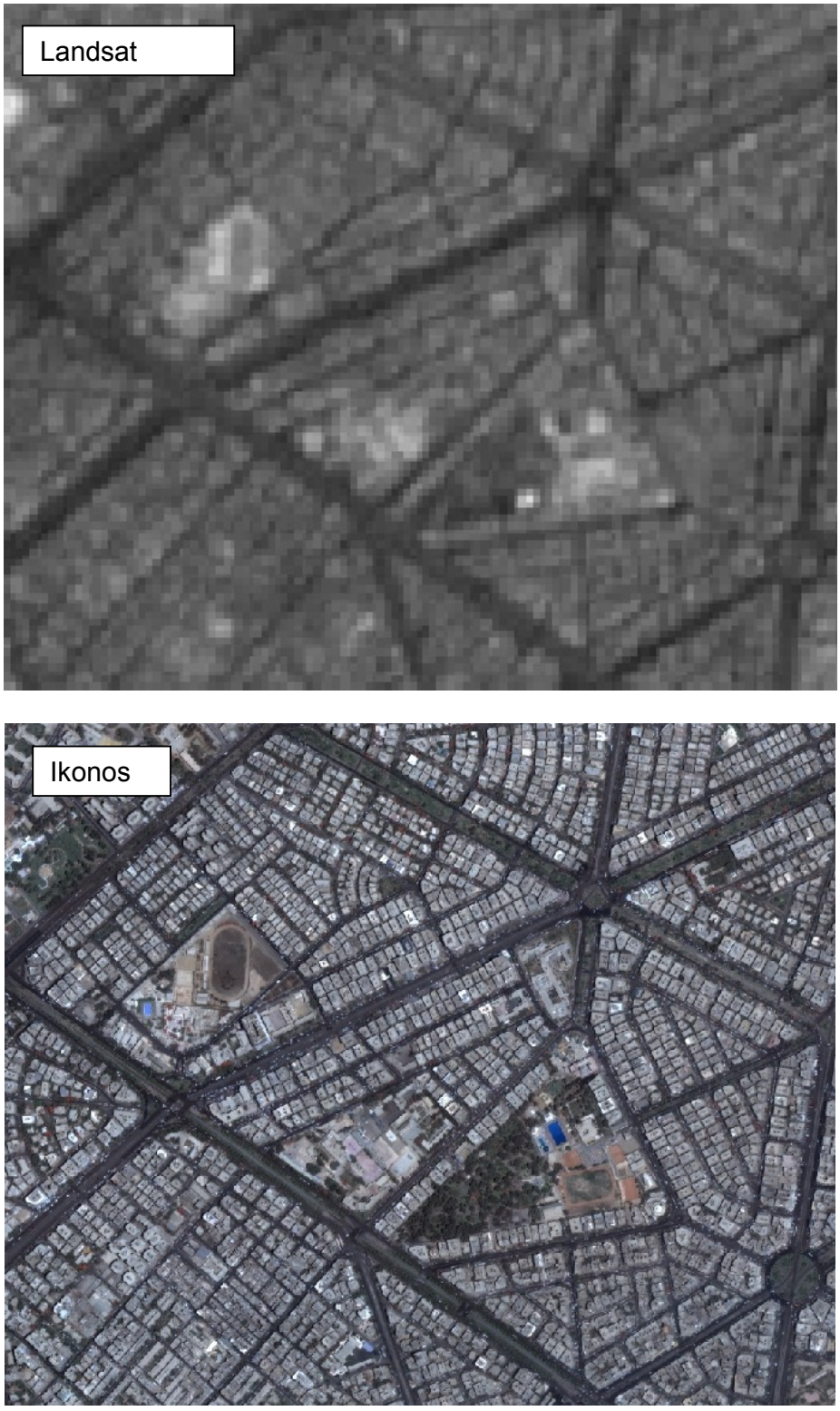


Fig. 15: Subsets of images of different spatial resolutions; Landsat ETM+ (30 m, 2006) and IKONOS (1m, 2000)
Source: Designed by the author.

Since the focus of this study is the built-up area, all man-made surfaces were defined as built-up surfaces. High resolution image (IKONOS 2000) was used in image analysis.

The classified image was integrated in a geographic information system with the census data using population data from the 2006 census which was conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS). The area and proportion of the built-up surface, based on image classification, was summarized for each shiakha and then related to the population size to calculate the population density for the built-up area, as will be clarified later in this chapter.

2.3.2 Change of the Population Density in Cairo Governorate 1996 – 2006

The analysis of the change of the population density confirms an emerging urban trend previously identified anecdotally by Stewart 1999 and Yin et al. 2005 according to which the central core of Cairo is experiencing a decline in overall density (Fig.16). Furthermore, the density in newly developed areas, especially those on desert fringes, is increasing dramatically. This kind of city development can be explained by the theories of natural evolution growth: While the land in the central city becomes filled in, development moves to open tracts of land in the suburbs on the peripheries.

As long as the cost of moving goods and people within cities was high, the urban areas were densely populated. Then, low and high income groups residing in the centre moved to the periphery of the city. The older and smaller housing units which were centrally located, were left as accommodation for lower income groups. This natural working of the housing market resulted in income stratified neighborhoods. There is also a tendency for lower income groups to live in central locations and for affluent households to reside in outlying suburban areas. The tendency of the middle class to live in the suburbs had been reinforced by transportation innovations and travel time considerations.

For the entire study area, the population density increased by 10.8 % from 15,631 to 17,316 persons per km^2 during the period from 1996 to 2006. A visual examination of the change of the population density expressed as a ratio of 2006 to 1996 values, identifies three types of area: Areas experiencing a decline of the population density, areas with little or no change, and areas in which the population density is rising. Each one of the three types indicates an on-going reorganization of Cairo's spatial structure, its population characteristics and the degree of housing demand in every part of Cairo as Fig. 16 shows.

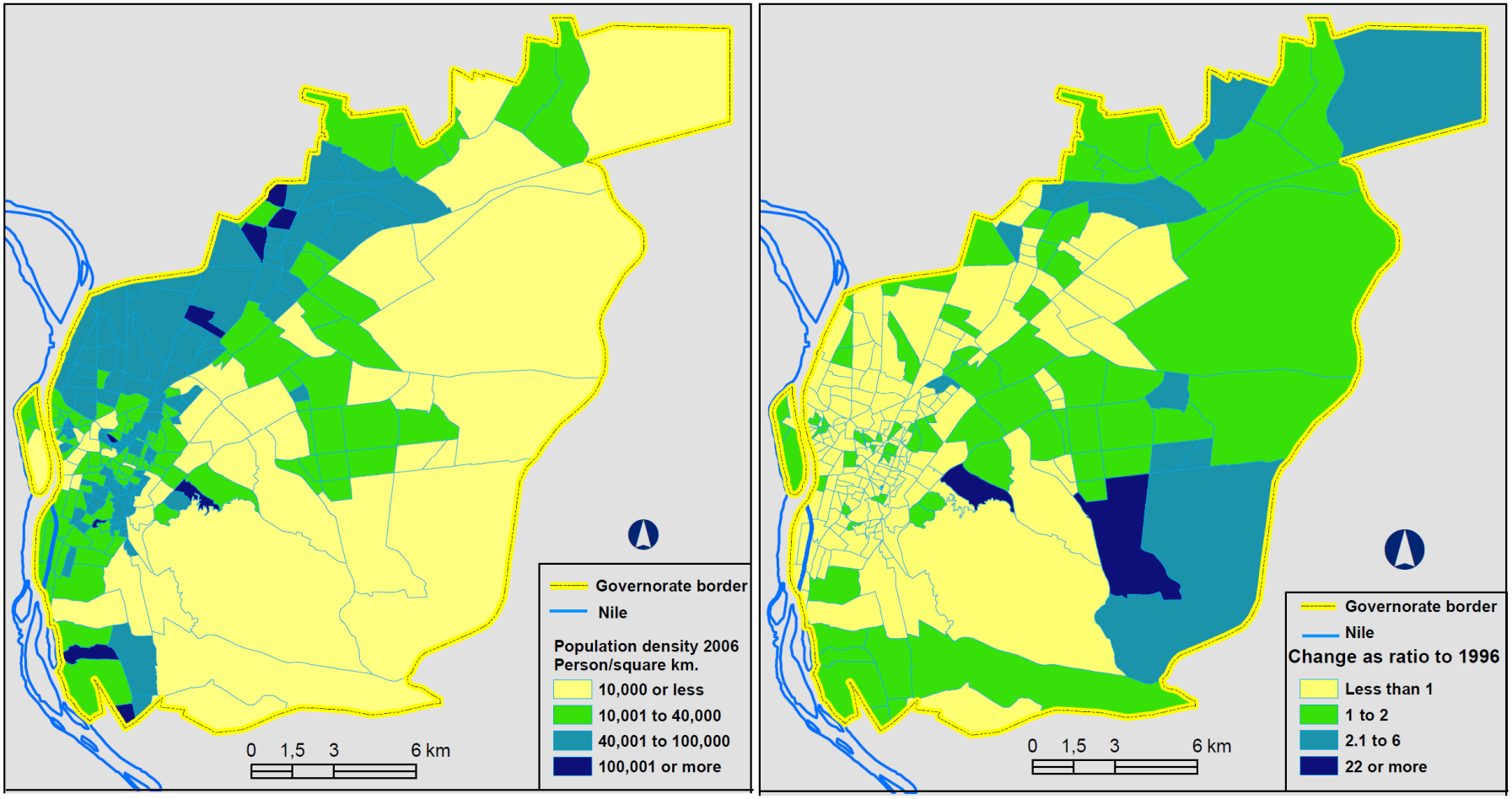


Fig. 16: Population density in Cairo Governorate 2006 and compared to 1996

Source: Designed by the author, based on CAPMAS 1998 & CAPMAS 2008a.

Areas of density decline: The shiakhat (plural of shiakha) located around the historic core and the aging central business district demonstrated a significant decline of the population density. These shiakhat are represented by ratios lower than one in Fig. 16. Approximately 67.4 % of the total number of shiakhat occupy 32.8 % of the total area of Cairo Governorate and show a decline in population density. The areas of density decline consist of some of the oldest parts of Cairo, established and modified in the period roughly 969 to 1798 AD. These areas include much of the historical Islamic city characterized by narrow, winding streets and high building density. The neighborhoods here have little modern infrastructure and residents with low incomes; much of the housing stock is in poor condition.

Most of the areas in this category belong to the poorest parts in the city, such as El-Sayeda Zeinab, El-Darb el-Ahmar, Boulak, Misr el-Kadema, El-Khalifa, Abdeen, El-Moski, Kasr el-Nil, and El-Azbakeya. Some of these areas are located in the former historical business district created largely in the 19th century under European influence.

Population density decline in these quarters can be attributed to the massive migration from the central quarters to the periphery of Greater Cairo Region. This massive migration can be explained by many reasons including the residential mobility affected by improvement of the standard of living, marriage, abandonment of the decaying buildings to avoid the risk of their demolition, evacuation of the old residential areas which exemplifies a historic monument and the commercialization process of the residential areas of Old Cairo (Meyer 1990, pp. 104 - 106).

This pattern is also a part of an overall shift of economic activities to more peripheral locations where land and access to means of transportation are more readily available (Stewart et al. 2004, p. 107).

Population density decline is not limited to the historical areas of the city. Fig. 16 shows some areas which exhibited significant decreases in population density. These decreases may be due to some informal housing clearance in the context of the national plan for informal housing development. Such quarters include for example Masakin Iwaa Ain Shams, and Ezbet Abo Hashish in the Hadayek el-Kobba district.

Stable Areas: Around the depopulating core of the city (Fig. 16) exists a ring of shiakhat with a low rate of change between 1 % and 2 %. Almost 27.3 % of the total number of shiakhat, which occupy 46.2 % of the total area of Cairo Governorate, show a stable population density. These shiakhat include some peripheral areas characterized by a

high level of population growth during the previous census period 1986 to 1996, such as El Basateen, Misr el-Gadida, El-Nozha, El-Marg and some areas of Shark- and Gharb Madinet Nasr. These shiakhat often reflect higher-income neighborhoods such as Heliopolis, which include single-family homes, and areas of middle-class housing built in the second half of the 20th century. There is little buildable land available in these quarters; however, the area is characterized by a higher level of amenities than in the old central areas (Stewart et al. 2004, p. 104). These shiakhat also include some informal neighborhoods such as El-Basateen and El-Marg on the southern and northern periphery of Cairo Governorate respectively. Although most of the residents of those two districts are of low-income class, the improvement of slums and providing amenities – in the context of the national plan for the development of informal areas – are the main reasons for the stabilization of the population density.

Densifying areas: shiakhat with increasing population density are perhaps the clearest indicator of the driving forces of decentralization in the agglomeration of Cairo (Yin et al. 2005, p. 608). Such quarters experienced an increase of population density between 1996 and 2006. This zone includes the census units with more than 2 ratio of change (Fig. 16). Almost 5.3 % of the total number of shiakhat, which occupy 21 % of the total area of Cairo Governorate, showed a more than two fold increase in population density. These census units concentrated in the peripheral areas of Cairo Governorate such as El-Nahda, El-Hay el-Asher, Kafr Abo Sier, Kafr el-Basha, El-Mahager and El-Wafaa' wa el-Amal (Fig. 16). This is the zone of the highest population growth rates in Cairo (Fig. 17).

Population densification in these areas is strongly influenced by the availability of large areas of buildable land, especially along the Ring Road, which represents the eastern boundary of the governorate after the modification of the administrative boundaries in 2008. The eastern portion of the Ring Road opened in the late 1980s. This road was designed in part to constrain the growth of Cairo on the surrounding land. However, as Fig. 18 shows, there is a strong relationship between the proximity to the Ring Road and the increase in population density.

Apparently the Ring Road failed to restrict the growth of the city but, instead, promoted urban development into both formerly rural areas and the desert fringe (Stewart et al. 2004, p. 107). These areas are the first destination of many of the new rural migrants.

Another phenomenon adds an additional dimension to the high population density in Cairo: This is the development in the so-called "City of the Dead".

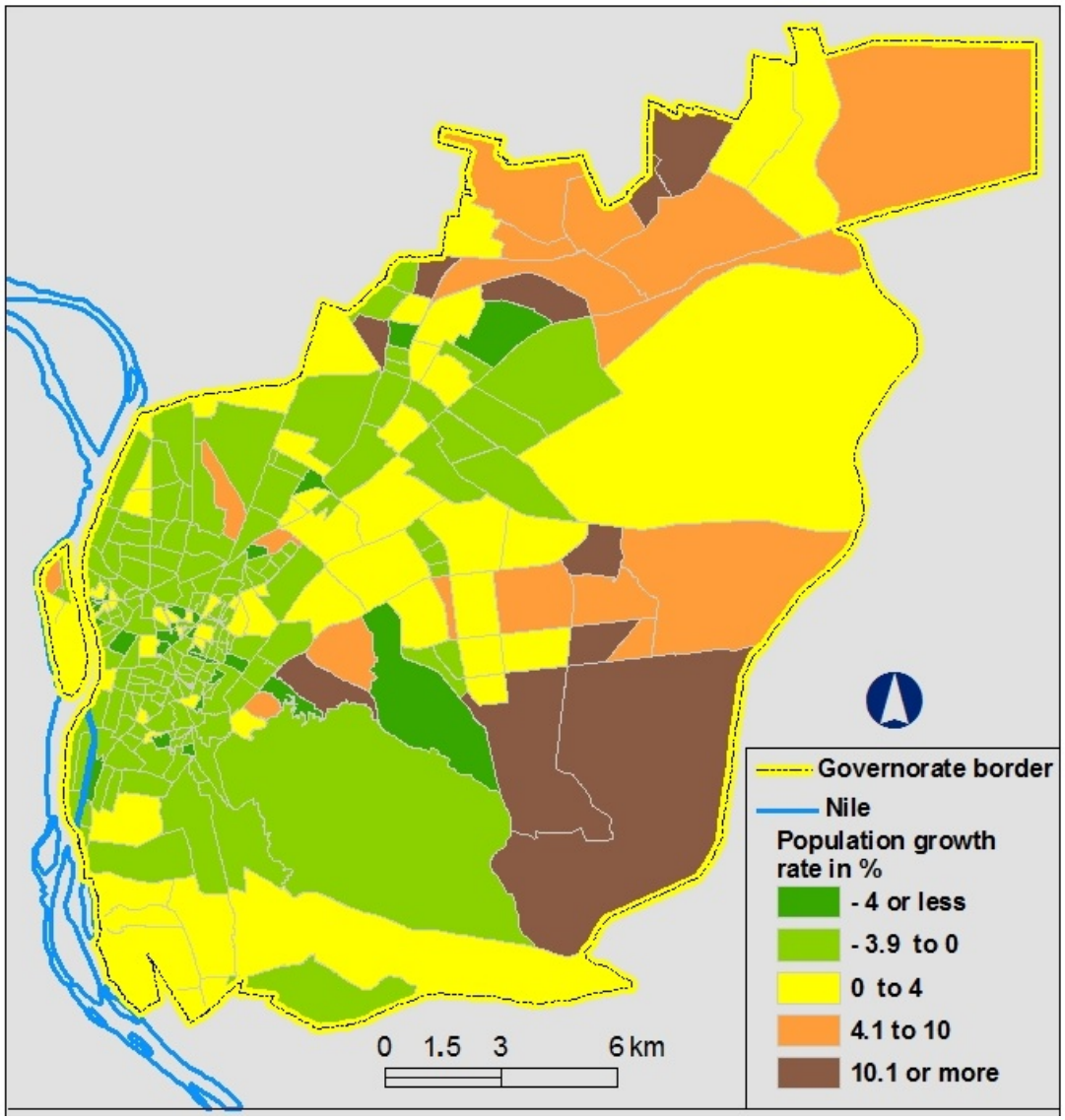


Fig. 17: Population growth rates in Cairo Governorate between1996 and 2006

Source: Designed by the author, based on CAPMAS 1998 & CAPMAS 2008a.

El-Sayeda Isha, Bab el-Wazeer, El-Emam el-Shaf'ey and El-Daarasa are the most famous cemeteries in Cairo Governorate, which cover a total area of about 1700 ha. Due to the stifling housing crisis, these cemeteries transformed to informal housing for outlaws.

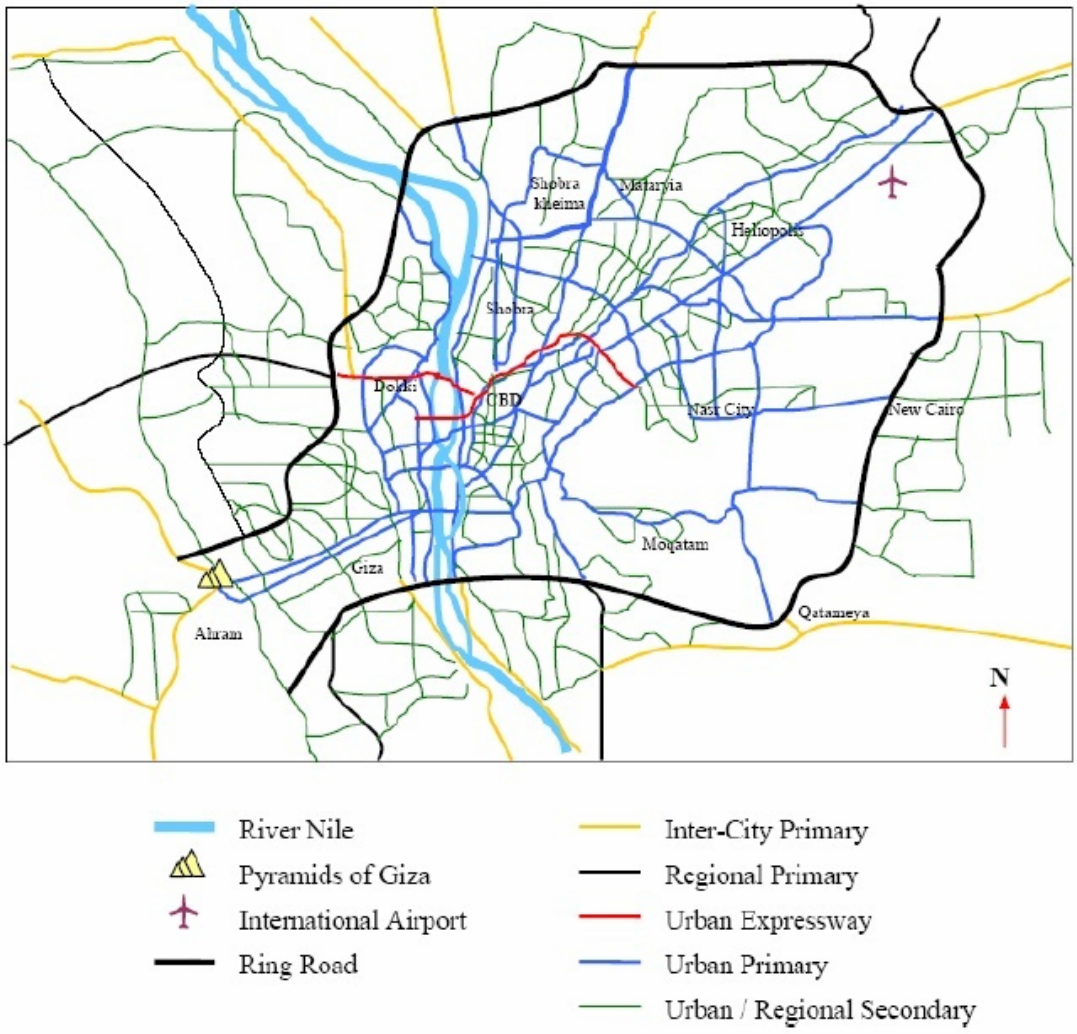


Fig. 18: The Ring Road of the Greater Cairo Region

Source: DRTPC Study Experts 2009, p. 24

It was estimated that, the residents of the cemeteries outside the walls of medieval Cairo reached about 600,000 persons in 2006. This number adds more burden to the actual population density of Cairo. Considering that the population of the City of the Dead represents approximately 100,000 families, they need the same number of low-cost housing units to be relocated and accommodated (UNDP & Egyptian MOLD 2008, p. 128).

2.3.3 Population Density in Selected Informal Areas

Morphologically, informal growth is not a peripheral spontaneous phenomenon isolated from the region's urban dynamics, but it is its integral component. Informal growth is accelerated by the dominant deconcentration and transformation processes which are tak-

ing place in the centre of the Greater Cairo Region, especially the commercialization of the residential areas and the housing stock near the CBD as well as the major transformation of the medieval city.
The spatial pattern of informal growth contradicts the conventional structural theory of urban form. What shapes the urban region and its growth is not the search for better housing by higher income groups, but the eviction of the poor from the central sections of the city because of the commercialization process.
The horizontal density of the informal development exceeded that of the region's core. Their vertical density, though still slightly below the region's core average, is expected to surpass it as the densification process continues (Fekade 2000, p. 143).

Cairo Governorate represents the main focus of hyper population density in informal settlements among all the Egyptian governorates. According to a recent study carried out by the Egyptian Cabinet of Ministries, the population of the informal areas in Egypt was estimated to be 14.8 millions in 2007. Of them, three millions or 21.4 % of the population in informal areas were living in Cairo Governorate only; which represents 45.4 % of the total population of the governorate. Although many of these dwellings are technically illegal, they are providing new housing opportunities for the middle-income groups and the poor, and they will continue to exist (Stewart et al. 2004, p. 107).

Table 16 and Fig. 19 show a comparison between the population density of selected informal areas in Cairo Governorate and the population density of their contained districts. It is clear from the table how much the population density of the informal areas exceeds the average rate of the districts. In Ezbet Abo Karn, in the district of Misr el-Kadema, the population density reached about 385,000 persons per square kilometer and exceeded 36 times the average population density of the district.

In a similar way, the population density of Ezbet el-Arab in the Gharb Madinet Nasr District exceeded 32 times the average population density of the district. The extreme population density of informal settlements reflects the fast extension and high population growth rates in those areas and the risk of the underestimation of the population in informal areas, which contributes to the inability of the planning authorities in providing sufficient infrastructure and amenities to these areas.

Smart growth proponents suggest that the housing needs of low-income households can be better met by neighborhoods of greater density, a greater variety of housing types and mixed land use than by neighborhoods dominated by low-density, single-family homes (Aurand 2010, p. 1015).

Table 16: Population density in some informal areas and the respective district of Cairo Governorate in 2006

District	Informal area	Size of informal area (km^2)*	Population estimation of informal area**	District persons/ km^2	Informal area per-sons/ km^2	Density informal area/district density
Manshiet Nasser	Manshiet Nasser	0.66	132,075	104,537	200,140	1.9
El-Sahel	Dayer el-Nahya	0.04	43,269	44,957	1,081,725	24.1
	Ezbet Wahba	0.03	11,332	44,957	377,733	8.4
Misr El-Kadema	Ezbet Abo Karn	0.13	50,000	10,467	384,615	36.7
Shark Madinet Nasr	Ezbet el-Haganna	1.90	37,090	4,164	19,521	4.7
Gharb Madinet Nasr	Ezbet el-Arab	0.47	100,000	6,450	212,766	33.0

Source: * Calculated by the author.

** Nawwar & Al Kotkat 2008b, pp. 5 - 7

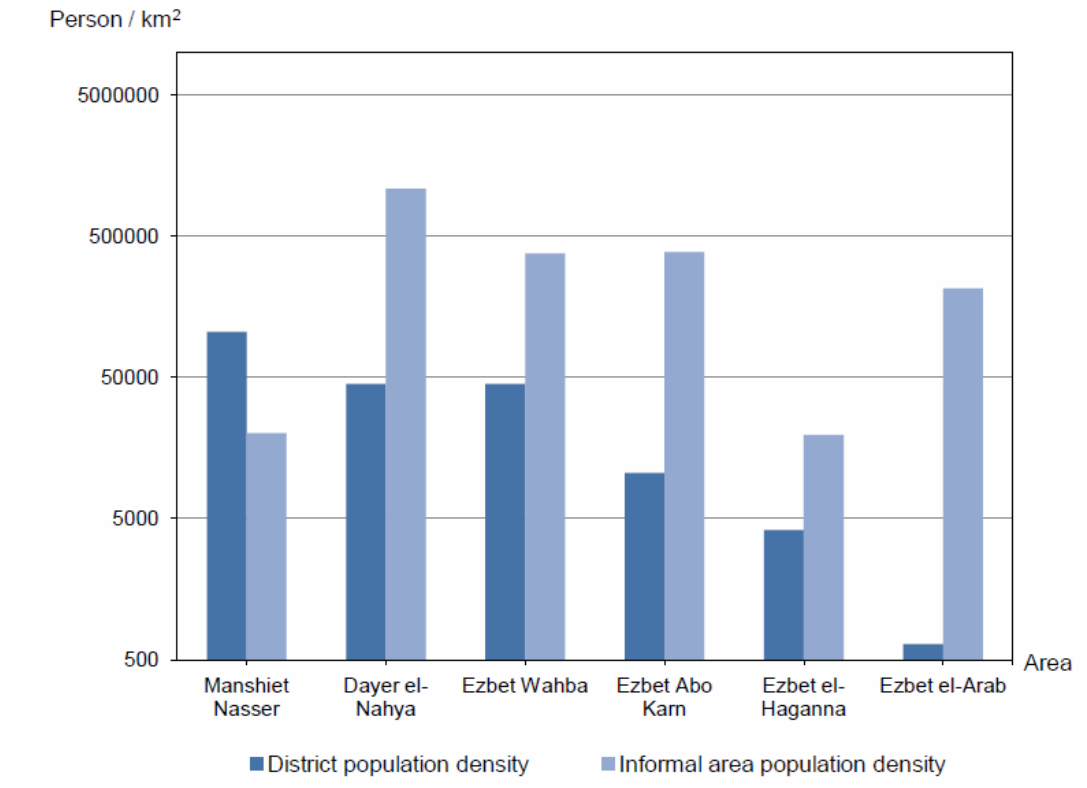


Fig. 19: Population density in some informal areas compared with the general density of their districts in Cairo Governorate 2006

Source: Designed by the author, based on Table 16.

2.3.4 Population Density of the Built-up Area in Cairo Governorate 2006

Although the change in population density by census units is the typical method of assessing changing population patterns, it may not fully reflect the expansion of urban land uses because different types of urban land use may have significantly different patterns of population distribution (Yin et al. 2005, p. 608).

One of the main factors affecting population density change between central and peripheral areas in Cairo Governorate is the proportion of the built-up area, which was calculated from Landsat 7 ETM+ image acquired in August 24th 2006. Fig. 20 shows the proportion of the built-up surface in 2006. While the central core of the city is characterized by a high proportion of built-up surface, the lowest rates are seen in the peripheral areas where much undeveloped land is available in the census units.

Fig. 21 shows the population density for the built-up area and the ratio of the difference to the raw population density in the whole area of each shiakha in 2006. The figure indicates that in central Cairo, where more than 75 % of the available land has been built on (Fig. 20), the difference between the raw population density and the population of the built-up area is extremely low. This is not unexpected, given Cairo's long history of a tightly bound spatial structure.

On the other hand, the largest differences between the raw density and the built-up density can be observed in the shiakhat of the desert fringe in the eastern portion of Cairo Governorate, where the built-up area is scattered over the vast prevailing desert landscape. Here, the population density of the built-up area in seven peripheral shiakhat was more than eight times as high as the raw density. These census units represent altogether about 35 % of the total area of the governorate. They are Sheraton el-Matar, El-Abagiyya, El-Hay el-Asher, El-Basateen el-Sharqiyya, Nady el-Sekka el-Hadid, El-Mantiqa 9 and El-Khawas. Despite the large share of those shiakhat of the total area of the governorate, their share of population did not exceed 3.9 % and 0.6 % of the total population of the governorate in 1996 and 2006 respectively.

It can be concluded that there is a disassociation between the population density and the proportion of the surface built-up in recent years, as the driving forces of urbanization changed from accommodating basic housing needs in the late 1970s and 1980s to meet diversified housing demands for different income levels and urban infrastructure development in the late 1990s.

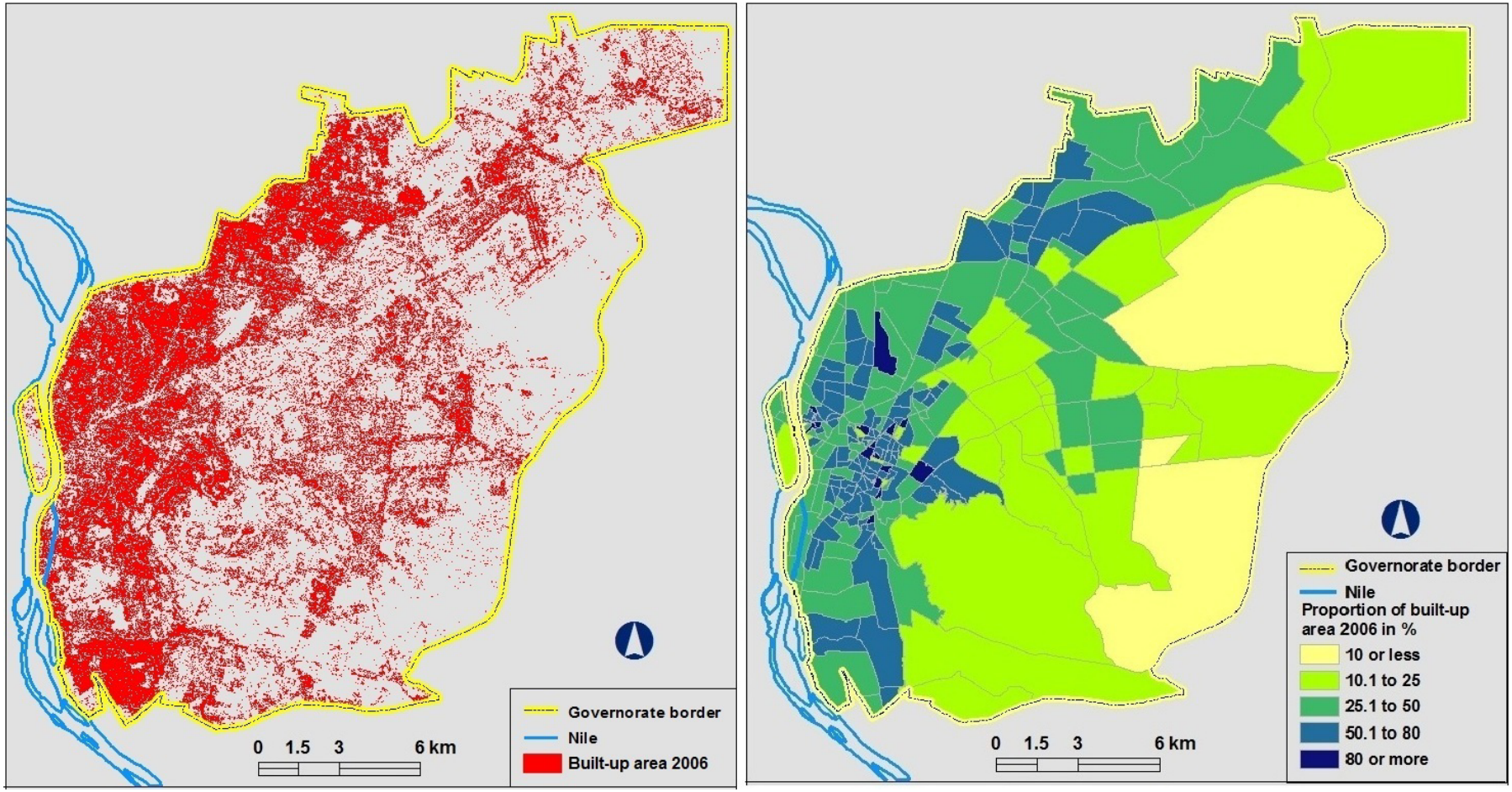


Fig. 20: Built-up area of Cairo Governorate 2006 and its proportion of the total area of each shiakha

Source: Designed by the author based on Landsat ETM+ image 2006 (path 176, row 39) & CAPMAS 2008a.

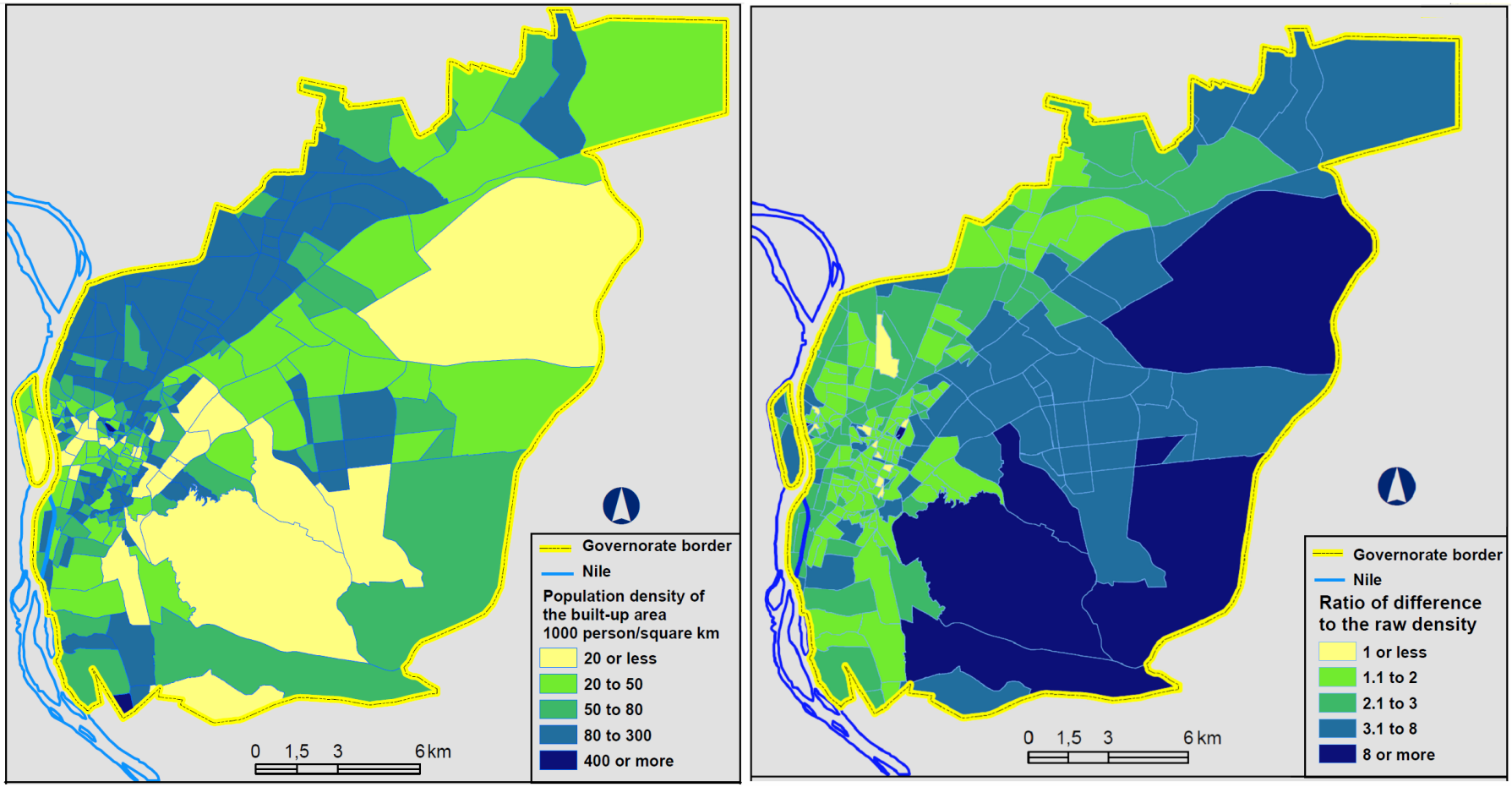


Fig. 21: Population density of the built-up area in 2006 and as ratio of the difference to the raw density of the whole area

Source: Designed by the author based on CAPMAS 2008a.

In other words, there is a trend of spatial segregation as the city became more diversified in terms of the socio-economic status. The role of the free market economics, newly introduced in Egypt, must also be mentioned as it encouraged the construction of highly speculative real estate properties designed for the elite. This is a marked change from the government's emphasis on large scale high-density projects to meet the pressing housing needs in previous decades (Yin et al. 2005, pp. 612 - 613).

2.3.5 Shifting of the Weighted Population Center 1996 – 2006

To examine the spatial population changes in relation to the centre of the city, the centers of the population based on the data of the 1996 and 2006 censuses were first determined. The centroids of all census units in 1996 and 2006 were defined using a script for Arc GIS. The location of the weighted population centre was then calculated as:

$$\bar{x} = \left[\sum_{i=1}^{n} (x_i \cdot pop_i) \right] / \sum_{i=1}^{n} (pop_i)$$

and

$$\bar{y} = \left[\sum_{i=1}^{n} (y_i \cdot pop_i) \right] / \sum_{i=1}^{n} (pop_i)$$

Where, $\bar{x}$ and $\bar{y}$ are the co-ordinates of the weighted population centre; x_i and y_i are the co-ordinates of the i^{th} census unit in the UTM co-ordinate system; and pop_i is the population of that unit.

The weighted population centers were calculated for both 1996 and 2006. Fig. 22 indicates that the population centre of Cairo Governorate shifted towards the east-north-east about 896 m^2 between the two census years. The direction of the shift of the population centre matches the earlier calculations by Stewart for the GCR between 1986 and 1996 censuses (Stewart et al. 2004, p. 109).

The shifting of the weighted population center confirms the overall trend of decentralization.

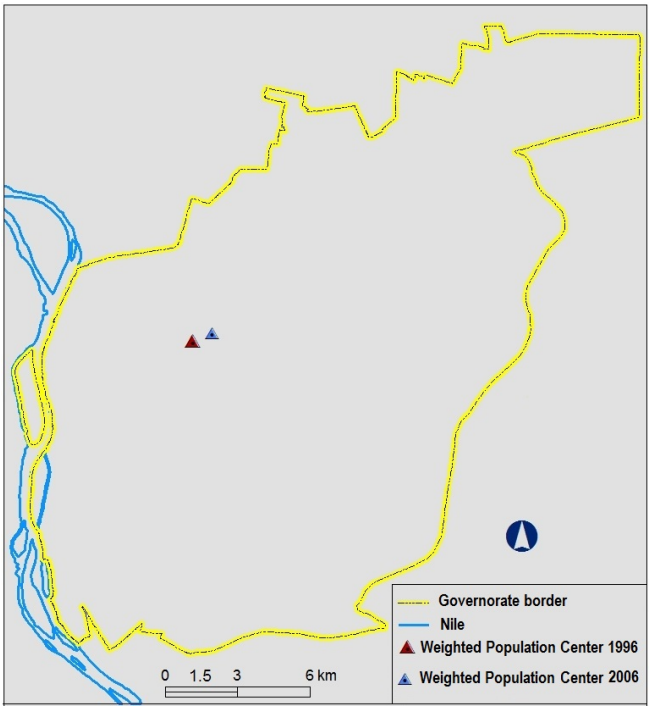


Fig. 22: Shifting of the weighted population center from 1996 to 2006

Source: Designed by the author based on CAPMAS 1998 & CAPMAS 2008a.

2.3.6 Summary

It has been observed that Cairo Governorate experienced a significant change of the population density during the last inter-census period 1996 – 2006. Although the general population density increased during the aforementioned period, spatially, the degree of the change of the population density varied greatly from the center to the periphery. Around the depopulating core of the city, a ring of stable areas in terms of population density developed. Population densification at the expense of the depopulated core increased in the peripheries of the city. The deterioration of the urban fabric in the core combined with the availability of buildable land on the periphery constituted the most influential factors for the spatial change of the population density. These factors have been manifested by examining the population density in selected informal areas where hyper population density can be noticed.

The change of the population distribution has been also manifested in the shifting of weighted population center towards east-north-east during the same period. The disassociation between the population density and the proportion of the built-up area underlines the role of the socio-economic indicators as a driving force of change of housing demand. Such socio-economic indicators are analyzed in the following chapter.

2.4 SOCIO-ECONOMIC INDICATORS OF THE POPULATION OF CAIRO GOVERNORATE

The housing problem in Egypt is normally approached as an economic issue. The fact remains, however, that the problem has also a social dimension which cannot be underestimated (El-Safty 1985, p. 143). Urban studies in the last two decades have focused mainly on social science issues such as poverty, social exclusion and employment promotion.

To describe the housing patterns in Cairo Governorate, this chapter tries to identify the factors which constrained the Cairene options and decisions by placing housing within a socio-economic context.

Harris et al. 2005 had pointed out the most frequent approaches in the classification of building areas. Firstly, data are gathered from different sources. Secondly, the most appropriate variables are selected, which should be reliable, robust and not repeated. Thirdly, input variables are processed, including evaluation and standardization. Fourthly, the appropriate weighting method is determined and applied. Finally, cluster analysis techniques are applied to produce classes. Fig. 23 illustrates a flow chart of the approach of studying socio-economic indicators in order to produce classes depending on the Socio-Economic Opportunity Index (SEOI).

Reviewing the most relevant and common socio-economic indicators is necessary to obtain deeper insights regarding the problem of identifying housing patterns, in terms of formality and informality, due to the following reasons:

- Informal areas generally have high concentrations of the urban poor, high illiteracy rates, high rates of unemployment or underemployment due to seasonal or daily jobs, a predominance of work in the informal economy, child labor, overcrowded dwellings and high infant mortality rates (Sabry 2010, p. 526).
- Informal areas are not inhabited only by the poor. Authorities declared that almost 17 million Egyptians live in informal urban areas. This figure includes many more than just the extremely poor. Studies revealed that the profile of informal areas includes a wide spectrum of socio-economic groups; its residents could include street vendors as well as judges (Shehayeb 2009, p. 35).

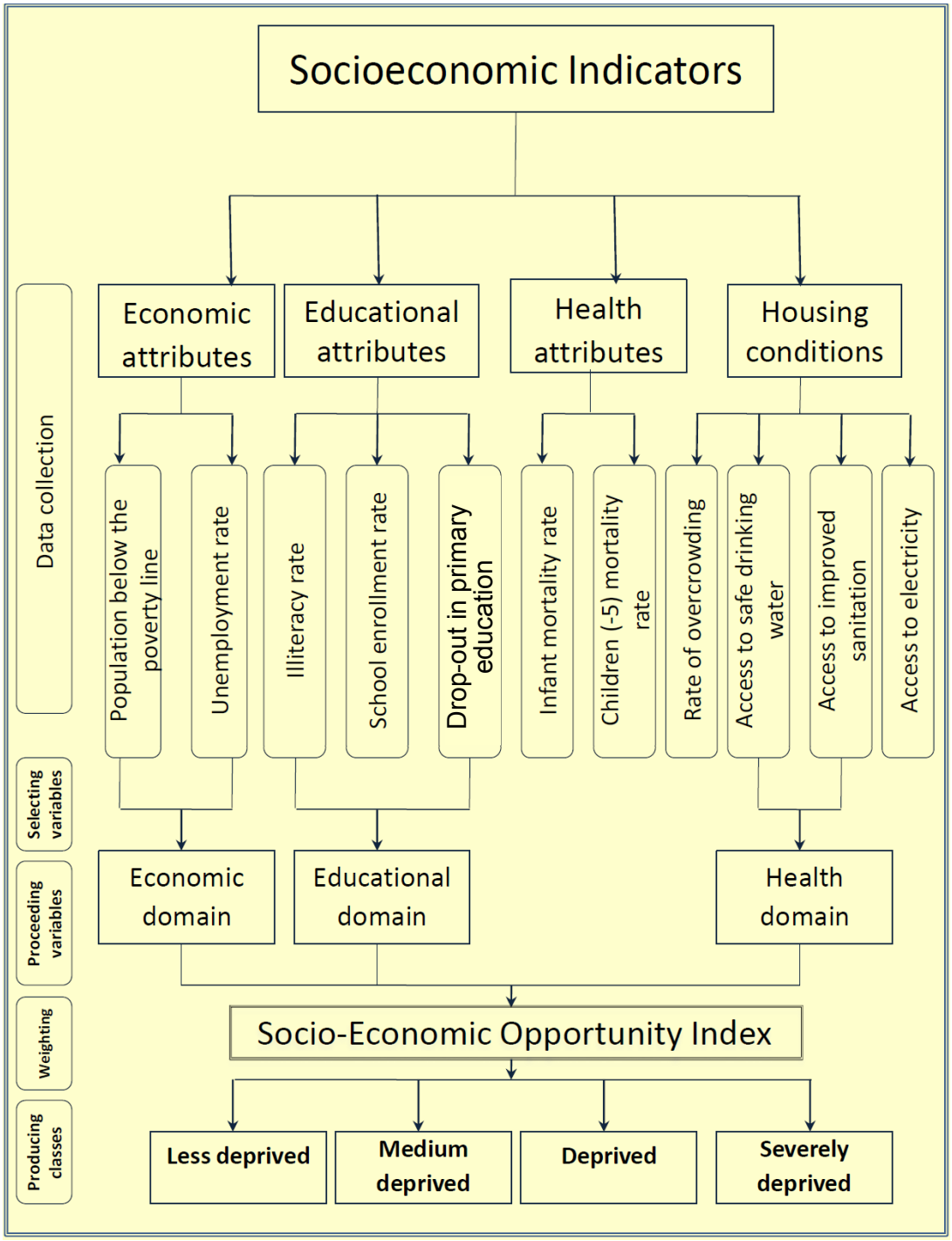


Fig. 23: Approach of studying socio-economic indicators and building classes

Source: Designed by the author.

– Socio-economic cohesion and interdependence are the key factors to improve the integration of poor communities and informal livelihood into the urban ecosystem in which the mutual attraction of multi-scale economies of informal and formal kind is reinforced (Vicente et al. 2006, p. 1).

- The pressure of housing often turned out to be a major constraint, as the city often is not geared to incorporate all the migrants of whom the majority belongs to low-income groups. As a result, we find that the proliferation of slums in urban areas is marked by deteriorating living conditions and environment problems (Banerjee et al. 2002, p. 274). The United Nations Human Settlements Program (UN-Habitat) defines a slum household as one that lacks one or more of the following amenities of life: Access to improved water and sanitation, security of tenure, durability of housing and sufficient living area (UNICEF 2012, p. 5).
- The pattern of urban growth in Cairo – as one of the largest mega cities in the world – has two contradictory facets. On one hand, mega cities act as engines of economic and social growth. On the other hand, most of this is also being accompanied by the urbanization of both poverty and environmental degradation (El Araby 2002, p. 389). Cairo's poor communities signify the growing socio-economic disparity especially after the start of the open door economic liberalization in the 1970s and the structural adjustment program of the IMF in the 1990s (Fahmi & Sutton 2010, p. 1766). The proliferation of more than 100 informal communities with some six million inhabitants signifies only one, but perhaps the most important component of the growing socio-economic disparity in Cairo since the beginning of Sadat's *Infitah* policy (Bayat 1996, p. 3).
- The implementation of the Open Door Policy within a framework of Western economic dependency has led to large inequalities in the socio-economic structure of the Egyptian society. It has also led to the emergence of parasite population groups who benefited from the new economic dependency by linking their interests to the West. Later in the 1980s and in particular during the 1990s, the implementation of the neoliberal privatization policy provided the chance to high-income groups to exert pressure in order to accelerate the public-private transformation process. As a result of the structural changes in the Egyptian economy an acute socio-cultural polarization of the population occurred. Socio-cultural groups adopting the new dominating Western culture were confronted by other groups calling for the upholding of traditional norms and values. They rejected and opposed the foreign cultural invasion and reacted with against the cultural submission with anger and occasionally with hostile resistance (Yousry et al. 1998, pp. 292 - 293).
- The segregation of different socio-economic groups within large cities is an important factor in understanding the urban environmental conditions. Finding such spatial patterns makes it possible to correlate them with the available infrastruc-

ture facilities and environmental loads in different parts of the city (Avelar et al. 2009, p. 27).

- There is a strong relationship between poverty and the educational status, a high infant mortality rate and the deterioration of the economic conditions of the individuals.
- Formulation of appropriate policies and intervention programs to improve the living conditions and secure the well being of slum dwellers requires a reliable knowledge base which clearly defines, identifies and signifies the main points of commonalities and diversities of these slum areas. Such a data is not available in the vast majority of the cities in developing countries.

The main purpose of this chapter is to rank the small geographical areas (shiakhat) according to their socio-economic indicators. Every geographic area will be assigned to a specific type of community according to the socio-economic characteristics of its population.

2.4.1 Economic Attributes

The proportion of the population below the poverty line is regarded as one of the main indicators in identifying the economic status of the population because it reflects how the population suffers from economic deprivation. The unemployment rate is also another economic indicator of poverty. The members of poor households tend to suffer from unemployment, underemployment and job changes i.e. seasonal jobs (Hassan, undated, p. 2). Therefore, the following part of this study tries to analyze the economic attributes of the population of Cairo Governorate through two indicators: the population below the poverty line and the unemployment rate.

2.4.1.1 Population below the Poverty Line

A worldwide consensus on poverty acknowledged slums and the living conditions of slum dwellers as a major challenge facing humanity.

Poverty is multidimensional as it involves monetary dimensions such as low-income levels and certain patterns of expenditures, and non-monetary dimensions such as hunger, illiteracy, epidemics and the lack of health services or safe water (UNDP 1997). The indictors of poverty differ at various regional, community, household and individual levels. At the household level, the poor families are characterized by a wide range of attributes which can be classified into four main categories including economic, demographic,

health, and social attributes. As for economic attributes, the household's income is one of the most common indicators of poverty.

To clarify the relationship between poverty and the type of housing, it needs to be stressed that not all of the urban poor in Egypt live in informal areas and that not all residents in informal areas are poor. Instead, the very poor, lower and middle income groups are found within the same settlements which not always deserve to be called slums as in some of them the living conditions are not much lower than in formal areas (Runkel 2009, p. 53). However, studying poverty within the context of housing patterns is important due to the following reasons:

- Although the terms "urban poverty" and "slums" are not synonymous, they are likely to be very highly correlated. Poor living conditions found in slums generally give rise to relatively low housing costs, whether for purchase or for rental, and therefore one may expect that a very high proportion of the urban poor lives in slums (Sliuzas & Kuffer 2008, p. 158).
- Urban poverty in low- and middle-income countries is often described in terms of types of housing (e.g. slums, marginal quarters, informal and squatter settlements) rather than by social groups (e.g. low-income individuals or households, the homeless). Chronic poverty is normally combined with health burdens linked to poor quality housing (Mitlin 2005, p. 1).
- Marginal, informal and squatter settlements are the physical manifestation of urban poverty. The root causes of the origin and growth of such settlements on the periphery of the cities are in most cases the result of rural-urban or urban-urban migration combined with economic inequality all over the country and of migration within the cities from central areas to the outskirts.
- Marginal and informal settlements develop because poor people desire at least a roof over their heads, but their low income and high cost of land have pushed them to where they are. Illegal and semi-legal land markets provide space for housing at a cost that is affordable by many low-income households and with the advantages of immediate possession and no bureaucracy.

2.4.1.1.1 Historical Perspective of the Population below the Poverty Line in Egypt and the GCR

Like many developing countries, poverty in Egypt is a major problem as one of the impediments to development. During the 1980s, the proportion of the population living in

poverty reached 17 %. The number of Egyptians living in absolute poverty grew by more than one million. The concept of absolute poverty means that there is a minimum acceptable standard of living, below which one is considered poor and above which one is regarded as non poor (Arndt 2007, p. 4). Rural poverty doubled and urban poverty increased more than 1.5 times. During the period 1985 – 1988, aside from Cairo and Giza cities, the number of households living in absolute poverty in the municipal areas of the five GCR provinces rose by 225 %, the largest increase of any municipal area in Egypt during the period. Thus the aforementioned shift of the population to urban areas has been accompanied by an increase in poverty, particularly in rapidly the growing areas of the GCR (El Araby 2002, p. 392).
In the early 1990s, there was a negligible decline of about 1 % of all Egyptians living in poverty; this proportion amounted to 16 % at that time. More than half of Cairo and adjacent Giza were classified either as poor or ultra poor (Bayat 1997, p. 3).

By 1995, the spatial differences in the income distribution had increased dramatically, with monthly household income in GCR averaging US$ 124, in contrast to the rest of the country where it was only US$ 68. A recent study of poverty carried out by the World Bank found that roughly 19 million Egyptians were living in absolute poverty in 2005 (Ministry of Economic Development (ARE) & World Bank 2007, p. 4).

Aside from the spatial differentials of income on the national level, GCR experienced a mismatch between the level of income and the different social strata of the metropolis. According to Raymond 1993, the lower stratum comprises about 56 % of Cairo's population and shares only 12 % of the aggregate income, while the middle stratum has a share of 39 % of the population with 34 % of the income. No more than 5 % of the upper stratum own about 54 % of the total income of Cairo´s population in 1990 (Raymond 1993, pp. 347 - 348).

However, the statistics show a general regression of the proportion of poor people on the level of Cairo Governorate from 8.8 % to 5.4 % by the years 2001 and 2006 respectively (UNDP & Egyptian MOLD 2008, p. 55), EHDR 2010 shows an increase of this proportion to 9.3 % of the total population of Cairo Governorate in 2009, of which 1.7 % are ultra poor.

2.4.1.1.2 The Spatial Distribution of Urban Poverty in Cairo Governorate

The spatial distribution of urban poverty in Cairo contributes to an apparent unawareness of extreme deprivation in the city. The general perception is that, unlike many Third World mega-cities, Cairo has no extended slums. Poor families living in middle-class and rich areas are not uncommon, and the roofs of downtown Cairo often shelter poor household (Rogers 2006, pp. 11 - 12).

Regional differences dominate the poverty map of Egypt. The governorate where the poor were most underrepresented was Cairo (World Bank & Ministry of Economic Development 2007, p. 19).

The number of the population below the poverty line in Cairo Governorate 2006 was estimated to be 358.800 persons. Fig. 24 reveals the great gap of the proportion of the population below the poverty line among Cairo's shiakhat. In general, the population in the shiakhat of the eastern zone is better-off than the inhabitants of the rest of Cairo's shiakhat. In the majority of the eastern areas the proportion of the population below the poverty line does not exceed 2 %, except for Ezbet el-Haganna as a pure informal area.

The proportion of the population below the poverty line reflects the general economic conditions on the average level of the governorate, but it hides the great inequality of the economic conditions from one area to another.

Some shiakhat showed a proportion of the population under poverty line which was up to 47 times higher than the corresponding rate in other shiakhat. This ratio reached its maximum with 14.1 % in Shiakhet El-Ma'dasa in the Manshiet Nasser, compared with the minimum share of 0.3 % in Shiakhet El-Nady el-Ahly in Shark Madinet Nasr district. It is worth mentioning that there are some disadvantages that limit the use of income as the sole indicator of poverty. Usually income and consumption do not take into account access to human or social assets that are critical to the standard of living such as clean water, education, clean environment and health care.
Accordingly, the data on the economic dimension of poverty such as income and expenditures usually do not completely reflect the reality, especially in areas where the informal sector is dominating. This emphasizes the importance of other dimensions of poverty such as unemployment which will be discussed in the following section.

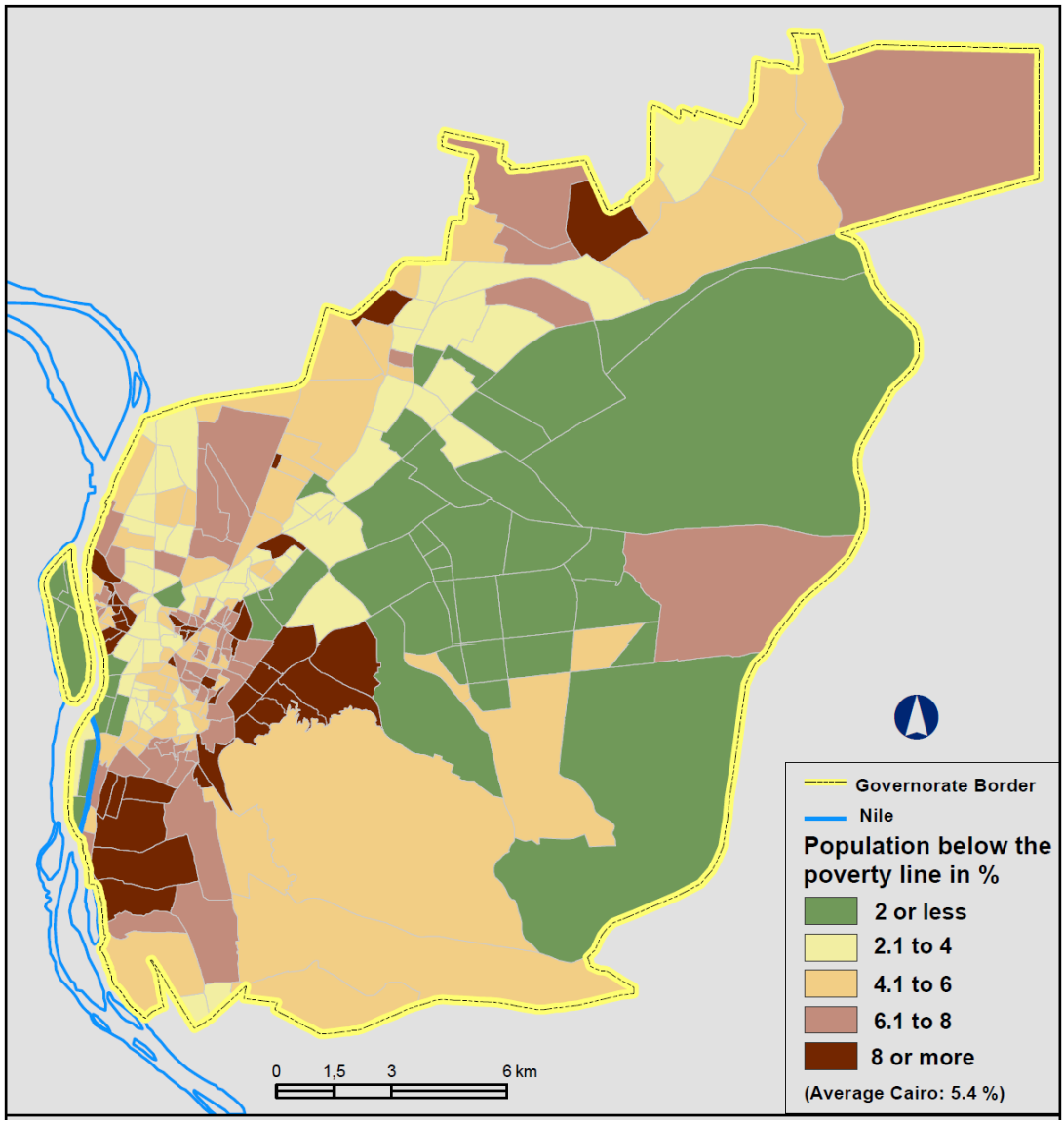


Fig. 24: Proportion of the population below the poverty line in Cairo Governorate 2006
Source: Designed by the author based on statistical data from UNDP & Egyptian MOLD 2008.

2.4.1.2 Unemployment Rate

The number of unemployed persons in any society reflects the inability of the existing economic activities to absorb the labor force in this community. Consequently, this involves a low level of income and a relatively bad quality of life for the jobless persons (UNDP & Egyptian MOLD 2008, p. 75).

Egypt belongs to those countries in which the demographic pressure has created a serious situation of surplus labor (Sims 2010, p. 36). From the beginning of the 1970s until 1986, there was a massive economic upswing due to the emigration of millions of Egyp-

tians who worked in oil-rich Arab countries or in der Western Word and invested their foreign earnings at home. At that time, there was a shortage of workers in Egypt. During the First Gulf War temporary Egyptian labor migrants had replaced male Iraqi workers who were drafted into the armed forces to fight against Iran. After the end of this war in 1988, most Egyptian migrants lost their jobs. As result of the Iraqi attack on Kuwait in 1990, about 750,000 Egyptian labor migrants were forced to return home. Unemployment rose dramatically and simultaneously the structural adjustment program was implemented in 1991. The economy was further liberalized and inflation accelerated (Gerlach 2009b, p. 104).

The economic growth rate in Egypt dropped from an annual average of 7 % during the period 2005 – 2008 to 4.7 % in the year 2008/2009. This resulted in an increase of the unemployment rate (Ministry of Economic Development & UNDP 2010, p. 25).

In 2007, Egypt's labor force stood at 23.8 million workers; since then it has increased by almost one million per annum. The labor force itself is characterized by a high unemployment rate, which was officially reported at 8.9 % in 2007, but is considered by many observers to be much higher. The economy's ability to create formal employment has been limited, and more and more workers have found jobs in the huge informal sector, which is, to a large extent, an urban phenomenon (Sims 2010, p. 36). After the January 25th Revolution 2011 the national unemployment rate was estimated to be 10 % (El-Masaa Magazine, 17th May 2011).

All informal settlements in Egypt show a relatively high rate of unemployment, low levels of professional skills and education and high illiteracy rates, particularly among women (Soliman & De Soto 2004, p. 97).

Unemployment in Cairo Governorate in 2006 reached 9.8 % of the total labor force (+15 years), which exceeded the national average of 8.3 %. This phenomenon may be attributed to the level of education as educated unemployed youth – especially secondary and the university degree holders – continued to be of a particular concern for Egypt as a whole. This phenomenon was more pronounced among the poor of urban areas where one out of two poor, but educated persons of 15 – 24 age group, was unemployed (Ministry of Economic Development & World Bank 2007, p. 84). The quality of education in relation to market demand continues to be a problem. Current education policy pushes more than 60 % of the preparatory completers towards technical secondary education, in which unemployment is the highest. The rate of unemployed persons who attained an intermediate qualification reached 62.4 % of the total unemployed persons in 2007

(UNDP & Institute of National Planning 2010, pp. 20 - 21). By 2006, the proportion of persons with intermediate and higher education in Cairo Governorate reached 49.7 % of the total population (15+ years) which exceeded by far the national level of only 28.5 % (UNDP & Egyptian MOLD 2008, p. 59).

On the level of shiakhat, Fig. 25 shows that almost 39 % of the total number of the shiakhat have higher unemployment rates than the general level of the governorate. These areas contain about 62 % of the total population in the governorate, which reflects the positive relationship between the increase of the population size and the high unemployment rates. Unemployment rates reached their maximum and exceeded twice the level of the governorate in some shiakhat, namely El-Hay 6, and El-Hay 7 in Gharb Madinet Nasr district and Rab'ah el-Adowiya in Shark Madinet Nasr District.

In Egypt as a whole, the rate of official unemployment is directly related to the educational status. Less than 1 % of the illiterates in the labor force are officially unemployed. This figure is rising steadily with the educational attainment reaching 15 % for graduates from secondary school and 17 % for university graduates. Cairo Governorate is no exception. In 2007, an enormous share of 46 % of the officially unemployed in Cairo Governorate had a university degree (Sims 2010, p. 38). The high level of education in the aforementioned planned shiakhat may clarify the increase of unemployment rates.

There is one major reason which explains why the better educated are not so much in demand in the labor market: The quality of higher education and the acquired skills are only partially appropriate for to the structure of the economy (Awad & Zohry 2005, p. 11). This means that there is an urgent need to pay more attention to the education and training systems in order to improve the quality of graduates and enhance their ability to find job opportunities in the labor market. In addition, the high unemployment rates in some unplanned shiakhat, such as El-Matarya el-Gharbiya and El-Matarya el-Qibliya in El-Matarya district as well as Ezbet Fahmi and Ezbet Gebriel in Dar el-Salam district, can be attributed to the large number of unskilled migrants from rural areas searching for job opportunities in Cairo Governorate.

Due to the multi-dimensions of poverty, the next section will focus on the non-monetary dimensions of poverty including education, health attributes, and housing conditions in Cairo Governorate.

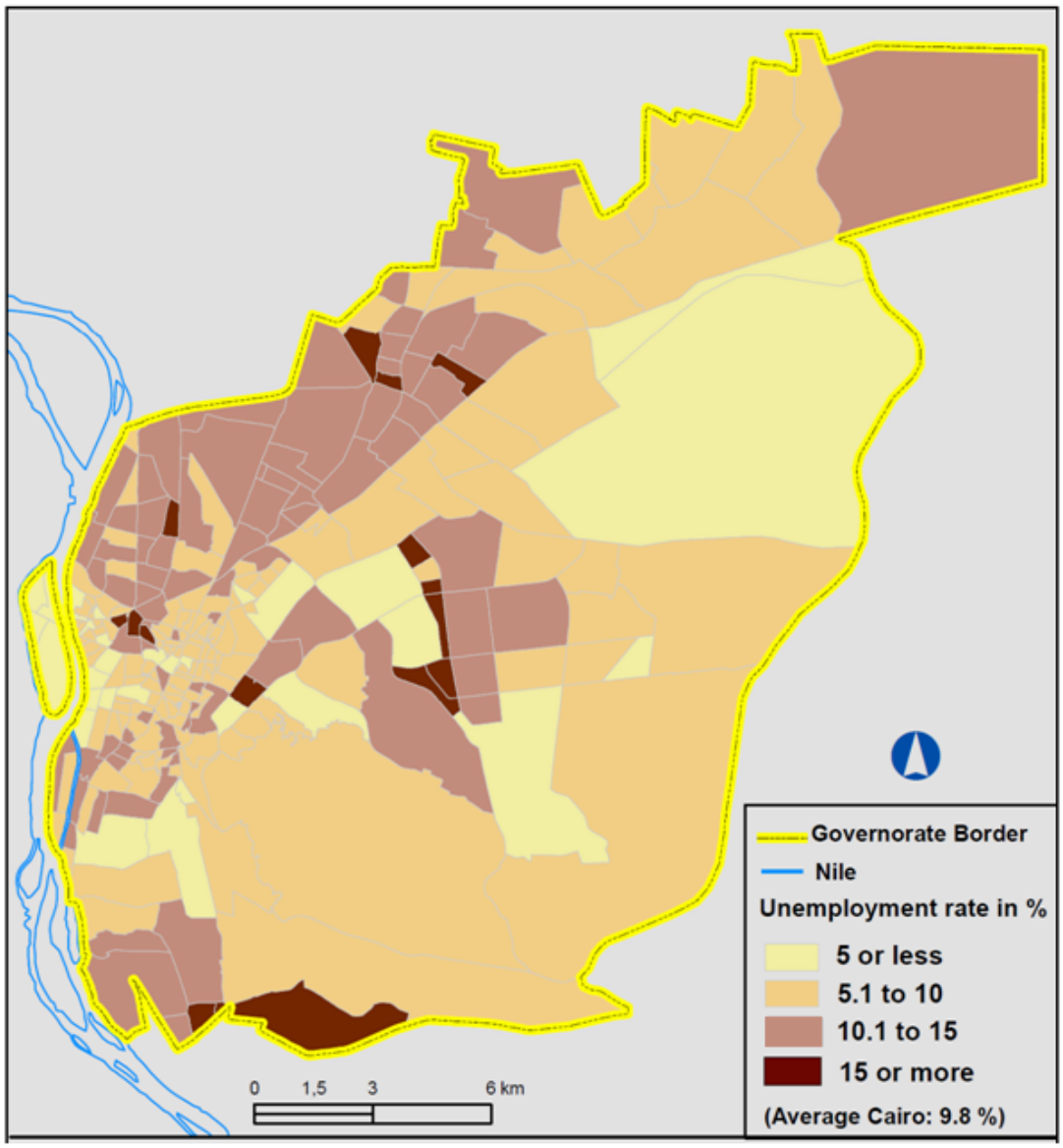


Fig. 25: Unemployment rate in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

2.4.2 Educational Attributes

2.4.2.1 Illiteracy Rate

Throughout the recent decades, large efforts have been made to improve the quality of education in Egypt. The national illiteracy rate among the population (10+ years) decreased from 71.3 % in 1960 to 39.4 % in 1996 (Awad & Zohry 2005, p. 9).

The period 1990 to 1999 was declared a decade for illiteracy eradication and adult education. Consequently, two national plans were set up to serve this purpose covering the period 1992 – 2000.

Notwithstanding decades of government campaigns to eradicate illiteracy in the country, the official rate stood still at 29.6 % (22.3 % for male and 37.3 % for females) in 2006. An additional 12 % were able to read and write, although they did not complete any schooling (Sims 2010, p. 37).

Fig. 26 compares the patterns of illiteracy in GC in the years 1947 and 1996 by calculating location quotient* for illiteracy in Cairo in these two years as follows:
The core area of Cairo is centered on Abdeen, and extending to the river bank in Kasr el-Nil and across the island of El-Zamalek. This area showed low rates of illiteracy in 1947. Surrounding the city core on all sides, there were old residential areas with high rates of illiteracy and poverty, including Boulak in the north, Bab el-Sheareya and El-Sharabya in the north-east, El-Darb el-Ahmar in the east, El-Khalifa in the south-east, and Misr el-Kadema in the south. Many of these areas were characterized by a strong influx of rural migrants.

Due to the low-income in the central areas it is not surprising that in 1996 the pattern of illiteracy was broadly the same as in 1947. Many of the same inner-city areas continue to exhibit levels of illiteracy that are higher than the city-wide average. These areas include Boulak, Bab el-Sheareya, El-Darb el-Ahmar and Misr el-Kadema (Harris & Wahba 2002, p. 73).

The illiteracy rate among the population (15+ years) in Cairo Governorate had increased from 18.9 % in 2001 to 20.1 % in 2006, which indicates a decline in the educational level of the governorate. However, this regression can be attributed to the administrative adjustment of the administrative boundaries in 2008, upon which the final results of the 2006 census were published. This means that some of the districts which had high educational indicators became part of the new governorate Helwan. These districts include El-Maadi and 15 May (UNDP & Egyptian MOLD 2008, p. 71).

Fig. 27 illustrates the disparities of the illiteracy rate in Cairo Governorate 2006. It shows that the illiteracy rate within 43 % of the total number of the shiakhat exceeded the

* Location quotient is a ratio that compares a region to a larger reference region according to some characteristics or asset.

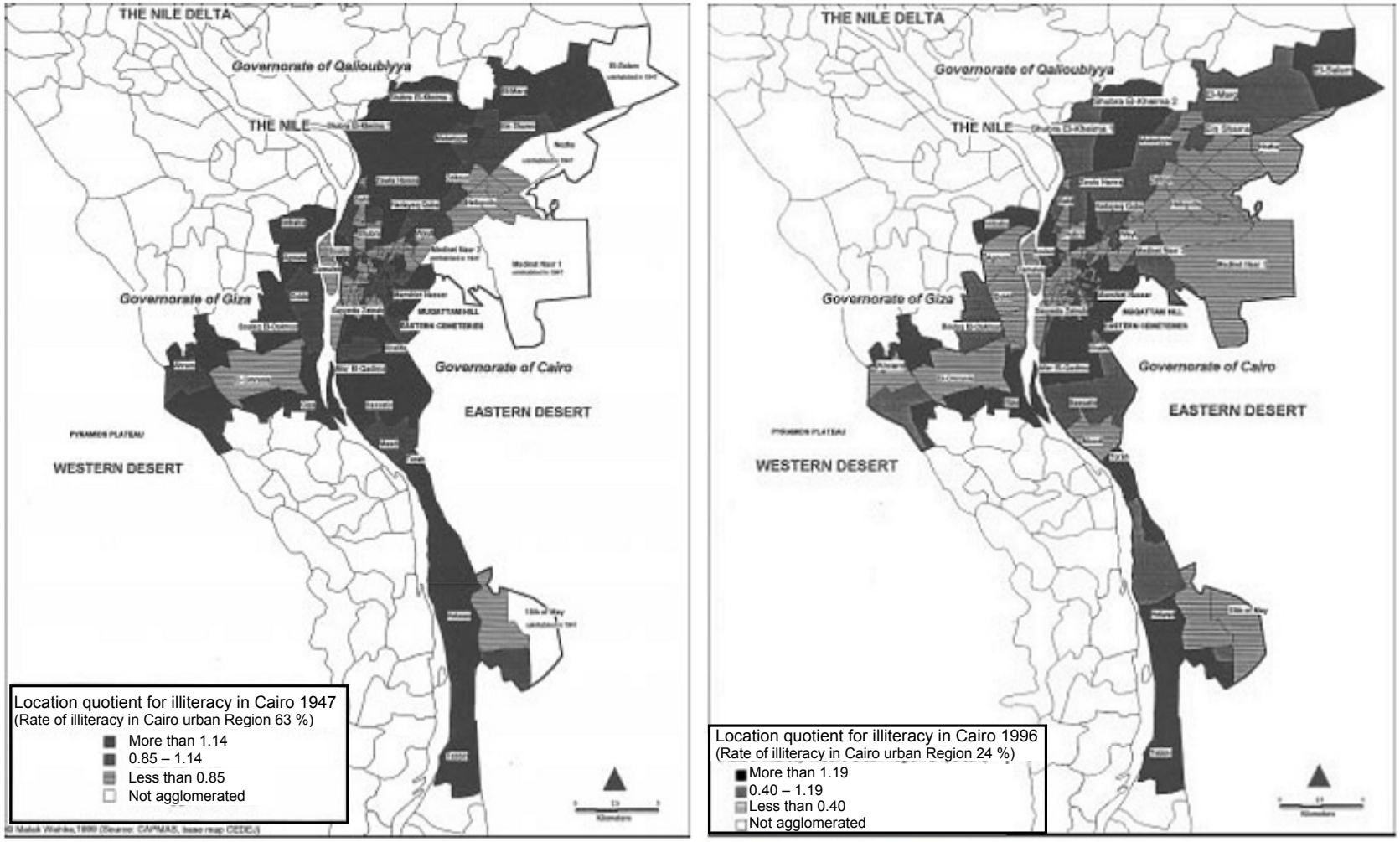


Fig. 26: The geography of illiteracy in Cairo Governorate 1947 and 1996

Source: Harris & Wahba 2002, p. 73, 75

average level of the governorate. It reached the maximum of 52.5 % in Shiakhet El-Ma'desa in the Manshiet Nasser District. The minimum rate of 1.2 % was in Shiakhet El-Nady el-Ahly in Shark Madinet Nasr District.The Illiteracy rates in informal and deteriorated slum areas are more pronounced. The shiakhat in the districts of Manshiet Nasser, Misr el-Kadema and El-

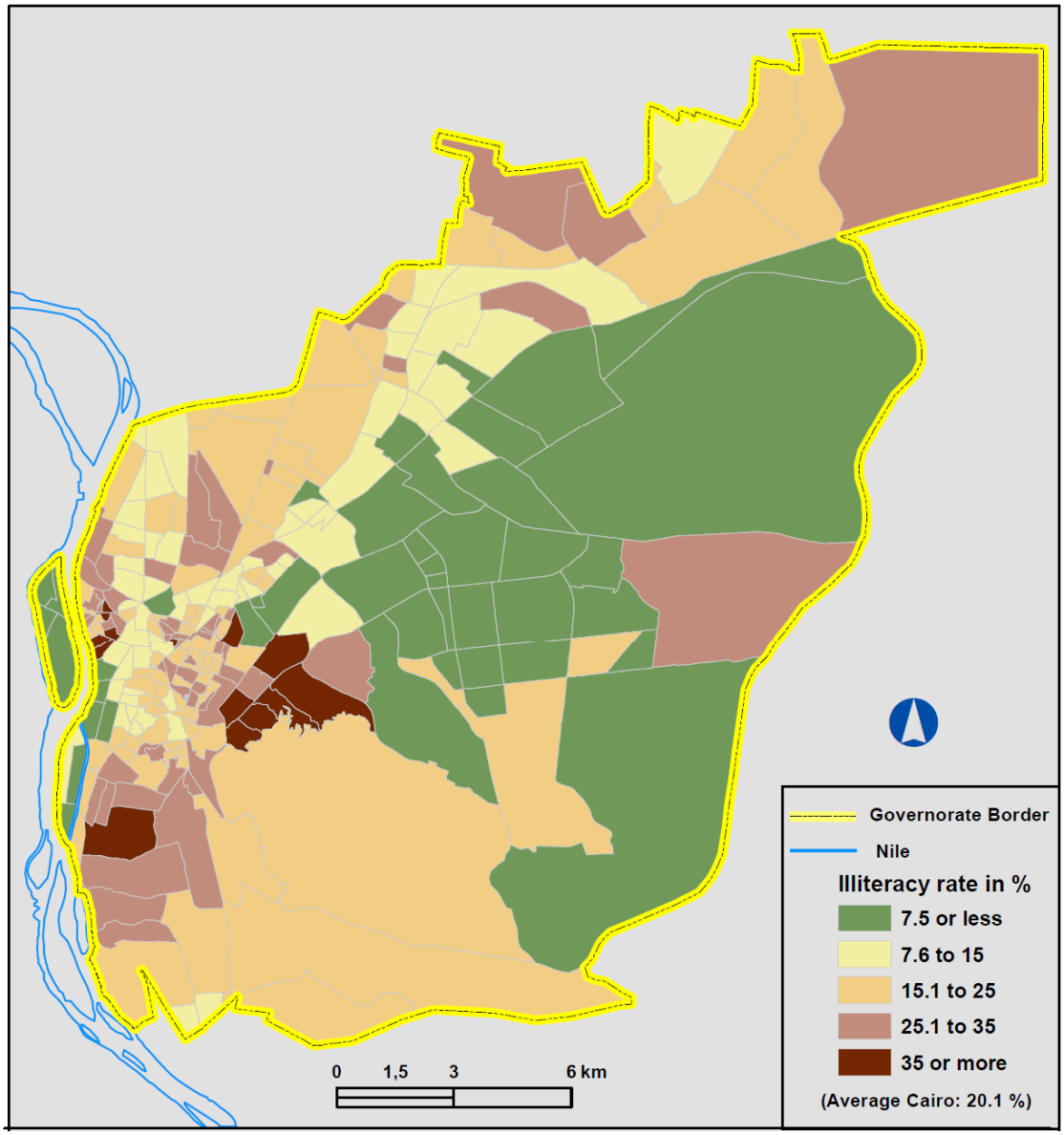


Fig. 27: Illiteracy rate in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

Zawya el-Hamraa registered higher rates of illiteracy than the shiakhat in the planned areas of the eastern zone of the governorate, except Shiakhet Ezbet el-Haganah as a squatter settlement on state-owned land. The variation in the illiteracy rate among the shiakhat can be attributed, on one hand, to the relatively high provision of educational institutions in the eastern zone compared to the western zone. On the other hand, the cultural and economic levels

of the families, which correlate closely with education, vary greatly among the shiakhat (UNDP & Egyptian MOLD 2008, p. 72).

Variations can also be attributed to the positive relationship between illiteracy and underdevelopment. There is a causal relationship between the rate of illiteracy and other indicators of underdevelopment such as poverty, low standard of living, decline in the national income, low individual productivity, the spread of diseases and population increase (El-Shaf'ey 2010, p. 65). Since informal and deteriorated areas are marked by phenomena of underdevelopment, those areas attained high rates of illiteracy.

The positive relationship between underdevelopment and illiteracy is supported by the strong correlation between the rate of illiteracy and the share of the population below the poverty line rate which reached 0.99.

2.4.2.2 School Enrollment Rate

Achieving universal primary education was the second goal of the MDGs (Millennium Development Goals) to be achieved by the year 2015. This goal can be verified through a set of indicators such as the school enrollment rate. The final results of the population census 2006 indicate that 21.6 % of the population of Cairo in the age of 6 to 18 has not enrolled in education which is twice as the national level in the same year that reached 10.4 %. Although enrollment rates have increased significantly over the last 20 years, Egypt has not reached universal primary education yet (UNDP & Institute of National Planning 2010, p. 37).

Fig. 28 shows the rate of school enrollment on the level of the shiakhat in Cairo Governorate 2006. Approximately, 45 % of the total number of the shiakhat have school enrollment rates which are below the general level of Cairo Governorate. Such low rates are concentrating in in two zones. Firstly, the old deteriorated parts of Cairo with the shiakhat in the districts of El-Gamaleya, Bab el-Sheareya, El-Darb el-Ahmar, and Boulak as well as the district of Misr el-Kadema. Secondly, the peripheral informal areas such as most of shiakhat in the districts of El-Sharabya, Manshiet Nasser, El-Basateen wa Dar el-Salaam and El-Marg.

The shiakhat mentioned above represent some of the major new informal areas and the old deteriorated areas in Cairo with the largest proportion of poor inhabitants in the governorate. There is a strong negative correlation coefficient between the proportion of the population below the poverty line and the school enrollment rate which attained -0.9. In other words, the higher the proportion of the poor population is, the lower is the rate of school enrollment. Contextually, rising school enrollment and improved educational attainment has been repeatedly shown to be one of the most effective ways to reduce poverty.

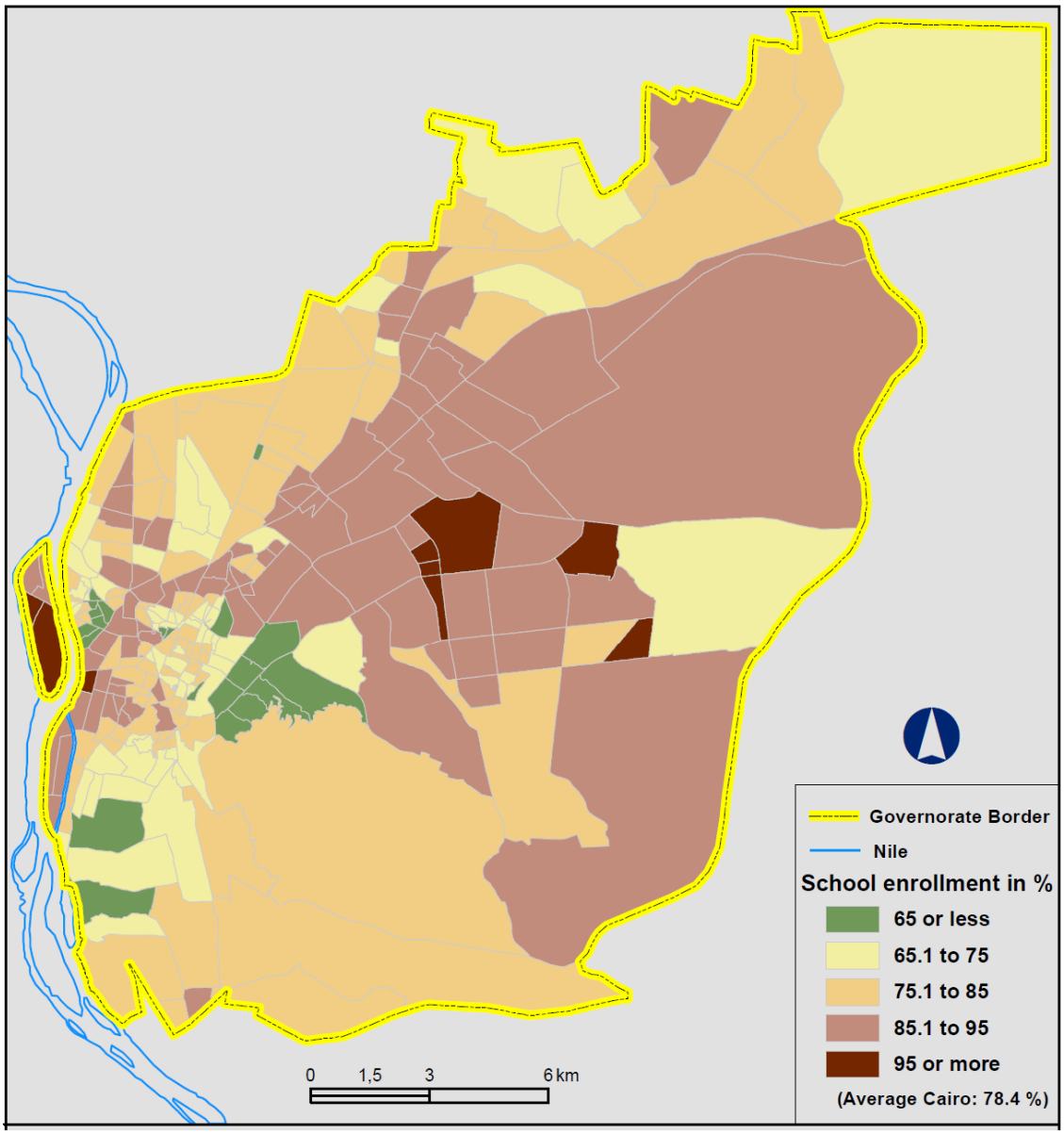


Fig. 28: Proportion of school enrollment in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

It is worth noting that poor children are consistently worse off than the rich in terms of school enrollment and that girls from poor households are significantly more likely not to attend school.

The main factors preventing poor children school attainment include monetary costs of education, the low value placed on education, and the need for children to help at home. In addition, it has long been accepted that customs and traditions limit school attendance by girls, particularly in informal areas, where the general pattern of living tends to be rural in quality,

reflecting the provincial origins of the residents who maintain their own repertoire of values and life even after having moved to the city (Langsten & Hassan 2009, p. 5).

Taking into account that child labor is strongly associated with not being in school, it is often assumed that child labor causes school dropout (Assaad et al. 1998b, p. 1). A high level of child labor is translated into a very low level of school attendance which then affects children's opportunities in life (Baker 2008, p. 5).

Although Egypt as a whole and most gender, wealth, and region-specific groups have made substantial progress in the educational attainment, children from the poorest families, particularly urban boys and all very poor girls, remain severely disadvantaged (Langsten & Hassan 2009, p. 2).

Aside from poverty, informal settlements and slum areas often have little or no public school provision, which puts distance to school as a barrier against school attendance and achieving high school enrollment rates. Even if public schools are available, they often suffer from overcrowding and overloading.

2.4.2.3 Drop-out in Primary Education

While the illiteracy rate reflects the result of the educational conditions during the previous periods, the school enrollment rate indicates the quality of the present conditions of education.

The drop-out rate is correlated with poverty levels, whereas children from poorer homes fail to complete their education and many of them never go to school.

The EDHS 2008 (Egypt Demographic and Health Survey) revealed that 48.7 % of school-age children between 6 and 18 years on the national level had never attended school, of which 18.5 % are male and 30.2 are female in 2008 (El-Zanaty & Way 2009, pp. 17 - 18).

The direct cost of education is perceived as the most important factor which prevents children from school attendance. Previous studies revealed that school enrollment has a direct positive relationship with household income. Another estimate in 1993 shows that the average annual cost of education per child in families with an annual income of less than or equal to LE 3600 (US$ 1.028) is about LE 348 (US$ 99) at the primary level, and LE 452 (US$ 129) at the preparatory level. In contrast, the annual income of a working child — estimated at LE 534 — constitutes about 14 % of the annual income of the families living under poverty line in urban areas. This may explain the high school drop-out rate of children of poor fami-

lies. Another relevant factor includes the need for children to work as unpaid family member at home, in informal enterprises or in agriculture. Such children are not able to attend school. It should also be taken into consideration that schools are often too far away from the homes of the children (Suliman & El-Kogali 2002, p. 4).

The proportion of children who had dropped out of primary education in Cairo Governorate reached 2 % in 2006. Fig. 29 shows that 72 % of the total number of shiakhat of Cairo Governorate had registered less than 1 % of their pupils who had dropped out of primary schools, including the shiakhat of the western, eastern and southern zone except Ezbet el-Haggana and some shiakhat of Boulak District.

Relatively high drop-out rates from primary education were experienced in the district of Manshiet Nasser and most of shiakhat of the northern zone including Shobra, El-Sahel, El-Sharabeya and El-Gamaleya. The maximum value of 10.5 % was registered in Shiakhet Sharks in Boulak District. In these areas, child labor in small scale manufacturing and numerous informal family enterprises is a widespread phenomenon.

2.4.3 Health Attributes

Socio-economic factors and the availability of infrastructure are contributing to the health status of the population in urban areas (Hardoy & Satterthwaite 1984, p. 308). Likewise, neighborhood and related contextual effects can influence health and other demographic outcomes through multiple pathways (Roushdy et al. 2005, p. 2).

The rate of mortality is one of the main indicators of the standard of living and development of a population (El-Zanaty & Way 2009, p. 115). Several factors have a significant and robust impact on mortality; they include the level of income, the share of health expenditure to GDP, access to sanitation, i.e. flush or pit toilets, access to electricity, and vaccination coverage in the first year of life (Wang 2002, p. 16).

Child mortality rates are generally regarded as the principal measures of country-level health status. Infant mortality rates are often higher in deprived areas, and children brought up in such environments are more likely to be exposed to criminal subcultures and to suffer educational disadvantage (Pacione 1997, p. 187).

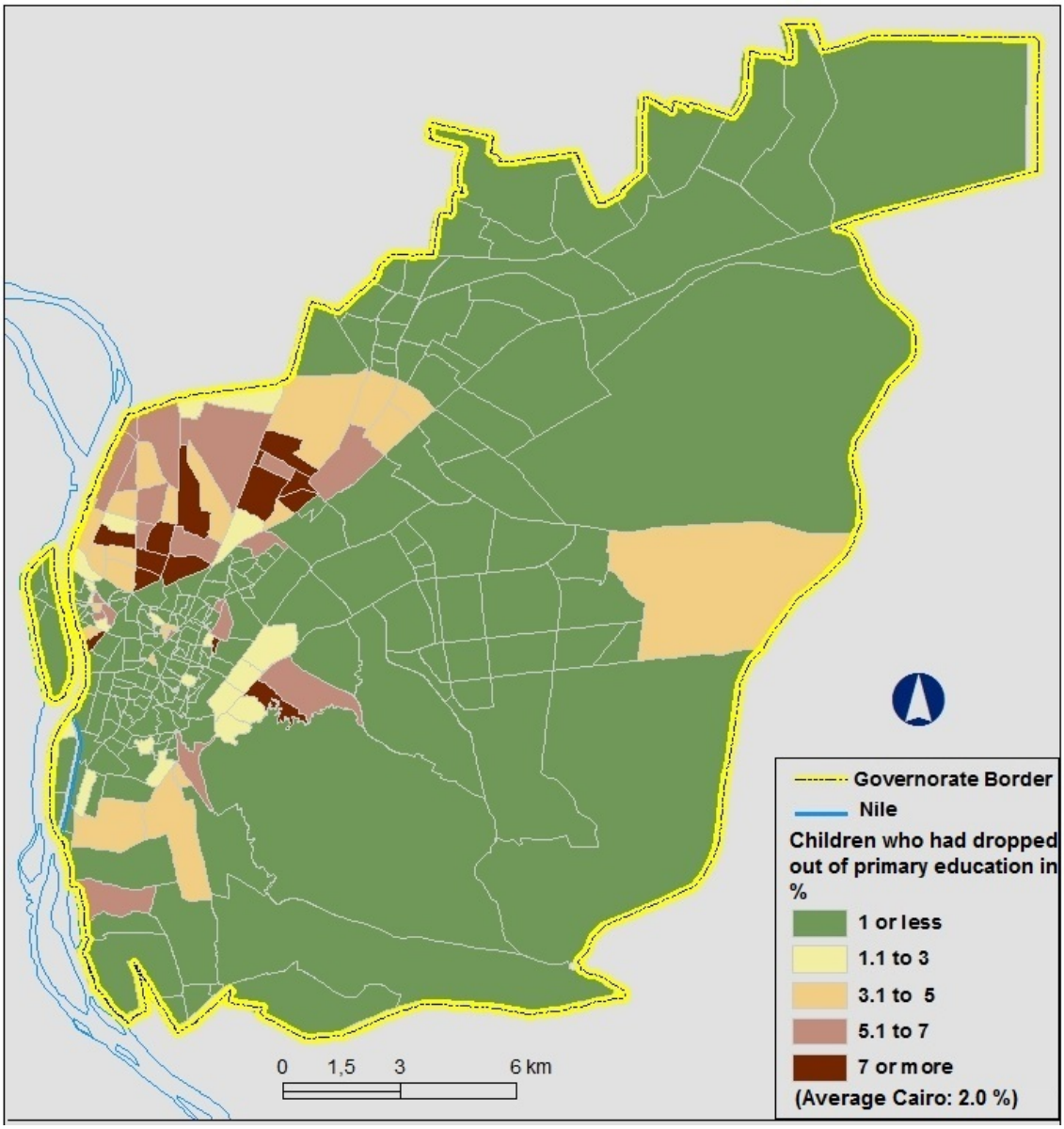


Fig. 29: Children who had dropped-out of primary education in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

To gain a better understanding of the health status in Cairo Governorate and its relation to other socio-economic dimensions, the following chapters are analyzing the child mortality as an indicator for the health status across the shiakhat of the governorate.

2.4.3.1 Infant Mortality Rate (IMR)

Prior to World War II, more than 250 out of every 1000 Egyptian infants died before reaching their first birthday, but since the late 1940s, the infant mortality rate has dropped quite steadily (Weeks et. al. 2004, p. 77). Until1990, it had declined to 37.8 ‰ and continued to shrink to 19.3 ‰ in 2006. This compares very favorably with the average infant mortality rate for Africa

in 2007 with 86 ‰ deaths and for Asia with 48 ‰ deaths (Sims 2010, p. 39). Notwithstanding, these rates are still relatively high by WHO standards.

The infant mortality rate in Cairo had halved between 1947 and1960, and then more than halved again until 1990. Much of this decline was due to improvements in health care, and especially a result of the national campaigns to increase awareness of the benefits of vaccination. Rising incomes contributed to this success, too. Even so, in the mid-1990s, El-Laithi (1996) estimated that about one-third of the population in Cairo lived in poverty, and that 14 % of the inhabitants of the metropolis were so poor that they suffered from malnutrition (Harris & Wahba 2002, p. 64).

Fig. 30 shows the rates of infant mortality in Cairo Governorate by the year 2006. On the general level of the governorate, this rate reached 28.1 ‰ which exceeded significantly the national level of 19.3 ‰.

The high rate of Cairo Governorate may be attributed to the rapid urban growth occurring on the fringes of the city, creating mega agglomerations of semi-legal informal settlements on agricultural land and illegal squatter settlements in desert areas. Urban poverty is increasing as quickly as cities are growing. The lack of attention to rural-urban migration and the natural increase of the urban population have resulted in the increment of large segments of underserved and disenfranchised people living in urban poverty.

In general, the crowded conditions of the slums and informal settlements, lack of clean water supply, lack of proper sanitation facilities and the severe air pollution, all has been contributing to the poor health status of the children living in these areas. Available data support the hypothesis that the health of children in urban slums is generally worse than national and rural averages (USAID 2003, p. 14).

In more than 27 % of the total number of shiakhat, IMR exceeded 30 ‰. The minimum is to be found in the Shiakhet Kasr el-Dobara in the Kasr el-Nil district, in which the CBD is located. The maximum of 84.7 ‰ was registered in the nearby Shiakhet Bab el-Louk in the Abdeen district, where a major medical center is based. Here, the extremely high infant mortality rate is probably to be explained by the fact that infant deaths are often recorded at the address of the hospital (Weeks et al. 2004, p. 80). Therefore, reports of infant mortality rates in Egypt lack the spatial accuracy due to the failure of the registration of deaths, which are not based on the place of residence of the child, but on the place of the occurrence of death, which is in many cases a public or private hospital (UNDP & Egyptian MOLD 2008, p. 69).

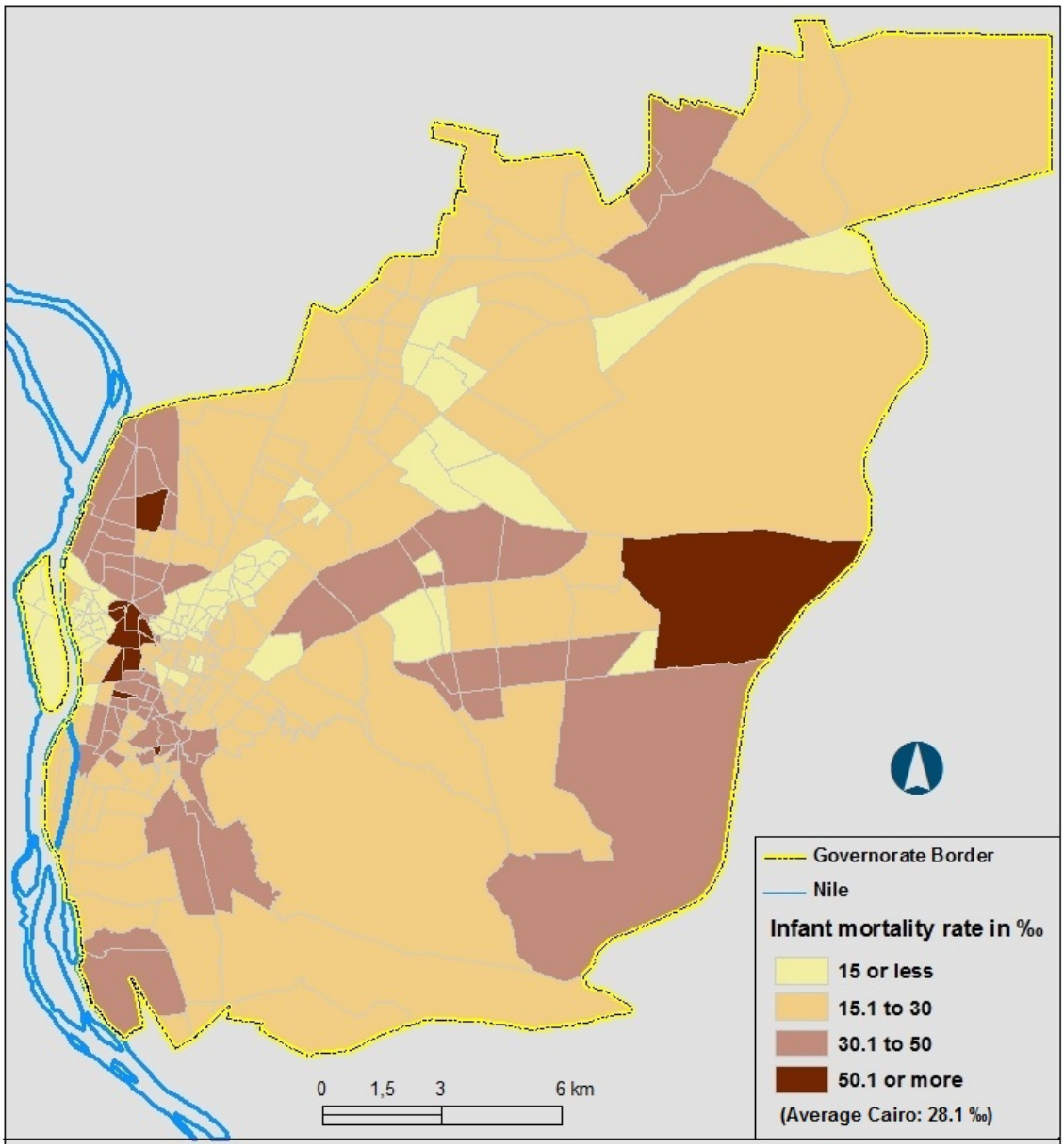


Fig. 30: Infant mortality rate in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

The unreliability of the data of infant mortality can also be shown by comparing two other districts. As shown in Fig. 30, the informal area of the Manshiet Nasser district lacks medical services. Here, the IMR ranges between 14.6 ‰ and 27.6 ‰. These high rates are still relatively low compared to the rate of 70 ‰ in El-Nozha, a well serviced district. The availability of public and special hospitals in the latter area can explain the high registered numbers of infant mortality.

Therefore, the infant mortality rate has to be dropped as an indicator of the health attributes used to develop SEOI (Socio-Economic Opportunity Index) due to the spatial unreliability of these data.

Egypt DHS 2000 found that 8 % to 9 % of the children living in Cairo were undernourished, whereas 18 % of the same age group were undernourished in the squatter settlement of Manshiet Nasser (Fry et al. 2002, p. 22). Under such poor and unhealthy conditions it is not possible to achieve here a lower infant mortality rate than in other planned and well-off areas, as studies reveal that early childhood mortality of poor households in urban Egypt mostly depends on their own standards of living (Roushdy et al. 2005, p. 18).

2.4.3.2 Children Under the Age of Five Mortality Rate (U5MR)

The second indicator used to measure the health status in Cairo Governorate is the Under Age Five Mortality Rate (U5MR) of children. This rate advanced from 33.1 ‰ to 37.6 ‰ during the period of 2001 to 2006 (UNDP & Egyptian MOLD 2008, p. 71).

Like IMR, Fig. 31 shows that the U5MR is not suitable for a spatial analysis of the health situation of the inhabitants of different quarters of Cairo because the deaths were registered in hospitals as the place of death occurrence, rather than at the place of residence of the deceased.

More than 25 % of the shiakhat in Cairo Governorate experienced U5MR higher than 40 ‰. It is worth noting that this category included both informal areas on desert land, such as Manshiet Nasser and Ezbet el-Haggana, and also well-planned and better-off areas, such as El-Nozha. This contradiction confirms the spatial irrelevance of the distribution of childhood mortality data to the standard of living of the population on the national level.

2.4.4 Housing Conditions

The uncontrolled urban development resulted in a lack of service provision in terms of infrastructure systems. There are housing structures which had been illegally built but which are in acceptable physical conditions; however, most of the informal settlements have been lacking access to water, electricity and sanitation as well as other basic services and infrastructure.

Housing conditions and access to basic infrastructure services are important indicators for the measurement of the welfare quality; this can be done directly through the assessment of increased utility and their asset value, and indirectly through their impact on the health of the population.

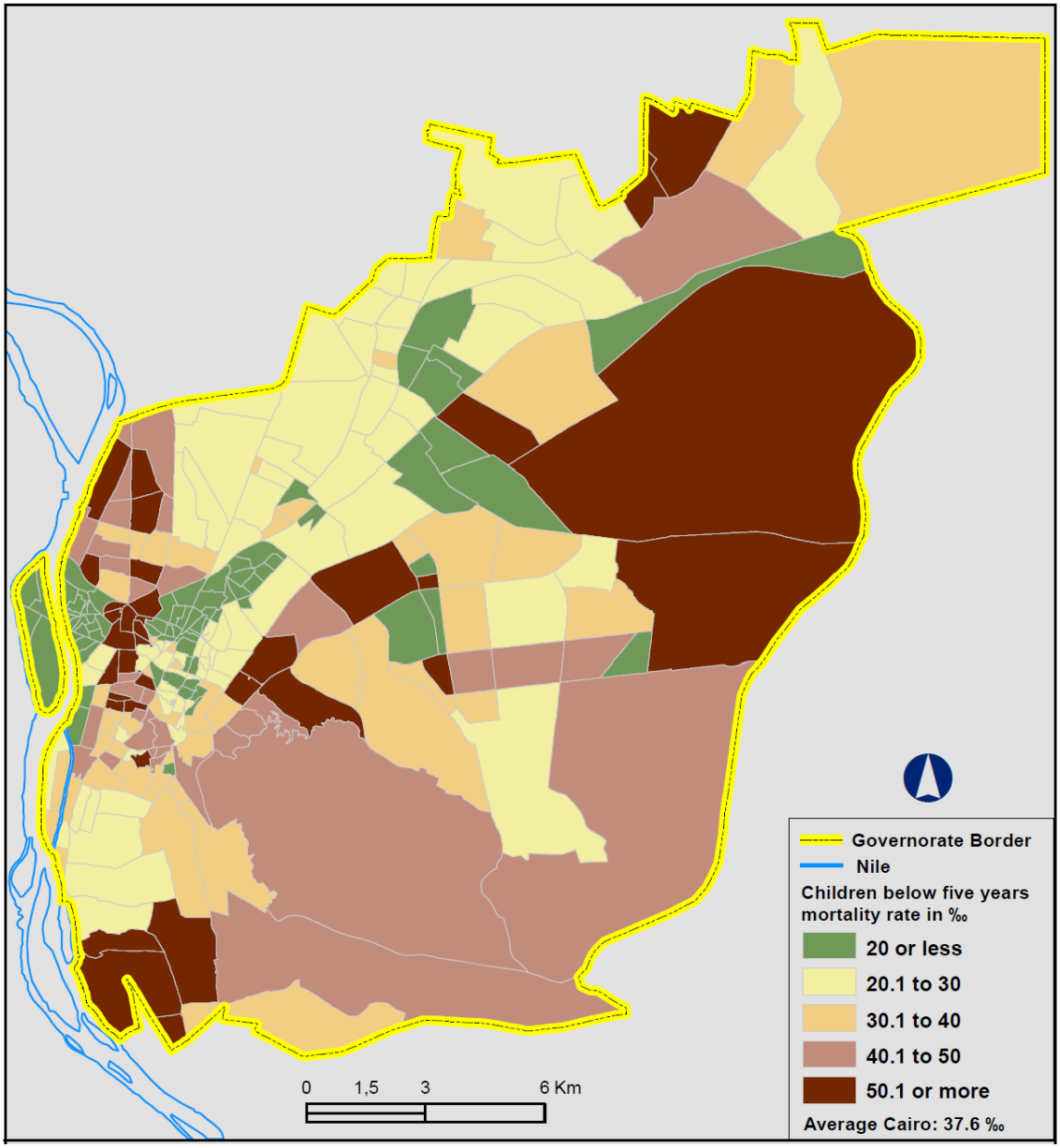


Fig. 31: Children under the age of five mortality rates in Cairo Governorate 2006

Source: Designed by the author, based on statistical data from UNDP & Egyptian MOLD 2008.

The health status of individuals is positively related to the access to potable water, good housing conditions and the availability of neighborhood health facilities. Poor households are less likely to have access to basic infrastructural services. Almost all poor households have electricity connections, but there are large disparities in the delivery of the public water system. Similarly, the sewage system suffers from modest coverage and poor service quality (Ministry of Economic Development & World Bank 2007, p. 50).

The Millennium Development Goals (MDGs) were adopted by the UN summit in New York in September 2000 and should be achieved by 2015. However, the degree to which these

goals are achieved varies from one country to another, based on socio-economic problems and the progress in the economic development (Keyzer & Wesenbeeck 2006). The MDGs aim to reduce poverty rates and solve problems of sustainable development especially in the Global South. The seventh goal focuses on “ensuring environment sustainability”. Target 7C, as a part of this goal, covers improving drinking water and basic sanitation (Mansour 2011, p. 10). Improving water supply and the sanitation systems are important to reduce poverty rates and to increase the quality of live. Access to potable and safe drinking water is an important component in human health, particularly in developing countries, where it seems to be associated with geo-demographic and socio-economic circumstances of the communities. Therefore, it is expected that fresh water and piped supplies are related to developed and urban areas while contaminated and unsafe water are related to slum and rural areas (Mansour 2011, p. 10).

Based on the importance of the housing conditions in analyzing settlement patterns, the following chapter will focus on overcrowding and the access to safe drinking water, improved sanitation and electricity

2.4.4.1 Rate of Overcrowding

Overcrowding, in its simplest sense, is the number of people accommodated in habitable rooms as compared to the recommended accommodation density of up to three persons per room. According to the indicators developed by UN-Habitat to monitor the Habitat Agenda and the MDGs, overcrowding is associated with a low number of square meters per person, high occupancy rates, i.e. the number of persons sharing one room, and a high number of single room units.

Fig. 32 clarifies that the room occupancy in the shiakhat of Cairo Governorate is within acceptable limits as the average rate of overcrowding did not exceed two persons per room in 2006. The less crowded areas, where the overcrowding rate did not exceed one person/room, concentrated in the well-off areas such as the shiakhat of the districts of Kasr el-Nil, El-Zamalek, and Misr el-Gadida as well as some parts of the Madinet Nasr district.

Nevertheless, extreme crowding and poor ventilation are problems which are quite common in sub-standard or slum housing (World Health Organization 1987, p. 8). However, the results of the last census show an equal level of crowding within both informal areas and formal areas. Actually, the unbalanced distribution of the rate of overcrowding is misleading and does not reflect the reality. The population of informal areas is normally under-counted because the Central Agency for Public Mobilization and Statistics (CAPMAS), the official source

for statistics in Egypt, has consistently under-counted population in informal settlements. Some large areas were found to be missed from this agency's lists, while others had estimates for their population that were only a small fraction of their real population (Sabry 2010, p. 525). The development of informal areas reveals that overcrowding is an inherent problem. By 1984, room densities in Cairo had reached a very high level. Some housing units, in districts like Bab el-Sheareya, had ten persons per room. The average in the 1990s in the old and poor districts of Cairo was seven persons per room.

The aggregate result of the cultural premises, combined with poverty, is extreme congestion. The early counts from 1969 indicated gross densities of one person per 2 m^2 to be common (Wikan 1980, p. 21), while on an average the families had nearly two persons per single sleeping place. People slept under beds as well as on top, three adults or up to seven children to a double bed etc. At the same time, such crowding is considered a hardship, and there are strong pressures to maintain a minimal separation of the sexes and privacy (Wikan 1990, p. 128).

In touch with the problem of extreme overcrowding is the average size of the family. There is a positive relationship between the overcrowding rate and the average family size since the correlation coefficient between them reached 0.7 in 2006. According to El-Safty, during the 1980s, urban conditions in crowded slum and informal areas were restoring the traditional form of residence which was resulting in a trend back to the extended family, through in a somewhat altered fashion. Since newly married young couples could not afford the high cost of a flat, they continued to live with their parents, thus combining more than one nuclear family. They probably were of different generations as in the case of the parents and their offspring living together, each with his own family; or they may constitute only one generation. It was not uncommon that the second generation continued to live in the same family unit after marriage, so it was not unusual to find an average of seven persons living in one room and in some houses even up to as many as twenty people in two rooms (El-Safty 1985, p. 143).

Whereas the indicator of overcrowding set by the UN-Habitat is calculated by the proportion of households with more than three people per room, the rate of overcrowding will be excluded from the final process of developing SEOI due to its weightlessness.

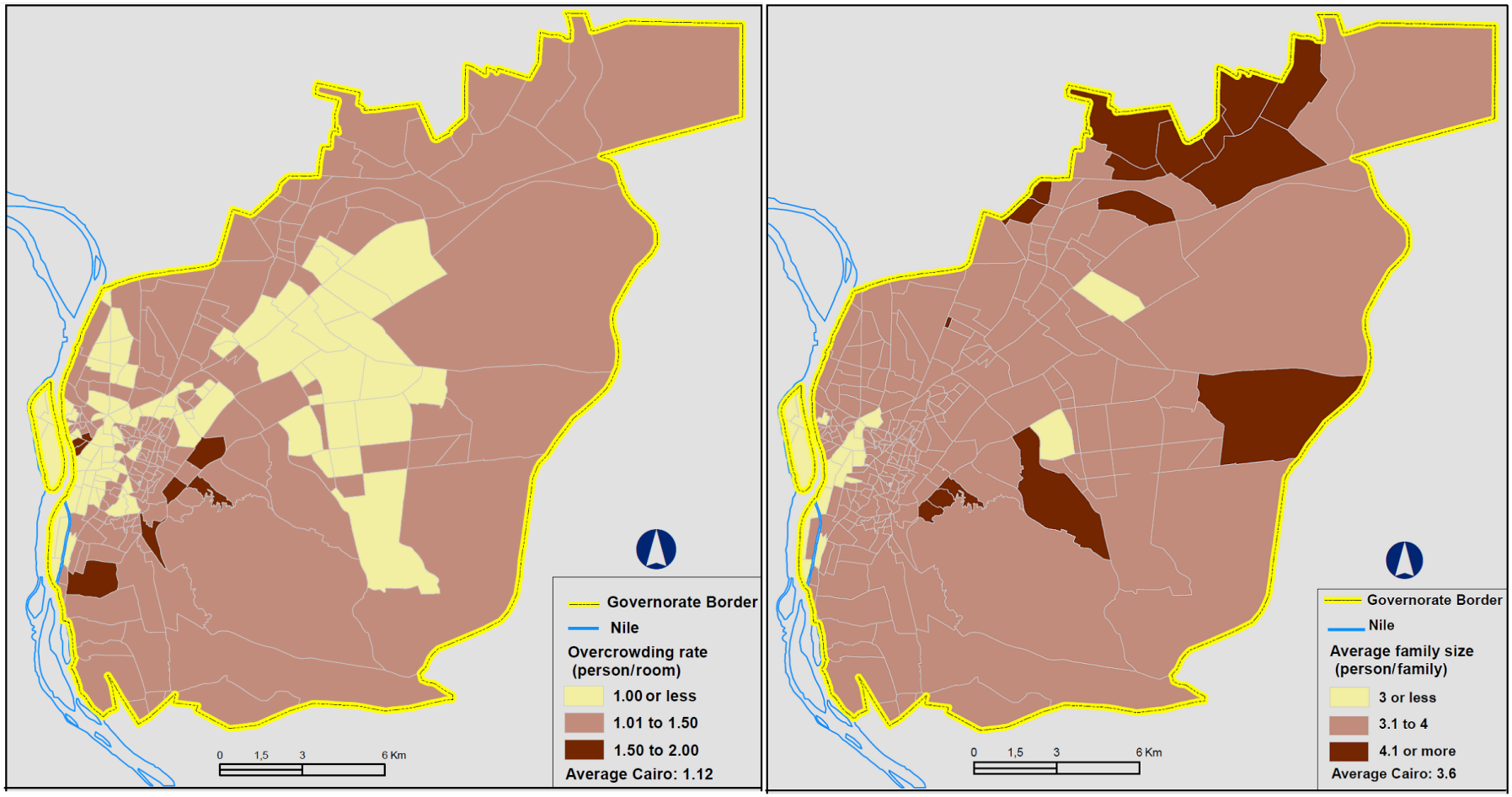


Fig. 32: Rate of overcrowding compared to the average family size in Cairo Governorate 2006

Source: Designed by the author based on CAPMAS 2008a.

2.4.4.2 Access to Safe Drinking Water

In 1977, the international community declared the 1980s the ''international drinking water supply and sanitation decade'' in the context of the United Nations Water Conference. The established goal confirms that by the end of the decade all people worldwide should have access to clean water and sanitation.

Although the world is on schedule to meet the drinking water target of the Millennium Development Goals (MDGs), almost 40 % of the world's population remains without improved sanitation in 2008 (WHO/UNICEF 2009).

Lack of access to safe drinking water has been seen by Fay et al. (2003) as one of many other socio-economic problems such as deprivation, literacy, slum areas, inadequate sanitation and poor population health (Mansour 2011, p. 10).

According to the international policy of the MDGs, access to improved and unimproved water is defined as the following quotation and Table 17 (WHO/UNICEF 2009):

"An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with faecal matte''.

Table 17: Improved and unimproved water sources

Improved	Unimproved
Piped water into dwelling, plot or yard	Unprotected dug well
Public tap/standpipe	Unprotected spring
Tube well/borehole	Small cart with tank/drum
Protected dug well	Tanker truck
Protected spring	Bottled water *
Rainwater	Surface water (river, dam, lake, pond)

Source: WHO & UNICEF 2009.

* Bottled water is considered to be improved only when the household uses water from another improved source for cooking and personal hygiene; where this information is not available, bottled water is classified on a case-by-case basis (WHO & UNICEF 2009).

Concerning water quantity and access distance, the Joint Monitoring Program (JMP) defines access to drinking water as "the availability of at least 20 liters a person per day from an improved source within one kilometer of the user's dwelling''. Due to lack of data about water quantity and access distance, piped water mainly inside the building is considered an indicator of access to safe drinking water. People with access to public taps and ground water

were considered as population without access to safe drinking water. Obtaining water from a tap outside the building or ground water is considered unsafe because these drinking water sources are exposed to potential outside contamination.

Fig. 33 shows that 3.6 % of the total population of Cairo Governorate have no access to the public water. However, the situation is much worse in three shiakhat namely El-Mugawrin in the District of Manshiet Nasser and in El-Berekdar in El-Gamaleya District and El-Sabtiyah in Boulak District where the proportion of population deprived from potable drinking water exceeded 30 % of the total population in 2006. This confirms that the problem of lacking access to potable drinking water in urban areas is often found in slums and marginalized settlements (Mansour 2011, P. 37).

The former three districts experienced the highest proportion of population without access to safe drinking water in Cairo Governorate. Manshiet Nasser district represents one of the major squatter settlements on desert land in Cairo. The other two districts belong to the deteriorated inner parts in the core of Cairo. In many slums and squatter areas, drinking water must be carried in from an outside source, usually a public pump somewhere on the block. In 2002, a study had been conducted in the settlement of the garbage collectors in Ezbet el-Nakhal, an informal quarter located on former agricultural land. The survey revealed that 85 % of the people used water pumps to obtain ground water which is available closely below the surface in an area severely contaminated by hazardous waste and faeces. 13 % of the inhabitants of this shiakha had no sanitary waste disposal and some of them had no water closets (Boussen et al. 2004, p. 69).

The underground water aquifer in the Nile valley and Delta in general has been much polluted by private sanitation (septic tanks). Septic tank is a long deep hole dug in the ground close by the building for its sewage disposal. Private sewage or on-site sanitation, which is not connected to the public network, is a common pattern in informal areas, and it represents a potential hazard for groundwater contamination (Mansour 2011, p. 37).

The main obstacle for providing a safe water resource to each building is the high cost for installing a pipe connection to the public water network. Such expenses are often not affordable for low-income people who represent the majority of population in informal areas. However, this problem can be solved by paying the fees for the installation of water pipes through monthly installments.

There are many barriers which challenge the existing level of access to drinking water in urban communities. These include unpredictable population growth, migration from rural to urban areas and slum growth on the margins of cities and towns (Mansour 2011, p. 17).

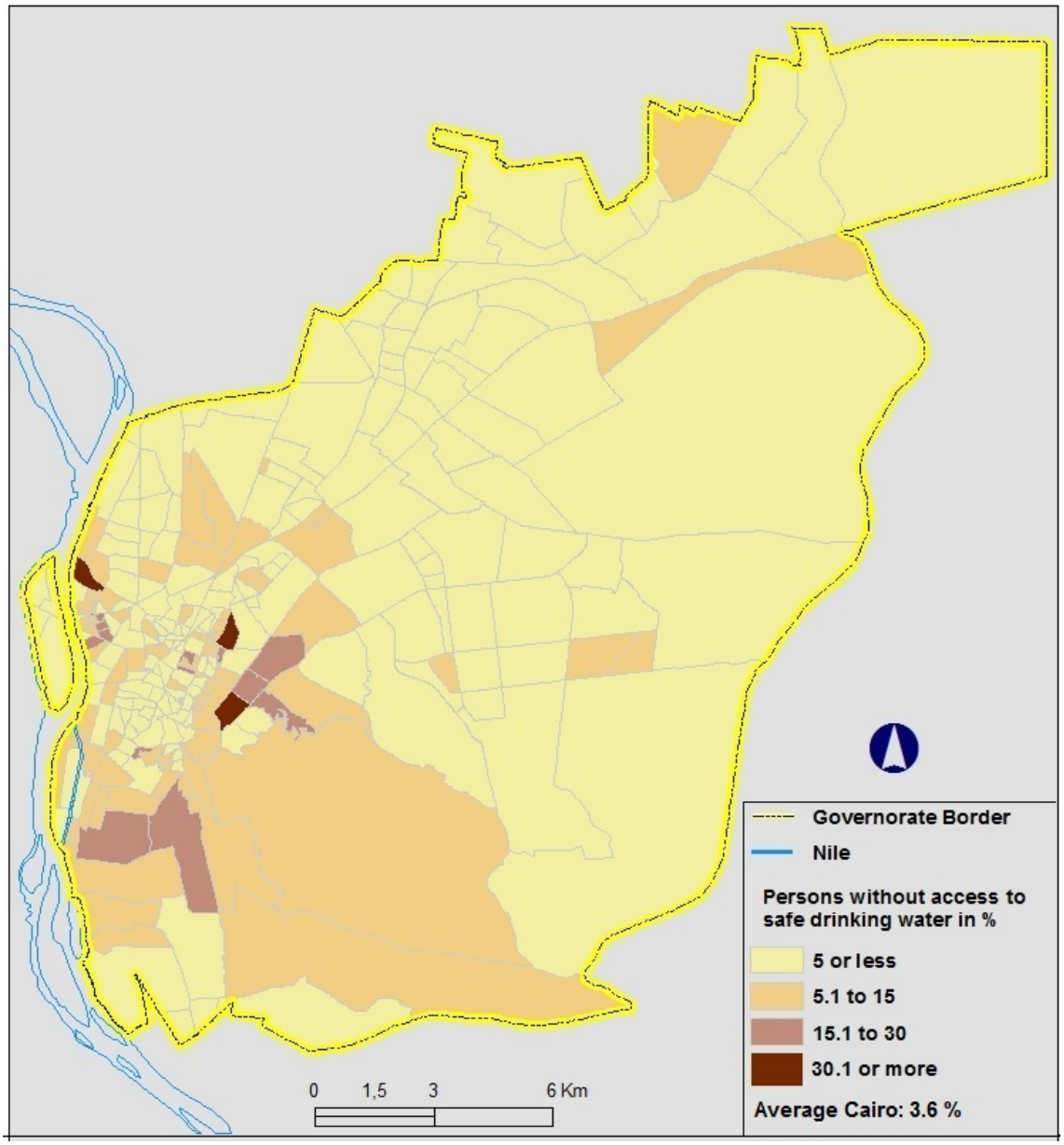


Fig. 33: Proportion of population without access to safe drinking water in 2006

Source: Designed by the author, based on CAPMAS 2008a

2.4.4.3 Access to Improved Sanitation

One of the most salient challenges facing the informal settlements is the provision of reliable sanitation services, specifically solid waste removal and sewerage infrastructure.

Unlike water and electricity, sewerage connections are quite difficult to be provided in informal areas. In some of the newer informal areas, the sewage system is practically not existing, while in older ones some pockets are still cut off and households rely on septic tanks for water disposal. Where connections are existing “on paper”, “sewage blockages and resulting overflows may be common” (Piffero 2009b, p. 66).

According to the final results of the last census, the sanitation system in Egypt is divided into three types: connection to the general network, local network and septic tanks.

In principle, there is an ambiguity related to the definition of improved sanitation. The official definition refers to the connection of the building to any sanitation facility to get rid of the solid and liquid human waste, no matter whether the connection ends at a treatment station or at an assembly tank. However, according to the popular definition the majority of the population in Egypt refers to improved sanitation only when the connection of the building to the public sewerage network is meant which ends at a treatment station (UNDP & Egyptian MOLD 2008, p. 76).

This study depends mainly upon the second definition as it considers population with connection to septic tanks together with population without access to any sanitation facility as aspects of unimproved sanitation. Currently, septic tanks are the most usable type of sanitation in informal and slum areas. The majority of the population in many informal areas has no safe underground sewage infrastructure and relies on on-site sanitation consisting of septic tanks and cesspits. With an increasing number of inhabitants in a building and rising water consumption, these cesspits have to be frequently emptied, which is very costly. Poor sanitation can cause groundwater contamination, as was previously mentioned.

Lack of access to adequate sanitation systems certainly affects public health and the burden of microbiological diseases (Mansour 2011, p. 144).

Fig. 34 shows a comparison between the proportion of the population without access to improved sanitation in Cairo Governorate according to both the official definition and the popular definition.

According to the popular definition, the proportion of the population without access to improved sanitation reached 3 % in 2006, compared to only 0.4 % of the total population of Cairo Governorate according to the official definition.

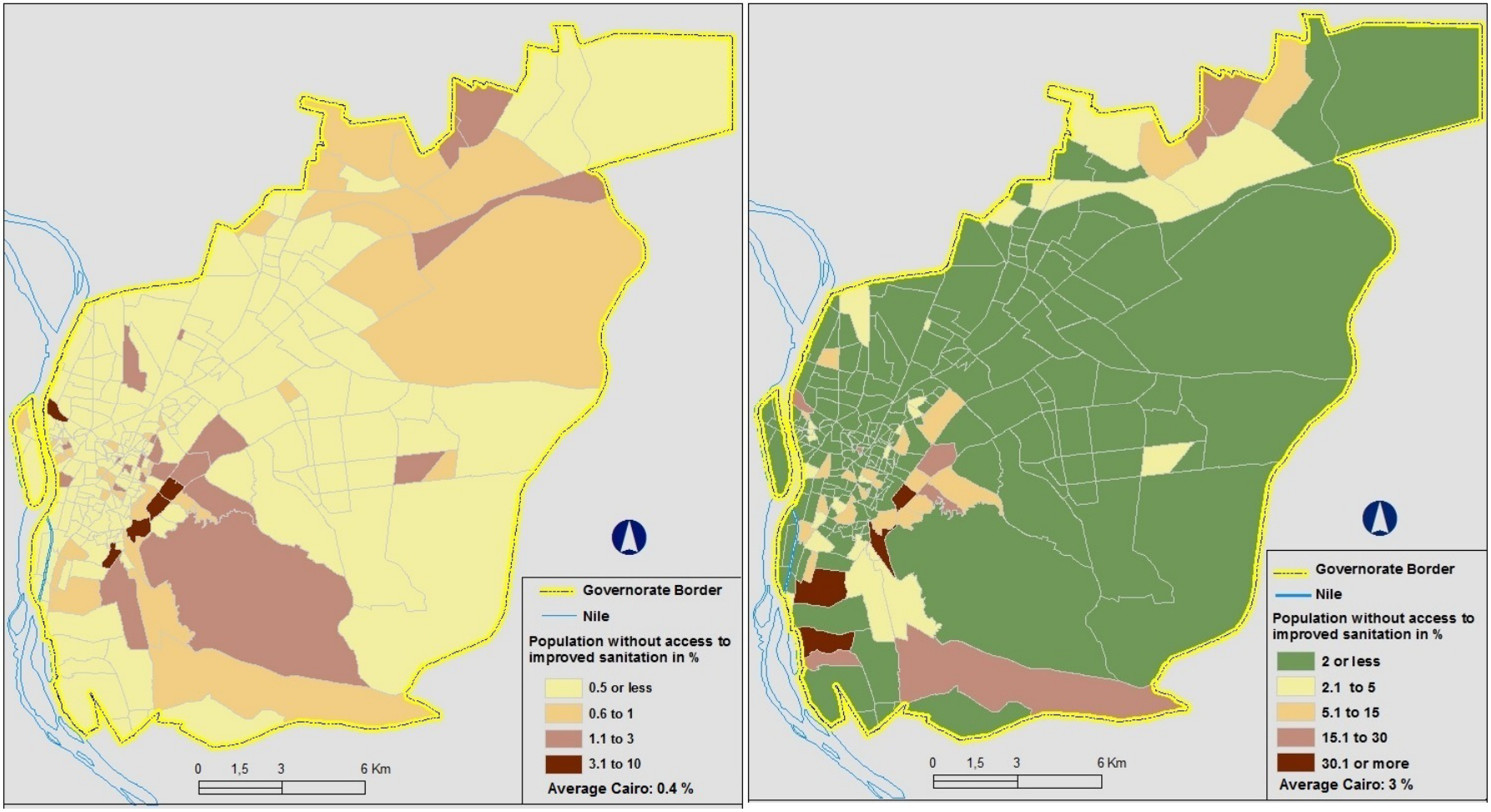


Fig. 34: Proportion of the population without access to improved sanitation in Cairo Governorate 2006, according to the official (left) and the popular definition (right)

Source: Designed by the author, based on CAPMAS 2008a.

Differential values between shiakhat according to the official definition seem to be constricted compared to those of the popular definition, as the standard deviation for the former does not exceed 0.8 and for the latter bounds to 8.4.

The great disparity between the shares of the population with regard to the two definitions can be explained by the increase of the population without access to improved sanitation in informal and slum areas. The analogy between the two map of access to safe water and to sanitation shows that usually improved drinking water supplies are associated with improved sanitation systems and vice versa (Mansour 2011, p. 144).

According to the popular definition, the most deprived areas from improved sanitation are El-Mugawrin (96 %) in Manshiet Nasser District, Athr el-Nabi (51 %) and El-Dayura (31 %) in Misr Al-Kadema District and Arab el-Yasar (41 %) in El-Khalifa District. The high values in the former districts together with the high values in central Cairo districts and El-Marg, El-Salam and Dar el-Salam districts may explain the spatial relationship between the expansion of informal and slum areas and the deprivation of basic infrastructure services.

2.4.4.4 Access to Electricity

Electricity enhances the quality of life in a number of ways. First, it can promote a healthier life style. Second, access to electricity in the first year of life can significantly reduce child mortality.

Access to electricity is fairly distributed among the inhabitants of the metropolis where the proportion of population without access to this facility reached only 0.63 % of the total population of Cairo Governorate 2006.

Fig. 35 shows that the number of shiakhat with more than 5 % of the total population without access to electricity are seven shiakhat only; two of them lie in the major informal area in Cairo which is Manshiet Nasser.

One of the most important problems related to population without access to electricity, particularly in informal areas, is the illegal insecure access to electricity which is often neglected by state authorities. An illegal hook-up is made to the electrical lines. Another problem can be seen as cables providing electricity run on street surfaces. This is a source of danger especially when sewage overflows. The third problem is represented in frequent electrical blackouts and power cuts.

Considering access to electricity as almost universal in Cairo, this determinant can be excluded when developing the Socio-Economic Opportunity Index.

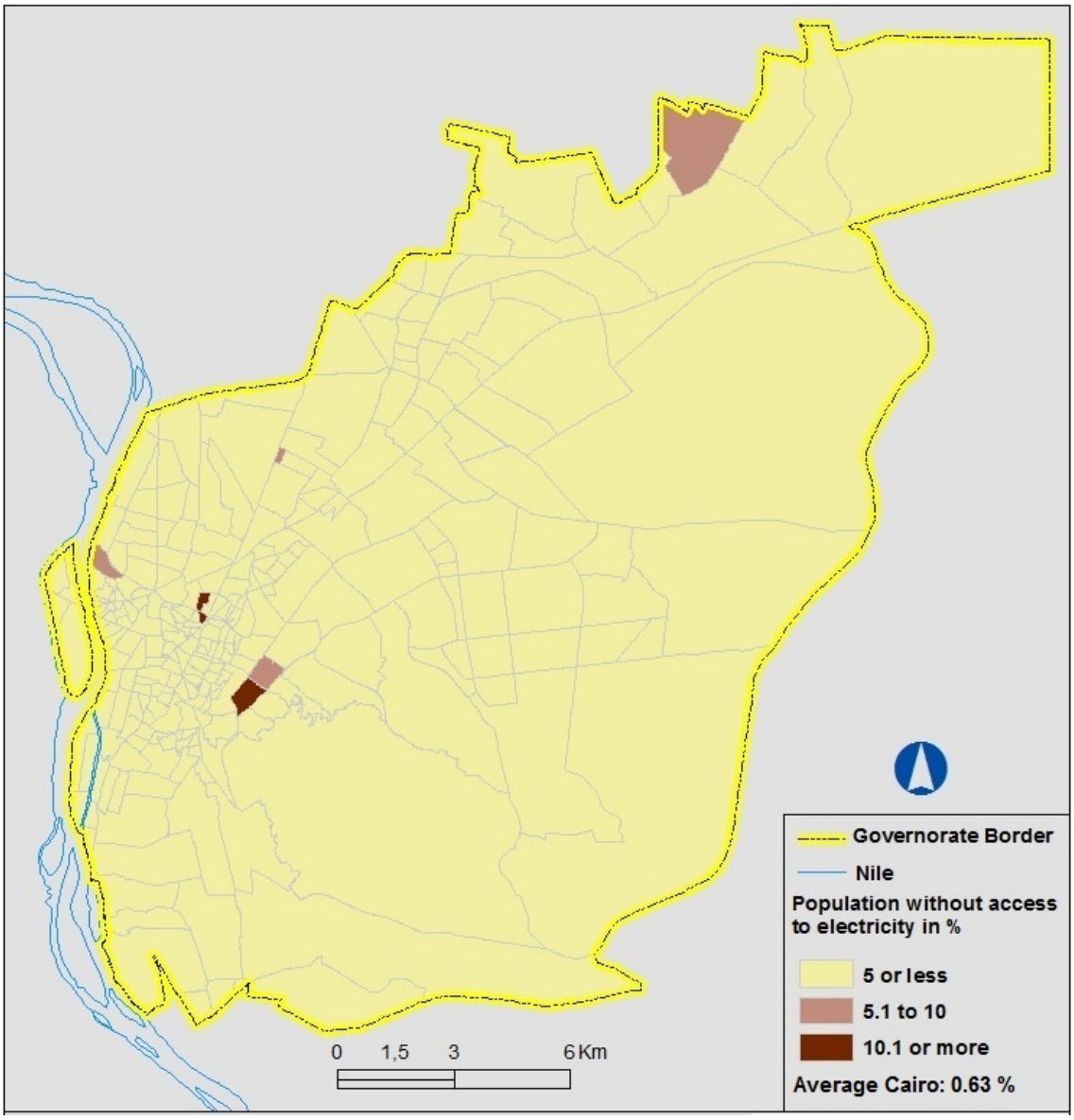


Fig. 35: Proportion of population without access to electricity in Cairo Governorate 2006

Source: Designed by the author, based on CAPMAS 2008a.

2.4.5 Developing the Socio-Economic Opportunity Index (SEOI)

Squatter settlements, due to its inherent illegal status, have services and infrastructure below the adequate levels. Such services are both network and social infrastructure like water supply, sanitation, electricity, roads, schools and health centers. Most of the households in squatter settlements belong to the lower income group or engage in various informal sector

enterprises. To quantify the different socio-economic deprivations of inhabitants of Cairo Governorate, a 'Socio-Economic Opportunity Index' (SEOI) is developed.

The index is a modified form of the "Human Poverty Index" and "Poverty of Opportunity Index" developed by UNDP and helps to identify the degree of deprivations of people of squatter settlements (Kalim & Bhatty 2006, p. 2).

In the Human Development Report, introduced by UNDP in 1997, the Human Poverty Index (HPI) was developed to quantify and rank human poverty. This index had covered the three dimensions of deprivation in human life: lack of access to basic education, lack of access to resources and short life period. The index did not consider income as a variable. The index was modified into a Poverty of Opportunity Index (POPI) in the Human Development Report of South Asia published in 1998 by introducing income poverty and by refining the concept and measurement of human poverty.

To identify the gradients of deprivation of the shiakhat of Cairo Governorate, the economic, educational and health attributes as well as the housing conditions are used to produce an index that provides a gradient of small geographical zones in the urban settings.

In calculating SEOI three important domains are taken into consideration. These domains are the economic, health, and educational situation of the population which include the most relevant parameters related to socio-economic deprivation.

The methodology used in SEOI replicates the Human Development Report of South Asia. The details of these domains are explained in the following sections.

2.4.5.1 Economic Domain

Being the most important domain for the computation of the deprivation, income has been placed as the basic indication in the Poverty of Opportunity Index (POPI). To develop SEOI, income is also taken as basic variable. In Poverty of Opportunity Index (POPI) calculations, one dollar per person a day is used as minimum below which the basic necessities of life cannot be financed. In our study the calculation of the population below the poverty line is depending on 2 US$ per person a day. The study of Kalim & Bhatty (2006) depends only on the proportion of the population below the poverty line as a cut-off point for representing economic deprivation. The unemployment rate is considered here as a new dimension to estimate the economic deprivation.

The following variables are used: population below the poverty line, unemployment rate, total population, and population 15+ years.

Weighting is based on the ratio of the total population to the population 15 + years.

For example: calculating economic deprivation on the general level of Cairo Governorate:

- Population below the poverty line = 5.4 %
- Unemployment rate = 9.8 %
- Total population = 6,758,581 persons
- Population 15+ years =5,034,481 persons
- Weight = total population / population 15+ years = 6,758,581 / 5,034,481 = 1.34
- Economic deprivation in Cairo Governorate = (5.4*1.34+9.8*1) / (1.34+1) = 7.28

2.4.5.2 Educational Domain

Education, as the basic parameter to define the deprivation in society, has been taken as a variable in the Poverty of Opportunity Index (POPI). In the same way in SEOI, education deprivation has been measured by means of taking weighted average of variables as mentioned below:

- Proportion of illiterate adults.
- Proportion of drop-out among primary school-age children.
- Total population 10+ years old.
- Primary school-age children.

Weighting is based on the ratio of the adult population 10+ years to primary school-age children.

For example: calculation on the general level of Cairo Governorate:

- Illiteracy rate = 20.1
- Drop-out of primary school-age children = 2 %
- Total population 10+ years old = 6,800,502 persons
- Primary school-age children = 588,424 children

- Weighting = Population 10+ years / primary school-age children = 6,800,502/588,424 = 11.6
- Education deprivation in Cairo Governorate = (20.1*11.6+2*1) / (11.6+1) = 18.6

2.4.5.3 Health Domain

Deprivation from health facilities is the basic symptom of poverty. When the people are suffering from health problems, their lives become miserable.

As previously stated, reports of infant mortality rates in Egypt are lacking the accuracy due to the failure of the registration of deaths, which are not based on the place of residence of the child, but are based on the place of the occurrence of death, which is in many cases a hospital (UNDP & Egyptian MOLD 2008, p. 69). Therefore, the use of infant mortality rates and of the mortality rate below the age of five years in calculating SEOI seems unreliable.

Water and sanitation are primary drivers of public health. A vast amount of studies finds a strong negative relationship between children's mortality rates and improved water sources and sanitation facilities. Improved water and sanitation are linked to lower incidences of diarrhea and related serious long-term consequences such as malnutrition and infections like pneumonia as well as physical and mental stunting (Molinas et al. 2010, p. 44).

Moreover, WHO estimated that every year 1.4 million children under the age of five die from diarrhea diseases attributed to unsafe water supply and inadequate sanitation and hygiene (WHO 2002).

Due to the strong relationship between the public health on one hand and access to safe water and improved sanitation on the other hand, the latter is used to measure health deprivation.

To measure the health deprivation, an average was taken of the following two variables by giving them equal weights:

- Proportion of population without access to safe water
- Proportion of population without access to improved sanitation

For example: calculation on the general level of Cairo Governorate:

- Proportion of the population without access to safe drinking water = 3.6 %
- Proportion of the population without access to improved sanitation = 3 %
- Health deprivation in Cairo Governorate = (3.6+3) / 2 = 3.3 %

2.4.6 Evaluating the Socio-Economic Opportunity Index (SEOI)

To calculate the socio-economic opportunity index, the following Atkinson formula of deprivation is applied:

$$X_A = (P_1X_1^{\mu} + P_2X_2^{\mu} + P_3X_3^{\mu})^{1/\mu}$$

Where X_A is the average required, X_1, X_2 and X_3 are the three domains of economic, educational and health conditions which are given equal weight of 1/3 which are P_1, P_2 and P_3 and μ = 3 (Kalim & Bhatty 2006, p. 8).

For example: calculation on the general level of Cairo Governorate:

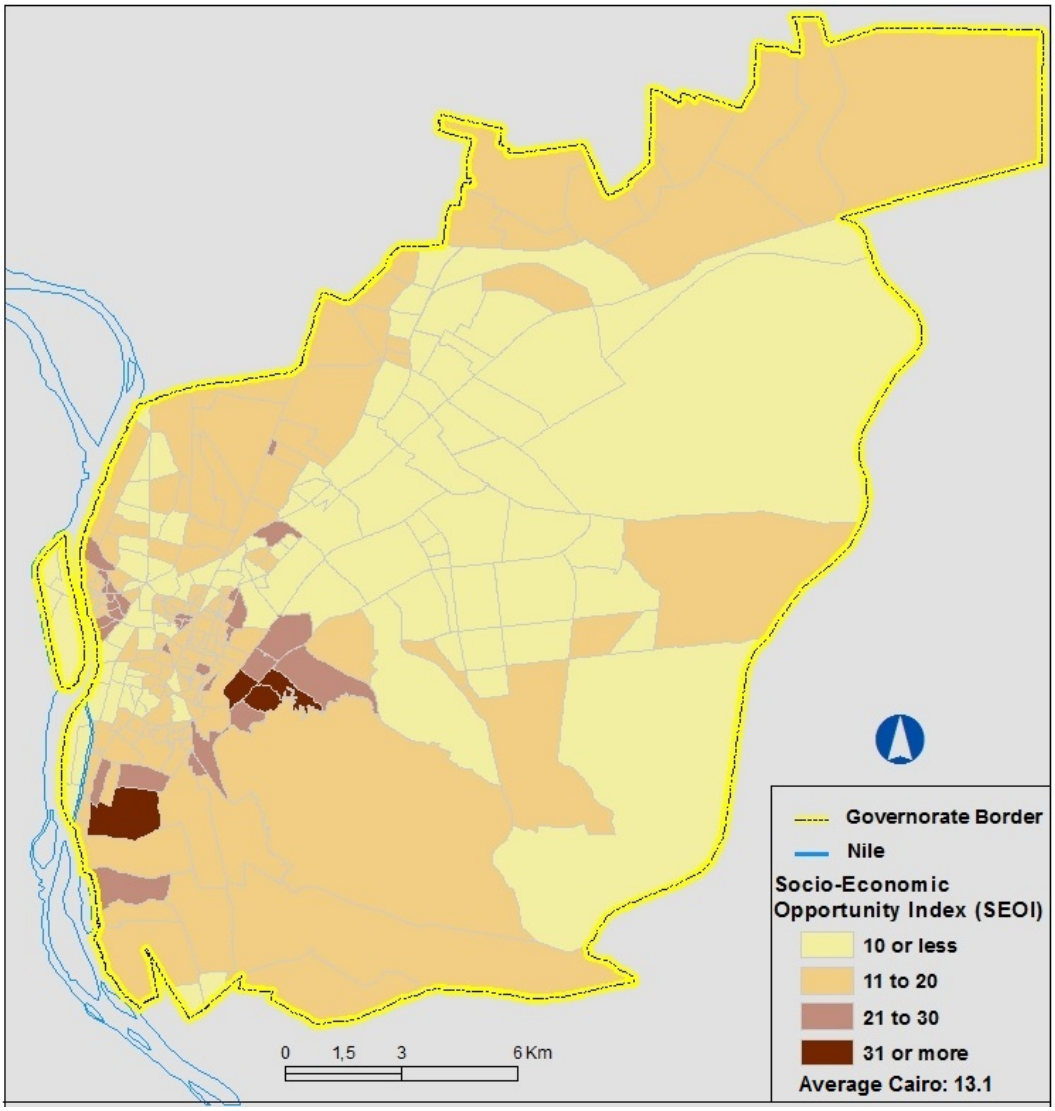
$$X_A = (⅓\ 6.29 + ⅓\ 18.6 + ⅓\ 3.3)^{⅓} = 13.1\ \%$$

The results of the Socio-Economic Opportunity Index (SEOI) indicate that 13.1 % of the residents of Cairo Governorate are deprived of basic social and economic opportunities. According to the Human Development Report, this value puts Cairo among the least deprived governorates in Egypt.

Fig. 36 shows the variation in the socio-economic status on the level of the shiakhat based on SEOI. The figure demonstrates four levels of socio-economic deprivation in Cairo Governorate shiakhat. They can be described as areas which are severely deprived, deprived, medium deprived, and less deprived. The first category, severely deprived (SEOI more than 30), is to be found in four shiakhat. Three of them belong to the Manshiet Nasser District; which are El-Mugawrin, El-Ma'desa, and Manshiet Nasser, in addition to Shiakhet El-Dayura in the Misr el-Kadema District. As an informal area squatted on desert land, the Manshiet Nasser District represents the most deprived area in Cairo Governorate. The SEOI reached its maximum value 64.5 in Shiakhet El-Mugawrin in the Manshiet Nasser District, which is five times as high as the index of the average level of Cairo Governorate. The high SEOI denotes the deprivation of informal settlements on state-owned land from the basic socio-economic services.

The second category, deprived areas, represented in 11.4 % of the total number of shiakhat, which contain 4.3 % of the total number of the population in Cairo Governorate. Within this category, the remaining shiakhat of Manshiet Nasser District are included.

This category includes also most of the shiakhat of the districts of Boulak, El-Gamaleya, El-Moski, and Misr el-Kadema. The districts represent the deteriorated inner pockets of the historic Cairo, where a high proportion of old, deteriorated, crowded structures are found within the medieval urban fabric. The deterioration of buildings existing in these areas are often the result of confused ownership – mostly inheritance quarrels – and/or owner neglect due to controlled rents. Many of the families inhabiting these structures are quite poor (Sims 2003, p. 6).



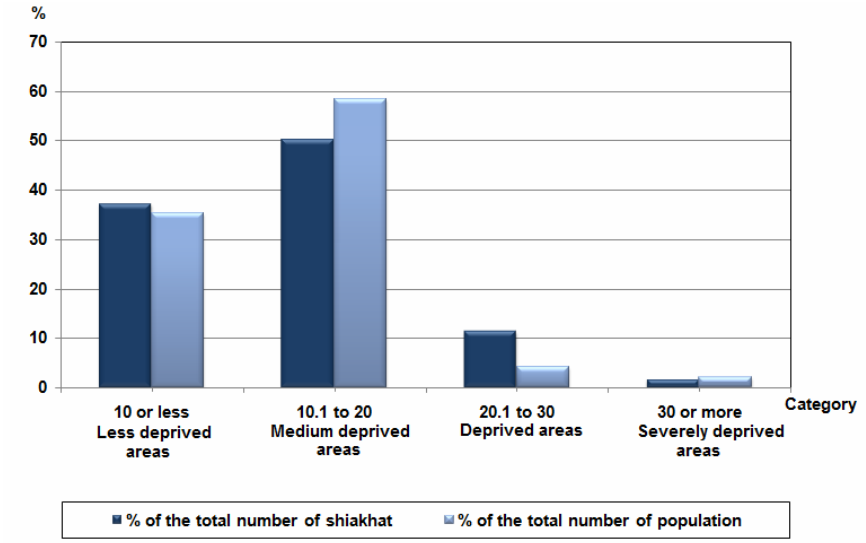


Fig. 36: Socio-Economic Opportunity Index in Cairo Governorate 2006

Source: Designed by the author.

The third category, medium deprived areas, is distributed within half of the shiakhat of Cairo Governorate which comprises 58 % of the population of the governorate. The map shows that the shiakhat of this category are distributed on the southern and northern margins of the governorate, where informal areas had expanded on agricultural land. This category includes the districts of El-Marg, El-Salam, El-Zawya el-Hamraa and Dar el-Salam. The comparison between the first category, in terms of informal areas on desert land, on one hand, and the third category in terms of informal areas on agricultural land on the other hand, ensures that residents of informal settlements built on agricultural land represent a wider socio-economic spectrum than on desert land who are the poorest among the poor of the population. The latter cannot afford housing built on legally bought land and are willing to take the risk of being evicted from their homes (Arandel & El-Batran 1997, p. 16).

The fourth category, less deprived areas, includes almost 37 % of the total number of shiakhat, with 35.4 % of the total population of Cairo Governorate. Almost all the shiakhat of the eastern zone of the governorate and the shiakhat of the western boundary are included in this category. This category comprises the shiakhat of the districts of Madinet Nasr, Misr el-Gadida, Kasr el-Nil and El-Zeitoun. They were built in the second half of the 20th century and house mainly families belonging to middle income groups and the social elite. Moreover, the provision of basic services and facilities play an important role in the relatively high standard of living of the population in these areas.

2.4.7 Summary

The principle objective of this chapter was to quantify the different socio-economic deprivations of the inhabitants of Cairo Governorate through producing classes of the small geographical zones in Cairo Governorate based on the Socio-Economic Opportunity Index (SEOI). Economic, educational and health attributes were analyzed as well as housing conditions. Some of the aforementioned attributes were used to produce the index, others were excluded due to either their unreliability or their weightlessness. The economic domain was measured through two variables; namely the population below the poverty line and the unemployment rate. The education domain was measured through the two variables illiteracy rate and school-age children who had dropped out of primary education. The health domain was measured by two variables relating to the housing conditions, namely access to safe drinking water and access to improved sanitation.

Developing and evaluating the index produced four levels of deprivation, namely, severely deprived, deprived, medium deprived and less deprived.

In the context of different housing patterns, with minor exceptions, informal areas on state owned land were included in the first category, namely, severely deprived areas. On the other hand, informal settlements on agricultural land were included in the third category, namely medium deprived areas. The analysis indicated that informal settlements on agricultural land exhibit better urban setting than squatter areas on state-owned land. Residents of deteriorated inner pockets experienced a better standard of living than those living in squatter settlements on state-owned land, but lower than those living in informal areas on agricultural land. Formal or planned areas were included mostly in the fourth category, namely less deprived areas.

So far, the smallest administrative subdivisions were classified on the basis of the pattern of population density and their socio-economic framework. Through the process of classification, the issue of housing patterns in terms of formality and informality was discussed. However, a comparison of characteristics of built-up area for each housing pattern in terms of its urban growth, structural and functional composition and the spatial accessibility to public services is lacking. These are the subjects of discussion in the subsequent part through the analysis of case studies of selected housing patterns.

3 EMPIRICAL INVESTIGATIONS FROM CASE STUDY AREAS

This part provides a comparative study in a form of a cross-case analysis of issues. At the city level, shiakhat, as the smallest administrative subdivision, have been classified within their pattern of population density and their socio-economic framework. The latter involved the economic attributes, educational attributes, health attributes and housing conditions. In order to operationalize studies at a lower level of scale, four case studies have been employed as the major units of analysis within which the characteristics of the built-up area are assessed in terms of its urban growth, structural and functional composition, and provision and accessibility to public services.

Since the major objective of the thesis is to study the housing patterns in the context of their socio-economic circumstances, a combination of criteria motivated the choice of cases. These include an attempt to select shiakhat that reveal great variations in terms of the Socio-Economic Opportunity Index (SEOI) as each shiakha reflects a level of deprivation viz. El-Ma'desa as a severely deprived area, Ain el-Sira as a deprived area, El-Marg el-Qibliya as a medium deprived area and El-Nozha as a less deprived area.

In selecting case studies, it was considered important to draw a distinction between formal settlements, semi-legal informal settlements, illegal squatter settlements and "ex-formal" settlements, i.e. originally a formally constructed settlement with later informal extensions and deteriorating building substance. The four selected types represent main patterns of housing in Cairo Governorate.

Commensurate with these criteria El-Ma'desa was selected as an illegal informal squatter settlement on state land. El-Marg el-Qibliya represents a semi-legal informal settlement on agricultural land, Ain el-Sira is characterized as an ex-formal area – i.e. at first built as a formal settlement which later adopted more and more informal elements – and El-Nozha was selected as a formally planned and well-off area.

3.1 HISTORICAL PERSPECTIVE OF THE CASE STUDY AREAS

In order to establish a detailed analysis of the case study areas, it is necessary to introduce the selected settlements at first by providing a historical overview and a brief description of the specific areas.

3.1.1 El-Ma'desa

El-Ma`desa is located about 3.5 kilometers from El-Azbakeya, the center of Cairo, towards the east (Fig. 37). It is surrounded by the Mokattam hills to the east, Shiakhet Manshiet Nasser to the north, El-Nasr Freeway 'Autostrad' to the west, and Shiakhet El-Khazan to the south.

The Shiakhet El-Ma'desa belongs to the district of Manshiet Nasser, the largest informal settlement on state-owned land in Greater Cairo Area (Fig. 37). Dwellings of such squatter settlements are constructed on illegally occupied land, not included in a legal subdivision. The Manshiet Nasser District in located in eastern Cairo. It includes the City of the Dead, the famous graveyard which had been populated by tomb-keepers and their families since the eighteen century. They were followed by people who worked in the adjacent limestone quarry and finally joined by refugees from Sinai and Suez during the 1967 War. In the 1960s, construction workers, who were building the suburb of Nasr City in eastern Cairo, started to settle in the closed quarry, which is separated from the graveyard by a main road, the El-Nasr freeway Autostrad connecting the south and the east of Cairo (Fig. 38). At first people came from Upper Egypt; then migrants arrived from the Delta, and later even young families in search for affordable housing from the GCR moved into the area of the case study. The settlement in the former quarry began with simple houses along the Autostrad and, with the arrival of new migrants, grew uphill to the east until the expansion ended at the steeply rising and dangerous limestone cliffs of the Mokattam Plateau (Runkel 2009, p. 73).

The studied Shiahat is located in an area of about 340 ha with a gross residential density of more than 98,000 persons square km. The official statistics indicated that 262,050 people lived in the whole district of Manshiet Nasser in 2006 (CAPMAS 2008a); however, Gerlach estimated that it is the home of about 800,000 inhabitants (2009a, p. 49). During the 1990s and the 2000s, the area was the location of several pilot development projects organized by the German Gesellschaft für Technische Zusammenarbeit (GTZ) and Participatory Development Program (PDP) in Ezbet Bekhit and Suzan Mubarak pilot project in Doweka. The area cannot be considered one homogeneous entity. In general,

the urban and social conditions are decreasing when you enter the area from the Autostrad and walk up the hill.

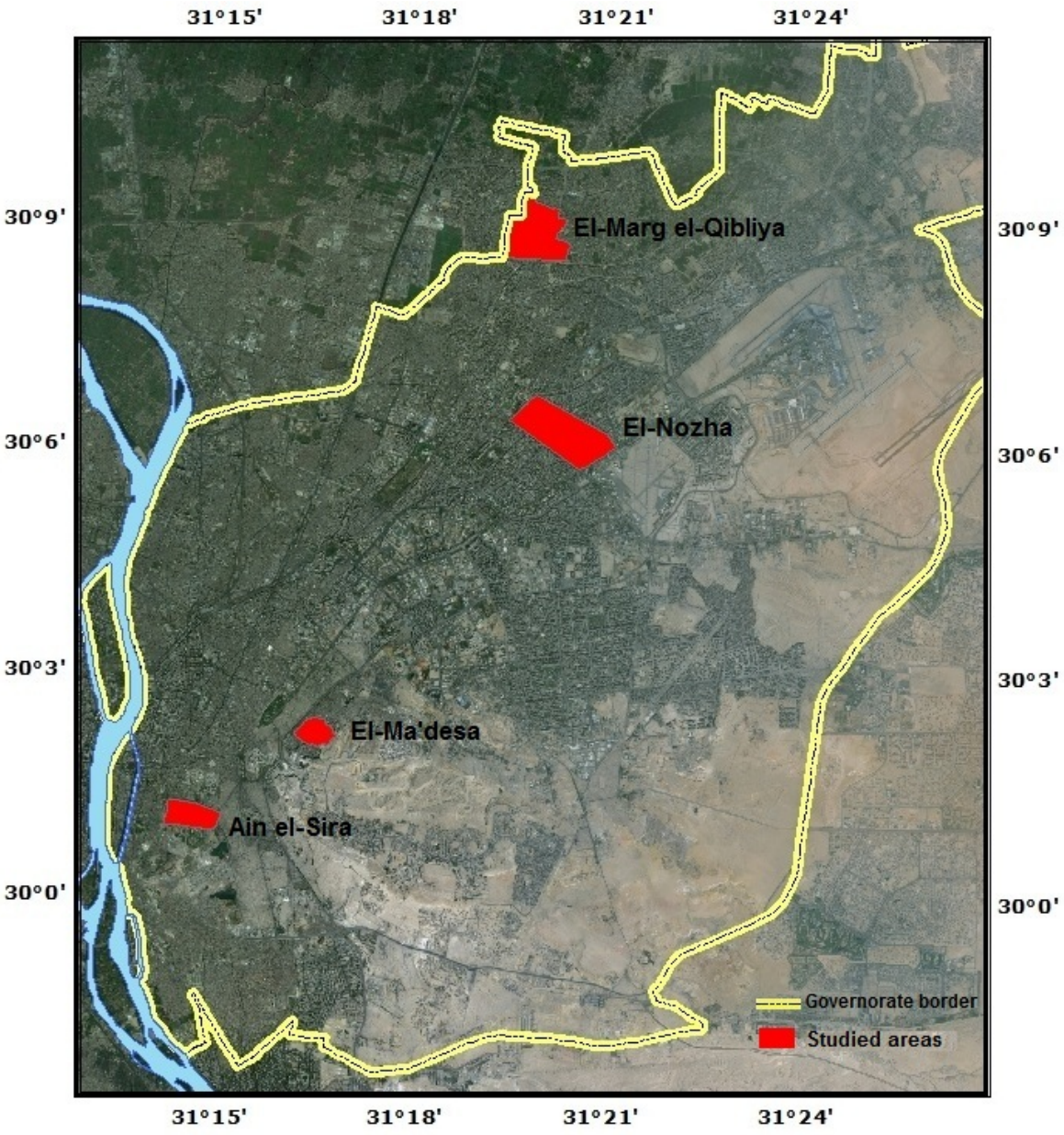


Fig. 37: Location of the case study areas in Cairo Governorate

Source: Designed by the author, based on Google Earth satellite image dated 23 August 2010

The special position within the metropolis is regarded as the main advantage of living in this area. It is located within walking distance to the Bazaar of Khan el-Khalili and to the commercial and small-scale manufacturing quarter of Bab el-Sheareya. The residents can also easily reach the Downtown areas of Attaba and Moski, which are important

business centers of Greater Cairo, through a range of cheap public and private transport options (Sims 2010, p.121).

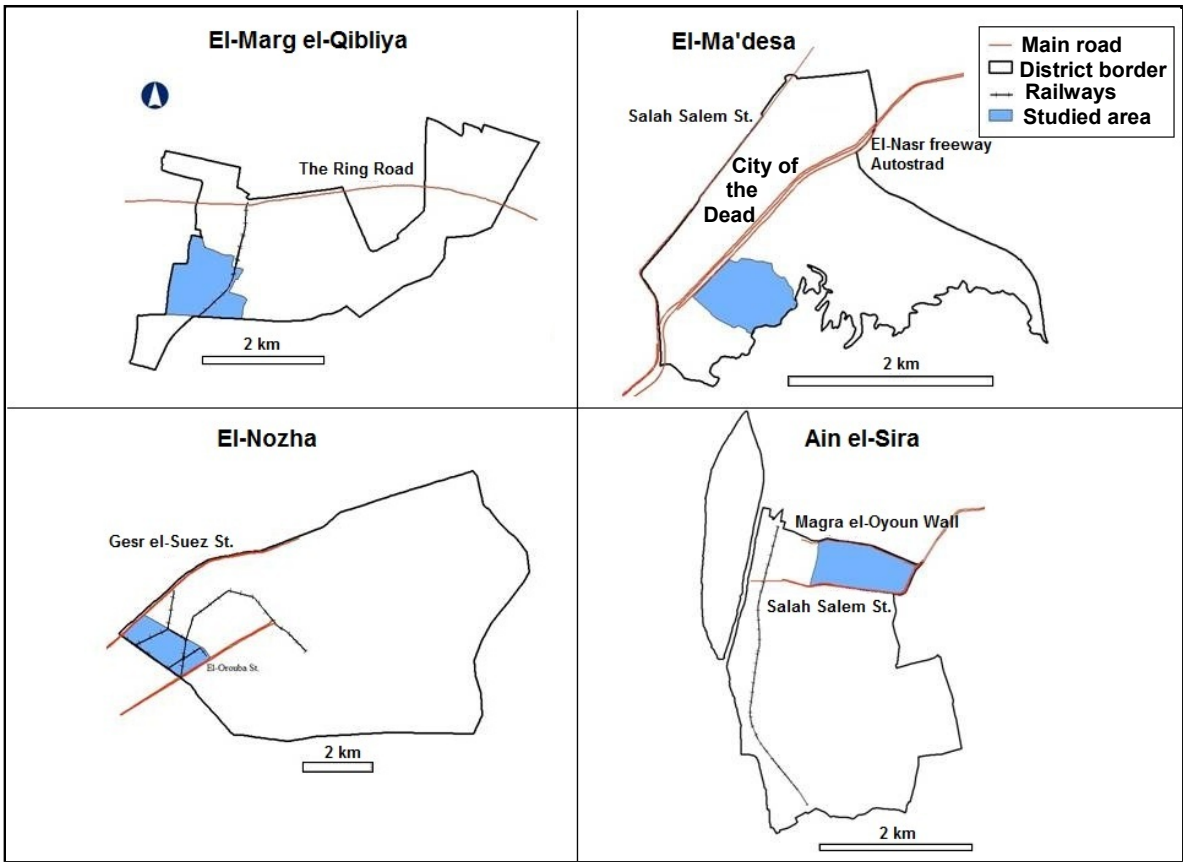


Fig. 38: Location of the case study areas with relation to the districts and the main roads

Source: Designed by the author.

In addition, numerous small-scale manufacturing enterprises are located in Manshiet Nasser and offer a gateway to the metropolitan labor market. They produce semi-finished products for the workshops in El-Gamaleya and finished articles for the retail shops in the Bazaar of Khan el-Khalili. The workshops provide not only work opportunities for adults but also for children. There is a high rate of dropping out from schools. Many children are working in the workshops either as a permanent job or during the summer (Abouelmagd 2011b, pp. 15 - 18).

Immediately beside the studied area the quarter of the garbage collectors is located on the higher plateau of the Mokattam Hills. Current residents include:

- Christian migrants from rural Upper Egypt who earned their living by garbage collecting and pig breeding;

- Newcomers who started to built houses in the 1970s;
- Recent newcomers in the 1990s are young married couples who could not find housing in other areas in Cairo.

The families of garbage collectors tend to be larger with 4 to 10 children than other families in this area with 3 to 5 children (Boussen & Bisada 2004, p. 42).

3.1.2 Ain el-Sira

Ain el-Sira is located in the Misr el-Kadema District. It is a public housing project established during the late 1950s and the early 1960s south west of Cairo's Citadel, on an area of approximately 40 hectares. It is located five kilometer from the city center (Fig. 37) between two main streets: Magra el-Oyoun to the north and the Salah Salem Highway to the south (Fig. 38). The project contains almost 5000 dwellings consisting of units with one, two or three rooms which are arranged in rows of blocks with four and five storeys.

Land used for housing represents about 19 % of the total area, while the rest is mainly public open space (Salama 1995, p. 104). This project has passed through physical and social transformation due to the change of the economic and housing policies since the 1970s. The apartments were gradually sold to their current inhabitants during the 1980s.

Ain El-Sira is one of the public housing projects in Cairo which demonstrates clearly the informal transformations in such quarters. This case illustrates how the overcrowded conditions have provoked uncontrolled extensions and informal construction activities by the inhabitants. Especially during the 1980s and 1990s, numerous huts were constructed between the housing blocks and rooms were added on the outside of flats on the ground floor as well as on top of the buildings. It is a low income neighborhood and home to the infamous tanneries of Cairo. These manufacturing enterprises are at the root of much environmental degradation through their use of toxic dyes and malodorous, poisonous effluents. The share of children among the workforce is very high. Although the tanneries provide employment, they present grave health risks to those working in this industry. The area of tanneries is home to a number of garages, workshops and other small businesses (EHDR 2008, p. 132). Not all inhabitants in this area are poor, but a relatively high proportion of the local population is characterized by extreme poverty.

3.1.3 El-Marg el-Qibliya

The mainly informal area of El-Marg el-Qibliya is located in the north of Cairo, about 11.5 km from the city center (Fig. 37). It is surrounded by the Skiakhet El-Marg el-Baharia to the north, Shiakhet Kafr el-Shorafa to the east, the El-Salam District and Shiakhet Ezbet el-Nakhl to the south, and the Qalyubiya Governorate to the west.

This area represents an example of an informal area on land which was legally bought but on which the construction of buildings was prohibited. The informal settlements in this area date back to the 1960's. Such semi-legal housing sites expanded on private agricultural land around old villages – in this case around the village of El-Marg which had already existed here prior to its incorporation into Cairo in 1960.

The period from 1968 to 1984 witnessed a growth rate of the built-up area amounting to 9 % per annum corresponding to 10 ha per year. Afterwards, the expansion slowed down with a rate of 3 % during 1984 – 2004 which corresponded to the urbanization of about 8 ha per year. The expansion of the built-up area was mainly motivated by the high growth rate of the population due to the following reasons:

- The booming real estate market during the period between 1960 and 1986 had its strongest impact on the periphery of the city where agricultural land was located.
- The good transportation accessibility due to the presence of the El-Marg railway station which was transformed later to a station of the Underground Metro Line (Fig. 38; Mosad 2006).

The building pattern within this area is characterized by 100 percent coverage of the housing plots, and little or no allocation for public open space or social facilities. The underlying pattern of the irrigated agricultural land in these areas was usually rigidly rectangular according to the layout of the irrigation canals, and it is likely that this order translated into subdivisions that appeared to be planned. But it could also be that at least some official planning was involved due to the large-scale dimension of the regular network of streets (Sims 2010, p. 62).

3.1.4 El-Nozha

The area is surrounded by the El-Orouba Street to the east, Gesr el-Suez Street to the west, Abd el-Aziz Fahmi Street to the north and Abu Bakr el-Sedik Street to the south. It is located approximately 9 km from the center of Cairo (Fig. 37).

Transportation was the cornerstone in developing the former suburb of Heliopolis to which the area of El-Nozha belongs. Heliopolis had been the symbol of the first generation of modern satellite cities. It was developed with ample pedestrian provision, communal infrastructure and public transportation.

In 1894 Baron Empain obtained the commission to provide Cairo with a tramway system which is considered the first seed in the birth of Heliopolis. The availability of this transportation facility was the precondition for building a new city in the desert (Fig. 38).

The Heliopolis Oasis Company (Societe des Oasis) was established to start the construction projects on desert land north east of Cairo. The company's name reflects the initial objective of Heliopolis to become an island of greenery in the midst of the desert. Nevertheless, when the economic crisis hit Egypt in 1907, two years after the Heliopolis Oasis dream had started, the plans had to be altered and the city of leisure had to be transformed into a residential area.

In order to attract people to purchase residential units in the new city, the company started installing the necessary infrastructure. The electric railway, public and private lighting, water facilities and garbage removal were among the several services offered (Nassif 2010, p. 50).

Its construction as a private enterprise by a foreign investor without state support and its location in the desert followed the model of a garden city at the time of its inception.

Baron Empain founded the Cairo Electric Railway and received the concession to operate the public transportation between Cairo and Heliopolis. Revenues from the operation of the first 10 km of the tram line starting in the center of Cairo and from the real estate development provided the financial means for the construction of the area which lead to the incorporation into Cairo in 1908 and the provision of public services to the residents.

In 1909, 168 buildings had been constructed and the city began to function. After World War II, middle class housing was introduced. Empain's original plans to create two spare

enclosures, one for luxury and one for economic housing, had been rejected. In 1960, population reached 168,000 residents. As a result, Heliopolis was divided into smaller quarters. One of them was the El-Nozha District.

El-Nozha distinguished itself from other satellite developments by its future oriented form. Wide streets, green zones, functional mix, controlled building heights made this area one of the most attractive location for housing in Cairo.

Both El-Nozha and Ain el-Sira are similar in their planned nature and their location in the desert. Despite these similarities, they are different in various ways;

- El-Nozha was built privately with no support from the government for mainly wealthy residents. Ain el-Sira was initially a public housing project for people with a low income.
- El-Nozha was an expression of individual thought rather than an official plan as the situation of Ain el-Sira.
- Ain el-Sira public housing encountered a process of deterioration and residential intensification in contrast to El-Nozha.

3.2 BUILT-UP AREA IN THE CASE STUDY AREAS; ITS URBAN GROWTH, STRUCTURAL AND FUNCTIONAL COMPOSITION

One of the theoretical frameworks in analyzing urban types is urban form and typo-morphological studies which reveal the physical and spatial structure of cities. They are typological and morphological because they describe urban forms (morphology) based on detailed classification of buildings and open spaces by type (typology) (Lupala 2002, p. 13).

Much current research in the morphogenetic tradition stems from the seminal work of Conzen (1960), who divided the urban landscape into three main elements of town plan, building forms and land use, and demonstrated how each reacted at a different rate to the forces of change:

1. *Land use* is most susceptible to change.
2. Since *buildings* represent capital investments and are adaptable to alternative uses without being physically replaced, change occurs at a slower rate than with land use.
3. The town plan or street layout is the most resistant factor to change (Pacione 2009, p. 137).

Similarly, the urban form was defined by Scheer and Petkov as the confluence of three corresponding elements: the street plan, land subdivision, and built objects (Scheer & Petkov 1998, p. 298).

It has been previously stated that the selection of the sample cases is mainly based on the variation in socio-economic status, in terms of the Socio-Economic Opportunity Index (SEOI).
Different socio-economic groups have different preferences for specific features of urban morphology (Xiao 2012, p. 212), and the structural and functional characteristics of the urban area reflect the outcomes of socio-economic conditions present at the time of land development and building. Accordingly, urban morphologists focus in particular on the tangible results of social and economic forces when they study the outcomes of ideas and intentions as they take shape on the ground and mould our cities. Buildings, gardens, streets, parks, and monuments are among the main elements of morphological analysis (Moudon 1997, p. 3). In other words, the spatial analysis of urban form represents the socio-economic interface of the urban area.

Closely related to urban form is urban growth. Urban growth has had increasingly significant socio-economic and environmental impacts at the local, regional and global scale. It has also a significant impact on the social structure of the areas of the case studies and their surroundings, in terms of population distribution and land use characteristics, as will be clarified later.

Temporal and spatial urban growth indicates the spatial and temporal dimensions of the land cover/land use change at the level of the urban landscape (Cheng 2003, p. 1). On the other hand, understanding how urban morphological patterns change over time and space is critical for the understanding of a host of socio-economic, natural and technological phenomena associated with the contemporary trends of urbanization (Batty & Longley 1994).

The main targets of this chapter are to follow spatio-temporal urban growth in the case studies, its patterns and causes during 1993 – 2006, and to search for relevant morphological and functional variables that can be used in analyzing housing patterns in terms of formality and informality.

Based on the previous targets, three main issues are being discussed in this chapter. These issues are the change in the built-up surface, the structural composition of the built-up area in terms of morphology and the functional composition of the built-up area in terms of land use.

The major themes used to analyze structural composition include street layout, types of buildings and housing tenure. As for structural composition, the analysis will focus on the current land use pattern, measuring land use mix and reviewing to which degree this mix is compatible or incompatible across the selected case areas.

3.2.1 Quantitative Measures

The approach to the data analysis employed in this chapter combined both quantitative and qualitative techniques, since both approaches are considered complementary to one another.

Mathematical morphology provides an explanatory tool and a guide for recognizing the complex phenomena which generate observed spatial structure.

To facilitate a meaningful comparison between the selected settlements, the study uses some attributes to measure the urban form of each area.

Unfortunately, studies of the evaluation of urban morphology are rare, due to the lack of a powerful methodology to quantify the urban form accurately (Xiao 2012, p. 1).

In this chapter, the characterization of housing patterns across the different shiakhat assumes the quantitative approach since the main ideas behind this characterization focus on the morphological properties of housing patterns in terms of formality and informality.

The quantitative analysis about urban morphology and function is carried out by applying some indices concerning structure and function of each case area.

The four main variables employed to facilitate the distinction of categorization of the selected quarters are connectivity, building density, and mixed land use.

The four mentioned variables constitute some of the principles that have been developed by proponents of the New Urbanism (Lupala 2002, p. 233). The New Urbanism ideas focus on optimal use of land and infrastructure. The selection of the variables was important to draw a distinction between formal and informal urban types.

3.2.2 Urban Growth of the Built-up Area 1993 – 2006

Urban development consists of physical expansion and functional changes. The former refers to the change in space, i.e. the transition from a non-built-up area to an urban settlement; the latter refers to the change in major activities as indicated by the land use (Abd-Allah 2007, p. 28).

The focus of this part is the spatial extent of all urban land use activities rather than internal variation of urban structure. In other words, this chapter measures and analyzes the intensity of urban development and the exchange between urban and non-urban land use during 1993 – 2006.

Table 18 and Fig. 39 show the spatial and temporal urban growth in the areas of the case studies from 1993 until 2006. Like the trend of the spatial expansion of Cairo as a whole, urban land use growth in terms of housing and construction had outpaced the population growth rate in Ain el-Sira. Although the total built-up area increased by a rate of 6.3 % per annum and although it almost doubled during the studied period, the annual growth rate of the population decreased by 0.3 %. As a public housing project, land used for housing was designed to represent about 19 % of the total area, while the rest was mainly public open spaces between and around the blocks (Salama 1995, p. 104).

Ain el-Sira encountered a process of residential intensification in terms of conversion of vast open spaces to built-up areas. Such conversion can be attributed to some factors including close distance from the city center, high overcrowding rate within the existing buildings, proximity to existing built-up area represented in the public housing and proximity to one of the major transportation arteries in Cairo represented in Salah Salem Highway.

Despite the unprecedented population growth rates in El-Marg el-Qibliya and El-Ma'desa as informal areas, they revealed lower urban growth rate compared to Ain el-Sira during 1993 – 2006. From Fig. 39 it is clear that urban growth in those two informal areas is in the saturation stage in terms of horizontal densification, where open land for housing development is more or less depleted and additional built-up surface were primarily a result of encroachment on the limited open space. Therefore, such two areas encountered a lower urban growth rate compared to their high population growth rate.

In El-Marg el-Qibliya, much of the land converted to urban use was highly productive agricultural land. One of the bad impacts of such a conversion was the use of El-Marg el-Omomi Drain for waste disposal. The drain was extending within the north western part of this area where most of the construction activities took place during 1993 – 2006. Therefore, vast built-up extensions were restrained in the neighboring belts of such a drain before the process of covering it when it represented an unhealthy environment. Urban growth increased in a ribbon like pattern after covering the drain and converting it into a road (Fig. 40).

Table 18: Annual growth rate of the built-up area compared to the population growth rate in the analyzed areas, 1993 and 2006

Shiakha	Built-up area 1993 (1000 m^2)	Built-up area 2006 (1000 m^2)	Annual growth rate 1993 – 2006 in %	
			Built-up area	Population
El-Marg el-Qibliya	765	1,205	3.4	4.1
El-Ma'desa	208	401	4.9	5.2
El-Nozha	600	846	2.6	-1.3
Ain el-Sira	158	377	6.3	-0.3

Source: Calculated by the author, based on CAPMAS 2008a.

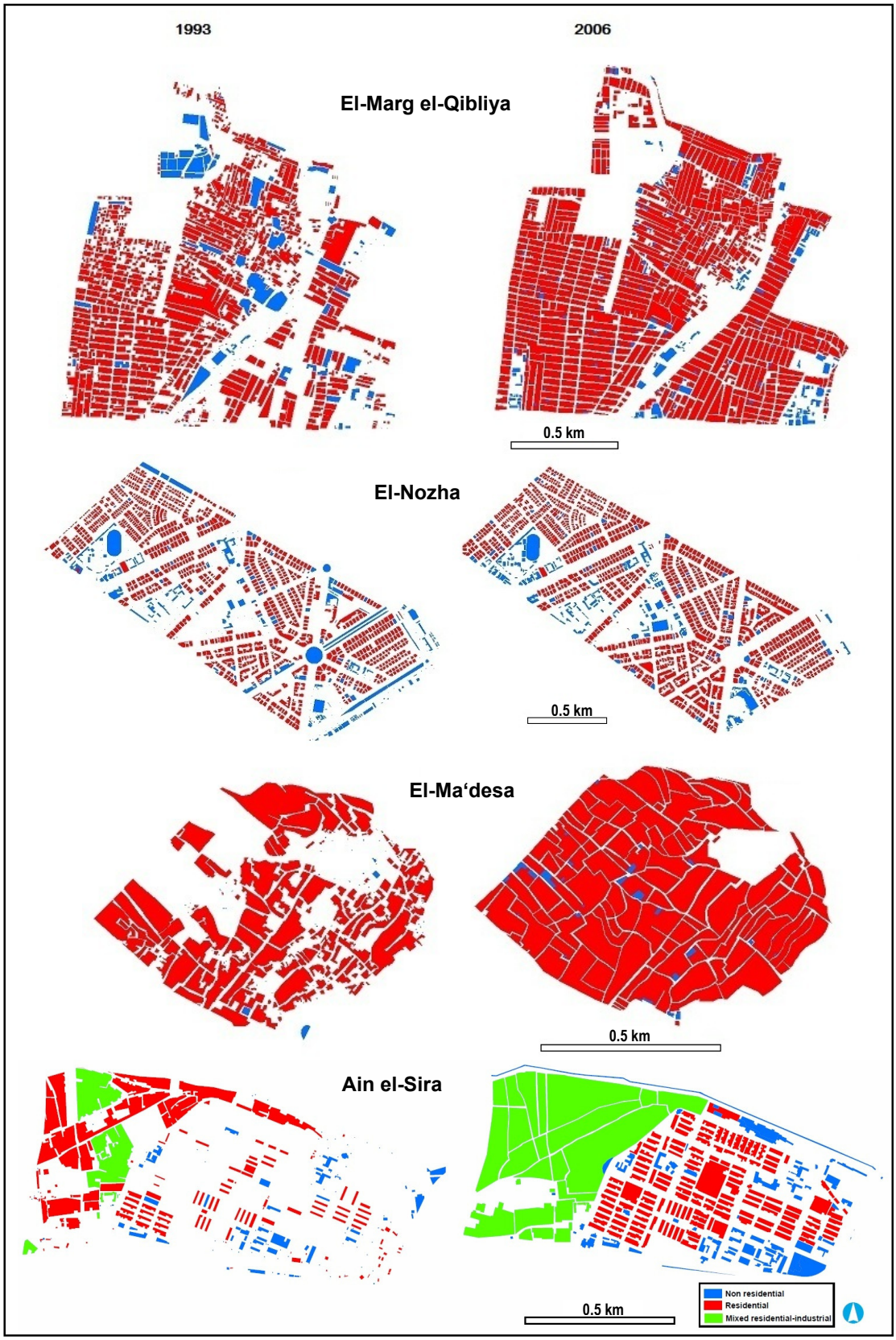


Fig. 39: Change in the built-up surface in the analyzed areas 1993 and 2006

Source: Designed by the author, based on digital maps produced by CAPMAS, version 1993 and 2006.

Fig. 40: Extension of the built-up area along the covered El-Marg el-Omomi Drain after its conversion into a road
Source: Author`s photo

On the other hand, access to Underground Metro Line El-Marg – Helwan comprises an important factor for the conversion of the land use along its path particularly after the extending of this line and the construction of El-Marg el-Gadida Station in 1999. By the completion of the station, the Metro Line, which extends on the western border of El-Marg el-Qibliya, was connected to the Ring Road. The Underground Metro Line easily links the peripheries to the downtown of Cairo with the same cost of transportation even if the distance is longer. It can be concluded that the completion of both the Metro Line together with covering the El-Marg el-Omomi Drain facilitated the opening up of El-Marg el-Qibliya settlements to vehicular accessibility and promoted urban development into formerly agricultural land during 1993 – 2006 (Fig. 41).

In El-Ma'desa, the western extensions along the eastern part of El-Nasr Freeway are most notable. Furthermore, infill developments of empty plots within the built-up area continued during this period. Such extensions can be attributed to the legalization of these informal settlements. During the 1990s, the squatters in the Manshiet Nasser District were allowed to buy the illegally occupied land on which they had built their houses, thus becoming legal house owners. This encouraged migrants from other parts of Cairo to settle in the remaining empty parts in this area.

Although El-Nozha showed a negative population growth rate during 1993 – 2006, the high urban growth rates in Cairo as a whole left their marks on such areas where lush gardens were consumed by urban growth. The major growth vectors in such area included road access and high land prices.

One remarkable feature in El-Nozha, with respect to the other three cases, is the formal extension of the built-up area which has been officially planned. Contrariwise, informal extensions constituted the major and most vibrant sector shaping urban growth in El-Ma'desa, El-Marg el-Qibliya and Ain el-Sira.

Fig. 41: Extensions of the built-up area along the Metro Line in El-Marg el-Qibliya

Source: Author`s photo

3.2.3 Structural Composition of the Built-up Area

Morphological characteristics of the built-up area plays an important role in the definition of urban types where urban configuration features are assumed to be associated with both spatial information and people's preference (Xiao 2012, p. 10). To distinguish the informal from the formal areas, the following morphological characteristics for formal areas were used: evidence of a subdivision plan, regular street patterns and street widths of six meters and more. Areas which do not exhibit these characteristics were considered informal (Sims & Sejourné 2000, p. 4).

3.2.3.1 Street Network

For Conzen (1960), a crucial part of the urban fabric is the town plan which comprises three distinct complexes of 'plan elements': streets and their arrangement in a street system, plot and their aggregation in street blocks, and building or, more precisely, their block-plans. Within an urban area distinct combinations of these plan elements form unitary areas termed 'plan-units' (Levy 1999, p. 80).

The pattern of the street network in the studied shiakhat can be classified into three types (Fig. 43):

1- Grid type: Grid networks have emerged basically to divide the irrigated agricultural land into two sets of streets in two different directions, usually orthogonal. In general, each set has equally spaced, parallel or semi-parallel streets. This type appears clearly within El-Marg el-Qibliya where the street layout follows field boundaries or manmade features, i.e. irrigation canals and drains. These streets can be very narrow (Fig. 42).

Although El-Marg el-Qibliya represents an example of a semi-legal informal area, it exhibits some planned features. That is, lanes are strictly parallel and there are occasional cross streets, which imply that someone plotted the area in drawings and set it out. However, the building patterns within these blocks are distinguishable from those in squatter areas such as El-Ma'desa, which is characterized by small building footprints, 100 percent plot coverage, and little or no allocation for public open spaces or social facilities. The underlying agricultural field patterns in El-Marg el-Qibliya were usually rigidly rectangular, and it could be said that this order itself translated into subdivions that appeared planned. But perhaps not, as the regularity and the cross-streets seem to suspiciously intentional and are of a scale that presupposes some official sanction (Sims 2010, p. 62).

Most of the streets in El-Marg el-Qibliya are in very poor state of maintenance due to the almost universal lack of paving and grading (Fig. 42), coupled with the episodic occurrence of local flooding and accumulation of sewage.

Fig. 42: Examples of the width and conditions of streets in El-Marg el-Qibliya
The left picture shows a disproportionate street width with regard to the building heights, and the right picture shows lack of paving and accumulation of sewage in the main streets.
Source: Author`s photo.

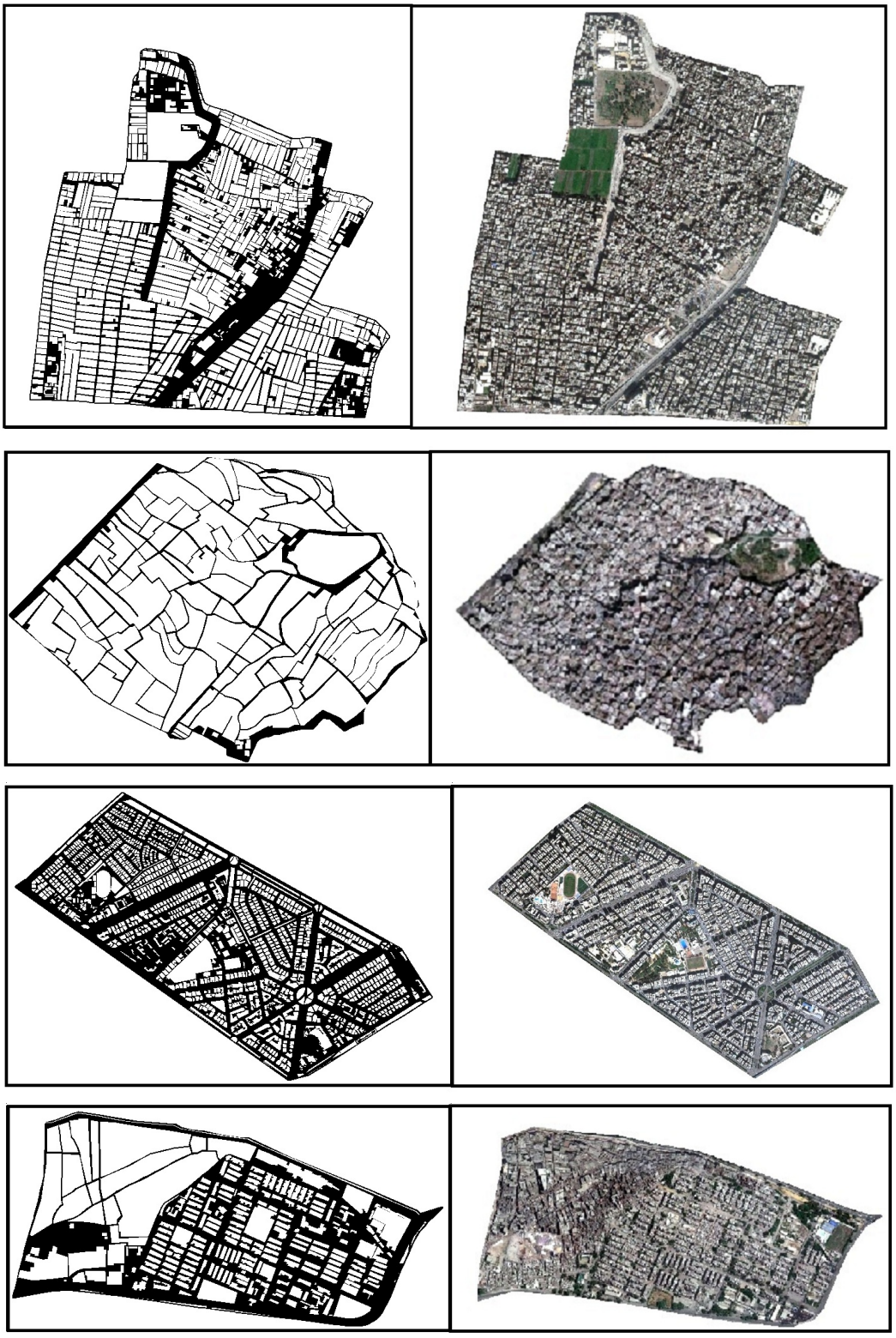


Fig. 43: Street network in the analyzed areas

Right side: Google Earth satellite image. Left side map of street layout derived from the right image
Source: Designed by the author, based on Google Earth satellite image 2010 (acquired 23 August 2010)

Coupled with developers' desire to maximize plot use, uncontrolled building heights have often resulted in an extremely small width of the streets. This building layout was reflected into poor ventilation and inadequate lighting. In other words, the layout of the buildings is too compact to guarantee adequate ventilation.

The grid type has been used in planning of non-agricultural areas such as the public housing settlement of Ain el-Sira. As a governmental had intended to build low-cost housing, the layout of this project consists of apartment blocks constructed parallel to one another. The street layout is characterized by a compact gridiron pattern (Fig. 44). The distance between the buildings was approximately 12 meter (Mohamed 2004, p. 168).

Unfortunately, the public housing in Ain el-Sira encountered a process of residential intensification. This means that new residential units were constructed on previously empty land between the housing blocks. Examples of residential intensification generally include the construction of accessory apartments, the conversion of non-residential structures to residential use, infill and redevelopment (Lee 2010, p. 31).

The main problem facing public housing dwellers was, and still is, the small size of the dwellings which cannot accommodate the growing needs of the families. The minimal standard on which the public housing design was based, resulted in interior layouts which could only support a limited number of functions and failed to accommodate the wide variety of daily activities and the changing needs of low income families. The low number of rooms, i.e. mainly one or two-roomed apartments, does not allow a separation of male and female family members as an important tradition in Islamic societies (Salama 1995, pp. 25 - 28).

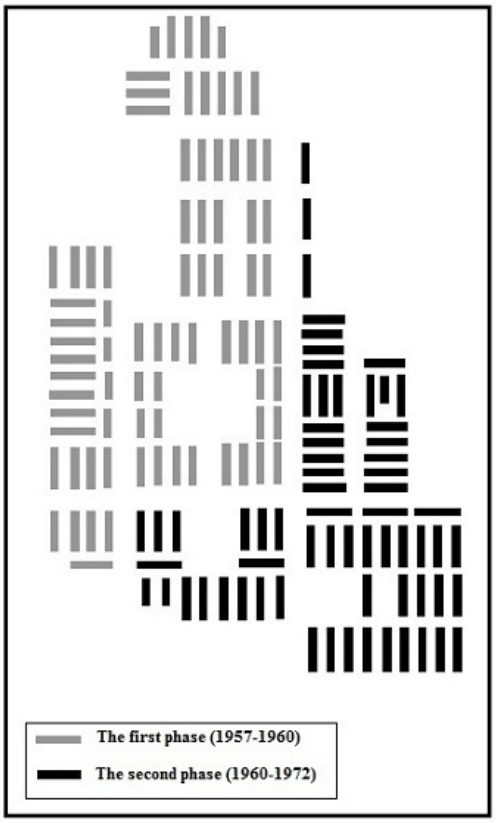


Fig. 44: The original street layout of Ain el-Sira public housing before the informal residential intensification.

Source: Mohamed 2004, p. 168.

Accordingly, residents had to adopt themselves to their new conditions through informal building activities. These activities include turning balconies into additional rooms, adding new balconies supported on street cantilevers, adding extra rooms on both ground floor and roof tops and finally, multi-storey stacks. One important observation worth mentioning is that the transformation seems to decrease in blocks located on the outer border of the project, particularly those located on main streets. Contrariwise, more extensive transformation has taken place at the internal parts of the project, particularly in blocks facing large common open spaces. Vast open spaces, created by arranging blocks in parallel lines, represented an enormous waste of land which has been used for extensions (Fig. 45). Extensions are more frequent at ground floor and roof top level. Ground floor extensions located on main streets were mainly used to accommodate a shop or a business (Fig. 46). The long distance between homes and shops led to the unplanned development of commercial activities along residential streets.

All the aforementioned transformation has influenced the original layout of this project.

Fig. 45: Informal extensions on the spaces between buildings in Ain el-Sira public housing

Fig. 46: Informal building activities in Ain el-Sira public housing

The left picture shows that extensions at the ground floor were used to accommodate shops on main streets; the right picture shows extensions at the roof top level which is used to accommodate residential use or poultry raising.

2- Radial type: The second pattern of street networks is the radial type. As shown in Fig. 43, this type appears in the network the streets in El-Nozha. This area has developed as a part of Heliopolis. Therefore, it has a western urban layout represented in radial urban fabric with a rigid grid pattern. This layout consists of three elements,

- A hub junction, a center where high levels of activity exist.
- A set of radial streets crossing or touching the hub, extending outwardly into other centers or routes (Fig. 47).
- The branches around the hub are usually rings which connect the radial lines.

3- Organic/irregular type: This type is characteristic for the Shiakha El-Ma'desa. As an unplanned area on desert state-owned land located below the Mokattam Plateau, the lack of irrigation channels which can be converted into streets in El-Ma'desa caused a much less regular urban pattern. Here, streets emerged more randomly according to their indigenous structure and sloping nature (Fig. 48). Its organic character is particularly distinctive with the densely built-up area in comparison to the character of the other three types of settlements (Fig. 43). The buildings cover almost completely the whole plots, leaving only narrow strips along the boundary. The urban fabric results from the subdivision of plots on an individual basis. As a result, houses are huddled together and little or no space is provided for common space and streets (Arandel & El-Batran 1997, p. 17). The built-up area contains many winding and intricate streets and cul-de-sacs which have no straight direction or a fixed width, creating often large irregular blocks which lack connectivity. The irregular street pattern reflects both the lack of a civil planning authority to prevent the encroachment of houses onto public thoroughfares and a response to local climate by maximizing shade (Pacione 2009, p. 470).

El-Ma'desa is characterized by a high level of internal accessibility for pedestrians, and a medium or low level of accessibility for vehicular traffic. While streets width permit access to vehicles to most areas, accessibility is impeded by the generally poor conditions of the streets. Such streets discourage access by cars, hence provide privacy and relative quietness. While El-Ma'desa was originally built for a pedestrian society, the street pattern poses major problems for city planners who seek to improve the vehicular accessibility.

Fig. 47: Radial street network in El-Nozha

Fig. 48: Narrow, winding and sloping streets in El-Ma'desa

3.2.3.1.1 Connectivity

Connectivity, as a measure of street network design, provides more insight to characterize the street network and building layout of the studied shiakhat. It measures how the interconnected street network disperses traffic, facilitates walking and indicates the quality of the pedestrian network (Lupala 2002, p. 234). In other words, it is a measure of geometric accessibility. By analyzing different types of connectivity in a street network, it is possible to identify which parts of the network are likely to have a negative accessibility and tend to be congested, and which parts are likely to have positive premiums with highly connected locations.

Better connectivity leads to more walking and biking, fewer vehicle miles traveled, better air quality, and a greater sense of community among residents (Song & Knaap 2004a, p. 214).

The two parameters used to highlight the different character of each area in terms of connectivity are *Blocks_peri* and *Blocks*.

- *Blocks_peri* refers to the median perimeter of blocks. The smaller the perimeter is, the greater is the internal connectivity.
- *Blocks* refers to the number of blocks divided by the number of housing units. The larger the blocks are, the better is the internal connectivity (Song & Knaap 2004a, p. 214).

As shown in Table 19 and Fig. 49, the internal street connectivity in El-Nozha is better than in the other three shiakhat. This is advocated by the lower value of the *Block_peri* measure and the higher rate of the *Blocks* measure.

Table 19: Measuring connectivity between neighborhoods

Shiakha	Blocks_peri indicator	Blocks indicator
El-Marg el-Qibliya	163.6	0.02
El-Ma'desa	299.13	0.01
El-Nozha	86.4	0.07
Ain el-Sira	132.5	0.03

Source: Calculated by the author.

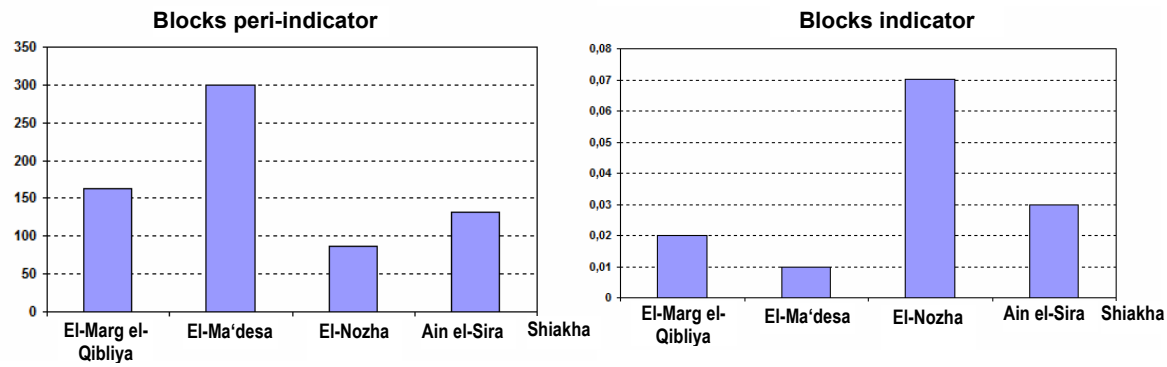


Fig. 49: Indicators of connectivity in the studied areas

Source: Designed by the author

On the other hand, the street network in El-Ma'desa ranks low in internal connectivity compared to the other three areas. The low level of connectivity is highly related to the socio-economic status of the population. Poorer immigrants tend to concentrate in areas with bad quality of housing and lower spatial connectivity. This is reflected in low

land prices and rents to be paid for such location (Xiao 2012, p. 132). The differences in the measures of internal connectivity of both El-Marg el-Qibliya and Ain el-Sira are not statistically significant.

3.2.3.1.2 Building Density

Another way to analyze the morphological configuration of the studied areas is to calculate the density of built elements. Geographical analysis of the density of houses, that is, a ratio of houses or other buildings to a space of measurement is the most fundamental in the study of city morphology and structure. It is also important to indicate the density of houses as a basic data in city planning (Ogasawara 1969, p. 71). On the other hand, it can be used as an indicator of the evolution of a city because the buildings which were constructed in different periods have different styles and vary greatly in how the land is used (Pan et al. 2008, p. 2542). In this chapter, the Building Coverage Ratio (BCR) is used to estimate the building density of the four cases. The BCR is the ratio of the total area covered by buildings to the total area of the specific area (Pan et al. 2008, p. 2542).

Table 20 and Fig. 50 show the differences of the BCR between the studied shiakhat. Two built-up structures can distinguished in the table, namely, dense building areas and low density building areas. The higher values of the BCR are attained in informal areas represented by El-Ma'desa and El-Marg el-Qibliya where the development of the settlements took place outside the formal land use planning and management procedures so that buildings do not abide by the applicable planning and building standards.

Contrariwise, the lower BCR areas are the formal areas represented by El-Nozha and Ain el-Sira. This explains why the BCR in El-Ma'desa is more than twice as high as in El-Nozha.

Table 20: Building Coverage Ratio (BCR) in the analyzed shiakhat 2006

Shiakha	Total built-up area (1000 m^2)	Total area (1000 m^2)	BCR (%)
El-Marg el-Qibliya	1,205	1,874	64.3
El-Ma'desa	401	484	82.8
El-Nozha	846	2,149	39.4
Ain el-Sira	377	721	52.2

Source: Calculated by the author.

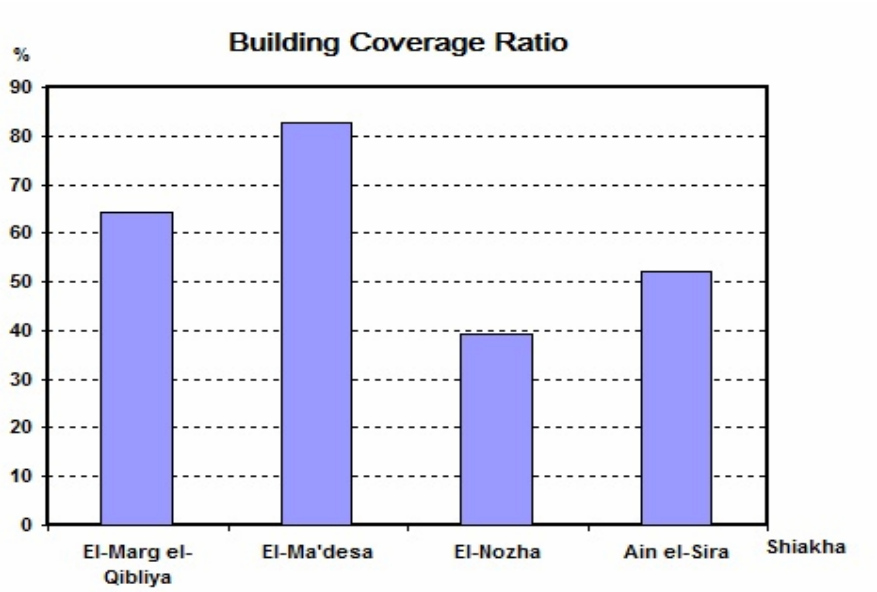


Fig. 50: Measuring building density in the analyzed shiakhat

Source: Designed by the author

The main factors contributing to the existing high building density in El-Ma'desa include high population density which exceeded 86,000 persons per square kilometer in 2006. Moreover informal land subdivision, informal land markets and developers urge to maximize plot coverage. Although high density allows more social control, the horizontal densification of this settlement constitutes an obstacle towards effective provision of infrastructure, extra pressure on land and residential spaces and is producing crowded and unsuitable environments for human development (Acioly & Davidson 1996, p. 6).

Unlike El-Ma'desa, although El-Marg el-Qibliya is an informal area, the underlying agricultural field patterns which translated into rigidly rectangular land subdivision may contribute to the lower BCR

On the other hand, the low density in El-Nozha, where the settlements were designed to cater for high income groups, can be explained by the fact that the development plans had stipulated plot coverage, height zoning, the floor area ratio and building uses. All the previous factors contribute to the lower BCR in the El-Nozha area.

3.2.3.2 Types of Residential Buildings

The study of different types of residential buildings within the field of urban geography has to take the following factors into consideration:

- Buildings and spaces are created by people and quite often characterize them (Kostof 1991). Therefore, if the residents build the houses themselves, then they reflect their lifestyles. However, if government agencies or contractors build them, they are more generic and may not represent the lifestyles of the households (Ananthakrishnan 1998, p. 20). In other words, there is a strong relationship between the nature of urban growth, whether regulated or unregulated, and the types of the buildings.
- The types of residential buildings are affected by some factors related to the consumer and others related to the producer. Considering the factors related to the consumer, the housing type is affected by socio-economic characteristics of the households such as occupation, educational status, monthly income and size of the household (Yetunde & Bayo 2013, p. 109). It is also affected by the site and the characteristics of the district and the location according to transportation.
  Considering the factors related to the producer, the only consideration is profit maximization (Topcu 2004, p. 17).

Based upon the previous factors, the types of residential building in the four selected areas are analyzed. Moreover, a comparison of the distribution of the types of residential buildings according to the results of the last two censuses (1996, 2006) is carried out.

Because the building census is the main source for data on the types of buildings, it is necessary to review the definition of the four types of residential buildings applied in the census:

- An *apartment building* consists of one or several floors, each containing more than one flat.
- A *house* may have one or more floors, each floor comprises one flat.
- A *villa* is a separate building which usually consists of at least two floors connected internally with stairs and which has a private area around it. The villa is considered as one housing unit.
- A *Rural house* represents the traditional form of residential buildings in rural areas and is generally built of clay. It consists of one or two floors, each with several rooms and usually equipped with an animal shed and with or without a WC. It is considered as one housing unit.

Taking into consideration that urban containment is likely to change the distribution of housing types found in the market due to higher residential land values, as an aspect of the production of structure types that use land more intensely (Aurand 2010, p. 1022),

this chapter highlights the change of the types of residential buildings in the studied shiakhat during the last census period 1996 – 2006.

Table 21 reveals that houses and multi-apartment buildings are the dominant types of residential building across the selected areas. On the other hand, there is a tendency to use apartment buildings as a preferred building type for residential development not only in the four shiakhat, but also in Cairo Governorate in general and in other major Egyptian cities. The factors contributing towards such trend are:

- Egyptians are accustomed to relatively high densities, which may even be considered as an asset insofar as higher densities increase communal interaction, neighborly relations, and the care for the young and elderly.
- A good location relative to the distance and accessibility of the places of employment and commercial activities remains a highly valued consideration.
- The scarcity of serviced sites naturally promotes high density developments.
- Multi-apartment buildings provide affordable housing for middle and lower income groups with decreasing production cost of housing (El-Husseiny 1987, pp.107-108).

Based on the spatial and temporal comparison of the types of residential buildings in Table 21 and Fig. 51, it is clear that in 1996 to live in a house was the most common pattern in the informal areas represented by El-Marg el-Qibliya and El-Ma'desa. About two third of the residential buildings in the two areas belonged to this category. The prevalence of a house as family owned building in informal areas rather than formal areas denotes the cultural preference of the residents of informal areas, as will be clarified later in the part related to housing tenure. Moreover, the development of residential buildings in informal areas is carried out and financed by individuals not by companies which is the case in planned areas represented by El-Nozha. Therefore, the house is the most appropriate residential type in informal areas in terms of cost effectiveness.

Table 21: Types of the residential buildings in the case study areas 1996 and 2006

Building type \ Shiakha		El-Marg el-Qibliya	El-Ma'desa	El-Nozha	Ain el-Sira
Apartment building	1996	2,517	478	1,189	479
	%	34.1	23.7	81.9	32.4
	2006	3,582	1,158	1,221	741
	%	44.5	45.5	84.3	53.1
	Percent of change	42.3	142.3	2.7	54.7
House	1996	4,689	1,400	153	880
	%	63.6	69.4	10.5	59.5
	2006	4,450	1,388	124	655
	%	55.3	54.5	8.6	46.9
	Percent of change	-5.1	-0.9	-19	-25.6
Rural house	1996	160	140	4	120
	%	2.2	6.9	0.3	8.1
	2006	13	1	0	0
	%	0.2	0.0	0.0	0.0
	Percent of change	-91.9	-99.3	-100.0	-100.0
Villa	1996	7	0	105	1
	%	0.1	0.0	7.2	0.1
	2006	6	0	103	0
	%	0.1	0.0	7.1	0.0
	Percent of change	-14.3	0.0	-1.9	-100.0
Total	1996	7,373	2,018	1,451	1,480
	2006	8,051	2,547	1,448	1,396
	Percent of change	9.2	26.2	-0.2	-5.7

Source: Calculated by the author, based on CAPMAS 2008a.

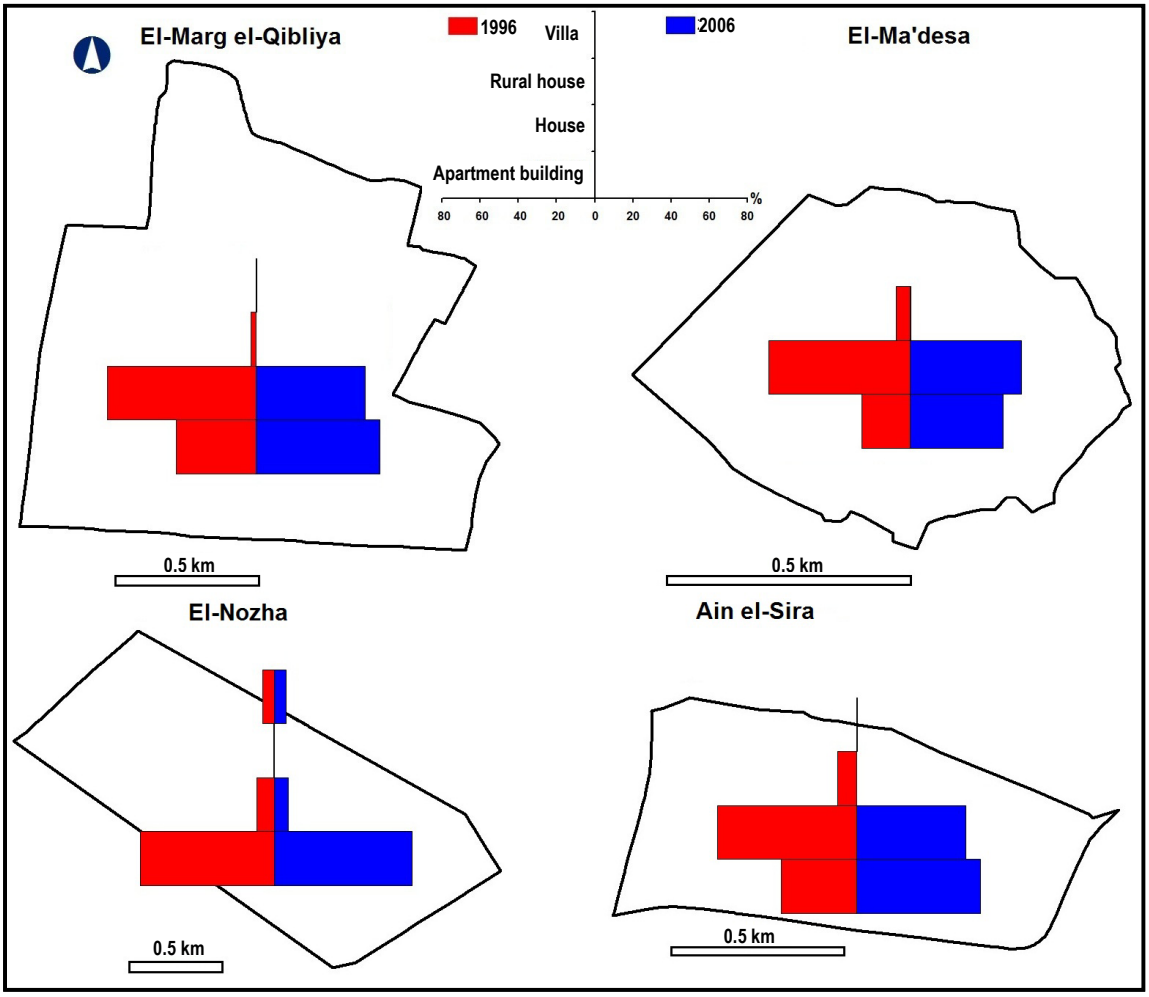


Fig. 51: Types of residential buildings in the case study areas during 1996 and 2006

Source: Designed by the author, based on Table 21

On the other hand, apartment buildings are by far the dominant type of buildings in El-Nozha where they represented 84 % of the total number of residential buildings in 2006. The majority of these buildings had been constructed during the first half of the 20th century. But due to the high attractiveness of this area and a steep rise in land prices the residential development at least during the last three decades has been characterized by the construction of high rising apartment buildings carried out by real estate companies catering for the higher income segments of the population in the form of modern condominiums. Those companies offer a higher standard and the provision of excellent services and facilities.

During the period 1996 – 2006, the number of apartment buildings in the two informal areas of El-Marg el-Qibliya and El-Ma'desa increased by 42 % and 142 % while the number of houses declined by 5.1 % and 0.9 %. This indicates the demolition of houses as a residential type in favor of the construction of apartment buildings in order to raise the profit generated

from these buildings. The increasing trend towards the construction of apartment buildings is desirable because it provides accommodation for more families. In addition, it reduces the cost of installing, operating and maintaining infrastructure facilities (Lupala 2002, p. 232).

One of the most notable transformations is the almost complete disappearance of rural houses in the studied shiakhat by 2006. This type of residential housing is no longer appropriate in densely populated urban areas. Similarly, the villa as aristocratic residential type has become an incongruous housing type to accommodate the rising demand for luxurious apartments in relatively central parts of Cairo. It is one of the most profitable businesses in the real estate market to buy old villas surrounded by large gardens, demolish the old building and construct a high rising luxurious residential building on the whole plot

with dozens of expensive apartments (Fig. 52). Especially during the 1980s so many beautiful old villas were demolished in favor of such luxurious real estate projects in areas like Heliopolis and Garden City that massive protests erupted via the media and by the population in the affected areas. In 1988, a legal ban was issued on the destruction of old villas which are to be preserved as architectural heritage. The decree reinforced already existing building codes that prohibited the demolition of old buildings, villas and palaces. This decree has been quite effective, but there are still cases of property owner who used loopholes in the law in order to pull down buildings they owned overnight, and to build a luxurious condominium instead. Meanwhile, other owners deliberately let their historical buildings decay, such that they would then have to be demolished (El-Aref 2014).

Fig. 52: Old villa beside high rising residential buildings in El-Nozha

Source: Author's photo.

Under these conditions the number of 105 villas in El-Nozha in 1996 remained relatively stable and declined only by two until 2006 (Table 21).

3.2.3.3 Housing Tenure

Housing is available in several forms of tenure. Housing tenure refers to the financial arrangements under which someone has the right to live in a house or apartment (Guide to Tenancies and Tenancy Agreements).

Affordability is usually defined in terms of tenure, as it is usually measured by what the average or less than average household can afford to pay out of its income for a modest rent or can reasonably amass to purchase a unit, compared to what the market offers (Sims 2010, p. 148).

Data in Table 22 and Fig. 53 indicate that the two most important types of tenure in the informal areas of El-Ma'desa and El-Marg el-Qibliya in 2006 were rental units under the New Rental Law and ownership units. Ownership refers to housing units which were constructed by their owners on either legally or illegally acquired land and in which the owners are living. The highest proportion of ownership is to be found in El-Ma'desa where 47 % of the total population live in houses which they own.

Table 22: Distribution of population by tenure type in the analyzed shiakhat in 2006

Shiakha / Tenure type		New Rental Law	Old Rental Law	Ownership	Purchased	Others	Total
El-Marg el-Qibliya	Number of persons	51,661	16,301	33,461	8,444	4,482	114,349
	%	45.2	14.3	29.3	7.4	3.8	100.0
El-Ma'desa	Number of persons	15,704	4,146	19,406	994	969	41,219
	%	38.1	10.1	47.1	2.4	2.3	100.0
El-Nozha	Number of persons	24,958	1,452	3,221	12,606	1,748	43,625
	%	56.4	3.3	7.4	28.9	4.0	100.0
Ain el-Sira	Number of persons	4,948	1,209	4,352	13,163	896	24,568
	%	20.1	4.9	17.7	53.6	3.7	100.0

Source: Calculated by the author, based on CAPMAS 2008a.

Although El-Ma'desa had originally been established as a squatter settlement on state land, the legalization of the occupation of land has proceeded so far that not only people who were able to buy their housing plots from the state but also the residents of illegal buildings and flats enjoy a relatively high degree of security of tenure. Legal and illegal real estate property is easily bought and sold either in the formal or in the informal property market.

El-Marg el-Qibliya is also an informal settlement, but here only 29 % of the total population live in their own houses. This can be explained by the semi-legal character of the settlement. The agricultural land had been legally bought. This meant that the risk of the eviction from one´s own land was very low. Therefore, the owners of the plots started immediate to construct the first few floors to accommodate their core family and the families of their sons and added further floors for letting to other families. The result is a building with ten or more floors in which the share of the owned units is relatively small.

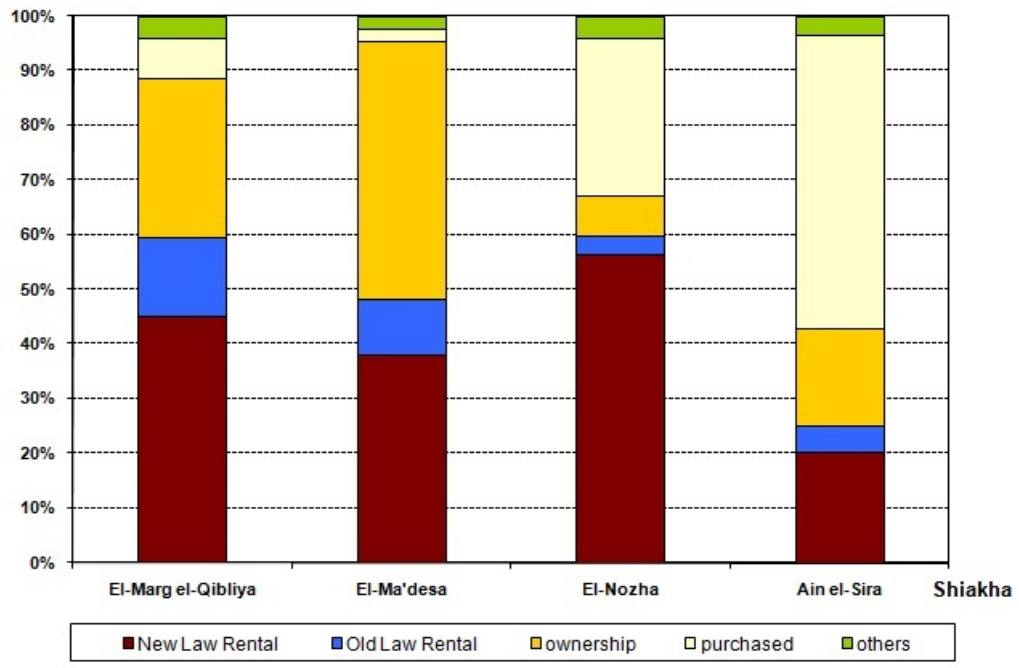


Fig. 53: Distribution of the population by type of tenure in the analyzed shiakhat 2006

Source: Designed by the author based on Table 22.

In El-Ma´desa, however, the illegal occupation of state land included a high risk of being evicted from the land. Therefore, the house owners started to construct at first only very few floors for the urgent need of their family members. Further floors with apartments for letting were only added after it had become clear that the insecure ownership can be legalized. This means that El-Ma´desa is only lagging behind the development in El-Marg el-Qibliya. Due to

a rapid increase in apartments on newly constructed upper floors in El-Ma´desa it is to be expected that a similar distribution of tenure types will here be observed very soon as has already been registered in the case of El-Marg el-Qibliya.

Regardless of the present prevalence of ownership as a type of tenure in informal areas, the rental housing sector has been and will continue to be the major provider of the bulk of housing for low-income households not only in Cairo, but also in cities of the developing countries in general (Yetunde & Bayo 2013, p. 103). This claim is advocated by the high proportion of the population under rental system in the studied shiakhat. They constitute about 60 % of the total population of both El-Nozha and El-Marg el-Qibliya and 48 % of the total population of El-Ma'desa.

The rental system in Egypt is divided into the Old Law and the New Law rental system. Rental according to the Old Law has rapidly declined since the introduction of the new system in 1996 and represents now only a small proportion of the rental system (Fig. 53). This type of tenure is pro-tenant and poses a lot of disadvantages especially to the landlords since it is effectively locked out of the process of housing exchange. The rents under the Old Rent Law are almost negligible in comparison to the current market prices. This tenure type is just a small remnant of the rent controls which had been enforced under Gamal Abdel Nasser more than half a century ago and which were amended by the rent laws in 1977 and 1981. It is practically impossible to obtain rent increases in tenancies governed by the old socialist laws. These laws apply to contracts entered into before the reforms in 1996 including contracts assigned to household members of the original tenant (Mena Associates & Amereller Legal Consultants 2006).

The percentage of tenure according to the New Rent Law, which de-regulated landlord and tenant relationships, is a strong indicator for the dynamic of the rental market in the different parts of Cairo since the new tenure system has been applied in 1996. Table 22 shows that more than half of the total population in El-Nozha, as a well-off area, are included in this type, in addition to 45 % of the population of El-Marg el-Qibliya as an informal area on previously agricultural land. Moreover, 38 % of the total population of El-Ma'desa are also included in this category. The relatively low share of tenure contracts based on the New Rental Law of only 20 % in Ain el-Sira is corresponding to the extremely high rate of purchased flats.

The third category in the housing tenure is ownership by purchasing the flat. This means that the person living in the specific apartment had purchased it after its construction by the original property owner who was in most cases a real estate investor or a real estate company.

The proportion of owners by purchasing varies considerably between the studied shiakhat. The percentage is relatively high in old formal settlements where new apartment blocks have been constructed and where old residential buildings with flats, which had been let by public institutions under the Old Rental Law, were privatized, i.e. sold at very favorable conditions to the former tenants. This is the main reason for the extremely high proportion of 54 % of the population in Ain el-Sira, where the rented apartments of the public housing project had been privatized. It provides also the main explanation for the share of 29 % of the inhabitants of El-Nozha who live in recently purchased flats. This is largely the result of the conversion of a military campus to private residential apartment buildings to the benefit of officers from the Ministry of Defense and their families.

On the other hand, it is obvious that the share of purchased flats has to be relative low in informal areas where new large-scale apartment blocks are rare and where no public residential buildings are available for privatization: This type of tenure is limited to only 7.4 % of the total population in El-Marg el-Qibliya and 2.4 % in El-Ma'desa.

3.2.4 Functional Composition of the Built-up Area

Another element which can be used to analyze urban form is the type of land use. The allocation of land to different uses is one of the key elements in theories of urban spatial organization and it is a physical manifestation of the social and economic stratification of the society (Bourne 1976, p. 533).

Land use is the projection of complex urban socio-economic activities on a land system. Therefore, the structural and functional characteristics of land use reflect the outcome of socio-economic processes.

In developing countries generally, urbanization has not been able to generate concomitant growth in the urban economy to enable the effective functioning of the cities especially in the provision of employment opportunities (Simon 1989, p. 43). The net effect of such socio-spatial processes, or in other words urbanization in poverty, is revealed most clearly in the land-use structure of the city (Pacione 2009, p. 137).

This part aims at examining the differences which exist in the land use mix of the selected shiakhat. Achieving this aim will be through the following objectives:

- To study existing patterns and mixing of land use.

- To review the factors and forces affecting the development of the land use mix across the four studied areas.

3.2.4.1 Land Use Pattern

Even though the growth of informal settlements has intensified in Egypt as a whole over the past half century, there has hardly been any attempt to put in place or adopt pro-active measures necessary to regulate the land use development in the booming informal settlements.

In the absence of formal guidelines and standards for land subdivision, the size of land parcels which are subdivided and transacted in informal settlements depends on the buyers' requirements and on the willingness of the sellers to dispose of their land. Subsequently, the development of these settlements takes place outside the formal land use planning and management procedures. As a result, conflicts in the land-use structure arose between formal and informal urban areas owing to the contradistinctive nature of their urban growth processes.

Table 23 reveals that the informal settlements of El-Ma'desa and El-Marg el-Qibliya are generally characterized by a dysfunctional settlement structure. The highly problematic types of the urban fabric in El-Ma'desa and El-Marg el-Qibliya are those which have expanded very fast, consuming large parts of state-owned land or irrigated fields and generating different patterns of fragmented land use. These kinds of phenomena are described as *urban sprawl.* The predominance of informal land use is primarily due to the organic nature of urban growth in both areas, and more fundamentally, owing to the dynamics of informal urban economic activities.

3.2.4.2 Aspects of Informal Land Use in the Area of Study

- As shown in Fig. 54, residential land use in El-Ma'desa is overwhelmingly dominant, accounting for approximately 88 % of the total. Similarly in El-Marg el-Qibliya, residential land use is by far the largest category, accounting for 58 % of the total. As a consequence, the share of residential land use in these two informal areas exceeds significantly the range of 35 % – 45 % which is commonly quoted for cities (Bourne 1981, p. 19). The high portion of residential land use reflects how urbanization in poverty has given rise to peculiar urban land development patterns which are defying spatial planning theories. On the other hand, it reflects that the informal sector has proven to be adaptive and responsive and has been providing the bulk of the urban population with

buildable urban land (Fekade 2000, p. 127). Contrariwise, residential land use is considerably less than the pre-determined criteria in both El-Nozha and Ain el-Sira and is accounting only for 25 % and 14 % of the total area.

Although land use standards (Law 28 of 1948) provide spatial separation of residential and industrial areas (Sedky 2000, p. 62), this is not adapted to the structure of informal settlements in both Ain el-Sira and El-Ma'desa where these uses are integrated. Fig. 54 shows that the western part of Ain el-Sira is characterized by intense industrial activities, which is referred to as tanneries area.

Table 23: Land use pattern in the case study areas 2006

Shiakha / Land use	El-Marg el-Qibliya		El-Ma'desa		El-Nozha		Ain el-Sira	
	Area (m^2)	%	Area (m^2)	%	Area (m^2)	%	Area (m^2)	%
Administrative	2,293	0.1	0	0.0	2,803	0.1	8,025	1.1
Commercial	7,056	0.4	2,894	0.6	12,554	0.6	6,258	0.9
Cultural	796	0.0	0	0.0	683	0.0	4,367	0.6
Educational	14,934	0.8	0	0.0	40,791	1.9	5,882	0.8
Industrial	4,230	0.2	392	0.1	0	0.0	0	0.0
Medical	5,135	0.3	0	0.0	10,410	0.5	2,870	0.4
Non-urban	571	0.0	172	0.0	0	0.0	0	0.0
Public services	657	0.0	0	0.0	15,750	0.7	3,138	0.4
Recreational	2,804	0.1	841	0.2	49,287	2.3	4,448	0.6
Religious	16,169	0.9	2,758	0.6	8,863	0.4	2,667	0.4
Transportation	10,533	0.6	0	0.0	1,407	0.1	7,888	1.1
Utilities	1,650	0.1	0	0.0	3,275	0.2	0	0.0
Vacant land	599	0.0	0	0.0	354	0.0	0	0.0
Green areas	12,000	6.5	19,379	4.0	210,001	9.8	59,458	8.2
Residential	1,079,053	57.6	426,034	88.0	530,229	24.7	102,260	14.2
Streets	605,741	32.3	31,422	6.5	1,262,437	58.7	309,879	43.0
Mixed residential - industrial	0	0.0	0	0.0	0	0.0	204,091	28.3
Total area	1,874,220	100.0	483,892	100.0	2,148,844	100.0	721,266	100.0

Source: Calculated by the author, based on digital maps produced by CAPMAS, version 2006.

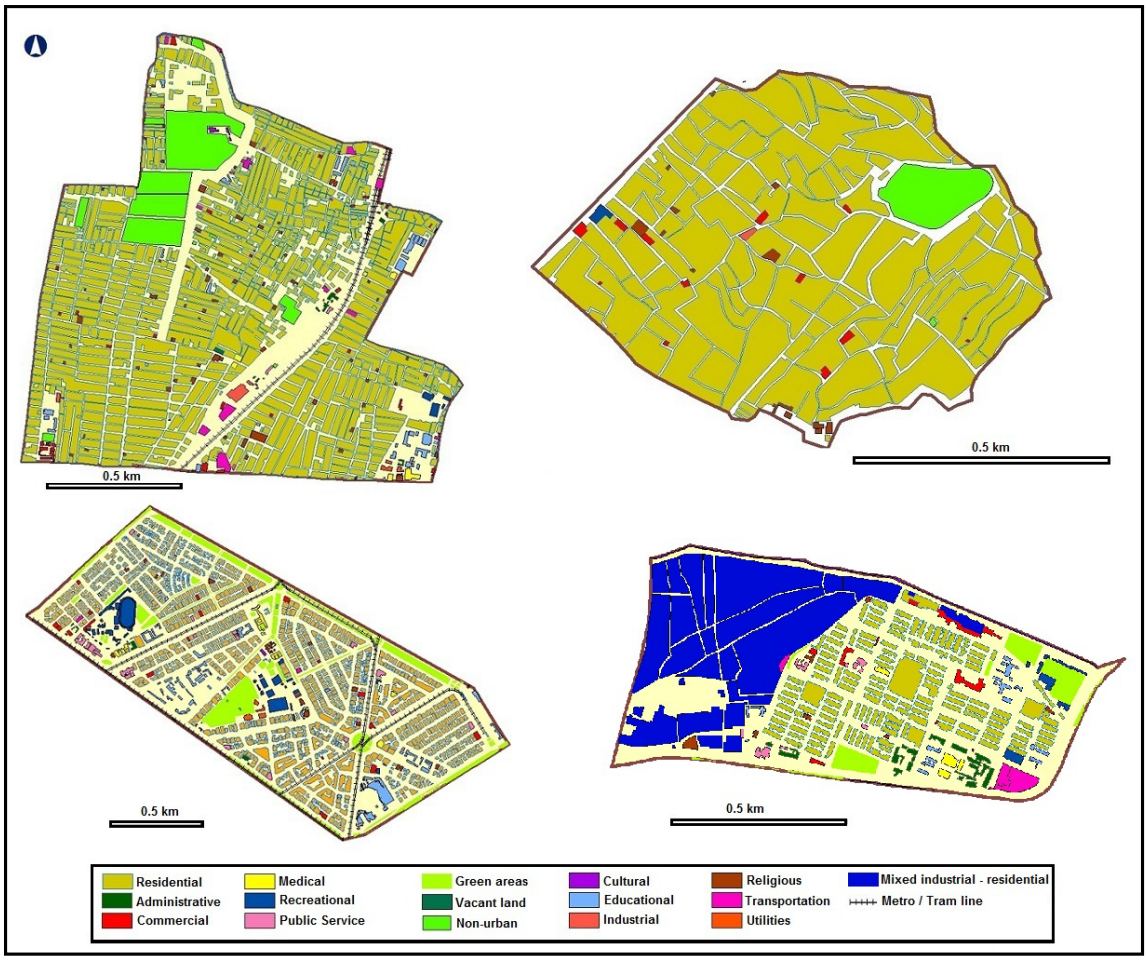


Fig. 54: Spatial distribution of land use in the analyzed shiahat 2006

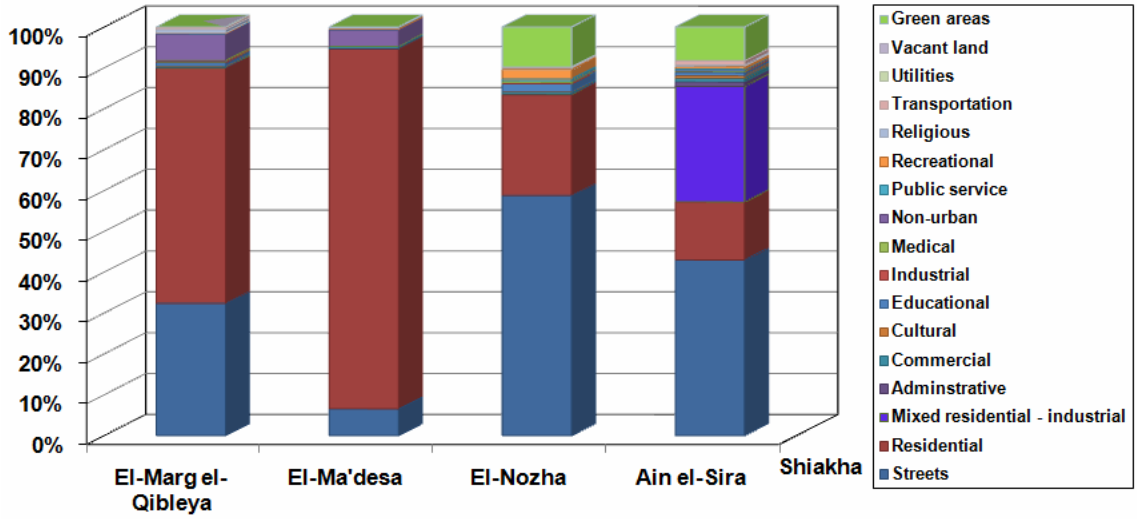


Fig. 55: Percent distribution of land uses in the analyzed shiahat 2006

Source: Designed by the author, based on Table 23.

As incongruous land use, these industrial activities have significant negative impacts on the surrounding areas, including, but not limited to, noise, malodor, aesthetic impacts and the deterioration of the network of infrastructure of the public housing of Ain el-Sira. The negative impact applies also to garbage sorting in El-Ma'desa. Although the quota of industrial land use does not exceed 0.1 % of the total in El-Ma'desa, it is relevant to mention garbage sorting as an industrial activity carried out in the streets (Fig. 56). There has been a series of attempts to transfer leather industries from Ain el-Sira to the industrial area of Badr New Town and garbage sorting from El-Ma'desa to remote sites off the Ain el-Sukhna Road, but these relocation schemes proved totally unrealistic due to the inability of the authorities to comprehend just how closely these enterprises are connected with other economic activities within Cairo's fabric (Sims 2010, p. 59).

Fig. 56: Garbage collecting and sorting in the streets of El-Ma'desa

– Most of the houses and apartment buildings in the studied shiakhat, especially the new ones, reserve the ground floor along the streets for commercial land use or workshops leading to haphazard and ad hoc emergence of small-scale economic activities reflecting the inadequate and unclear regulations to control shop and workshop licensure.

– Although land subdivision laws require that 33 % of the land to be set aside for public uses* (Sedky 2000, p. 62), the informal sector in El-Ma'desa minimized such areas to only

* Public uses include all forms of urban land use earmarked for public services and utilities.

11 % of the total area in favor of maximization of the residential land use leading to scarcity of public land upon which to construct public services (Fig. 54 & Fig. 55). On the other hand, the share of public land use reached a maximum of 75 % of the total area in El-Nozha, as an officially planned area.

- Considering that the provision of streets is usually 15 % – 20 % of the total land uses in cities (Lupala 2002, p. 240), Table 23 and Fig. 54 reflect the insufficiency of such land use in El-Ma'desa, as an informal area. Nevertheless, streets in informal settlements in general, and in El-Ma'desa in particular are taking many more dimensions than just to be a link between two spaces. They are used as extended home and work space, extended café, ceremony hall and playground (Eldefrawi 2013, pp. 6 - 7). The same situation applies to the internal side streets of El-Marg el-Qibliya. The street compensates for limited private space of the apartments. Contrariwise, the main streets are not included in residents` concern as those streets are more public, shared by many other people and open to outsiders.

3.2.4.3 Land Use Mix

Mixed land use is a measure reflecting the evenness of distribution of several types of land use within an area. It is defined as a mixture of commercial, residential and industrial land use within a specified geographical area as opposed to the segregation of residential land use from non-residential uses (Aurand 2010, p. 1023).

The pervasiveness of mixing of the land use structure in the analyzed shiakhat requires to discriminate between two types of mixed land use which are compatible and non-compatible.

Mixing could be compatible and complementary, if the activities co-exist without suffering any negative externalities resulting from the presence of the other. The converse is obtainable where mixing is non-compatible (Simon 1989, p. 46).

- *Compatible* mixing of different types of land use can be defined as a finely grained mix of primary forms of land use, namely a variety of housing and workplaces with housing being predominant and being closely integrated with all other supporting services within a convenient walking distance of the majority of the homes (Murrain 1993, p. 86). It contributes immensely to the physical and socio-economic processes in the city. Moreover, it enables the intensive utilization of sites or buildings at all times of the day thus maximizing the economic returns on such investments (Simon 1989, p. 43).

Advocates for mixed land use have argued that the practice of separating land uses has led to excessive time for commuting, traffic congestion, air pollution, inefficient energy consumption, loss of open space and habitat, inequitable distribution of economic resources, job housing imbalance, and loss of the sense of community. Compatible mixed land use has been considered as one of the antidotes to the problems caused by urban sprawl. It is argued that a greater mixture of complimentary types of land use, which may include housing, retail, offices, commercial services, industrial and civic use can be beneficial since it can promote transit-supportive development, preserve open space and other landscape amenities, facilitate a more economic arrangement of land use, encourage street activity to support retail businesses, help achieve regional housing and employment targets, reinforce streets as public spaces, encourage pedestrian and bicycle travel, and thereby create a sense of community (Song & Knapp 2004b, p. 664).

– *Non-compatible* mixing of conflicting uses has undesirable effects on the urban environment. The interpretation of an area by unwanted forms of land use leads to the generation of nuisances. Environmental problems such as noise, sanitation and waste disposal are typical for areas where mixing is unregulated and non-conforming (Simon 1989, p. 43). Incompatible mixed land use is negatively perceived by planners and many officials (Shehayeb 2011, p. 18).

To measure the mix of non-residential land use, the following measure is used:
Mix_Actual: It is the size of the area used for commercial, industrial, and public purposes in square meters divided by the number of housing units in the specific area. The higher the ratio is, the greater is the land use mix (Song & Knaap 2004a, p. 214).

Quantitatively, it is apparent from Table 24 and Fig. 57 that land use mixing is found in varying degrees of intensity depending on the nature of urban development of each case. Consequently, the structure of El-Nozha and Ain el-Sira is characterized by the preponderance of mixed land uses, as planned areas. On the other hand, land use in El-Ma'desa and El-Marg el-Qibliya, as informal areas, is relatively homogeneous – primarily residential land – with only minor amounts of non-residential land use.

The predominance of land use mixing in El-Nozha and Ain el-Sira can be attributed to their location at intervening transportation nodes (Fig. 38), where small localized peaks of intense concentration develop (Simon 1984, p. 40).

Table 24: Measuring land use mix in the selected shiakhat in 2006

Shiakha	Non-residential land use (1000 m^2)	No. of housing unit	*Mix_Actual*
El-Marg el-Qibliya	189,426	46,055	4.1
El-Nozha	356,178	21,215	16.8
Ain el-Sira	105,001	8,716	12.0
El-Ma'desa	26,436	17,363	1.5

Source: Calculated by the author, based on CAPMAS 2008a & digital maps produced by CAPMAS, version 2006.

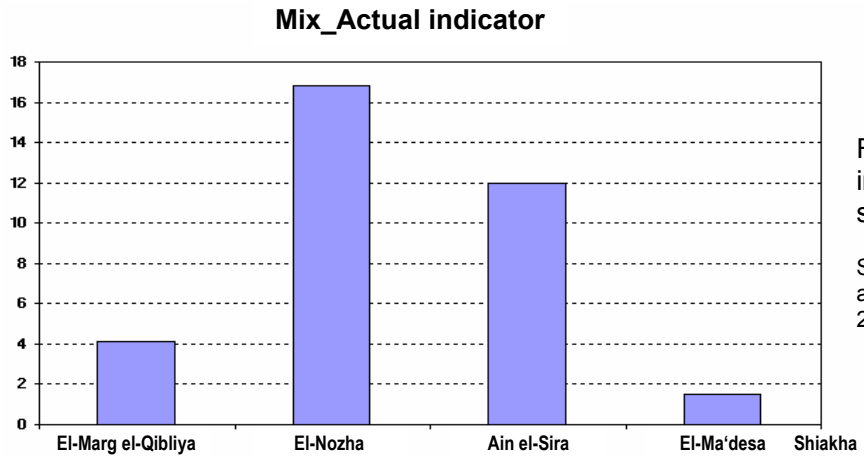


Fig. 57: *Mix_Actual* indicator in the case study areas

Source: Designed by the author, based on Table 24.

Associated with the location factor are the high accessibility values and their ability to attract a great influx of population providing the threshold requirement to support and maintain activities in the mixed pattern. Land values at these sites are relatively high because urban land market mechanisms are being reinforced by the factors of accessibility. It encourages the concentration of activities to help maximize investments in land development (Simon 1984, p. 47).

From a spatial perspective, land use mixing occurs in three forms, namely, horizontal, vertical or a combination of both of them.

The analysis of land use mixing reveals some aspects of non-compatible horizontal mixing in all the cases either formal or informal. In El-Nozha, the aggregation of private services, such as schools and hospitals, could locate in the same area to maximize the use of priced land regardless of the size of the served population. In Ain el-Sira, both the leather industry in the west and the residential land use intensification within the public housing area are two aspects of non-compatible land use mix. It is worth mentioning that these two aspects of non-compatible land use accelerate the deterioration of the standards of environmental quality and affect the general functioning of the urban system in this planned area. In both El-Marg el-Qibliya and El-Ma'desa, the existence of pockets of non-urban land use within residential use and the absence of most of the supporting services within convenient walking distance of

the majority of the population is to be regarded as non-compatible horizontal mixing, in the light of the intensive residential land use and the high population size and density.

3.2.5 Summary

The principle objective of this chapter was the examination of characteristics of the built-up area of the selected Shiakhat. It has been shown that there are variations in terms of urban growth, structural composition and functional composition of housing patterns. During the period 1993 – 2006, rapid unguided horizontal densification has been taking place in Ain el-Sira, El-Marg el-Qibliya and El-Ma'desa as contrasted to that of El-Nozha where horizontal densification has more or less reached saturation. Such unguided horizontal densification resulted from encroachment on either agricultural land, as in El-Marg el-Qibliya, or on the limited open spaces within the existing built-up area, as in Ain el-Sira and El-Ma'desa.

The observed morphological characteristics in terms of street network, types of residential buildings and housing tenure are also relevant to both the process of urban growth and the aforementioned socio-economic characteristics of each studied area.

El-Ma'desa, as severely deprived informal area on state owned land, is characterized by irregular street network with low internal connectivity and high building density. Although the recent growth trends in El-Marg el-Qibliya and Ain el-Sira are unregulated, they largely exhibit regular grid street network. El-Nozha, as a planned less deprived area exhibits radial street network with high internal connectivity and low building density.

The transformation of low-rising residential buildings into multi-storey apartment buildings characterizes the housing development in El-Marg el-Qibliya, El-Ma'desa and El-Nozha.

Regardless of the recent trend towards the New Law Rental as significantly increasing type of tenure, ownership of housing units is still dominant or at least relatively strong in the informal areas of El-Ma'desa and El-Marg el-Qibliya.

It has been observed that morphological and socio-economic characteristics of the analyzed areas are reflected in dysfunctional settlement structure and homogeneous land use in El-Marg el-Qibliya and El-Ma'desa. Since El-Nozha is a formally planned area, it is characterized by a compatible and greater land use mix. The most distinguishable incompatible land use mix in Ain el-Sira is the intense industrial activity in the tanneries area.

Considering that accessibility is a performance measure of land use and that it plays a significant role in land use development and transformation, it will be discussed in the proceeding chapter.

3.3 PROVISION AND ACCESSIBILITY TO PUBLIC SERVICES IN THE CASE STUDY AREAS

To evaluate the case study areas in terms of formality and informality, one major aspect to be taken into account is the provision of public services. Another consideration is the citizens' accessibility to these services. According to the UN Committee on Economic, Social and Cultural Rights, adequate housing must be in a location which allows access to healthcare services, schools, child-care centers, and other social services (Hartung 2011, p. 61). Accessibility is perhaps the most important concept in defining and explaining urban form and function (Song 1996, p. 474).

Accessibility is traditionally regarded as one of the most important determinants of the urbanization pattern, and it is often argued that relocation decisions are made in order to minimize the frictional effects of distances (Stanilov 2003, p. 783).

Although the concept of accessibility is multidimensional, accessibility may be defined in terms of affordability, acceptability, availability and spatial accessibility, evaluating geographical accessibility in residential areas offers critical information for public policy in the planning and service provision as it allows for the identification of areas with lower or higher access to urban resources and the assessment of spatial and social inequalities in the degree of accessibility (Apparicio et al. 2008, p. 2).

The definition of accessibility in the Dictionary of Human Geography is "… the ease with which people can reach desired activity sites, such as those offering employment, shopping, medical care or recreation''. Because many geographers and planners believe that the access to essential goods and services is an important indicator of the quality of life, measures of accessibility are used to compare the accessibility levels of different groups of individuals and households, or different places and locations. This includes the origin location, the mode of transportation, and the location of the destination to which accessibility is being measured (Gregory et al. 2011, p. 1992). Accessibility is therefore a measure of spatial opportunities rather than actual usage.

Accessibility has been the focus of many studies in recent decades. The widespread adoption of the accessibility concept demonstrates the originality of Hansen's (1959) and Weibull's (1976) vision. They were the first to define accessibility systematically. In essence, these two authors interpreted and modeled accessibility as the potential opportu-

nities which can be reached from a given place by paying certain generalized and space/time based costs (Modarres et al. 2013, p. 1).

Traditionally within urban studies, sprawl has been defined and measured based on morphological characteristics of urban development patterns. The focus on morphology explains the outcomes rather than causes or processes leading to particular development pattern. An alternative to the morphological approach focuses on functions. Urban functions (housing, job etc.) and their activities (living, working etc.) generate specific spatial patterns as an outcome. So, examining urban functions provides an understanding of the causes and the processes of sprawl. An example of the function-oriented approach to sprawl is measuring residential accessibility to urban functions. Accessibility measures the efficiency of spatial interactions between functions such as housing and retailing. Measuring sprawl through accessibility permits an identification of the causes of sprawl, and provides policy-relevant guidance on urban sprawl control policy (Sohn et al. 2012, p. 230).

Over the last decades, the spatial distribution of, and differential accessibility to, urban services have attracted the attention of urban geographers. A wide variety of service patterns has been examined including shopping opportunities, police protection, dental care, primary medical care, recreational facilities, social services for the elderly, mental health facilities, nurseries and fire services. Within this field of investigation particular attention has been devoted to the provision of public services.

These comprehensive studies analyzed both the location and characteristics of service facilities in an effort to uncover bias or discrimination against low-income groups (McLafferty 1982, p. 347). Poor urban households are much less likely than other urban households to enjoy access to public services (Hewett & Montgomery 2001, p. 2).

The inadequate provision of public services can compromise health, hinder economic growth, and stimulate efforts to reduce poverty.

On the other hand, greater proximity to social service providers is thought to increase the likelihood that eligible individuals in need will receive care or assistance, as shorter distances reduce the burden of commuting, particularly among members of the low-income population who have less access to automobiles than the other groups (Allard 2004, p. 2).

Therefore, accessibility is important, especially for the poor population with limited mobility and revenue since more direct and easier access confers opportunities by reducing the time and financial costs of access, and by potentially influencing life choices (Apparicio et al. 2008, p. 2).

Good accessibility to urban functions leads to lower vehicle miles travelled or an increase in walk trips because compact development and a mix of land use provide urban functions at a closer distance (Sohn et al. 2012, p. 232).

In summary, the physical accessibility of people to urban services and facilities is a key component of quality of life at the intra-urban level (Pacione 1989, p. 12).

Because of their unplanned and 'random' construction, from which the informal settlements derive their name in Egyptian Arabic *ashwayat,* meaning 'disordered' or 'irregular', these areas suffer from problems of accessibility, narrow streets, absence of vacant land and open spaces, insufficient infrastructure and services, and very high residential density.

Accordingly, the main aim of this chapter is to highlight changes and gaps in the provision of public services across the studied shiakhat and to determine whether service provision and the location of service points are adequate to meet the needs of the population in the selected four areas in terms of accessibility.

In analyzing physical accessibility, this study equates people's accessibility with distance, whereas the closer the residences of the people are to the facility, the better is the accessibility. Adequate accessibility means a relatively short travel distance and travel time to nearby facilities. Spatial accessibility is evaluated and presented as the potential availability of a certain function, rather than the actual utilization of that function. Therefore, public services are analyzed and the layout of the buildings of each studied shiakha is assigned to its nearest public facility.

Processing of the resulting information leads to the evaluation of the efficiency and effectiveness of the level of public services in the compared areas.

3.3.1 Methodology

In the past, accessibility had mostly been considered in relation to travel time. However, this measurement assumes that most of the people have private vehicles or can afford to

make use of public transport. This cannot be considered in the present study because many people in informal and semi-informal areas still have to walk long distances to gain access to service points. Consequently, distance and not travel time should be used to determine the geographical accessibility to services. Conventional facility location models define a facility's service area simply as a circular-shaped region based on a specified radius by circular coverage (Hacioğlu 2010, p. 17). The present study uses this model, as it is concerned with measuring the accessibility of the closest facility to the residential areas using Euclidean distance (straight line).

In order to determine the maximum distances that beneficiaries have to travel to different public service points, a multiple ring buffer was created for each service point using Arc GIS proximity analysis tools. A straight-line distance buffer is the better approximation of the actual service area when compared to the container approach, since it does not create a non-random pattern of access. Using the buffer to represent a service area allows also for spatial externalities outside of a political boundary. Allowing for spatial externalities is important when measuring accessibility because service points often serve an area irrespective of a political or arbitrary boundary (Talen 1998, p. 22).

By using the multi ring buffer tool, the service areas were created for several specified distances around the service points in the studied areas. These specified distances represent different levels of accessibility, viz. good, medium or bad accessibility. The accessible distance varies according to the type of the service. Keeping in mind that people often move across administrative boundaries to access the service points which are the nearest ones to them, the study identifies the main service points around the boundaries of the studied areas, which lies within a radius equal to the lowest level of accessibility. For example, kindergartens which are located at a distance of more than 300 meters from the built-up area in the studied shiakhat are considered as the lowest level of accessibility to the population. So, in the case of kindergartens, an area of 300 meters radius around the administrative boundaries of each selected shiakha were specified and added to the layer of kindergartens within the boundaries of each study area during the construction of the buffer. This method was applied to all service types. As a common measurement, the cumulative opportunities measure was applied, which measures how many households are accessible from a given service point. This study uses three average commuting distances to measure the accessibility for residential zones. In order to identify distances' limits, the study applies the level of distances identified by Kenawy (2005), who specified three levels of distances for each type of service.

This part focuses on educational, health, religious, fire, police, and post services and recreational facilities.

3.3.2 Provision and Accessibility to Educational Services

The opportunity to obtain a sound education is a key element of human welfare. The absence of this opportunity affects the life chances of those confronted by this form of disadvantage. The different degree of the availability of human educational opportunities can be examined from two perspectives. The first refers to the availability of educational facilities in terms of the physical accessibility of schools to the local population. The second concerns the quality of the educational environment as measured by students' performance in public examination (Pacione 2009, p. 364).

This study will analyze the physical accessibility because there are no data available concerning the students' performance in public examinations.

Generally, this part is concerned with three levels: Firstly, pre-school education (kindergartens). Secondly, basic education (primary and preparatory). Thirdly, secondary education.

3.3.2.1 Provision and Accessibility to Kindergartens

Child-rearing has not been a major focus of research in geography despite the fact that its organization is both spatially and temporally variable (Holloway 1998, p. 29).

Broad-scale differences in the provision and use of pre-school education can mean that children in some areas gain an educational advantage over children in other areas (Holloway 1998, p. 31). One of the main educational childhood services are kindergartens.

Pre-school education in kindergartens is an independent educational stage lasting two years for children aged 4-5 years. While early childhood education is not yet considered as part of general education, private and language schools require that the child complete two years of pre-school attendance before being admitted to grade one. The aim of this action is to achieve comprehensive development of children and prepare them for school. Usually, kindergartens in Egypt are located close to other service institutions, such as primary schools or religious centers.

Pre-school education is basically an urban phenomenon in Egypt. Although the enrollment rate in early childhood care and education was 24.4 % on the national level (UNDP

& Institute of National Planning 2010, p. 45), in Cairo 35 % to 40 % of the children aged 3-5 years attend nurseries and kindergarten schools (El Tawila 1997, p. 22).

When the provision of kindergartens is examined in the selected areas, El-Marg el-Qibliya has the highest level of provision followed by El-Nozha in terms of the number of kindergartens. They have ten and six kindergartens respectively. When these numbers are related to the beneficiaries who are the children in pre-school age, the result is completely reversed because the number of children in El-Marg el-Qibliya is ten times higher as in El-Nozha. This comparison reflects that El-Nozha is well-served as a formal well-planned area compared to the poorly served informal area of El-Marg el-Qibliya (Fig. 58). The comparison also reflects the extent to which kindergartens are over-burdened in El-Marg el-Qibliya as the number of children surpasses the capacity of the small number of kindergartens. Rather than unattached kindergartens, most of the schools in El-Nozha are private and language schools. Some of these schools require the child to complete two years of pre-school attendance before being admitted to grade one. Subsequently, El-Nozha is an over-served area in terms of the provision of kindergartens. The relatively high fees of these private schools are easily affordable for the well-off people who represent the majority of this area.

Although Ain el-Sira had been officially planned as a formal settlement, it is under-served in relation to the availability of kindergartens. This service is completely missing within its administrative boundaries. Two nearby kindergartens are poorly located from the perspective of the population living in this Shiakha, as they lie outside the administrative boundary of Ain el-Sira in the neighboring area Hadayek Zeinhom.

The area of El-Ma'desa has no kindergartens at all, neither within its boundary, nor up unto 300 meters around its boundaries. This may be explained by some barriers such as poverty or low standard of living which prevent most of the families from paying for such a service, or may reduce their access to transportation which is very bad in this area. Another barrier in this informal community may arise from the lack of understanding of the importance of kindergartens as an early childhood service. Accordingly, when a community is resisting a service, providers find it difficult to sustain their involvement (Ware 2012, p. 6).

To analyze and evaluate how close the proximity of the residential areas to kindergartens in four selected areas is, the study identifies three levels of accessibility:

- The residential areas within a distance of 150 m away from a kindergarten represent the areas of good accessibility.
- The residential areas within a distance of 150 – 300 m away from a kindergarten represent areas of medium accessibility.
- The residential areas within a distance of more than 300 m away from a kindergarten represent areas of bad accessibility.

Table 25 and Fig. 58 show the accessibility levels to kindergartens:

- El-Marg el-Qibliya achieved the best overall access rate as 54 % of its total residential areas are within a distance of 300 meter to the nearest kindergarten.
- El-Nozha is characterized by a lower degree of overall access. Here, 60 % of its total residential area lacks accessibility to kindergartens.
- While the accessibility to kindergartens is very bad in Ain el-Sira, where only 12 % of the residential areas are within 300 meters to the nearest kindergarten, the situation is even worse in El-Ma'desa, where all pre-school children live at a distance of more than 300 m from the nearest kindergarten.

Table 25: Accessibility to kindergarten in the analyzed areas 2006

Shiakha	**Distance (m)**	**< 150**	**150-300**	**> 300**	**Total built-up area (1000 m^2)**
	Accessibility	**Good**	**Medium**	**Bad**	-
El-Marg el-Qibliya	**Service area (1000 m^2)**	211	439	555	1,205
	Percentage	17.5	36.4	46.1	100.0
El-Ma'desa	**Service area (1000 m^2)**	-	-	401	401
	Percentage	-	-	100.0	100.0
El-Nozha	**Service area (1000 m^2)**	120	217	509	846
	Percentage	14.1	25.7	60.2	100.0
Ain el-Sira	**Service area (1000 m^2)**	7	38	332	377
	Percentage	1.8	10.1	88.1	100.0

Source: Calculated by the author

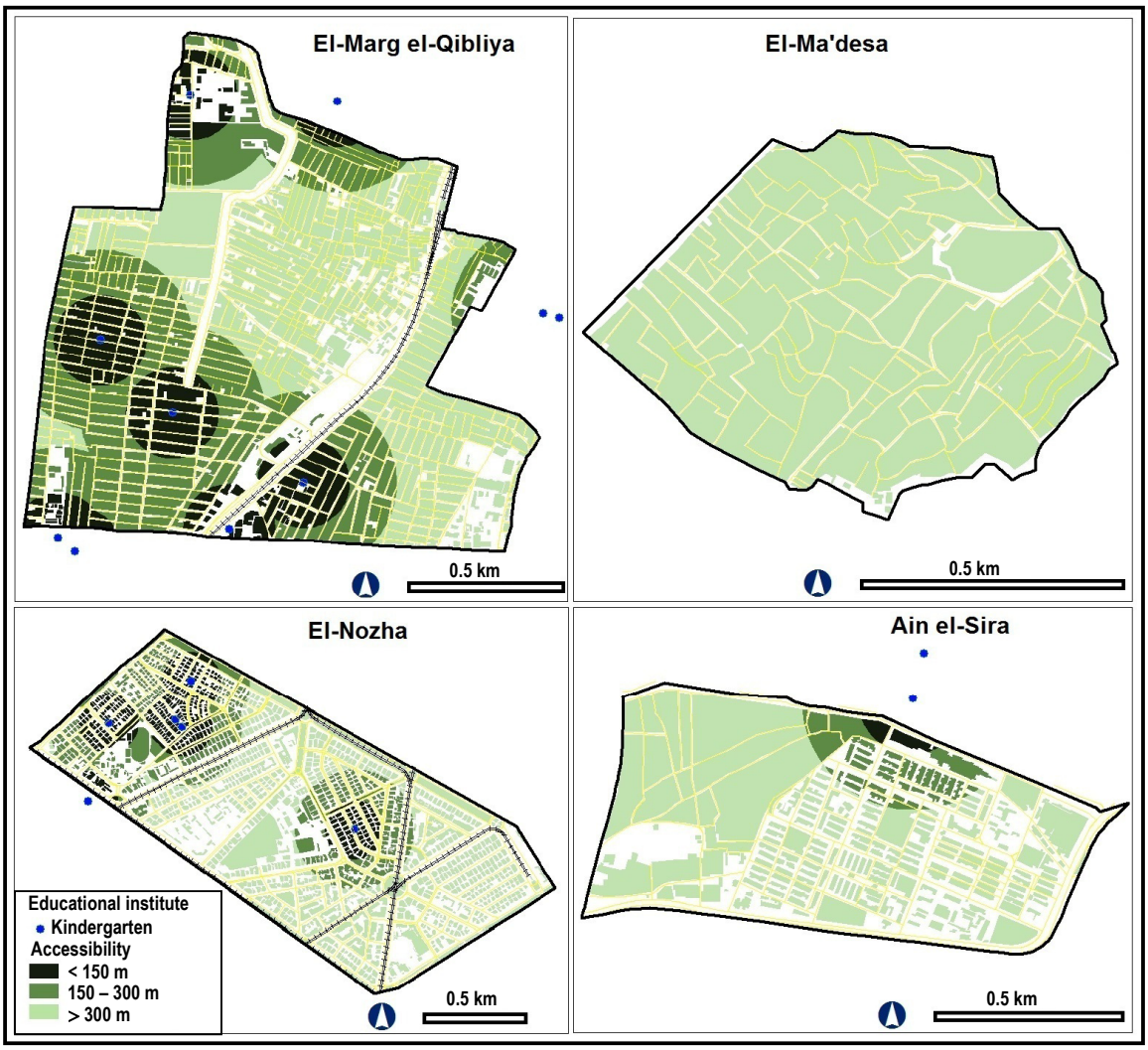


Fig. 59: Site and accessibility to kindergartens in the analyzed areas 2006

Source: Designed by the author

3.3.2.2 Provision and Accessibility to Primary Schools

Despite the fact that schools are central to the social geographies of everyday life, as they are one of the few institutions which can be found in almost every urban and suburban neighborhood, they have received less attention from geographers than institutions such as clinics and hospitals, despite the fact that, for most people, encounters with sites of medicine are rarer than encounters with sites of education (Collins & Coleman 2008, p. 281).

The study of school accessibility is important for at least three reasons. Firstly, access is important in terms of how it affects basic questions of fairness, i.e., the degree of spatial inequality when some children can walk to school and others have to endure long bus rides. Secondly, the accessibility to schools has important implications in terms of social

equity when students of lower socio-economic status have less access to schools. This is explored by analyzing the relationship between accessibility and socio-economic status. Finally, school access may potentially be related to student performance (Talen 2001, p. 466).

In Egypt, compulsory basic education starts at the age of six. It lasts nine years and covers the six-year primary education cycle and the three-year preparatory cycle.

The importance of measuring the physical accessibility to educational facilities in the four areas of study can be summarized as follows:

- In addition to the direct benefits of accessibility to a good school, children living close to a school obtain extra user benefits through shorter journey times and greater opportunities to participate in after-school activities. Pacione (1989) discovered a correlation between levels of accessibility and social class.
- Poor access to schools may impose time and transportation costs beyond the abilities of poor families to pay.
- Accessibility to basic education has been identified as a major indicator of human capital formation of a country or a region, which is an important determinant of its long-run rate of growth and a measure of development. In most developing countries of the world, educational attainment is the shortest way to escape from the poverty trap.
- An understanding of the conditions of education services in a region in terms of availability and accessibility will afford both education planners and other stakeholders in the society to be able to identify the existing lapses and to plan for the future improvement (Ajala & Asres 2008, p. 12).

Fig. 59 shows that the distribution of primary schools varies greatly among the shiakhat under study. Although El-Marg el-Qibliya and El-Ma'desa are both characterized by informal housing, the provision of primary schools between them differs considerably. Community initiatives in education, in terms of private schools in El-Marg el-Qibliya, compensate for the shortage of state schools. The private schools represent 76 % of the total number of primary schools in and around the boundaries of El-Marg el-Qibliya. The cheap prices of land and the high investment returns from private schools in such a former agricultural area together with the lack of state schools motivated private business men to invest in educational institutions. These private educational institutions are also offering the transport of the pupils in special buses to and from school. With more than 23,000 primary school-age children and the five state schools are overcrowded, over-

loaded and have a high student-teacher ratio. Contrary, in private schools, where tuition fees can in certain cases be up to ten-fold state schools, there are thousands of vacant places (Piffero 2009, p. 74).

In El-Ma'desa as a poor informal area, the state schools represent the sole option for the residents. The two nearby primary state schools are poorly located for the children because they lie up to 300 meter outside El-Ma'desa administrative boundaries. The situation appears worse when one considers that these two schools work double shifts and that the estimated rate of enrollment is 46.7 % among school-age children in this shiakha. The capacity of the two schools to cope with the large number of more than 9,000 primary school-age children is obviously not sufficient. Insecurity of tenure together with scarcity of vacant land in appropriate locations to establish new schools discourage investment in this area in terms of opportunities for establishing private schools.

Like El-Marg el-Qibliya, El-Nozha has six state schools and it is supplied with eight private schools. Despite these similarities, there are a number of marked differences between those two areas. Firstly, the state schools in El-Nozha work only one shift. Secondly, although the number of state schools is similar in the two studied areas, the number of primary schools-age children differs considerably and does not exceed 5,000 in El-Nozha. While state schools in El-Marg el-Qibliya have a high student-teacher ratio, state schools in El-Nozha tend to offer smaller classes. This may lead to better discipline in El-Nozha state schools with the result that students may achieve higher academic standards.

Ain el-Sira has only two primary state schools (Fig. 59). Taking into consideration that the number of primary school-age children in this area is approximately 6,500, it can be concluded that the schools are overcrowded and overloaded. Despite the fact that this area was planned, it encountered informal transformations represented in the slum pockets located inside the public housing and the nearby tanneries area. Such informal extensions have made the functioning of this service very poor and create unserviced parcels of lands.

To analyze and evaluate how close the proximity between the residential areas and the primary schools in the analyzed shiakhat is, three levels of accessibility are identified:

- The residential areas within a distance of 300 m from a primary school represent areas of good accessibility.

- The residential areas within a distance of 300 – 500 m from a primary school are regarded as areas of medium accessibility.
- The residential areas within a distance of more than 500 m from a primary school classified as areas of bad accessibility.

Fig. 59 and Table 26 show different degrees of proximity to the primary schools in the shiakhat under study:

Table 26: Accessibility to primary schools in the analyzed areas 2006

Shiakha	Distance (m)	< 300	300-500	> 500	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	684	456	65	1,205
	Percentage	56.8	37.9	5.3	100.0
El-Ma'desa	**Service area (1000 m^2)**	141	231	29	401
	Percentage	34.9	57.6	7.5	100.0
El-Nozha	**Service area (1000 m^2)**	556	236	54	846
	Percentage	65.7	28,0	6.3	100.0
Ain el-Sira	**Service area (1000 m^2)**	84	151	142	377
	Percentage	22.3	40.1	37.6	100.0

Source: Calculated by the author

- Primary schools in El-Nozha are not only adequately provided but they are also well-located. As a result, this area achieved the best overall access as two third of its total residential parcels are located within 300 meter of the nearest primary school.

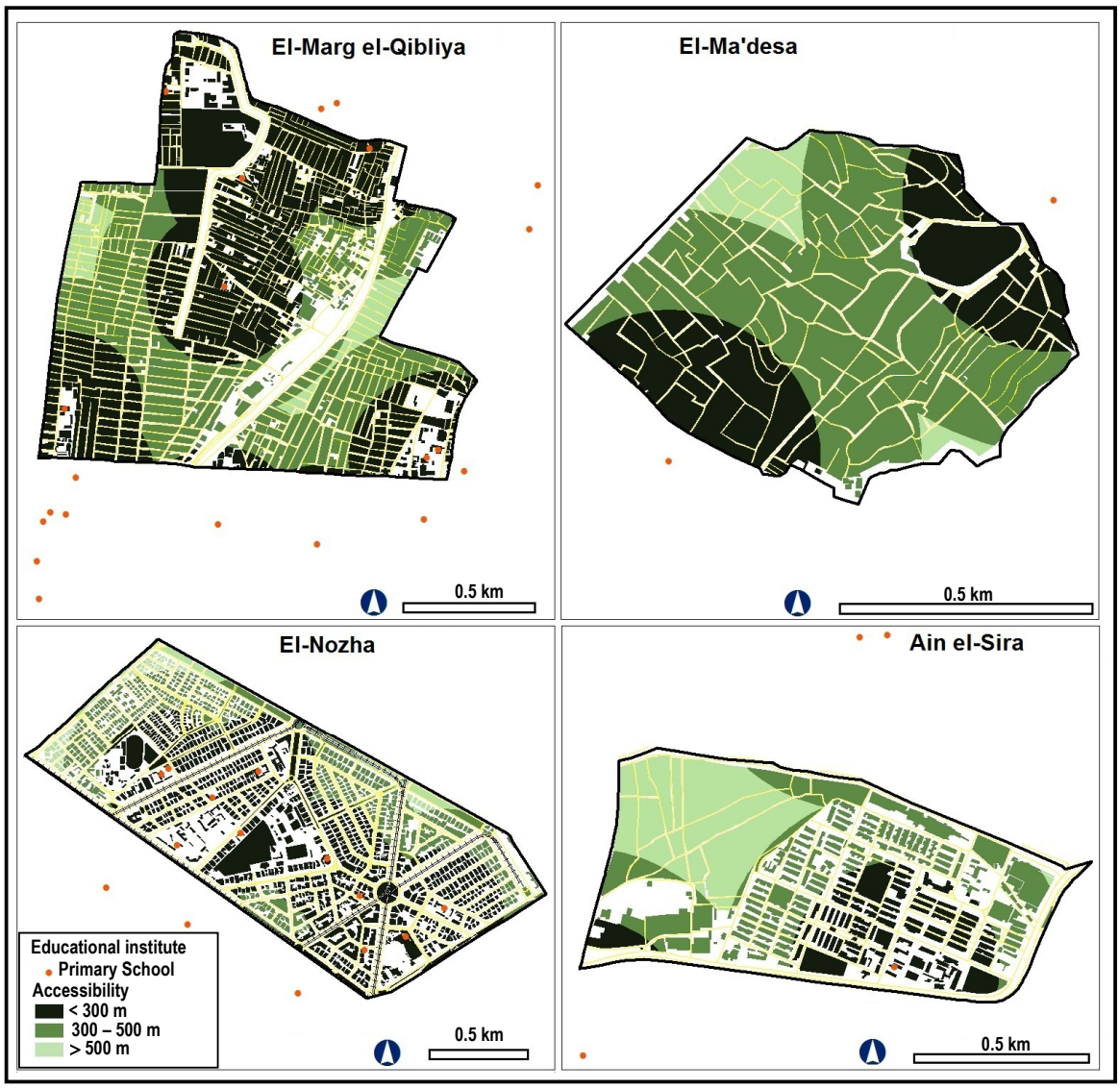


Fig. 59: Site and accessibility to primary schools in the analyzed areas 2006

Source: Designed by the author

- El-Marg el-Qibliya is comparable to a large extent to El-Nozha in terms of levels of accessibility to primary schools. Taking into consideration that enrollment differentials are influenced by socio-economic status (Chimombo 2005, p. 132), the school enrollment in El-Marg was noted to be lower compared with El-Nozha as it reached 81.7 % and 93.8 % in the two areas respectively. Provision of accessible schools can be a tool for increasing enrollments (Filmer 2004, p. 23).
- Significant poor accessible clusters exist in the tanneries area in the north western part of Ain el-Sira. The majority of the workers in these tanneries are children (Institute of National Planning & UNDP 2008, p. 133). Due to the causal relationship be-

tween child labor and school enrollment, only 66 % of the students in this area are enrolled.

- Although 57 % of the total residential area of El-Ma'desa achieved a moderate degree of access, the least accessible areas are notably located in the middle parts of this shiakha. The negative consequences of the meager accessibility are represented in gender disparities and discontinuation of schooling due to the distance to schools especially for girls from poor households. Schools for girls are not safely accessible on foot (Suliman & El-Kogali 2002, p. 11).

In general, access in the sense of geographic distance is not only a major problem in Ain el-Sira, El-Ma'desa and El-Marg el-Qibliya. The problem lies also behind the type and quality of school.

3.3.2.3 Provision and Accessibility to Preparatory Schools

Primary schooling is followed by three years of preparatory education. Mandatory basic education in Egypt was limited to the primary stage but was extended to the preparatory stage in 1991 (Assaad et al. 1998b, p. 6).

The most remarkable feature in the spatial distribution of preparatory schools is their location, in most cases, in close proximity to primary schools. As a result, the provision of preparatory schools is the same as the provision of primary schools, in terms of school ownership. School enrollment and the poor functioning of state schools across the studies areas resulted from the increase of school digestion of pupils. The problem of school dropout gets worse in the preparatory stage, as the likelihood of dropout is significantly lower before the age of 12 – i.e. the age at which the primary stage is completed – but significantly increases later on at the preparatory stage (Suliman & El-Kogali 2002, p. 24). The gender-partitioning starts during this stage, as there are schools for girls and schools for boys.

In Ain el-Sira, two preparatory schools are available, one for boys and the other for girls. In the outer areas, there are 4 schools, two for boys and one for girls and the fourth is a state experimental language school for both genders.

Five preparatory schools are existing in El-Marg el-Qibliya, two of them are state schools, two are private schools, and the fifth is an Azhary religious school. In the outer areas, there is only one private school.

No schools at all are located in El-Ma'desa. Only two state schools can be found in the outer areas.

El-Nozha is equipped with nine schools; one of them is an experimental language school, in addition to two state schools and six private schools. In the outer areas, there are 2 schools, one is governmental school and the other is private.

Although Fig. 60 and Table 27 reveal the high degree of accessibility among preparatory schools, this level of accessibility is misleading, if we take into consideration the type and quality of the schools.

Table 27: Accessibility to preparatory schools in the analyzed areas 2006

Shiakha	Distance (m)	< 500	500-750	> 750	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	954	224	27	1,205
	Percentage	79.2	18.5	2.3	100.0
El-Ma'desa	**Service area (1000 m^2)**	204	182	15	401
	Percentage	50.7	45.5	3.8	100.0
El-Nozha	**Service area (1000 m^2)**	737	109	0	846
	Percentage	87.1	12.9	0.0	100.0
Ain el-Sira	**Service area (1000 m^2)**	377	0	0	377
	Percentage	100.0	0.0	0.0	100.0

Source: Calculated by the author

3.3.2.4 Provision and Accessibility to Secondary Schools

Secondary education in Egypt includes general and vocational education. Vocational education is differentiating between industrial, commercial and agricultural schools.

As soon as students complete their basic education, their grades determine whether they may be accepted in general secondary schools or in vocational schools. After finishing vocational secondary education, the students get a diploma whereby they can be integrated in the labor market. General secondary school students are expected to complete their university education before joining the labor market.

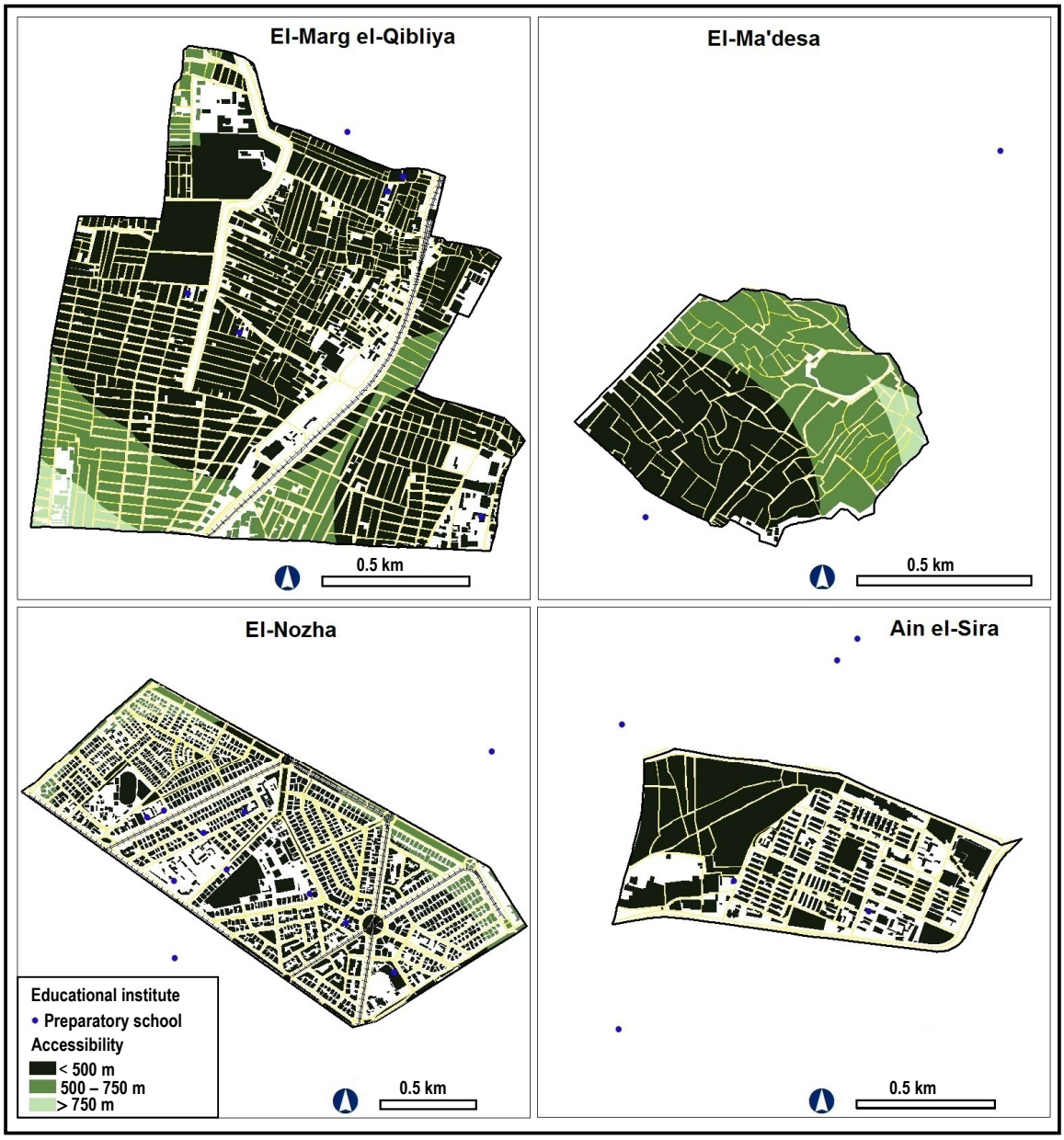


Fig. 60: Site and accessibility to preparatory schools in the analyzed areas 2006

Source: Designed by the author

Vocational secondary education represents the greatest share of absorptive capacity at the secondary level (36.7 % for general secondary education, 30.2 % for technical industrial education, 7.7 % for technical agricultural education, and 25.4 % for technical commercial education; Al Ahram Magazine, 29th November 2004).

The quality of education in relation to market demand continues to be a problem. Current education policy pushes more than 60 % of the preparatory completers towards technical secondary education, in which the unemployment rate is the highest. The enrollment in

secondary education reached 46.1 % in 2007/2008 (UNDP & Institute of National Planning 2010, pp. 20 - 21).

Public secondary education in Egypt is very weak, hardly equipping the one million students who graduate each year with the kind of skills required in the private economy (Sims 2010, p. 37).

As shown in Fig. 61, there are three schools in El-Marg el-Qibliya. Two of them lie within the boundaries, one is a general school for boys and the second is an Azhary school. The latter is equal to a general school. The third one is situated outside the boundaries and is a general school for girls.

On the other hand, in El-Ma'desa there is only one general secondary school for boys in the surrounding area.

The most remarkable feature in the distribution of secondary schools in the previously mentioned informal areas is the absence of accessible technical schools which are preferable for the poor who represent the majority of the inhabitants in these two areas. As a result, many parents, particularly of the poor families, make the rational decision to place their boys in informal workshops rather than in schools, knowing that through the traditional apprentice system they will at least end up with a marketable skill and can, hopefully, start their own business (Sims 2003, p. 19). Girls from poor households are significantly more likely not to attend school or even complete their secondary education due to the absence of accessible secondary school particularly in El-Ma'desa (UNDP & Institute of National Planning 2010, p. 5).

Contrariwise, Ain el-Sira is characterized by the diversity of secondary schools. One of them lies within the area and is a general school for girls. The other three schools are located in the surrounding shiakhat. They are general schools for boys, commercial schools for girls, and a common technical school. The proximity of Ain el-Sira to the city center promoted here the better level of accessibility to secondary schools compared with the peripheral areas of El-Marg el-Qibliya and El-Ma'desa.

El-Nozha enjoys a common general secondary school within its boundaries, and three schools out of range. The latter are two general secondary schools for boys and a commercial secondary school for girls. As a well-off planned area, the majority of its inhabitants are willing to place their children in general secondary schools in order to complete their university education.

Fig. 61: Site and accessibility of secondary schools in the analyzed areas 2006

Source: Designed by the author

To analyze and evaluate how close the proximity of the residential areas to the secondary schools is in the different shiakhat, the study identifies three levels of accessibility:

- The residential quarters within a distance of 750 m away from a secondary school represent areas of good accessibility.

- Medium accessibility is applied in residential areas located within a distance of 750 – 1000 m from a secondary school.
- The accessibility of residential areas situated within a distance of more than 1000 m away from a secondary school is classified as bad.

Fig. 61 and Table 28 indicate that the level of accessibility to secondary schools in both Ain el-Sira and El-Marg el-Qibliya is much better than in El-Ma'desa in particular where 88 % of its total residential areas lack accessibility to secondary schools. This level of accessibility is misleading taking into account the socio-economic situation of the population and the type and quality of education.

Table 28: Accessibility to secondary schools in the analyzed areas 2006

Shiakha	Distance (m)	< 750	750-1000	> 1000	Total built-up area (1000 m^2)
	Accessibility	Good	Medium	Bad	-
El-Marg el-Qibliya	**Service area (1000 m^2)**	750	205	250	1,205
	Percentage	62.3	17.0	20.7	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	48	353	401
	Percentage	0.0	12.1	87.9	100.0
El-Nozha	**Service area (1000 m^2)**	351	168	327	846
	Percentage	41.5	19.9	38.6	100.0
Ain el-Sira	**Service area (1000 m^2)**	298	79	0	377
	Percentage	79.0	21.0	0.0	100.0

Source: Calculated by the author

3.3.3 Provision and Accessibility of Health Services

The health system in the shiakhat under study is organized with some facility types offering specific services, and as such, there are significant differences in the services offered in terms of type of facility. Healthcare services are unevenly distributed among the population in the four analyzed areas. Fig. 62 shows the wide disparity between the shiakhat and the gap in healthcare provision.

Health services in the cases are provided through the following types of facilities:

- Public healthcare facilities in El-Marg el-Qibliya are limited to two rudimentary primary healthcare units and an ambulatory surgery center. The healthcare units provide free treatment services and they primarily provide immunization and family planning services. Immunization services are not provided in general or in district hospitals, which means that no facility does offer all services. Therefore, clients may have to visit several different facilities to meet all of the basic health needs of their families. Each healthcare unit is responsible for serving an average population of between 25,000 – 50,000 people. Government health centers in general, and in informal areas in particular, are very rudimentary equipped and most inhabitants must resort to the large private health sector, especially private specialized doctors and clinics, when they fall ill. However, the costs of these services, and the over-dependence on prescribing drugs for practically all conditions, means that for poor families illness can mean a serious financial crisis.
- Regarding the ambulatory surgery centers, they lie in between hospitals and clinics, in term of the level of service. These centers carry out surgeries which require that the patients will be able to leave the center within less than 24 hours. Such centers do not offer emergency services. Most of the population in the El-Marg District depends on El-Salam hospital which is considered to be financially burdensome. As a district hospital, El-Salam hospital was designed to serve the catchment population of between 50,000 and 100,000 people, while it serves virtually almost 600,000 inhabitants in both districts of El-Salam and El-Marg. This situation reveals how poorly El-Marg District is served in terms of public hospitals, and it reflects the importance of establishing a district hospital in the El-Marg District.
- Unlike El-Marg el-Qibliya, El-Nozha has adequate coverage and efficiency of public health services represented in four hospitals and a governmental health unit. These hospitals vary in terms of capacity and the quality of service. One of these hospitals is a general hospital with more than 200 beds. It contains all medical specialties and has a system for emergency transportation, thereby it can provide all relevant services. The other three hospitals are regarded as secondary or tertiary healthcare facilities and tend to be much more advanced in terms of technology and medical expertise in comparison with general and district hospitals (Ministry of Health and population, El-Zanaty Associates & ORC Marco 2005, p. 14). These hospitals charge modest user fees, however, they remain largely subsidized.

- As a central area, the poor population in Ain el-Sira is living closer to healthcare services than the poor population in suburban areas such as El-Marg and El-Ma'desa. Like El-Nozha, Ain el-Sira has adequate coverage and efficiency of public healthcare services represented in three district hospitals, three medical centers and two specialized hospitals. The latter are two teaching and research hospitals which belong to Cairo University. One of them is a pediatrics hospital and the other is a chest hospital.
- In El-Ma'desa, public healthcare services continue to fall short of demand. No public healthcare services are available within this area. The available services lie within the neighboring districts represented in a teaching hospital and ophthalmology hospital. The urban poor can find themselves unable to gain entry to the modern systems of hospitals, clinics and well-trained medical staff. Poor households suffer most since they have to walk long distances to catch the bus to reach the next healthcare center. When the poor succeed in receiving formal subsidized healthcare, such as health units, the care is likely to be insufficient to improve their health.

If it can be assumed that poorer Egyptians are sicker than richer Egyptians and thus are in greater need of health care, then this distribution of health institutions does not indicate that access to health care is equal for those of equal need (Rannan-Eliya et al. 1999, p. 20).

A comparison of the shiakhat in Fig. 62 illustrates the extreme variation in spatial accessibility to healthcare services when the residential locations are considered.

During the construction of the accessibility zones of healthcare services, the total level of medical services within the cases was assumed to be constant.

Based upon the hierarchy of the levels of the medical services in Egypt and the size of the population in the studied areas, it is obvious that an upgrading of some hospitals is required. Accordingly, the current ambulatory surgery center in El-Marg el-Qibliya should be transformed to a district hospital to serve efficiently the population of the district as a whole. A comprehensive reorganization of the health delivery services implies also establishing additional health clinics and medical centers which provide supplementary and complementary services.

A comparison of the figures in Table 29 illustrates the extreme variation in spatial accessibility to medical services for the population when the residential location is considered.

The proximity of Ain el-Sira to the city center promoted the relatively high level of accessibility for the whole population. Here, more than 97 % of the built-up area is located within 500 meter of the most comprehensive range of medical services.

Table 29: Accessibility to medical centers in the analyzed areas 2006

Shiakha	Distance (m)	< 500	500-1000	> 1000	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	388	492	325	1,205
	Percentage	32.2	40.8	27.0	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	45	356	401
	Percentage	0.0	11.1	88.9	100.0
El-Nozha	**Service area (1000 m^2)**	513	268	65	846
	Percentage	60.7	31.7	7.6	100.0
Ain el-Sira	**Service area (1000 m^2)**	368	9	0	377
	Percentage	97.5	2.5	0.0	100.0

Source: Calculated by the author

The worst levels of accessibility to healthcare services were attained in both El-Ma'desa and El-Marg el-Qibliya, in terms of physical distance. 73 % of the population in El-Marg el-Qibliya is living within 1000 meter of the nearest medical services, but these services are of a low quality. In other words, although healthcare services would appear to be convenient, the poor do not necessarily have access to these services.

Even if the poor are able to access these services, the quality of healthcare they receive is likely to be grossly inadequate. The situation is worst in El-Ma'desa where 88 % of the residential area is located more than 1000 meter from the nearest medical service institution.

In addition to the insufficient health services in both El-Marg el-Qibliya and El-Ma'desa, the accessibility for cars is very bad. Therefore, residents have to walk a relatively long distance to reach the bus station and other transport facilities.

Fig. 62: Site and accessibility to medical centers in the analyzed areas 2006

Source: Designed by the author

3.3.4 Provision and Accessibility to Fire Brigade Centers

The outbreak of fire in a settlement is one of the most serious emergency situations with its sudden and potentially fatal character. Providing immediate and effective response to fire is important because of the emergency in a situation that poses an immediate risk to health, life, property or the environment.

The location of the emergency facilities has an impact on the immediate response (Hacioğlu 2010, p. 10).

Considering that fire station are an essential part of neighborhood design, the most important indicator to evaluate the performance of fire services is accessibility in a-four-minute targeted response time (Hacioğlu 2010, p. 89).

Fig. 63 and Table 30 underline the insufficiency of the spatial distribution of fire stations, particularly in El-Ma'desa and El-Marg el-Qibliya.

El-Ma'desa completely lacks fire fighting system and El-Marg el-Qibliya has meager access to fire fighting facility because the majority of its residential area is located at a distance of more than 1000 meter from the nearest fire brigade facility. Taking into consideration the various factors influencing the response time such as settlement character including road network, density of population and quality of the building stock, the response time in case of fire accidents can be expected to be far too long in both El-Marg el-Qibliya and El-Ma'desa.

Table 30: Accessibility to fire brigade centers in the analyzed areas 2006

Shiakha	**Distance (m)**	**< 750**	**750-1000**	**> 1000**	**Total built-up area (1000 m^2)**
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	321	272	612	1,205
	Percentage	26.7	22.6	50.7	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	0	401	401
	Percentage	0.0	0.0	100.0	100.0
El-Nozha	**Service area (1000 m^2)**	241	194	411	846
	Percentage	28.4	22.9	48.6	100.0
Ain el-Sira	**Service area (1000 m^2)**	344	32	21	377
	Percentage	91.6	8.4	0.0	100.0

Source: Calculated by the author

Due to the close positioning of housing, in case of a fire accident in one building, it is likely to spread hastily to the adjacent ones. In addition, the compact layout of buildings combined with the narrow street network block fire engines from gaining access to the internal parts of the settlement.

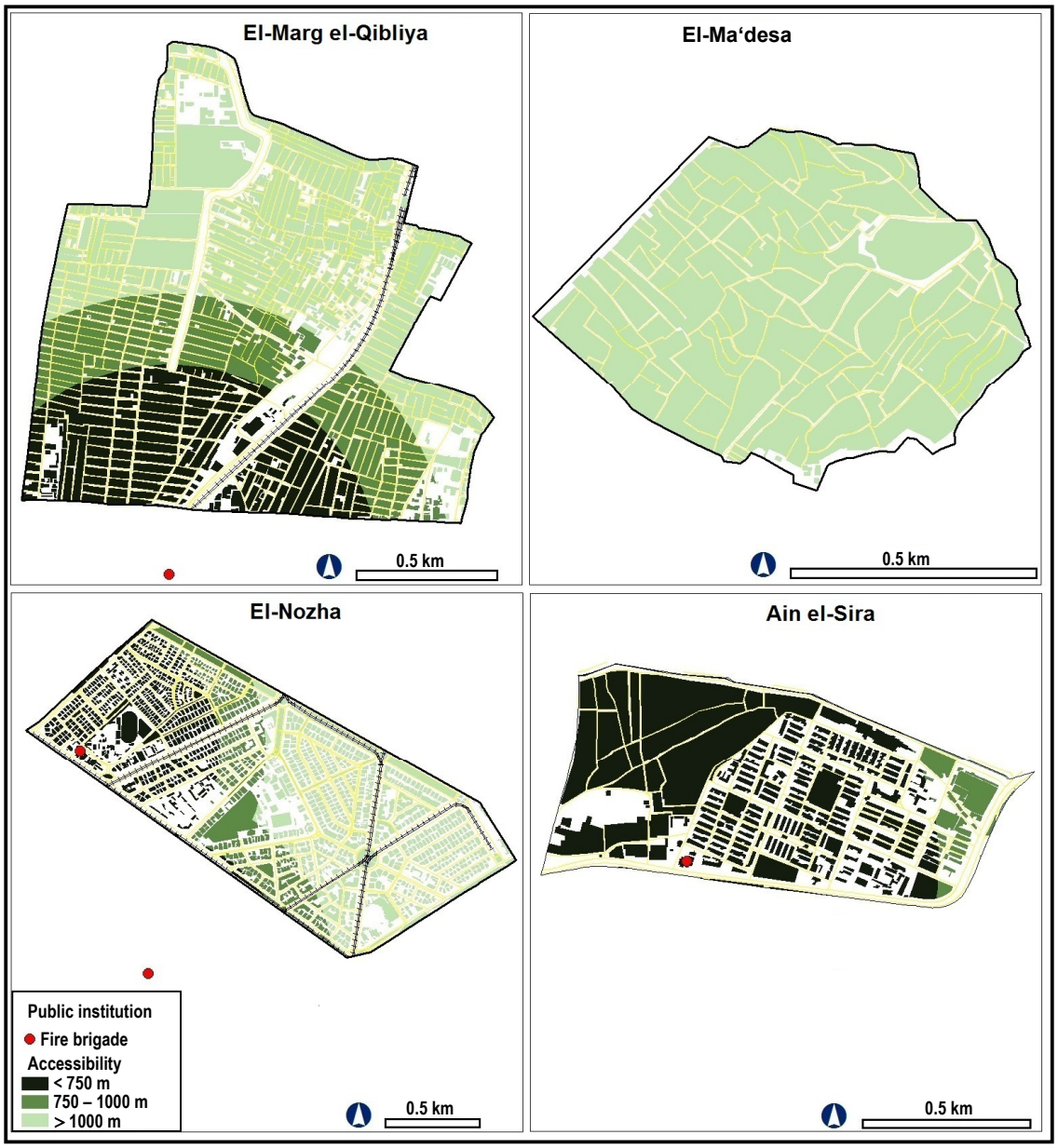


Fig. 63: Site and accessibility to fire brigade centers in the analyzed areas 2006

Source: Designed by the author

The road conditions in these shiakhat are too obstructive for fire engines where too many open sewage pits, deep water holes and garbage heaps are spreading out and where

often the lanes are too narrow (Kenawy 2005, p. 52). Therefore, these poor conditions have a fundamentally negative impact on the urban quality of the neighborhood and subsequently the response time.

An urban area with high population, high road traffic rate, diverse land use, and heterogeneous human activities has a high demand for public facilities, including emergency facilities (Mahmud & Indriasari 2009, p. 92).

Similar to El-Marg el-Qibliya, almost one half of the total residential area of El-Nozha is located more than 1000 meter from the nearest fire brigade center.

Despite this similarity, there is a marked difference in terms of settlement character. El-Nozha was planned with straight and wide boulevards, a radial access road network, large plots, and a relatively high standard of housing that can easily be accessed. Based on these planning advantages, the response time is shorter for areas of more than 1000 m distance from the nearest fire brigade facility in El-Nozha compared to El-Marg el-Qibliya.

Although El-Ma'desa and Ain el-Sira are comparable in terms of the total built-up area, more than 91 % of the built-up area in Ain el-Sira lies at a distance of less than 750 m from the nearest fire brigade. As a public housing project, public services were planned and constructed during the early stages of this project.

3.3.5 Provision and Accessibility to Police Stations

Although police protection is closely interrelated with the socio-economic status of the population and the neighborhood crime rates (Thacher 2011, p. 286), it is irrelevant to the population size of the cases. Data presented in Table 31 and Fig. 64 show that the picture is very different when the studied areas are compared.

- The distribution of police protection varies between formal and informal areas. With a population of about 42,000 inhabitants, the most severely disadvantaged area is El-Ma'desa which receives no police protection at all. When the rate of crime is considered, the level of deprivation is exacerbated. This contributes to the negative image of informal areas which are often stigmatized and associated with high crime rates (DPD & GTZ 2011, p. 28).

Squatter settlements present a favorable environment for criminals and outlaws, because these areas provide them with a safe haven from police force, due to the difficulties of controlling these areas and knowing their roots in advance (Dewidar et al. 2009, p. 396).

Although criminal cases have not been mentioned in this study, one can generally argue that the higher density character of the settlement and the higher activity intensity within such spaces have provided a sense of self protection against crime. In areas where state protection has failed, the communities are characterized by applying a high level of social-control and an expansive right for self-defense. Therefore, most of the residents perceive informal areas as relatively safe environments, with occasional nuisances such as traffic accidents, hustling, or harassment (Shehayeb 2009, p. 38).

Table 31: Accessibility to police stations in the analyzed areas 2006

Shiakha	**Distance (m)**	**< 750**	**750-1000**	**> 1000**	**Total built-up area (1000 m^2)**
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	284	285	636	1,205
	Percentage	23.5	23.7	52.8	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	0	401	401
	Percentage	0.0	0.0	100.0	100.0
El-Nozha	**Service area (1000 m^2)**	474	268	104	846
	Percentage	56.0	31.7	12.3	100.0
Ain el-Sira	**Service area (1000 m^2)**	368	9	0	377
	Percentage	97.7	2.3	0.0	100.0

Source: Calculated by the author

– The most advantaged area is Ain el-Sira. It has only one police station, but it is centrally located so that 98 % of the total built-up area lies within 750 m of the nearest police station which has a significant impact upon faster response time. Here, the provision of protection through the police infrastructure is suitable for the size of the population in this area of approximately 37,000 inhabitants in 2006.

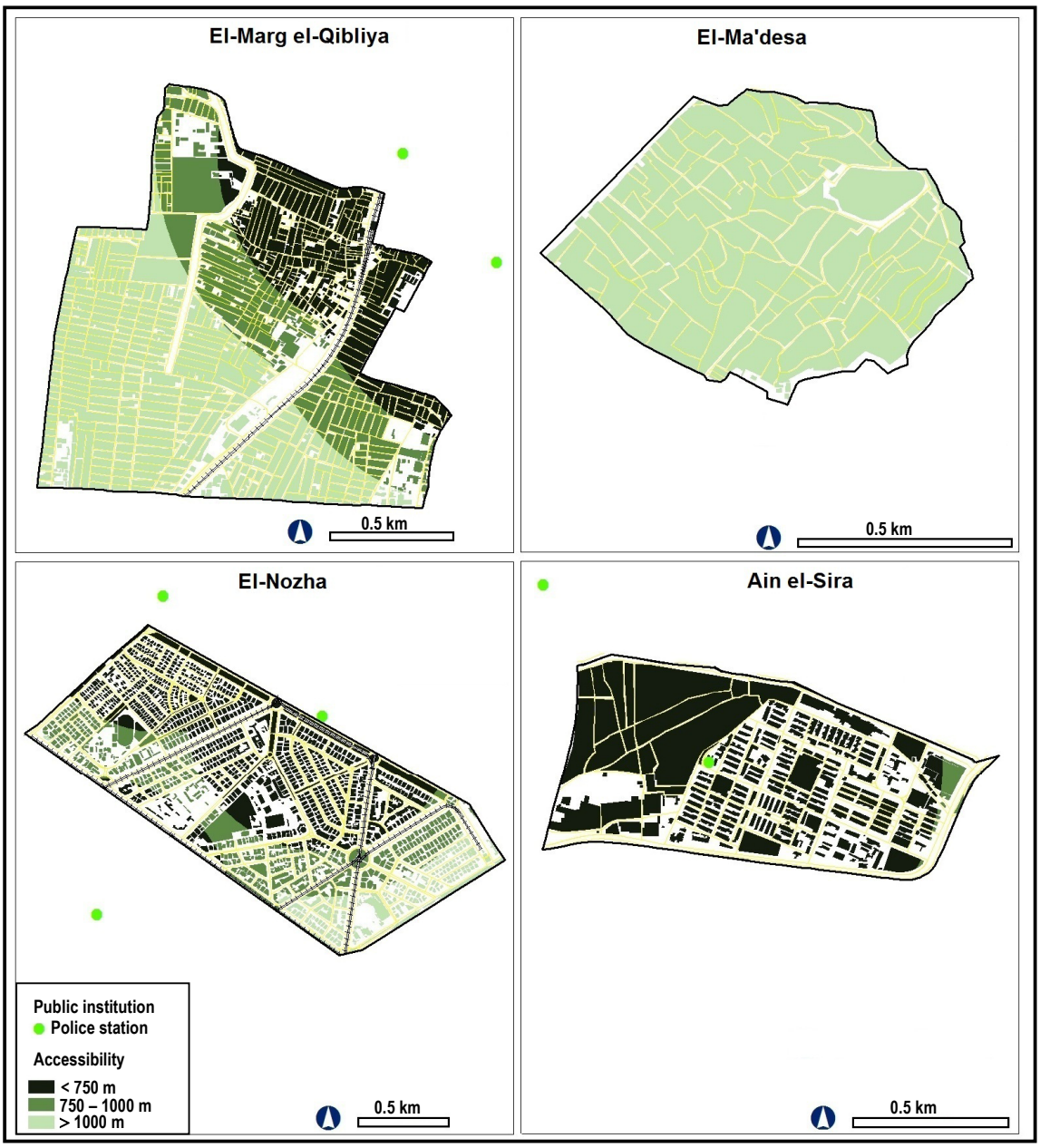


Fig. 64: Site and accessibility to police stations in the analyzed areas 2006

Source: Designed by the author

– With a total population of about 114,000 residents, police protection in El-Marg el-Qibliya is limited to one police station and a small police office. The police station was established to serve the El-Marg District as a whole with a total population of more than 500,000 residents.

This implies the dire need to construct at least one new police station in this shiakha because the two available facilities are poorly located outside the border of this area. Therefore, the majority of the total built-up area has bad access to police protection.

- El-Nozha, as a well-off area, is favored in terms of police services and protection against crime. In addition to the El-Nozha police station and the other two mini-stations in the neighboring area, it is distinguished by the availability of adequate street lighting.

3.3.6 Provision and Accessibility to Post Offices

In addition to postal services, post offices in Egypt offer a wide range of services especially for low-income people. These services include various governmental, social and financial services.

According to Table 33 which compares the number of post offices with the size of the population in each shiakha, it is clear that there is a lack of postal services in the studied areas with the exception of El-Nozha. The level of dearth with respect to the high size of beneficiaries is exacerbated in the informal areas represented by El-Ma'desa and El-Marg el-Qibliya. With a total population of 114,000 inhabitants, El-Marg el-Qibliya is poorly served with post offices which are limited to only one branch. This branch is poorly located within the surrounding zone as shown in Fig. 65. Accordingly, 85 % of the total built-up area suffers from poor accessibility to post offices (Table 32). According to the criteria used in Table 33, there is an insistent need to establish further seven post offices. The lack of available branches puts also a heavy load on the existing branches, in the light of various services offered by post offices.

- Within the context of the continuous shortage of community facilities, El-Ma'desa has no post offices according to the access criteria used in this study.
- El-Marg el-Qibliya and Ain el-Sira have only one post office for each, but this is well located at the center of the shiakha. Accordingly, more than three quarters of the total built-up area are located within a distance of 500 m from the nearest post office. Nevertheless, there is a need of one more post office to match the size of the population.
- Although El-Nozha is in a favorable position in terms of the number of post offices, the majority of its built-up area is located within a distance of more than 500 m from the nearest post office.

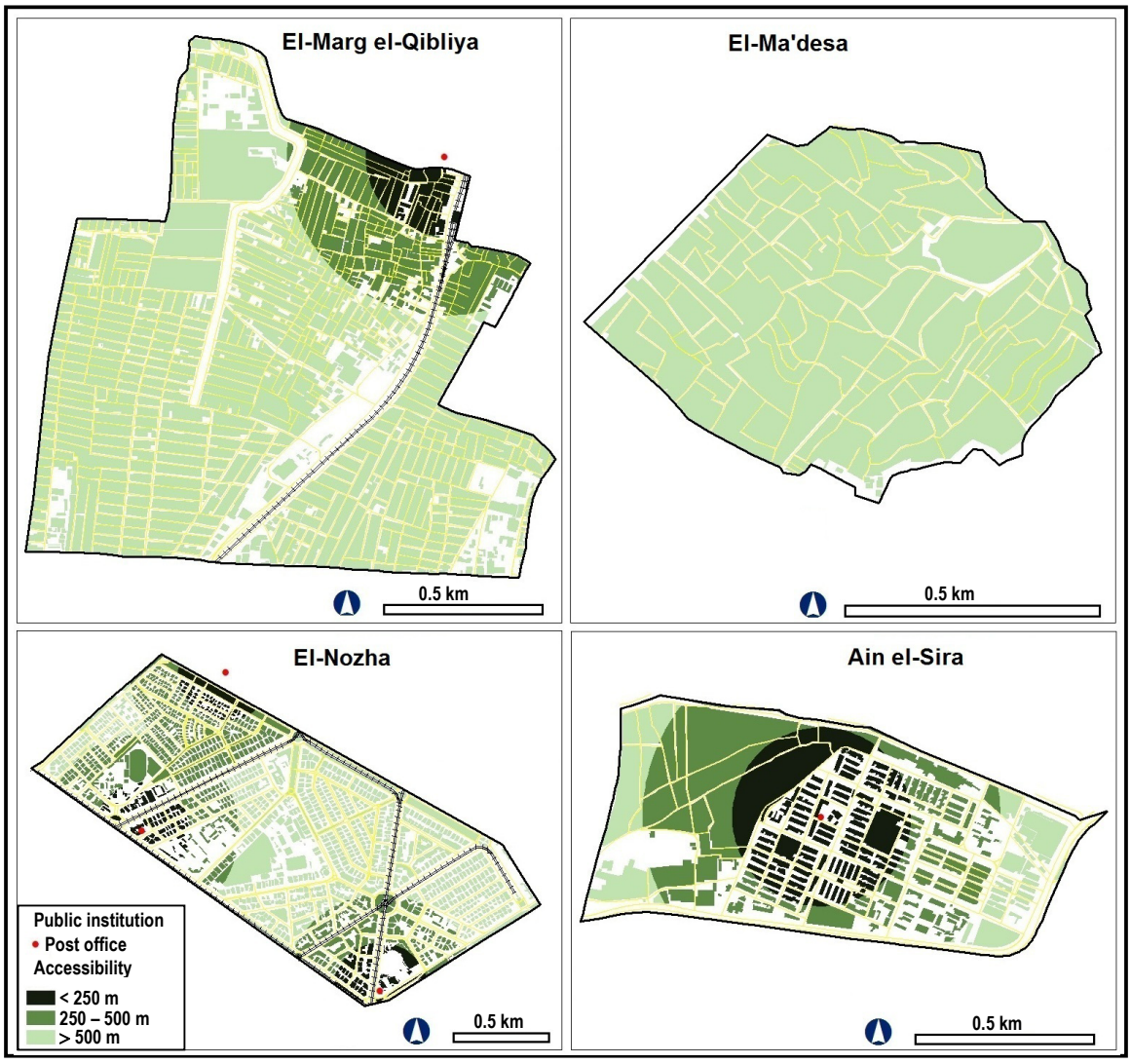


Fig. 65: Site and accessibility to post offices in the analyzed areas 2006

Source: Designed by the author

Table 32: Accessibility to post offices in the analyzed areas 2006

Shiakha	Distance (m)	< 250	250-500	> 500	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	38	138	1,029	1,205
	Percentage	3.1	11.5	85.4	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	0	401	401
	Percentage	0.0	0.0	100.0	100.0
El-Nozha	**Service area (1000 m^2)**	90	296	460	846
	Percentage	10.6	34.9	54.5	100.0
Ain el-Sira	**Service area (1000 m^2)**	110	182	85	377
	Percentage	29.2	48.1	22.7	100.0

Source: Calculated by the author.

Table 33: The required number of police stations and post offices according to the population size

Population size (1000) / **Number of public facilities**	**5**	**10**	**30**	**70**	**100**
Police station	-	-	1	1	2
Post office	-	1	2	4	8

Source: Kenawy 2005, p. 72

3.3.7 Provision and Accessibility to Recreational Facilities

3.3.7.1 Provision and Accessibility to Parks

Green spaces are an important aspect of urbanization because they are an indicator of quality of life. Cairo, as one of the mega cities of the developing world, experienced an extraordinary growth of unplanned and informal settlements, which resulted in increasing social and spatial inequality and environmental degradation. It also forced the municipality to limit the size of green areas in favor of other types of land use.

As a result of this undervaluation of green spaces as a luxury, an unfair distribution and access to green areas is experienced within many shiakhat.

In the context of public services, the research focuses on urban parks designated by the municipality. Parks are particularly important for lower-income residents who rely on public green spaces for the majority of their leisure and recreational activities.

In general, the users of green spaces prefer areas which should be nearby, attractive, and large. However, after the distance was taken into account, the size and amenities were considered more important for encouraging use than the attractiveness (Wendel et al. 2012, p. 273).

The rapid population growth in Cairo outpaced the areas designed as parks and thus unfair distribution was exacerbated between inner and outer districts. Currently, Cairo is notorious for its lack of greens space per inhabitant. According to the "Ministry of State for Environmental Affairs", green areas in Cairo Governorate covered approximately 393 ha in the year 2010, which means per capita of 2 m^2 (Ministry of State for Environmental Affairs 2012, p. 243). Comparing the satellite images of Cairo and other world cities, this problem is clearly visible. Statistics also show a severe shortage in green areas compared to both international criteria and the local criterion for New Towns in Egypt. International planning criteria for green areas were rendered to 10 – 18 m^2 per capita, while the local criterion for New Towns in Egypt ranges between 11 m^2 and 13 m^2 (El-Zafarany, undated, p. 1).

The distribution of green spaces in Cairo, with special reference to the studied areas, reveals not only the lack of green spaces, but also the unfair distribution of such areas among the districts. The green area per person ranges from 6.03 m^2 in El-Nozha to 2.8 m^2 in Misr el-Kadema, 0.096 m^2 in Manshiet Nasser, and 0.016 m^2 in the El-Marg District (El-Zaafarany, undated, p. 7).

Fig. 66 demonstrates that no parks are located within the borders of the studied shiakhat. Accordingly, opportunities to visit them are rare. Providing neighborhood parks in the congested areas is vital for their function as recreational areas for the local population to congregate and socialize (Oh & Jeong 2007, p. 25). Nevertheless, the parks in the analyzes areas are found to be inadequately distributed in relation to the population density.

In El-Marg el-Qibliya with about 114,000 inhabitants, urban parks are completely missed. Only few green land pockets used for agriculture still exist. Table 34 reveals that only 11.5 % of the residential area in El-Nozha and 9.3 % in Ain el-Sira can benefit from neighborhood parks situated within a radius of 500 m.

Considering that parks within a walking distance of 1000 m are still reachable for residents, El-Nozha achieved the best overall access to green spaces with more than 70 % of its built-up area situated within a distance of less than 1000 m to the nearest park. In addition, quite a number of neighborhood gardens are existing here between the residential blocks.

Despite the informal character of El-Ma'desa, it has the great advantage of being located near Al-Azhar Park. This is a district park with an area of 32 ha. This park is assumed to serve a radius of about 5 km. In other words, the service area of this park may extend to serve El-Ma'desa. This park was built on an old-open informal landfill in some of the poorest districts of Cairo (Duquennois & Newman 2009, p. 24).

Taking into consideration the low standard of living in these areas and the entrance fees to the park, financial limitations are likely to hinder the frequent utilization of this park by the poor who represent the majority of the inhabitants of El-Ma'desa.

Finally, it is clear that the number and locations of parks in the studied shiakhat are deemed to be insufficient, especially in informal areas.

Table 34: Accessibility to parks in the analyzed areas 2006

Shiakha	Distance (m)	< 500	500-1000	> 1000	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	0	0	1,205	1,205
	Percentage	0.0	0.0	100.0	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	111	290	401
	Percentage	0.0	27.8	72.2	100.0
El-Nozha	**Service area (1000 m^2)**	96	500	250	846
	Percentage	11.5	59.0	29.5	100.0
Ain el-Sira	**Service area (1000 m^2)**	35	183	159	377
	Percentage	9.3	48.6	42.1	100.0

Source: Calculated by the author

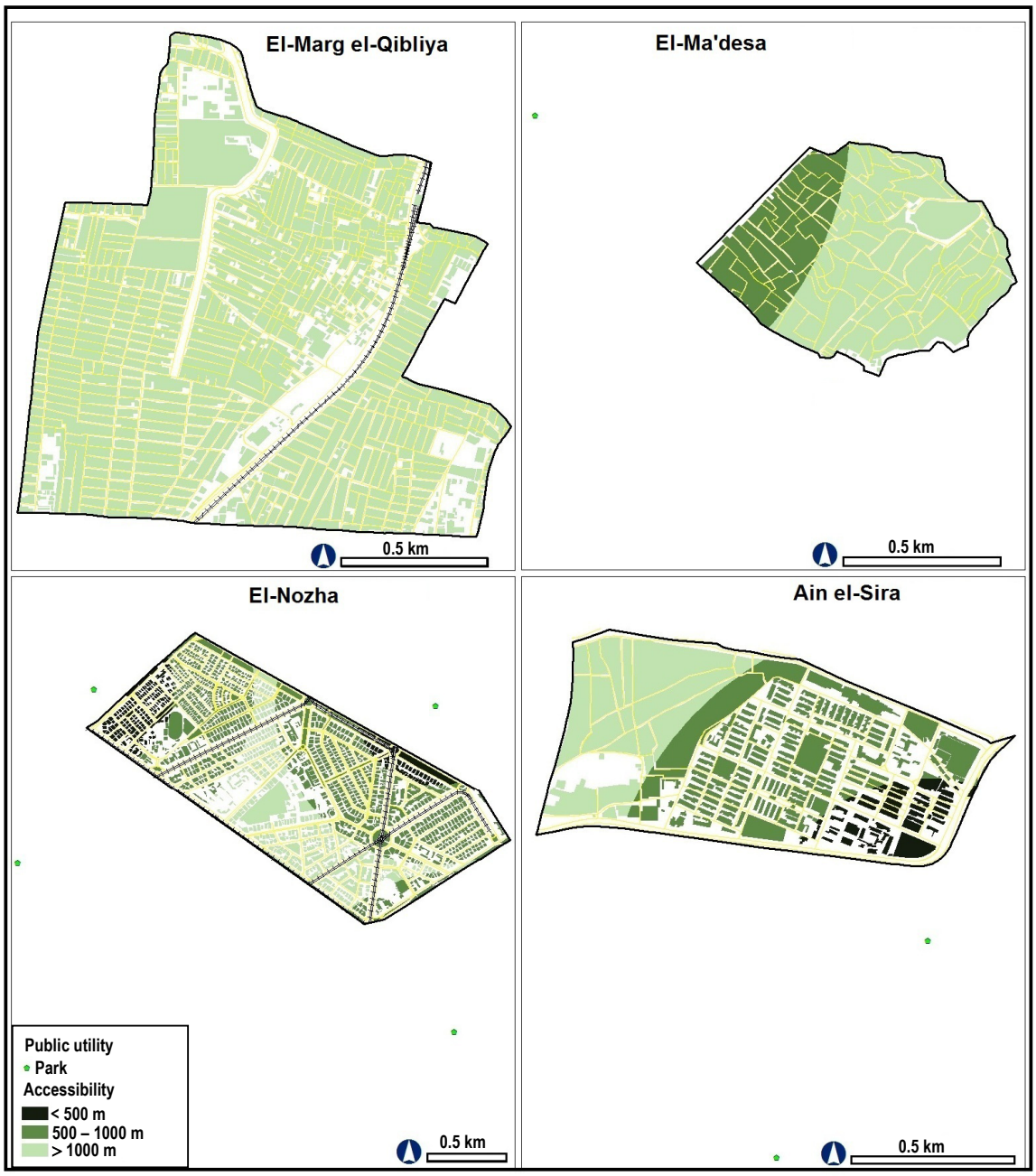


Fig. 66: Site and accessibility to parks in the analyzed areas 2006

Source: Designed by the author

3.3.7.2 Provision and Accessibility to Sport Facilities

Sport facilities include all facilities and sites allowing sport activities which are open to the public for free or not (Billaudeau et al. 2011, p. 115). Sport facilities in Egypt include playgrounds, youth centers and sport clubs.

Since the purpose of using recreational facility differs according to income levels, sport facilities and playgrounds for children and youths are needed more in low-income neighborhoods, while landscape and greenery are desired more by high income groups.

- Unfortunately, there is a dissociation between high-social-need and high-accessibility areas, where the proportion of children is irrelevant for the accessibility to playgrounds. Although the studied shiakhat have a high proportion of children, playgrounds are completely lacking in these areas. The proportion of children in the age of less than 15 years is high in informal areas represented by El-Ma'desa and El-Marg el-Qibliya reaching 33.9 % and 31.2 % respectively. It is slightly lower in Ain el-Sira with 26 % and reaches its minimum in El-Nozha with only 14.4 %.
- Considering that low-income people are less able to afford private recreational activities like sport clubs, they have a greater need for no-cost recreational facilities like playgrounds. For this population it is very difficult to raise the matching fund required by sport clubs. Having playgrounds closely located to such poor residential areas is likely to be particularly important for ensuring children's access to safe play spaces (Smoyer-Tomic et al. 2004, p. 292).
- Provision of public playgrounds should be higher to meet the needs of children in areas with a high proportion of attached dwellings because these types of residences typically have less private space (Smoyer-Tomic et al. 2004, p. 292). These buildings lack entirely nearby courtyards. The children play at the streets which are of poor surface conditions and they are sometimes the cause of nuisance to surrounding neighbors. Accordingly this problem is very serious in El-Ma'desa and El-Marg el-Qibliya. Playgrounds and open spaces for leisure activities are given least priority in funding and land allocation in informal areas (DPD & GTZ 2011, p. 20).

Fig. 67 and Table 35 show the distribution and accessibility of sport facilities in the shiakhat under study:

- Although El-Ma'desa has two youth centers, they are poorly located in the outer surrounding areas. Accordingly, 81 % of its total built-up area is situated in a distance of more than 1000 m from the nearest sport facility.

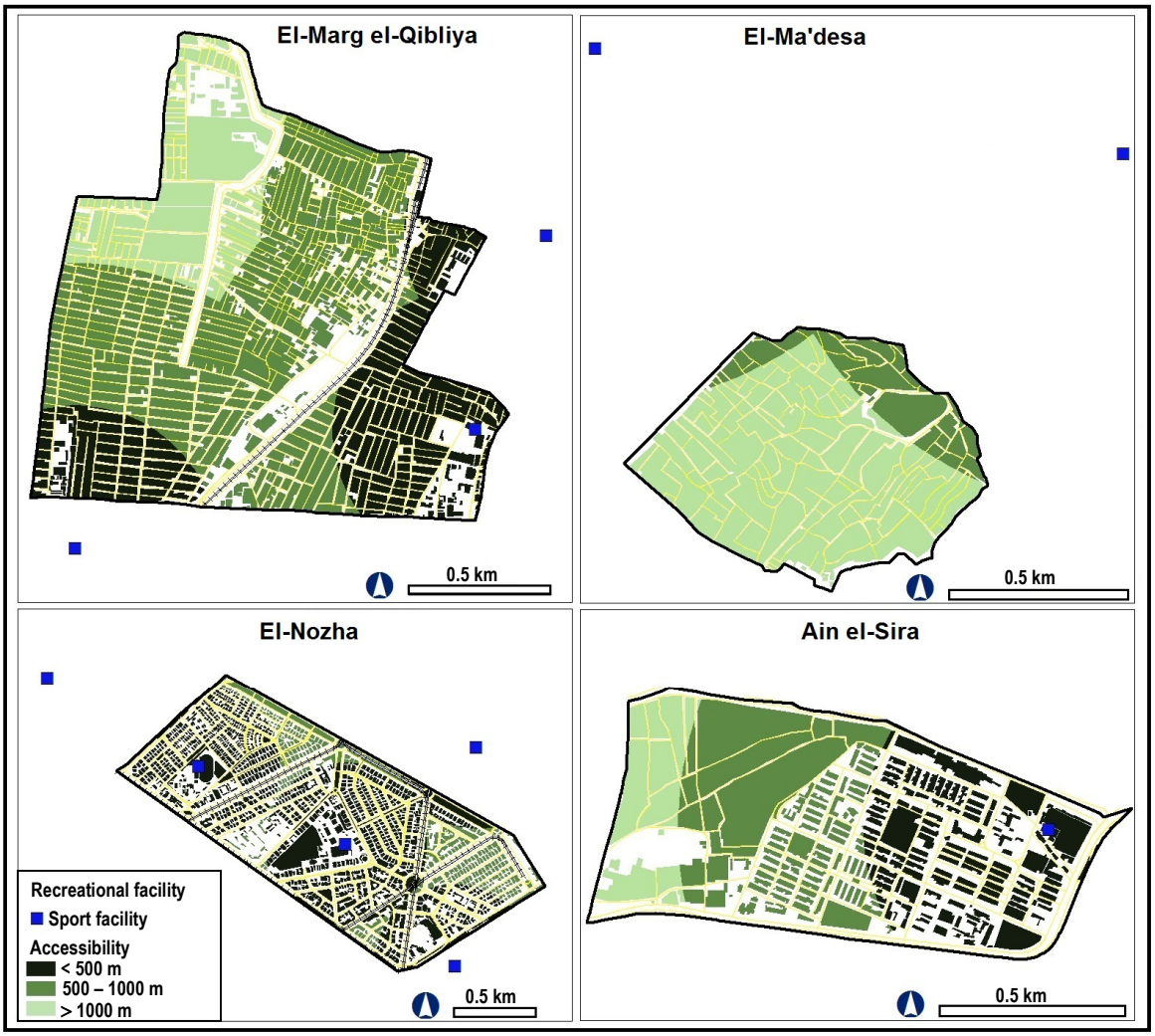


Fig. 67: Site and accessibility to sport facilities in the analyzed areas 2006

Source: Designed by the author

- Sport facilities in El-Marg el-Qibliya are represented by just one youth center, which is poorly located near the eastern boundary of this area; another youth center is to be found in the surrounding area. Municipal youth centers are one of the most important open spaces which offer a range of activities for visitors and members. In summer, they receive youths who cannot afford private clubs or a summer vacation. Most of the youths are male in age of 13 to 20 years or more. Unfortunately, youth centers suffer from the poor conditions of their playgrounds.
- While informal areas are characterized by a severe deprivation of sport facilities, El-Nozha as a well-off planned area has five private professional sport clubs. The clubs were built by rich investors to serve mainly the elite and wealthy middle class who have the capacity to pay for the use of such facilities.

Table 35: Accessibility to sport facilities in the analyzed areas 2006

Shiakha	Distance (m)	< 500	500-1000	> 1000	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	337	626	242	1,205
	Percentage	28.0	52.0	20.0	100.0
El-Ma'desa	**Service area (1000 m^2)**	0	77	324	401
	Percentage	0.0	19.1	80.9	100.0
El-Nozha	**Service area (1000 m^2)**	652	194	0	846
	Percentage	77.0	23.0	0.0	100.0
Ain el-Sira	**Service area (1000 m^2)**	117	189	71	377
	Percentage	31.1	50.1	18.8	100.0

Source: Calculated by the author.

The clubs are professional in terms of the availability of diverse sport facilities such as tennis courts, swimming pools, soccer fields, gyms and training rooms for muscle-building exercises, cardio-training, collective courses, as well as athletic facilities etc. In addition to the adequate provision of sport facilities, they are here well located because more than 77 % of the total built-up area is situated within 500 m from the nearest sport facility.

- Ain el-Sira has only one public sport club. This club is comparable to youth centers in terms of its accessibility to the urban poor. It is poorly located near the eastern boundary of this shiakha, leaving 69 % of the total built-up area located at a distance of more than 500 m from the nearest sport facility.

3.3.8 Provision and Accessibility to Religious Institutions

Religion plays a major role in Egyptian social and political life and has influenced the development of housing. In Egypt, 90 % of the total population are Muslims, and about 10 % are Christians. Provision of religious institutes was affected by the relative distribution of the population according to their religion.

Regardless the spatial distribution of mosques, their number is connected to the size of the population in the studied shiakhat. In other words, as the size of the population in-

creases, the number of mosques also increases. Mosques are needed to be located within an accessible walking distance from the residences of the inhabitants.

Before discussing the distribution of mosques in the analyzed areas, it is essential to clarify the importance of mosques especially in informal residential development.

The construction of mosques – a *masgid* or *zawiya*, i.e. a small mosque – done either by the community or by private developers, is a fundamental aspect in facilitating informal development in Cairo. Mosques ensure the installation of basic services within informal sites and facilitate residential development since they are prioritized in receiving water and electricity by the providers of public utilities on commercial terms (Runkel 2009, p. 56). In addition, they give a sense of security to settlers because the municipalities do not have the authority to demolish places for prayers (Soliman 2004, p. 183). Generally, mosques in informal areas are incorporated in the first floor of a building or built through mutual help on vacant land or on a site bought communally (El Sioufi 1981, p. 28).

Mosques act as community centers aside from their being religious establishments. Where state facilities are absent or too far away to be accessed by the inhabitants of informal areas, schools or at least literacy classes, kindergartens and health centers are sometimes associated to mosques and run by them. Such private initiatives compensate only partially for the lack of affordable public services (Piffero 2009b, p. 67).

The effective role of the mosque in the informal residential development is evident in the large number of mosques in El-Marg el-Qibliya with 101 mosques per square kilometer. The catchment area of each mosque does not exceed 10,000 square meter. As shown in Fig. 68 and Table 36, the scattering of mosques in El-Marg el-Qibliya resulted in adequate accessibility to mosques because 91 % of the total built-up area is situated within 150 meter of the nearest mosque. Churches are limited in terms of number and proximity because there are only two churches in El-Marg el-Qibliya. They are located in the southern part of the shiakha leaving the northern part poorly served with such religious institutions. In Ezbet el-Nakhl only one church is available in the surrounding areas.

As previously illustrated, El-Ma'desa lacks all types of public services and it is completely depending on the neighboring areas to get access to public services. The only available services within its boundaries are the religious establishments. The shiakha enjoys a fairly reliable number of mosques and churches. The most remarkable feature in the spatial distribution of the religious institutes is the concentration of mosques in the western part of this shiakha near El-Nasr freeway, where residents are predominantly Muslims.

Table 36: Accessibility to religious institutions in the analyzed areas 2006

Shiakha	Distance (m)	< 150	150-300	> 300	Total built-up area (1000 m^2)
	Accessibility	**Good**	**Medium**	**Bad**	**-**
El-Marg el-Qibliya	**Service area (1000 m^2)**	1,109	96	0	1,205
	Percentage	92.1	7.9	0.0	100.0
El-Ma'desa	**Service area (1000 m^2)**	196	137	68	401
	Percentage	48.8	34.2	17.0	100.0
El-Nozha	**Service area (1000 m^2)**	370	373	103	846
	Percentage	43.7	44.1	12.2	100.0
Ain el-Sira	**Service area (1000 m^2)**	187	172	18	377
	Percentage	49.6	45.6	4.8	100.0

Source: calculated by the author.

Churches concentrate in the eastern part, where the majority of inhabitants are Christians. In addition to the significant role of the mosque in informal residential development, the church plays the same role particularly in El-Ma'desa. With the establishment of the Coptic church in 1975 in this area, people started to feel more secure about the issue of eviction and, accordingly, they started making substantial investments in permanent forms of housing and using permanent materials.

The Christian inhabitants have extended the role of the churches beyond worship and spiritual guidance to offering educational and recreational services to the various age groups within the community, both of them had been lacking (Assaad 1998a, p. 4).

In Ain el-Sira, religious institutions were represented by 7 mosques within the area and 11 mosques within a range of 300 m outside the area. Unlike informal areas, the mosques in Ain el-Sira are detached. As shown in Fig. 68, all mosques are located in the eastern planned part or in the governmental economic housing. In addition, some indigenous mosques were built in the spaces between the building (Fig. 69) due to inadequate religious services and to cope with the population growth in this area. Religious institutions are completely lacking in the informal western part where tanneries are located.

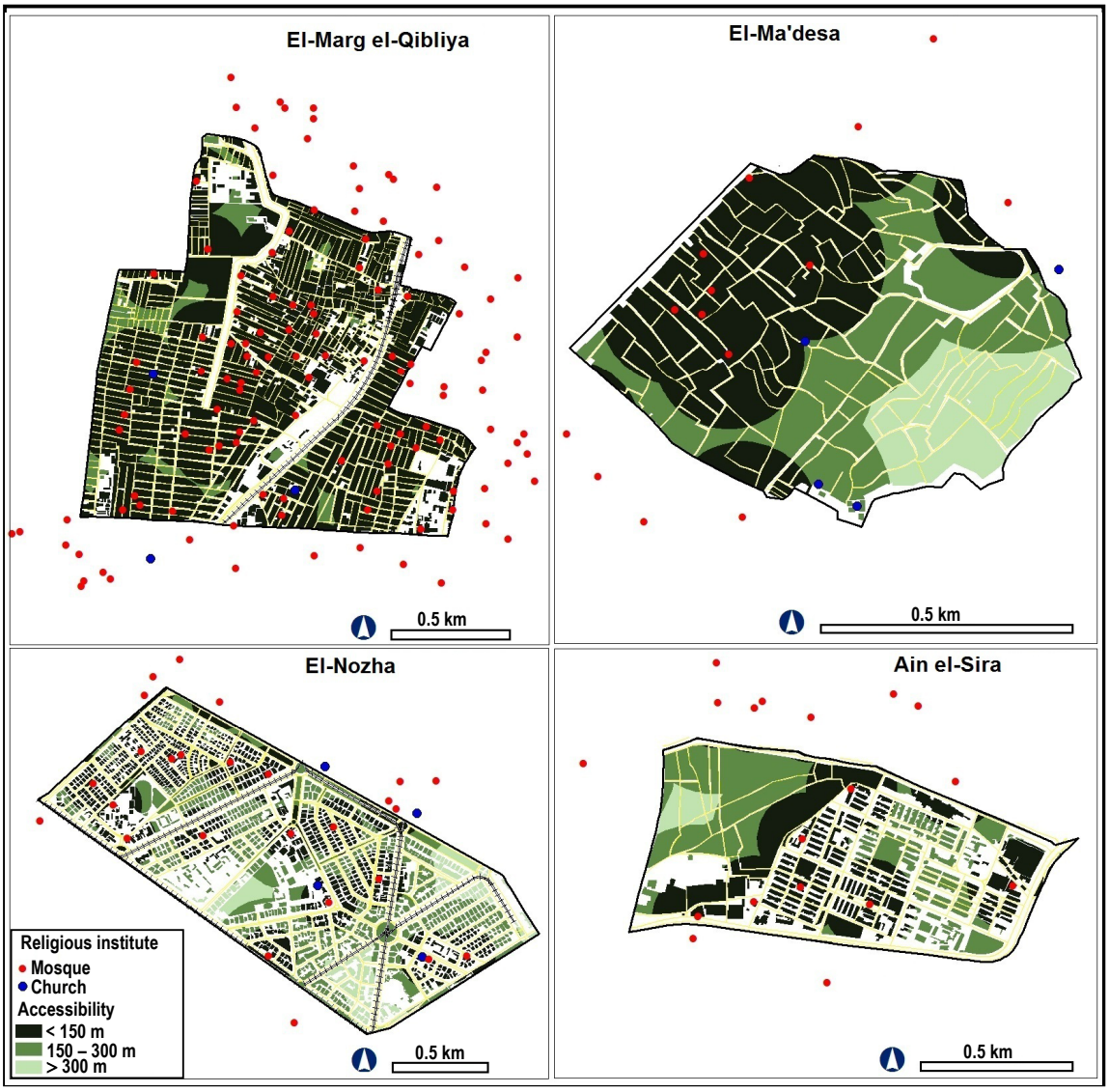


Fig. 68: Site and accessibility to religious institutions in the analyzed areas 2006

Source: Designed by the author

Fig. 69: Indigenous mosque in the spaces between the building blocks in the governmental housing of Ain el-Sira

Both Ain el-Sira and El-Nozha are comparable in terms of the detached mosques. Despite this similarity, there are a number of marked differences. Firstly, mosques in Ain el-Sira were built through mutual help, while they were built through official authorities in El-Nozha. Secondly, El-Nozha has 26 mosques compared to 18 mosques in Ain el-Sira, but Ain el-Sira achieved better accessibility to mosques which is reflected in the density of mosques per square km which reached 50 mosques compared to only 30 mosques in El-Nozha. Third, El-Nozha has four churches, two within the area and two outside.

3.3.9 Summary

This chapter has demonstrated the inadequate service provision which characterizes both informal and semi-informal areas in Cairo Governorate with the major consequences on the degree of accessibility to each type of services.

It has been shown that El-Ma'desa, as a squatter settlement with some kind of saturation in terms of horizontal densification and unavailability of buildable land, suffers from the scarcity of public land upon which public services can be constructed. Accordingly, any attempt to develop service institutions on its land is prevented, except for services which emerged simultaneously with the urban growth of the area viz. mosques and churches. This is due to the fact that land parceling and construction activities have been sporadic. Instead, individuals acted on their own without co-ordination or a comprehensive overview regarding future public requirements such as public service areas, recreational areas and the like. Saturation of the land together with narrow and irregular street pattern represent constraints to the economic provision of services in this area. Therefore, getting access to a good quality of public services is far more difficult in such an informal area.

Like El-Ma'desa, El-Marg el-Qibliya as a semi-informal area, or in other words an informal settlement on agricultural land, started off without any public infrastructure and social services. As the area matures and the number of inhabitants increased, horizontal expansion was unmanageable in terms of service provision.

Although community efforts have made notable results in the provision of basic services, public facilities are still problematic, since they require public land sites which is extremely scarce. Overall, the provision of services to an informal area such as El-Ma'desa may take decades and depends mainly on the pressures a community can put on local politicians.

Barring the tanneries area in the western part of Ain el-Sira, this Shiakha enjoys a better level of public service provision and accessibility compared to the other two informal and semi-informal areas due to its planned nature and its proximity to the center of the metropolis.

On the other hand, El-Nozha, as a formal planned well-off area, was developed with ample public and private service provision and adequate accessibility.

4 CONCLUSION, POTENTIAL LIMITATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The major challenge for the research was to clarify the differentiation among the housing patterns, thereby using Cairo as a case study.
This particular case study was chosen for two reasons:

- Cairo is one of the world's "mega-cities" and is beset by problems that are similar to most other large cities in the developing world.
- As the capital of Egypt, Cairo is the primary victim of the problems arising from the rapid population growth and urbanization in Egypt as a whole.

This thesis has made contributions to the understanding of different housing patterns in Cairo Governorate in the context of the successive housing policies within which these patterns have emerged, their population density, socio-economic characteristics, structural and functional composition as well as their provision and spatial accessibility to services.
This chapter summarizes the key findings of the study in the light of the established objectives and includes comments on the study's limitations. Finally, it explains perspectives for future research which are based upon the shortcomings of the current study and it recommends to expand the survey by including additional methods as a means to uncover further relevant factors for understanding the spatial differentiation in the housing structure of Greater Cairo.

4.1 Objectives Revisited: A Summary of Findings

This part explains how the research objectives have been met and discusses how each identified goal was accomplished.

4.1.1 Addressing Objective 1: Reviewing the Housing Policy of Egypt

With the objective to study the transition of the housing policy in Egypt in general and in Cairo in particular, the review of the theoretical approaches and the statistical sources on housing provision identified six stages of housing policy in Egypt in relation to six political regimes: From the pre-revolutionary phase during the first half of the 20th century, followed by the national state economy 1954 – 1974, the Open Door Policy 1974 – 1981, the neoliberal period 1981 – 2005, the reformist phase between 2005 and the beginning of the Revolution of January 2011 and finally the latest period until the end of 2013. Es-

pecially, the extremely important housing laws with particular reference to rent control were investigated in the context of each political regime.

From the investigation of the six stages, it was concluded that there has been a shift from capitalism to national state economy and then to liberal capitalism followed by neo-liberal capitalism.

This shift together with housing laws have affected the current housing patterns and the crisis in Cairo Governorate, where the expansion of public housing was related to the period of national state economy simultaneously with the establishment of the phenomenon of the squatting on state-owned land on the peripheries of the city. During the Open Door period, informal settlements expanded massively on private agricultural land in particular. Unfortunately, the New Towns policy on desert land, which was adopted during the Open Door period, had no effect at all on slowing down the growth of the informal settlements.

The liberalization of the economy during the neoliberal period stimulated an oversupply of both upper-income, luxury apartments and vacant housing units.

In conclusion, successive governments effectively tolerated, if not tacitly encouraged, informal settlements in Cairo as a cheap means of allowing ordinary Cairenes to house themselves at minimal expense to the state, thus preventing housing from becoming a source of political discontent.

Reviewing the legal framework revealed that three housing laws have played a leading role in shaping the current housing situation: The Old Rental Law 1969, the New Rental Law 1996 and the Mortgage Law 2001. The study showed also that rent control laws failed to achieve their legislative purpose.

4.1.2 Addressing Objective 2: Analyzing the Factors of the Housing Problem in Egypt

Based on the analysis of housing policy, it was recognized that the interaction between four key factors contributed to the evolution and development of the existing housing problems.

With the objective to analyze such factors, the relevant literature and statistical data on the elements of population growth in Cairo and Egypt – including births, deaths, natural increase and internal migration, age-sex structure and poverty data – as well as information on the development of the price of both building materials and buildable land were obtained. Based on the analysis of these data, it was concluded that the population of Cairo Governorate has grown four-folds during the last 60 years.

The massive rural-urban migration to Cairo Governorate mainly during the period of the National State Economy represented the major source for population growth during 1960s. Recent census data show a decline in the importance of rural-urban migration in Cairo's population growth in favor of natural increase. However, an intra-urban migration from the center of Cairo to its periphery is still dominating and contributing to the redistribution of the population in the governorate (see Fig. 11).

Furthermore, Cairo is experiencing a youth bulge with 30.6 % of the population in the age group 15 – 29 years by 2006. The analysis showed also that the increasing urbanization process under the dictate of poverty was accompanied by unfavorable economic circumstances regarding the housing sector and was combined with a continuous increase in the price of both building materials and buildable land during the six political regimes. While the government had fixed prices of construction material and buildable land during the phase of the National State Economy, the prices rose dramatically afterwards due to economic liberalization which triggered both monopolization and speculation.

The results show that the mentioned factors together with the inability of the official authorities to provide adequate housing units contributed to the aggravation of the housing problem in Egypt. These conditions shaped the emerging housing patterns during the last 60 years when squatter settlements spread over state-owned land, semi-informal settlements expanded in agricultural areas and formal settlements continued to transform and densify in what can be viewed as the informalization of the formal settlements.

4.1.3 Addressing Objective 3: Applying RS and GIS in Urban Geography

At the technological level, in order to assess the probability of using remote sensing and Geographic Information Systems (GIS) in the field of urban geography, this study has demonstrated the usefulness of applying remotely sensed images and Arc GIS in various domains. An integrated geo-spatial technology, i.e. Remote Sensing (RS) and Geo-

graphic Information System, contributed substantially for assessing, understanding and mapping the housing patterns within Cairo Governorate.

By utilizing medium resolution ETM+ image 2006, the different built-up areas of Cairo Governorate in 2006 were characterized. High spatial resolution IKONOS Image was used to assist image analysis. By using Arc GIS tools for creating linkage between the layer of the built-up area derived from the classified image and the digital layer of the administrative boundaries of the shiakhat of Cairo Governorate, the size of the area and the proportion of the built-up area were calculated for each shiakha. The two linked layers were integrated with the 2006 census data to calculate the population density for the built-up area (see Fig. 20 and Fig. 21).

Moreover, high resolution Google Earth satellite image 2010 was used to detect the street layout of the analyzed areas (see Fig. 43).

The software package Arc GIS demonstrated a supportive technique for assessing variations and mapping socio-economic indicators on one hand and producing classes depending on the Socio-Economic Opportunity Index on the other hand.

The mean center tool was used in Section 2.3.5 to calculate the weighted population center to examine the spatial population changes in relation to the centre of the city.

Moreover, in chapter 3.3, Arc GIS proximity analysis tools were applied in assessing the accessibility to different public service points where a multi ring buffer was created to determine the service areas for specified distances around the service points in the areas under study.

4.1.4 Addressing Objective 4: Exploring Population Density in Cairo Governorate

In order to explore the patterns of population density as an outcome of the existing housing problem in Cairo Governorate, a census dataset on the population size on the level of the shiakhat, the smallest administrative subdivisions, was obtained for the years 1996 and 2006, established in Arc GIS, and computed to develop a measurement for the raw population density. In addition, the measurement of the population density of the built-up area was developed by linking census data to the layer of the built-up area by the year 2006. The results were consistent with the former finding described in chapter 4.1.2

which detected an intra-urban migration within Cairo Governorate from the center to the periphery.

Comparing the population density during the last inter-census period identified three types of areas with reference to the ratio of change of population density (see Fig. 16):

- Areas of declining density represented by a ratio below 1 and located around the historic core and the aging central business district.
- Relatively stable areas with a rate of change between 1 and 2 which are located around the depopulating core of the city.
- Shiakhat in which the density more than doubled, indicated by a rate of change above 2; these areas are concentrated in the peripheral parts of Cairo Governorate.

The results have been manifested by examining the population density in selected informal areas where hyper population density can be observed (see Fig. 19) and by the shifting of the weighted population center during the last inter-census period.

The results for the analysis of the changing population density of the built-up area do not entirely support the established hypothesis in chapter 2.3 that this type of density gives much deeper insight into the city's growth than the raw population density. This can be explained by the fact that the vertical growth of the residential area has not been included in the analysis. Otherwise, the results underline the role of the socio-economic indicators as a driving force of change of housing demand.

4.1.5 Addressing Objective 5: Investigating Socio-economic Characteristics and Developing SEOI for the Population of Cairo Governorate

With the objective to give an overview about the socio-economic characteristics of the population of Cairo Governorate and to develop an index which allows the ranking of the population according to their socio-economic status, the research has been able to contribute to the understanding of housing patterns within the context of their associated socio-economic characteristics. A thorough analysis of the socio-economic characteristics of the inhabitants of Cairo Governorate demonstrates how closely the actual development of housing patterns is related to the socio-economic characteristics of the residents of the specific areas.

Despite the fact that the classification of the population according to the level of deprivation has been applied in a variety of socio-economic studies, none of them was relevant to explain the existing housing patterns.

The starting point for calculating the Socio-Economic Opportunity Index (SEOI) was the exploration of the available datasets from the Cairo Human Development Report 2006 and the Population Census of the same year to determine the domains which are relevant for the socio-economic characteristics and the development of the index components. Based on the data analysis, eleven socio-economic components were analyzed and assessed (see Fig. 23). As a result, five components were excluded while six components were retained as the index components. A weighting method was developed to reflect the importance of the components in terms of their contribution to measuring socio-economic deprivation. The weights for the six index components were established and the components were integrated into one index. A map of the Socio-Economic Opportunity Index for the geographical subdivisions of Cairo Governorate was created to present the SEOI values for all the shiakhat (see Fig. 36).

The results explored four levels of socio-economic deprivation in Cairo Governorate. It was recognized that the spatial variation of the level of socio-economic deprivation reflects the nature of the dominating housing pattern in each shiakha of Cairo Governorate. The squatter settlements on originally state owned land were included in the first category, namely, “severely deprived areas”. Informal settlements on agricultural land are to be found in the category of “medium deprived areas”. Deteriorated old parts of Central Cairo fell into the category of “deprived areas”, while formal or planned areas were classified as “less deprived areas”.

These results are consistent with the finding in section 4.1.4 and support the role of socio-economic characteristics as a driving force of the change of housing demand and accordingly, the spatial variation of the dominating housing patterns in Cairo Governorate.

4.1.6 Addressing Objective 6 and 7: Analyzing the Urban Landscape and Assessing Public Services Provision and Accessibility

At a more detailed scale, four shiakhat have been analyzed in an attempt to fulfill the final research objectives of this study which are to study the urban landscape of the existing housing patterns in Cairo Governorate with reference to the land use structure, the

building characteristics and the street layout as well as to highlight changes and gaps in the public services provision and accessibility.

The selected areas are El-Marg el-Qibliya, El-Ma'desa, Ain el-Sira and El-Nozha. These shiakhat were chosen because they represent the main housing patterns in Cairo Governorate. Moreover, it was considered to select areas which reveal a great variation in terms of the Socio-Economic Opportunity Index as follows:

- El-Ma'desa represents illegal squatter settlements on state owned land which are "severely deprived" of socio-economic opportunities.
- Ain el-Sira is typical for deteriorated public housing settlements which are characterized as "deprived" areas.
- El-Marg el-Qibliya represents semi-legal informal settlements on agricultural land classified as "medium deprived" areas.
- El-Nozha belongs to the group of formal settlements classified as "less deprived" areas.

Having selected the areas to be analyzed in detail, spatially and statistically relevant datasets of the four shiakhat were obtained and established in Arc GIS. The quantitative analysis was applied mainly to study the urban landscape in terms of its urban growth as well as its structural and functional composition, while accessibility to public services was measured by placing a multiple ring buffer around the location of each infrastructural service institution to identify three levels of accessibility. The main findings of analyzing the four areas are summarized in Table 37.

4.2 Limitations of the Study

During the course of this survey, some limitations of the study in general and the methods applied here became visible. These limitations do not undermine the validity of the main findings, but they suggest ways in which further research might be directed.

The limiting factors are related to several different issues. The first aspect is related to the previous publications about Cairo, most of which are dealing with the whole Metropolitan Area of Greater Cairo rather than the Cairo Governorate only.

The second factor refers to the lack of sufficient data on socio-economic characteristics and the unreliability of data on mortality and the rate of overcrowding. Therefore, only six indicators could be used to develop the Socio-Economic Opportunity Index (see chapter 2.4).

Table 37: Summary of the main findings in the analyzed areas

Area / Issue	El-Ma'desa	El-Marg el-Qibliya	Ain el-Sira	El-Nozha
Growth of built-up area 1993/2006	Informal land subdivision and housing development triggered by the informal land market.	Encroachment on the limited agricultural pockets between the buildings. Residential densification was affected by vehicular accessibility.	Informal land development as triggered by residential intensification of the open spaces within the public housing project.	Planned urban growth in a formal settlement of the first half of the 20th century. Vast gardens were consumed by urban growth.
Street network	Irregular type contains many narrow, winding and sloping alleys. Streets are of poor conditions. Bad internal street connectivity and high housing density.	Grid type resulted from the underlying agricultural field patterns. Streets are of poor quality. Lower internal street connectivity and medium housing density.	Grid type as a governmental housing project. Only major streets are of good quality. Lower internal street connectivity and medium housing density.	A western radial street layout with rigid grid pattern. Streets are of good quality. Better internal street connectivity and low housing density.
Types of residential buildings	Houses and apartment buildings are dominating			Apartment buildings are dominating.
Housing tenure	Rental units under the New Rental Law and ownership are dominating.		Purchased flats and rental units under the New Rental Law are dominating	Rental units under the New Rental Law and purchased flats are dominating.
Land use	Dysfunctional settlement structure; homogeneous land use, mostly residential. Retail and workshops on the ground floor.	Dysfunctional settlement structure and homogeneous land use, mostly residential with haphazard commercial land use on the ground floor.	Incompatible land use mix triggered by intensive industrial activity.	Compatible mixed land use, except for intensive commercial land use along the major roads.
Provision and accessibility of public services	Under-served area in relation to public services. Poor accessibility to public services except for religious and commercial services.	Inadequate public services. Community efforts compensate for such deficiency in terms of private educational, medical, religious and commercial services.	Barring the tanneries area, this shiakha enjoys a higher level of public service provision due to its planned nature and its proximity to the city center.	As a planned-well off area, it was developed with ample public and private service provision and good accessibility.

Source: Designed by the author.

Another limitation is due to missing data on the level of shiakhat concerning the attributes of building characteristics such as the height and age of the residential buildings. Some of this information was collected, computed and published on the 2006 Census,

but it is only available on the aggregated level of the district. So, it cannot be applied to the disaggregated level of the analyzed shiakhat.
The fourth limitation is the mixed house patterns in the same administrative unit such as Ain el-Sira. This shiakha contains two different housing patterns, namely, the public housing together with an informal manufacturing area where tanneries are concentrated. This limitation provided a challenge to identify or develop a clear-cut distinction of housing patterns and imposed the generalization of the results.

4.3 Recommendations for Further Research

This work provides a grounding base for further investigations towards addressing the different housing patterns, not only in Egypt, but also in many developing countries which are suffering from the problem of the rapid expansion of unplanned settlements.

Based on studying the transition of housing policy in Egypt as a whole and in Cairo in particular, different forms of settlements have emerged that require redefinition of the housing patterns based on socio-economic variables, population density, structural and functional composition as well as the provision and accessibility of public services.

This observation points to the need of rethinking and developing new concepts which are consistent with the on-going dynamics of settlement development and resulting forms instead of the conventional concepts which have been frequently depicted as formal or informal settlements.

The vast uncontrolled expansion of new settlements after the Revolution of January 2011, both on agricultural and state owned land, represents a field of study on which substantial research efforts should be made in the light of recent political events and new types of developers of illegally constructed residential buildings.

One direction to extend this dissertation is to understand the newly emerging housing patterns such as gated communities, which spread out on the peripheries of Greater Cairo Region, in the context of the combination of the criteria used in this research and to compare such pattern to the existing housing patterns.

Based on the empirical investigations of selected residential areas, it was concluded that a variety of problems are associated with informal, ex-formal and semi-informal housing such as inadequate and lack of access to public services, legal property titles and illegal construction without a permit, which does not comply with the building regulations. Ac-

cordingly, there is a need to develop a system which focuses on installing or improving the cooperation between public administration, private sector, civil society, communities and researchers. This system should focus on rehabilitation rather than eviction or demolition. Such a system should advance research, expand and share knowledge on the subject, and finally focus on multidisciplinary approaches.

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APPENDIX

Table 38: The geographical units mentioned in the thesis and their administrative setting

Geographical area	Administrative setting
10th of Ramadan City	Sharkiya Governorate
15th of May City	Helwan Governorate
6th of October	6th of October Governorate
Abbasya	El-Waily District (Cairo Governorate)
Abu Zaabal	Qaliubiya Governorate
Ain el-Sira	Misr el-Kadema District (Cairo Governorate)
Arab el-Mohamady	El-Waily District (Cairo Governorate)
Arab el-Yasar	El-Khalifa District (Cairo Governorate)
Athr el-Nabi	Misr el-Kadema District (Cairo Governorate)
Attaba	El-Moski District (Cairo Governorate)
Bab el-Louk	Abdeen District (Cairo Governorate)
Bab el-Wazeer	El-Darb el-Ahmar District (Cairo Governorate)
Badr City	Helwan Governorate
Boulaq el-Dakrour	Giza Governorate
Dayer el-Nahya	El-Sahel District (Cairo Governorate)
Doweka	Manshiet Nasser District (Cairo Governorate)
El-Abagiyya	El-Khalifa District (Cairo Governorate)
El-Basateen el-Sharqiyya	El-Basateen wa Dar el-Salam District (Cairo Governorate)
El-Berekdar	El-Gamaleya District (Cairo Governorate)
El-Daarasa	El-Gamaleya District (Cairo Governorate)
El-Dayura	Misr el-Kadema District (Cairo Governorate)
El-Emam el-Shaf'ey	El-Khalifa District (Cairo Governorate)
El-Hay 6	Gharb Madinet Nasr District (Cairo Governorate)
El-Hay 7	Gharb Madinet Nasr District (Cairo Governorate)
El-Hay el-Asher	Shark Madinet Nasr District (Cairo Governorate)
El-Khawas	El-Gamaleya District (Cairo Governorate)
El-Ma'desa	Manshiet Nasser District (Cairo Governorate)
El-Mahager	Manshiet Nasser District (Cairo Governorate)
El-Mantiqa 9	Shark Madinet Nasr District (Cairo Governorate)
El-Marg el-Baharia	El-Marg District (Cairo Governorate)

El-Matarya el-Gharbiya	El-Matarya District (Cairo Governorate)
El-Matarya el-Qibliya	El-Matarya District (Cairo Governorate)
El-Mugawrin	Manshiet Nasser District (Cairo Governorate)
El-Nady el-Ahly	Shark Madinet Nasr District (Cairo Governorate)
El-Nahda	El-Salam District (Cairo Governorate)
El-Nozha	El-Nozha District (Cairo Governorate)
El-Sabtiyah	Boulak District (Cairo Governorate)
El-Sayeda Isha	El-Khalifa District (Cairo Governorate)
El-Wafaa' wa el-Amal	Shark Madinet Nasr District (Cairo Governorate)
Embaba	Giza Governorate
Engineers City	Giza Governorate
Eshash el-Torgoman	Boulak District (Cairo Governorate)
Ezbet Abo Hashish	Hadayek el-Kobba District (Cairo Governorate)
Ezbet Abo Karn	Misr el-Kadema District (Cairo Governorate)
Ezbet Bekhit	Manshiet Nasser District (Cairo Governorate)
Ezbet el-Arab	Gharb Madinet Nasr District (Cairo Governorate)
Ezbet el-Haganna	Shark Madinet Nasr District (Cairo Governorate)
Ezbet el-Nakhl	El-Marg District (Cairo Governorate)
Ezbet Fahmi	Dar el-Salam wa el-Basateen District (Cairo Governorate)
Ezbet Gebriel	Dar el-Salam wa el-Basateen District (Cairo Governorate)
Ezbet Wahba	El-Sahel District (Cairo Governorate)
Garden City	Kasr el-Nil District (Cairo Governorate)
Hadayek Zeinhom	El-Sayeda Zeinab District (Cairo Governorate)
Heliopolis	Misr El-Gadida District (Cairo Governorate)
Helwan	Helwan Governorate
Kafr Abo Sier	El-Marg District (Cairo Governorate)
Kafr el-Basha	El-Marg District (Cairo Governorate)
Kafr el-Shorafa	El-Marg District (Cairo Governorate)
Kasr el-Dobara	Kasr el-Nil District (Cairo Governorate)
Khan el-Khaili	El-Gamaleya District (Cairo Governorate)
Kum Ghurab	Misr el-Kadema District (Cairo Governorate)
Maadi	Helwan Governorate
Manial	Giza Governorate

Masakin Iwaa Ain Shams	Ain Shams District (Cairo Governorate)
Mokattam	El-Khalifa District (Cairo Governorate)
Nady el-Sekka el-Hadid	Gharb Madinet Nasr District (Cairo Governorate)
Nasr City	Madinet Nasr District (Cairo Governorate)
New Ameria	El-Zeitoun District (Cairo Governorate)
Omrania	Giza Governorate
Rab'ah el-Adowiya	Shark Madinet Nasr District (Cairo Governorate)
Sadat	Menofiya Governorate
Sharks	Boulak District (Cairo Governorate)
Sheikh Zayed City	Giza Governorate
Sheraton el-Matar	El-Nozha District (Cairo Governorate)
Shubra el-Khaima	Qaliubiya Governorate
The 1000 houses area	Misr el-Gadida District (Cairo Governorate)
Waraq el-Hadar	Giza Governorate
Zamalek	El-Zamalek District (Cairo Governorate)